

# The effect of VET completion on the wages of young people

MELBOURNE INSTITUTE OF APPLIED  
ECONOMIC AND SOCIAL RESEARCH

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# About the research



## *The effect of VET completion on the wages of young people*

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As part of the drive to lift Australia's productivity, there has been a push for an increase in the number of course completions in both the vocational education and training (VET) and higher education sectors. While it is generally assumed that completing a course is the desired outcome, it is also expected that individuals will acquire skills even if they do not complete the course.

Using the 1995 and 1998 cohorts of the Longitudinal Surveys of Australian Youth (LSAY), this study looked at both the effects of participation in and completion of post-secondary educational qualifications on wages.

## Key messages

- ✧ Participation in tertiary education brings wage advantages for young people, even if the course is not completed. This presumably reflects the skills acquired, although it could also reflect the personal characteristics that have led to participation in the first place.
- ✧ As expected, completion of a qualification in general brings a further wage advantage.
- ✧ On average, the largest wage benefits come from participating and then completing a bachelor's degree.

One of the difficulties of this type of study is that the relatively small sample sizes impact on the statistical significance of some of the results. They also limit the degree to which the variation in outcomes can be captured. This particularly affects the analysis of vocational qualifications because of the very large variation in wage outcomes; for example, courses such as electrotechnology lead to relatively high wages, which are not shared by courses such as those in the food trades. We need to keep in mind that some individuals will fare much better than the average, while others do less well.

Tom Karmel  
Managing Director, NCVER



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# Executive summary

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This project examines the effects of vocational education and training (VET) and higher education qualifications on the wages of young people in the three years following their last education spell. The main contribution of this research is that it clearly distinguishes the participation and completion effects (albeit with a particular focus on the latter), while most previous studies have looked exclusively at course completion. The use of the 1995 and 1998 cohorts of the Longitudinal Surveys of Australian Youth (LSAY) data allows us to distinguish completed and uncompleted courses. Focusing on whether or not there are wage benefits associated with the completion of a vocational qualification versus partial completion is important, given the push for greater course completions.

Descriptive statistics reveal that, for some VET and university courses, completers experience higher wages than non-completers in the few years following the course. However, the differences in wages between completers and non-completers are not consistently significant or tend to disappear over time for VET students, whereas they remain positive and significant for university students.

The relative wage premiums associated with course completion are referred to as completion premiums. Completion premiums are calculated as the difference in hourly wages between completers and non-completers one, two and three years after their last education spell. Completion premiums for early school leavers are variable and imprecisely estimated due to small sample sizes. For Year 12 graduates, a completion premium of about 12% is statistically significant for apprenticeships and traineeships at certificate level I or II in the year following the course. The completion premium for one year after the course is close to 19% for university graduates, and remains statistically significant two and three years after obtaining the degree, with no sign of a reduction in the size of the premium over this period.

Multivariate analyses, consisting of estimating (Mincer type) wage equations one, two and three years after the last education spell, reveal a consistent picture. After controlling for a range of individual characteristics and for potential selection biases, only the completion premiums attached to university qualifications are consistently significant in the three years following the course, for both males and females. Moreover, the university completion premiums tend to increase over time, from about 10% for females and 7% for males after one year, to about 16% for females and 12% for males three years after.

By contrast, completion of a VET course generally has positive effects but these effects are imprecisely estimated. There are, however, a few exceptions:

- ✧ Wage penalties (that is, negative completion premiums) are found one year after completion of certificates level III or IV for female apprentices and trainees and for males not in an apprenticeship or traineeship. One reason why wage penalties could arise for those who complete such courses compared with those who don't relates to the fact that some may have left a course as a consequence of obtaining a relatively high-paying job (compared with jobs typically found by those who complete their course).
- ✧ Splitting the sample between those in the top and bottom 50% of test scores shows a completion premium, ranging from 7% to 9% for those in the top 50% who completed a certificate level I or II, a non-apprenticeship certificate level III or IV or a diploma. However,

none of these VET completion premiums remains statistically significant in the third year following the course.

Controlling for attrition only results in marginal changes to the findings from the multivariate analysis. In addition to the completion premiums for bachelor's degrees, a few additional VET completion premiums now appear to be significant at the 5 or 10% level. For males, those who complete diplomas are shown to have wages of about 7% and 9% higher than non-completers two and three years after the course. The enrolling premiums as well as the field of study effects remain even after attrition has been controlled for. Other effects regarding prior education level and schooling remain largely unchanged. These results suggest that the impact of participant attrition in LSAY is minimal, as data appear only weakly correlated to the unobserved determinants of wages.

Overall, the results reveal that completion of a VET course may have a positive effect on subsequent wages but these effects tend to be imprecisely estimated. By contrast, we find strong and convincing evidence that enrolling in a VET course increases subsequent wages. In other words, completion may not matter in terms of wages, with VET participants still enjoying higher wages than non-participants. However, we cannot exclude the possibility that our sample is simply too small to estimate completion effects precisely.

# Introduction

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This project examines the effects of vocational education and training (VET) and higher education qualifications on the wages of young people in the three years following their last education spell. The main contribution of this research is to clearly distinguish the participation and completion effects (albeit with a particular focus on the latter); research to date has tended to focus exclusively on completed courses. To the extent that partial completion may affect subsequent wages, the estimates of the private returns from education may not be accurate if, in the comparison group, non-completers are not clearly distinguished from non-participants.

In particular, the aim of this project is to estimate the relative wage premiums associated with course completion (as opposed to partial completion) for both VET and higher education students. Completion premiums are calculated as the difference in hourly wages between completers and non-completers one, two and three years after the last education spell. This research may be of interest to education providers to gauge how much effort should be devoted to ensuring high completion rates.

The project adopts an evidence-based approach and uses the 1995 and 1998 cohorts of the Longitudinal Surveys of Australian Youth (LSAY). The wage effects of course enrolment and completion are examined for all VET (including apprentices and trainees) and higher education students, controlling for a range of factors such as age, gender, previous education level, numeracy and literacy scores, as well as background characteristics such as parental occupation.<sup>1</sup> In particular, the project seeks to determine whether the effects of enrolment and completion on wages depend on the type of post-school education. The methodology is based on Mincer-type wage equations, estimated one, two and three years after the last education spell in order to assess the persistence of the wage effects. Two alternative approaches are devised to account for two potential sources of selection bias. First, we follow the approach suggested by Heckman (1976) to account for the fact that wages are only observed for young people who are working. Second, we use an inverse probability weighted estimator to deal with the potential selection bias due to attrition in LSAY data.

The report is organised as follows. In the next section we discuss the existing Australian literature related to completion premiums and returns from education; this is followed by a description of the data. The remainder of the report sets out the economic modelling approaches and details the factors that are incorporated in the wage equations. After the results from the economic modelling exercise have been discussed, some concluding remarks and observations about the policy implications of our findings are made.

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<sup>1</sup> This project can be seen as an extension to another NCVER project, *Outcomes from combining work and tertiary study* by Cain Polidano and Rezida Zakirova, which explores the factors influencing completion probabilities and the effect of non-completion on subsequent employment outcomes (but not on wages) for university and TAFE-based students.

# Results from previous studies

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This section discusses previous studies by distinguishing two themes in the literature.<sup>2</sup> First, the most relevant to this research, but also the least rich source, is the stream explicitly interested in course completion. Second, we examine the large body of literature more generally interested in the effects of education on wages, but where uncompleted courses are ignored.

The study by Curtis (2008) based on descriptive statistics from the Longitudinal Survey of Australian Youth 1995 (LSAY95) cohort found that the weekly earnings of females differed very little, whether programs were completed or not. Weekly earnings are even slightly lower for female apprenticeship completers than for non-completers. For traineeships, a small non-completion penalty is observed for both males and females. Comparing male completers and non-completers, Curtis reports that the weekly earnings penalty is the highest for apprenticeship non-completers, whereas no effect was found for non-apprenticeship VET.

Karmel and Nguyen (2007) consider the effects of completing VET on subsequent wages for trainees. Their analysis is restricted to those gaining full-time employment after training and a subgroup containing those in full-time employment before and after training. Based on the 2002 and 2003 Student Outcomes Surveys, the multivariate analysis shows that the wage effects depend on the type of course followed and also on the previous level of education. For those with a previous highest qualification of certificate IV and above, additional VET study has virtually no payoff. Females with a certificate III, unlike males, see benefit in their wages from further VET study only if they complete a certificate III or above. The strongest effects are found for those with lower education levels (certificate II or below). Both males and females in this group benefit from further study at certificate III or higher level, and there is an additional wage premium for those who complete the qualification. However, in the subgroup comprising those in full-time employment before and after training, the wage premium is observed only at certificate IV or higher level. The analysis only controls for education, age and gender.

Karmel and Mlotkowski (2010) examine the issue of completion from a different perspective. They are interested in the effect of wages on the probability of completing an apprenticeship or traineeship. The underlying assumption is that the higher the completion wage premium, the higher completion rates should be. Three sets of wages are estimated: the wages of apprentices and trainees in a training contract; the wages apprentices and trainees would expect to get in alternative employment; and the wages apprentices and trainees would expect to get on completion of the training contract. The study finds that ‘only for trade apprentices do expected wages on completion significantly exceed expected wages in alternative employment’ (Karmel & Mlotkowski 2010, p.11). In other words, only for trade apprentices is completion associated with a significant wage premium. The other main finding is that the differences between the training wage, the wage in alternative employment and the wage on completion have a limited effect on completion.

Another body of the literature examines the effects of education on wages, focusing only on completed qualifications and ignoring uncompleted courses. These studies are based on wage

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<sup>2</sup> The main findings of the studies surveyed in this section are summarised in table A1 in the appendix.

equations, also called Mincer equations, following the work by Mincer (1974). The aim is to estimate the average wage premium associated with a particular level of education. Although these studies do not allow comparisons between completers and non-completers, they should provide an upper bound of the completion wage premium since they compare completers with a reference group, which generally comprises those with no post-school education. The general finding in the Australian literature is that there is a wage premium associated with VET qualifications for early school leavers (that is, Year 12 non-completers), whereas the effect is less pronounced for those who completed Year 12.

Based on data from the 1981 and 1991 Australian censuses, Preston (1997) found a substantial wage premium of about 20–25% for VET male graduates when compared with those who did not complete Year 12. The premium dropped to about 10% when compared with those who completed Year 12. However, Budd and Madden (1999), using the 1990 Survey of Income and Housing Costs and Amenities, found lower wage premiums than Preston (1997). For males, the premiums were about 8.5% and 4% for VET graduates when compared with school non-completers and school completers, respectively.

Using the 1993 ABS Survey of Training and Education and a different comparison group, Miller and Mulvey (1996) estimated the wage premium to be about 7.5% for males and 13% for females when comparing those with a trade qualification with those who left school before age 15. The study distinguishes trade qualifications and post-secondary certificates (without further explanations). The corresponding premium associated with a post-secondary certificate is about 10% for males but is not statistically different from zero for females.

Borland et al. (2000), using the 1997 Survey of Education and Training Experience (1997 SET), estimate a wage equation for male weekly earnings for those aged 18 to 59 years. Although the authors did not report the effects of VET qualifications (the main focus was on university degrees), Ryan (2002a) computed these effects, based on their estimates. Borland et al. (2000) distinguish those with a certificate or a diploma and those with a trade qualification. Those with a certificate or a diploma earn about 13% more than school completers. Those with a trade qualification earn about 14% more than school non-completers, but there is no significant difference with school completers.

Based on data from the 1993 Survey of Training and Education and the 1997 Survey of Education and Training Experience, Ryan (2002b) compares vocational qualification graduates with individuals who did not complete Year 12 and who did not undertake any post-school qualifications. The study finds that (among those working full-time) VET qualifications have a positive effect on wages. Associate diploma graduates are paid about 10% more than Year 12 completers and basic and skilled vocational qualification graduates about 10% more than school leavers, with the effects being slightly higher for males and a bit below 10% for females. However, these effects disappear over time (that is, wages converge with age) as wage progression is slower for VET graduates than for other individuals. Other studies, by Lamb, Long and Malley (1998) and Long, McKenzie and Sturman (1996), also find a small positive effect of VET qualifications on wages for males, but no significant effect for females.

However, these studies do not encompass the last decade, where there may well have been structural changes to the returns from education compared with previous decades. The earnings estimates computed by Coelli and Wilkins (2009) over the period 1981–82 to 2003–04 suggest that the premium associated with VET qualifications (compared with no post-school qualification) remained fairly stable for males but fell for females. Based on Australian Bureau of Statistics (ABS) Income Surveys, the premium remained stable at about 13% for males and dropped from 21% to 8% for females between 1994 and 2001. However, based on census data the same premium dropped from about 15% in 1981 for both males and females to about 10% for males and less than 10% for females in 2001. Lee and Coelli (2010) indicate this is in line with earlier work by Borland (1999), Gregory (1995), Karmel (1994) and others who found that earnings gaps associated with educational attainment for both males and females had fallen over the period from 1968–69 to 1981–82.

Leigh (2007) presents another recent study examining the returns from education in Australia. Using data from the 2001–05 waves of the Household Income and Labour Dynamics in Australia (HILDA) survey, Leigh found substantial wage premiums for VET qualifications above certificate I or II. The estimates are based on hourly wages but the effects on annual earnings are also examined to capture the participation effects on the intensive margin. Although the wage premium associated with a certificate III or IV is not significant for school completers, it is estimated to have a significant effect on early school leavers. For them, the premium is between 9% on hourly wages and 19% on annual earnings. Diplomas or advanced diplomas are associated with a 6% wage premium for both early school leavers and school completers.

Overall, the Australian studies support the idea that VET qualifications have a positive effect on wages, at least for males, but they also suggest that the effects are limited and depend crucially on the choice of the comparison group. Most studies compare VET graduates with Year 12 graduates and/or school dropouts, while no distinction is made between completers and partial completers. This approach may not capture accurately the effect of VET qualifications. In particular, since VET graduates themselves are either school completers or non-completers, it seems appropriate to follow Leigh (2007) and to consider school completers and non-completers as two separate groups and to examine the effects of VET qualifications on wages within each group. Unlike the studies mentioned above, the focus of this report is not on estimating the average wage effects associated with VET qualifications but rather on establishing whether or not there is a significant wage premium associated with VET enrolment compared with non-participation and with VET completion compared with partial completion.

# Data and descriptive statistics

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## Data

The data for this study consist of the 1995 and 1998 cohorts of the Longitudinal Surveys of Australian Youth data (LSAY95 and LSAY98).<sup>3</sup> Both cohorts are nationally representative samples of about 14 000 students who were in Year 9 in 1995 and 1998, respectively. The data were collected using stratification, with the major stratum the state of schooling in 1995 (1998). The selection of students within states was proportional to the size of the school sector, with students from small states oversampled and students from large states undersampled. Three school sectors (government, Catholic and independent schools) were used as strata.

The respondents were surveyed annually from about 14 to 25 or 26 years of age, depending on the cohort.<sup>4</sup> Following the collection of written information in the first year for each cohort, students were contacted annually by telephone and asked a range of questions across the following sections: school; transition from school; post-school study; work; job history; job search activity; not in the labour force; living arrangements, finance and health; and general attitudes. The focus of the questionnaires changes as the cohort ages, with a greater emphasis on employment and post-school education in the later years of the survey.

There are three sets of weights provided in the LSAY data. Sample weights reflect the original sample design and ensure that the sample matches the population from which the sample was drawn. The distribution of stratum levels (state and school sector) matches that of the original population. The second set contains attrition weights. These account for most of the non-random respondent attrition and are based on overall achievement quartiles and gender. The final set of LSAY weights for each wave combines sampling and attrition weights.

Winship and Radbill (1994) argue that sampling weights must generally be used to derive unbiased estimates of univariate population characteristics, but the decision about their use in regression analysis is much more complicated and controversial. They argue that, if sampling weights are purely a function of the independent variables included in the model, unweighted OLS (ordinary least squares) estimates are preferred. We do use the combined weights for descriptive tables 1 to 3, but do not use weights in the multivariate analysis.<sup>5</sup>

An issue worth mentioning regarding information on course completion in the LSAY data is that the first few waves of each cohort are not directly usable. This is because, prior to 2001 (that is, wave 7) in LSAY95 and prior to 2002 (that is, wave 5) in LSAY98, there is not sufficient information (if any) on non-completed courses. To circumvent this problem, we use the retrospective questions asked in 2001 in LSAY95 and in 2002 in LSAY98 about previous education spells (since leaving school) and their completion status. To the extent that the respondents can

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<sup>3</sup> 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.

<sup>4</sup> Most young people in Year 9 are 14 or 15 years of age.

<sup>5</sup> In our case the combined weights for sampling and attrition, at least in part, depend on several variables included as explanatory variables in our specification.



recall accurately previous education spells, it means that observations from waves prior to wave 7 in LSAY95 and prior to wave 5 in LSAY98 can be reintegrated into our sample (as long as the respondents participated in waves 7 and 5 for LSAY95 and LSAY98 respectively). 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.

In this study, the sample of analysis consists of young people who have left school, either before or after completing Year 12. Since the focus of this study is on wages, the main sample of analysis is restricted to young people in work (and not studying) one, two or three year(s) after their last education spell (and for whom valid wage information is available).<sup>6</sup> The last education spell is defined as the most recent education spell prior to work, which 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 work spell. Although repeated observations from the same individual account for about 10% of all observations one year after the last education spell, repeated observations are virtually non-existent for the samples based on observations two and three years after the last course. In other words, only about 10% of young people observed in LSAY interrupt their post-school studies to work for a year (or more) before pursuing further study and are still in LSAY when returning to work.<sup>7</sup>

The final sample covers the period from 1997 to 2008. Since nominal wages are not directly comparable across such an extended period of time, all wages are inflated to 2008 prices using the ABS consumer price index.<sup>8</sup>

Since this report examines education levels it is useful to briefly describe the various levels of post-school qualifications we distinguish, except for university degrees, which are internationally well known and used. Certificates I–IV provide practical skills with higher certification levels, signifying more advanced qualifications. Certificates I and II provide individual basic skills, upon which to build further. Certificates III and IV are more advanced and replaced the previous trade certificates. Further information about certificate level courses is provided in appendix B.

## Descriptive statistics

Table 1 presents employment rates one year after the last education spell (completed or not) for early school leavers and school completers separately. The table is broken down by the last education spell and provides the sample size and distribution.

As expected, the vast majority of early school leavers who enrolled in post-school education did so by enrolling in a VET program, and for more than half of them it was in an apprenticeship or traineeship program. For Year 12 graduates, 35% enrolled in a VET program, with a similar proportion enrolling in a university course.

Table 1 shows that the early school leavers who had not engaged in post-school education experience have the lowest employment rate, slightly below 70%, one year after leaving school. The other half of early school leavers, those who enrolled in post-school education, experienced higher employment rates (one year after finishing or interrupting post-school study). However, these employment rates are still well below those experienced by school completers. Overall, those who

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<sup>6</sup> However, those not in work are included in table 1 in order to present employment rates.

<sup>7</sup> The longer the interruption, the least likely they are to still be in LSAY when returning to work. Obviously, this should not be seen as the true proportion of students taking a gap year since young people are only followed up to 26 years of age and 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.

<sup>8</sup> The CPI increased by more than 38% between December 1997 and December 2008 (ABS series ID A2325846C).

have participated in apprenticeship and traineeship programs (which they may or may not have completed) have higher employment rates than those who engaged in other non-apprenticeship VET courses, one year after leaving the VET program.

**Table 1 Employment rates one year after last education spell (completed or not) by school-completion status (weighted)**

Last course started	Early school leavers			Year 12 graduates			All		
	Share (%)	Employment rate (%)	No. of obs	Share (%)	Employment rate (%)	No. of obs	Share (%)	Employment rate (%)	No. of obs
No post-school study	47.2	68.7	1 219	29.9	81.7	2 834	33.6	77.8	4 053
Certificate I/II	5.1	73.2	132	2.7	84.8	255	3.2	80.8	387
A/T: Certificate I/II	19.0	85.7	491	8.7	93.6	829	10.9	90.6	1 321
Certificate III/IV	9.1	79.4	234	7.4	86.4	700	7.7	84.7	934
A/T: Certificate III/IV	8.5	87.1	220	3.0	90.8	289	4.2	89.2	508
Certificate (level unknown)	2.7	78.6	69	1.4	90.1	137	1.7	86.3	206
A/T: Certificate (level unknown)	2.8	92.6	73	0.6	90.7	56	1.1	91.8	130
Diploma	3.8	89.9	97	11.1	90.3	1 049	9.5	90.3	1 146
Bachelor or higher	1.8	89.0	46	35.1	93.6	3 332	28.0	93.6	3 378
<b>Total</b>	<b>100.0</b>	<b>76.8</b>	<b>2 582</b>	<b>100.0</b>	<b>88.8</b>	<b>9 481</b>	<b>100.0</b>	<b>86.2</b>	<b>12 063</b>
<b>All VET</b>	<b>51.0</b>	<b>83.9</b>	<b>1 317</b>	<b>35.0</b>	<b>89.9</b>	<b>3 315</b>	<b>38.4</b>	<b>88.2</b>	<b>4 632</b>
<b>All VET A/T</b>	<b>30.4</b>	<b>86.7</b>	<b>785</b>	<b>12.4</b>	<b>92.8</b>	<b>1 174</b>	<b>16.2</b>	<b>90.3</b>	<b>1 959</b>

Notes: The table is based on a sample of non-students. The sample can contain multiple observations for the same individual. All numbers are weighted, including the number of observations. A/T = apprenticeship/traineeship.

Table 1 can also be generated to examine employment rates two and three years after the last education spell (see appendix tables C1 and C2). These tables show a substantial increase in employment rates between the first and second year for early school leavers, with the average employment rate increasing from 77% to 84%. The increase is smaller for school completers, with the employment rate reaching about 92% two years after the last education spell. Afterwards, employment rates for both groups seem to level off, with no significant changes between two and three years after the last education spell.

Table 1 indicates that the subsample of young people in work one year after their last education spell is not randomly selected in relation to educational attainment. Not surprisingly, those with the highest education levels tend to experience higher employment rates. Although not shown in table 1, additional investigation of the data indicates that those who completed the last course they began experience higher employment rates than those who did not.

We now turn to the main sample used for the multivariate analysis, which includes only young people for whom valid wage information is available. This means that those not in work (or those in work but with no wage information) are excluded (since the focus is on wages).

Based on this sample, table 2 presents the completion rates by last course begun for early school leavers and Year 12 graduates who were in work one year after their last education spell. The same tables for those in work two and three years after the last education spell are presented in appendix tables C3 and C4, respectively.

**Table 2 Completion rates by last education spell and school-completion status for non-students working one year after the last education spell (weighted)**

Last course started	Early school leavers			Year 12 graduates			All		
	Share (%)	Completion rate (%)	No. of obs	Share (%)	Completion rate (%)	No. of obs	Share (%)	Completion rate (%)	No. of obs
No post-school study	42.5	-	699	27.2	-	1992	30.0	-	2691
Certificate I/II	4.6	66.9	76	2.7	69.0	197	3.0	68.4	273
A/T: Certificate I/II	20.9	61.4	344	9.5	74.8	696	11.6	70.4	1041
Certificate III/IV	9.3	62.6	154	7.1	72.8	521	7.5	70.5	675
A/T: Certificate III/IV	9.5	73.8	156	3.0	81.9	223	4.2	78.6	379
Certificate (level unknown)	2.5	54.1	42	1.3	71.6	96	1.5	66.3	137
A/T: Certificate (level unknown)	4.0	71.2	65	0.6	65.9	43	1.2	69.1	108
Diploma	4.5	54.3	75	11.1	63.6	811	9.9	62.8	886
Bachelor or higher	2.2	52.0	35	37.6	76.7	2756	31.1	76.4	2792
<b>Total</b>	<b>100</b>	<b>63.5</b>	<b>1646</b>	<b>100</b>	<b>73.8</b>	<b>7335</b>	<b>100</b>	<b>72.3</b>	<b>8981</b>
<b>All VET</b>	<b>55.4</b>	<b>64.0</b>	<b>911</b>	<b>35.3</b>	<b>70.8</b>	<b>2587</b>	<b>39.0</b>	<b>69.0</b>	<b>3499</b>
<b>All VET A/T</b>	<b>34.4</b>	<b>66.0</b>	<b>565</b>	<b>13.1</b>	<b>76.1</b>	<b>963</b>	<b>17.0</b>	<b>72.3</b>	<b>1528</b>

Notes: The table is based on a sample of non-students in work one year after the last education spell and for whom valid wage information is available. The sample can contain multiple observations for the same individual. All numbers are weighted, including the number of observations.

Overall, completion rates are higher for university degrees, at nearly 77%, than for VET programs (about 70%). However, the latter average masks the fact that completion rates are higher for apprenticeship VET programs than for other VET programs.<sup>9</sup>

Table 2 also reveals that completion rates are higher among Year 12 graduates than among early school leavers. Although completion rates differ only a little between apprenticeship and non-apprenticeship VET programs for early school leavers, they are substantially higher for apprenticeship VET programs among school completers.

The highest completion rates are observed for apprenticeship certificate III or IV, at nearly 79% overall. Completion rates are also particularly high (76% overall) for university degrees (except among early school leavers but this is a very small subgroup).

Comparing table 2 with appendix tables C3 and C4 reveals a large decline in sample size over time, with the sample almost halving between one year and three years after the last education spell. Partly this is due to attrition but also to the fact that LSAY tracks young people only up to 25–26 years of age. Appendix tables C3 and C4 do not reveal any major changes in the structure of the sample in terms of education levels, if only for an increase in the share of those who did not undertake any post-school studies. One could have expected the opposite result, with attrition being more important for the least-educated but this is compensated, to some extent, by the fact that those with higher education levels tend to enter the labour market at an older age and are thus

<sup>9</sup> This is in line with Curtis (2008), who also finds lower completion rates for non-apprenticeship than for apprenticeship VET programs. In terms of levels, Curtis (2008) reports higher completion rates than those found in table 2. However, the sample used by Curtis (2008) is different from the sample used here since Curtis (2008) only considers completion status by 2004 of courses commenced by 2001 by LSAY 95 respondents, regardless of the employment status. Completion rates in table 2 are closer to the estimates derived from administrative data by Ball and John (2005, p.10).

less likely to still be in LSAY three years after their last education spell.<sup>10</sup> In addition, the samples only contain those who are working and the previous table shows that employment rates tend to be lower among the least-educated. Hence, there seems to be no need for concern about losing disproportionately more low-educated young people between one year and three years after the last education spell.

Based on the same sample as table 2, table 3 presents completion wage premiums by last education spell and by school completion status. The premiums are calculated one, two and three years after the last education spell. Table 3 is based on the average hourly wage rates and standard errors presented in appendix tables D1 to D3.<sup>11</sup> The completion premium is computed as the difference in hourly wages between completers and non-completers. The significance of the wage differentials is assessed, based on the associated standard errors.<sup>12</sup> The following discussion ignores the results for unknown certificates since wage premiums are highly volatile for this small subgroup.

**Table 3 Completion premiums (based on hourly wage rates) by last education spell and school completion status (in %, weighted)**

Years since finishing last course <i>Last course started</i>	Early school leavers			Year 12 graduates		
	1 year	2 years	3 years	1 year	2 years	3 years
Certificate I/II	-13.0	0.1	20.5	-1.8	-1.9	5.7
A/T: Certificate I/II	16.7**	10.2	30.9***	11.9***	8.2	1.3
Certificate III/IV	-3.2	8.6	1.8	0.1	-1.4	-1.5
A/T: Certificate III/IV	-13.4	12.4	3.5	-4.8	-5.8	6.1
Certificate (level unknown)	26.3	14.0	22.3	4.0	10.1	-3.6
A/T: Certificate (level unknown)	29.1	-1.7	90.3**	52.4***	20.5	42.3
Diploma	14.6	0.2	5.9	0.4	-0.5	2.7
Bachelor or higher	-3.0	26.8*	10.1	18.9***	17.7***	18.4***

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

For early school leavers, table 3 shows both negative and positive completion premiums, but many of them are imprecisely estimated, which is likely to be due to the small size of this group. Positive completion premiums ranging from 10.2% to 30.9% are observed for early school leavers undertaking a certificate I or II as apprentice or trainee.

For Year 12 graduates, sizable (and statistically significant) completion premiums are observed one year after apprenticeships or traineeships at certificate level I or II and for university degrees. Although the completion premium is close to 19% for university graduates, after one year it is only about 12% for apprentices and trainees who completed a certificate I or II. Moreover, only university graduates still experience a significant completion premium two and three years after obtaining their degree, with no sign of a decrease over this period (while it does decrease for apprentices and trainees who completed a certificate I or II).

Regarding wage levels, appendix tables D1 to D3 show that, on average, those who did not engage in post-school study tend to have the lowest wages, followed by those who enrolled in post-school

<sup>10</sup> Given that we do not distinguish between university degrees, this does mean that the proportion of PhDs and master's degrees (versus bachelor's degrees) is decreasing over time as we move from the sample containing those observed one year after the last course to the sample containing those observed three years after the last course.

<sup>11</sup> In addition, tables D1 to D3 present average wages for those who did not participate in post-school study.

<sup>12</sup> For instance, significance at the 5% level is determined by checking that the confidence intervals for wages of completers and non-completers, created by taking the point estimates plus or minus 1.96 times the reported standard error, do not overlap.

study and did not complete, and then those who enrolled and completed. As expected, average hourly wages tend to increase over time as young people establish themselves in the labour market and gain work experience.

The overall pattern is that, although completion premiums can be observed for some VET and university students in the few years following the last education spell, VET premiums are not consistently estimated with enough precision or tend to disappear over time (which is in line with the findings by Ryan 2002b), whereas university premiums remain positive and statistically significant.

## Specification

### Ordinary least squares and Heckman model

The sample of analysis described in the previous section consists of young people who have left school. A Heckman model based on a wage equation and a selection equation is estimated for both VET and higher education students. The well-established approach developed by Heckman (1976) is designed to address the incidental truncation of wages. That is, wages are only observed for the individuals who are working. This means that the wage equation is only estimated on a subset of the sample, which is problematic if working is systematically correlated with unobservable characteristics. Standard ordinary least squares (OLS) estimates would be biased in that case.

The specification of the wage equation is based on the work by Mincer (1974). The model is estimated separately 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. The natural logarithm of the gross hourly wage ( $w_{it}$ ) for each individual  $i$ , where  $t$  denotes the number of years since the last education spell, is expressed as a function of a set of observable characteristics,  $X_{it}$  (see the next section for a detailed list), as well as the last education spell (indicated by a vector of dummy variables,  $Edu_i$ ) and the associated completion status ( $Complete_i$ ):

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

where  $\varepsilon \sim N(0, \sigma)$

The effect of course completion on wages is estimated by interacting completion status with the type of course ( $Edu_i Complete_i$ ), whereas the coefficient  $\beta_e$  associated with  $Edu_i$  identifies the enrolling premium. 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.<sup>13</sup> For example, the coefficient associated with completion of a diploma indicates the size and significance level of the associated completion premium.<sup>14</sup>

We assume the following employment (or selection) equation:

$$Emp_{it}^* = a_e Edu_i + a_{ec} Edu_i Complete_i + a_x X_{it} + a_z Z_i + \mu_{it} \quad t = 1, 2, 3 \quad (2)$$

where  $\mu \sim N(0, 1)$  and  $corr(\mu, \varepsilon) = \rho$

The wage rate,  $w_{it}$ , is observed if  $Emp_{it}^*$  is positive.  $Z_i$  is a vector containing the instrumental variables, deemed to influence employment probabilities but not wages. If the error terms of equations (1) and (2) are correlated, that is, if  $\rho \neq 0$ , OLS estimates will be biased. However, the

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<sup>13</sup> Econometric studies in which uncompleted courses are ignored provide an estimate of  $\beta_{ec}$  while restricting  $\beta_e$  to be zero.

<sup>14</sup> In order to distinguish wage effects of course completion between non-apprenticeship and apprenticeship VET qualifications,  $Edu_i$  contains an additional dummy variable indicating apprenticeship or traineeship status for those who enrolled in a certificate level III or IV. The same distinction was not applied to certificates level I or II because of the smaller group size (see table 2).

Heckman approach provides consistent and asymptotically efficient estimates. The Heckman approach is implemented by following Greene (2003, p.782–7). The wage equation (1) and the selection equation (2) are estimated jointly by a maximum likelihood estimation.<sup>15</sup>

This vector,  $Z_i$ , contains 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.<sup>16</sup>

In addition, a third instrument is included in  $Z_i$  based on a question asked in wave 1 of LSAY about post-school plans. The variable is a dummy indicator of whether or not the respondent was planning to work straight after school, with the possibility of combining work and post-school study. This variable provides a proxy for the inclination to work and it is found to have an effect on employment probabilities, especially one year after the last education spell. The assumption is that the response to a question asked when a person was 14 or 15 years of age about future plans should not affect wage rates observed a few years later.

The model is estimated for the general sample and also separately for school completers and non-completers. In the general model, as well as in the model for school completers, completion dummies (and other relevant explanatory variables) are interacted with gender to estimate potential differences in wage effects by gender. The sample based on early school leavers is too small to allow such interactions. Sensitivity analyses are carried out to test whether completion premiums vary among young people in the top 50% and bottom 50% according to the sum of their numeracy and literacy test scores. The sensitivity analyses consist of estimating the model separately for these two groups. The aim is to test whether completion premiums and other wage effects differ between these two ability groups.

A well-known potential problem arises when educational choices, such as completion or enrolling decisions, are endogenous. That is, some unobserved factors (such as a person's innate ability) may affect wages and enrolling or completion decisions in a systematic way. For example, education attainment may depend on unobservable factors such as general ability levels. If this is the case, the estimated enrolling and completion premiums are likely to be biased upward (if unobserved factors are positively correlated). Previous studies have provided estimates of the potential bias in education returns due to such unobserved heterogeneity by using instrumental variable techniques or a sample of twins. Lee and Coelli (2010, p.5) reviewed the (small) Australian literature attempting to estimate this bias (see Leigh & Ryan, 2008, Miller, Mulvey & Martin, 1995, 2005, 2006) and concluded that 'the causal effect of schooling on earnings is a little lower than the estimates obtained using Ordinary Least Squares (OLS) and no endogeneity correction'. Leigh (2007) reduces his estimates by 10% to account for the ability bias. This current study follows Leigh (2007) and does not explicitly aim to control for the potential endogeneity of education. It is relatively straightforward to adjust the coefficient estimates according to any given estimation of the ability bias following a similar approach to Leigh. In addition, since this study is based on LSAY data,

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<sup>15</sup> This is preferred to the two-step approach since the later does not produce the correct standard errors if  $\rho \neq 0$ .

<sup>16</sup> 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, it is hard to see how this would lead to higher 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.

numeracy, literacy and tertiary entrance scores provide logical proxies for ability levels. Hence, should there be any bias, it is likely to be in the lower range of the estimates provided by Leigh.<sup>17</sup>

### Attrition and the inverse probability weighted (IPW) estimator

Sample attrition causes a potential concern, knowing that attrition is substantial and may not be random.<sup>18</sup> For instance, respondents are more likely to drop out of the survey if they are males, have low test scores or are migrants. As long as the factors explaining attrition are observable characteristics that can be explicitly controlled for in the wage equation, the estimates should not suffer from any bias. However, observed factors only partly explain attrition. 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.588–9, 2002b).<sup>19</sup> This approach has the double advantage of extending to nonlinear models and not requiring exclusion restrictions.<sup>20</sup> The IPW estimator is implemented in two steps. First, we estimate a probit model for appearing in the survey at time  $t$  based on all first-wave respondents, conditional on a set of observable characteristics ( $M_i$ ):

$$In_{it}^* = \gamma_m M_i + \eta_{it} \quad t = 1, 2, 3 \quad (3)$$

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

Individual  $i$  is observed at time  $t$  if  $In_{it}^*$  is positive.<sup>21</sup> 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 an ignorable non-response, conditional on  $M_i$ . Under this assumption, Wooldridge (2002b) shows that the inverse probability weighting produces a consistent  $\sqrt{n}$ -asymptotically normal estimator. In addition, Wooldridge (2002b) shows

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<sup>17</sup> Endogeneity tests carried out following the approach suggested by Wooldridge (2002a, p.118–19) only weakly support the view that completion decisions are endogenous in the wage equation. The null hypothesis, which is that completion is exogenous, cannot be rejected, with p-values 0.16 and 0.15, for the samples based on observations one and three years after the last education spell. However, for observations two years after the last education spell, the null hypothesis is rejected with p-value 0.02. The test suggested by Wooldridge (2002a) requires instruments. The instruments are based on questions asked in waves 1 and 2 about study plans after high school. The first instrument is whether or not the last education spell matches declared post-school study plans. The second instrument is whether or not there was a change in post-school study plans between waves 1 and 2. Both instruments are assumed to affect completion probabilities but to have no direct effect on wages. These two instruments are jointly significant, at least at the 5% level, in the probit model for completion with Chi-square values of 8.7 and 6.58 in the samples based on observations one and two years after the last education spell, respectively. For the sample based on observations three years after the last education spell, the instruments are not jointly significant, with a Chi-square value of 2.93. These tests are performed on the wage equation described above, in which the interaction terms (*Edu,Complete*) between the last education spell and completion are removed.

<sup>18</sup> In both LSAY95 and LSAY98, about two-thirds of the respondents have already dropped out of the survey by wave 10.

<sup>19</sup> Contoyannis, Jones and Rice (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)

<sup>20</sup> As explained by Contoyannis, Jones and Rice (2004), this approach requires ‘variables that predict attrition and that are correlated with the outcome of interest [ $(y_{it})$ ] 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 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 (see previous section).

<sup>21</sup> 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.



that a convenient feature of the sequential method described above is that ‘the (correct) asymptotic variance that adjusts for the first-stage estimation is actually smaller than the one that does not’. In other words, 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, Jones and Rice (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 1 for all respondents (and, possibly, be subject to minimal changes over time).  $M_i$  contains the literacy and numeracy test scores, the type of school, the socioeconomic 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 Heckman IPW model is estimated for the general sample and also separately for school completers.<sup>22</sup>

As it is possible to have multiple observations for the same individuals, the models described above are all subject to a clustering method in order to obtain robust standard errors.

## The explanatory variables

Explanatory variables ( $X_i$  above) to be included are:

### **Level of schooling obtained and type of school**

Highest level of schooling obtained:

Year 12 (that is, school completer)

Less than Year 12 (that is, school non-completer)

Distinction between Year 10 or less and Year 11 for the sample of early school leavers

School type:

Public schools, Catholic schools, and other independent schools

### **Most recent education spell started (completed or not), $Edu_{it}$**

Qualification level:

Certificate level I or II

Certificate level III or IV

Certificate level III or IV as apprentice or trainee

Certificate level unknown

Advanced and associate diplomas

Bachelor’s degree

### **Most recent education spell interacted with completion status, $Edu_iComplete_i$**

All of the above education dummies to be interacted with a completion dummy.

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<sup>22</sup> The approach was found to be problematic when applied to school non-completers, possibly due to the small sample size of this group. Hence, results for this group are not reported.

**Education level (prior to last education spell)**

No post-school education  
Certificate level I or II  
Certificate level III or IV  
Certificate level unknown  
Graduate diploma/graduate certificate  
University degree

**Field of study (in case of post-school education)**

Arts and humanities  
    Society and culture  
    Creative arts  
    Food, hospitality and personal services  
    Mixed field programs  
'Hard' sciences  
    Natural and physical sciences  
    Information technology  
    Engineering and related technologies  
    Architecture and building  
    Agriculture, environmental and related studies  
'Soft' sciences  
    Health  
    Education  
    Management and commerce  
Missing field<sup>23</sup>

**Ability<sup>24</sup>**

Math ability test scores  
    Scaled from 1 to 20  
Reading ability test scores  
    Scaled from 1 to 20  
Tertiary entrance scores (TER)  
    Scaled from 1 to 10  
Missing TER

**Parental background variables**

Socioeconomic status (five dummy variables based on father's occupation, or mother's occupation if the father's is missing).

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<sup>23</sup> This category is introduced to avoid dropping out the substantial number of observations with missing field of study.

<sup>24</sup> To avoid collinearity issues, TER scores are used if available, while maths and reading scores are only used if the TER score is missing. A dummy variable is created to indicate missing values in TER scores. Only if this dummy is one are maths and reading scores used (otherwise they are coded zero).

Upper SES

Managers and administrators

Upper-middle SES

Professionals

Lower-middle SES

Associate professionals

Tradespersons and related workers

Advanced clerical and service workers

Intermediate clerical, sales and service workers

Lower SES

Intermediate production and transport workers

Elementary clerical, sales and service workers

Labourers and related workers

Missing SES<sup>25</sup>

### **Personal characteristics**

Age dummies (19 and under, 20–21, 22–23, 24 and above)

Gender

Worked while at school: dummy variable indicating paid work while at school

Number of gaps in post-school education (a gap being defined as a non-studying period of at least a year in between two education spells)

Born in a mainly English speaking country or a non-English speaking country

Level of remoteness (metropolitan, regional, rural or remote area)

Indigenous status

### **Instruments used in the employment (or selection) equation**

In a couple relationship

Has any children

Was planning to work after leaving/finishing school (when asked in wave 1).

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<sup>25</sup> This dummy variable is introduced to avoid dropping out the substantial number of observations with missing parental SES.

# Results

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This section presents and discusses the estimates of the wage equations obtained using the two approaches described above. Enrolling and completion wage premiums obtained from the Heckman approach are presented in figures 1 and 2 for males and in figures 3 and 4 for females.<sup>26</sup> Tables 4 and 5 present the corresponding coefficient estimates for males and females respectively. Figures 5 to 7 present the completion wage premiums obtained by estimating the Heckman model separately for Year 12 graduates and early school leavers.<sup>27</sup> Likewise, figures 8 and 9 present the completion wage premiums from the Heckman model estimated separately for young people in the top 50% and bottom 50%, according to the sum of their numeracy and literacy test scores.<sup>28</sup> Tables 6 and 7 present the results of the Heckman IPW model for males and females respectively. The results of the Heckman IPW model estimated separately for male and female school completers and for school non-completers are presented in appendix tables E5 to E7.

To limit the size of the tables and to facilitate comparisons, only the coefficient estimates associated with education are reported, while the coefficients associated with the other explanatory variables listed in the previous section are omitted.<sup>29</sup>

Since most of the variables of interest are categorical variables, one category has to be omitted and chosen as the reference group. Regarding education level, the reference group is comprised of those without any post-school qualification and who did not complete Year 12 (or those who did not complete Year 11 for the sample based on early school leavers). The coefficients can be interpreted as the premiums attached to various post-school choices by comparison with no post-school education. Tables 4 to 7 (and appendix tables E1 to E7) present the estimated premiums attached to enrolling in post-school education by level of course. The coefficients on the interactions between completion and the level of course provide the estimates of the completion premiums presented in tables 4 to 7, appendix tables E1 to E7 and figures 1 to 9. The tables also report the effect of prior education level, which is the education level prior to enrolling in the last course, on wages.

The three sets of estimates in tables 4 and 5 present the results corresponding to the joint estimation of equations (1) and (2) (the Heckman model) based on wages one, two and three years after the last education spell.

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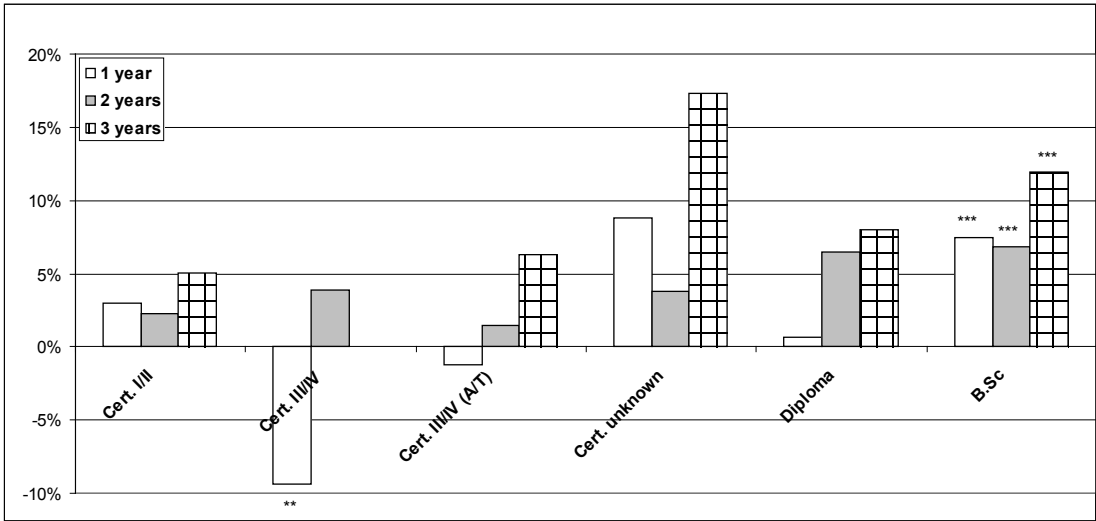
<sup>26</sup> Only one wage equation was estimated but interaction terms with gender provide different coefficient estimates for males and females.

<sup>27</sup> The corresponding coefficient estimates are provided in appendix tables E1 to E3.

<sup>28</sup> The corresponding coefficient estimates are presented in appendix tables E4a and E4b.

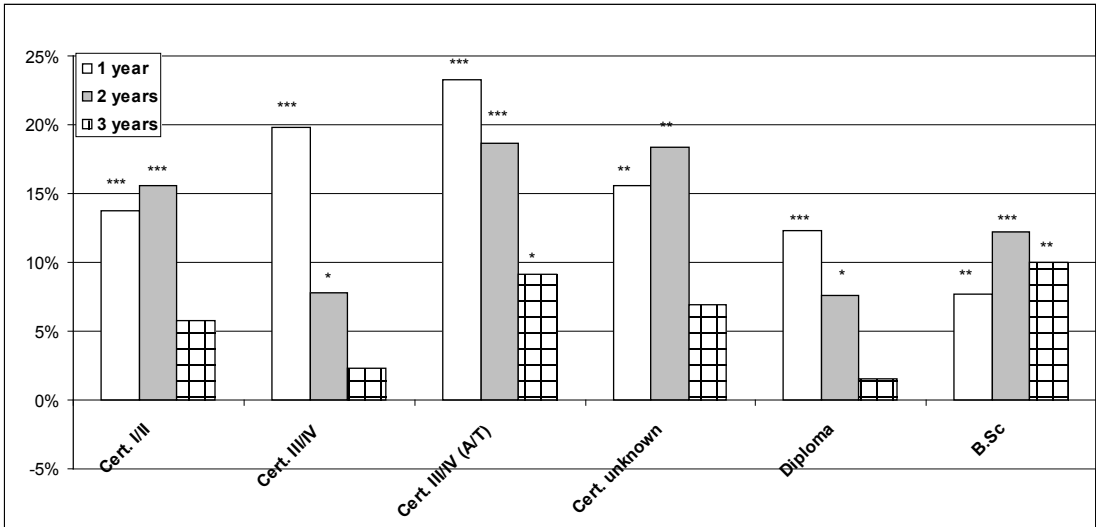
<sup>29</sup> To limit the number and size of the tables the coefficient estimates from the selection equation used in the Heckman model are not presented, albeit the results of the tests for the joint significance of the instruments used in the selection equation are reported at the bottom of the tables. These results are briefly discussed below.

**Figure 1** Estimated completion wage premiums one, two and three years after the course (males, Heckman model)



Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Figure 2** Estimated enrolling wage premiums one, two and three years after the course (males, Heckman model)

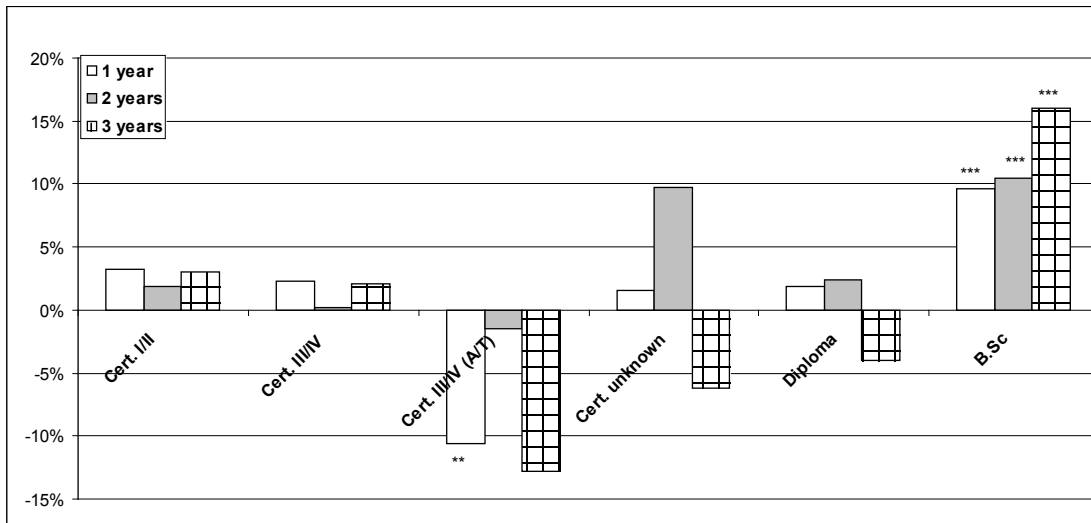


Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

The difference between the Heckman and OLS estimates is that the former account for the (potential) selection bias due to the fact that wages are only observed for those who are working. Wald tests reported at the bottom of tables 4 to 7 (and appendix tables E1 to E7) reveal that  $\rho$ , the correlation between the unobserved determinants of wages and employment outcomes, is significantly different from zero in a few cases only. In these cases, OLS estimates are biased. However, the comparison between the Heckman estimates in tables 4 and 5 and the OLS estimates (not shown here) reveals that the extent of the bias on the education coefficients is limited. In the other cases, where  $\rho$  is not significant, the null hypothesis that both equations are independent cannot be rejected and, in this context, OLS and Heckman provide similar estimates. The weak evidence in

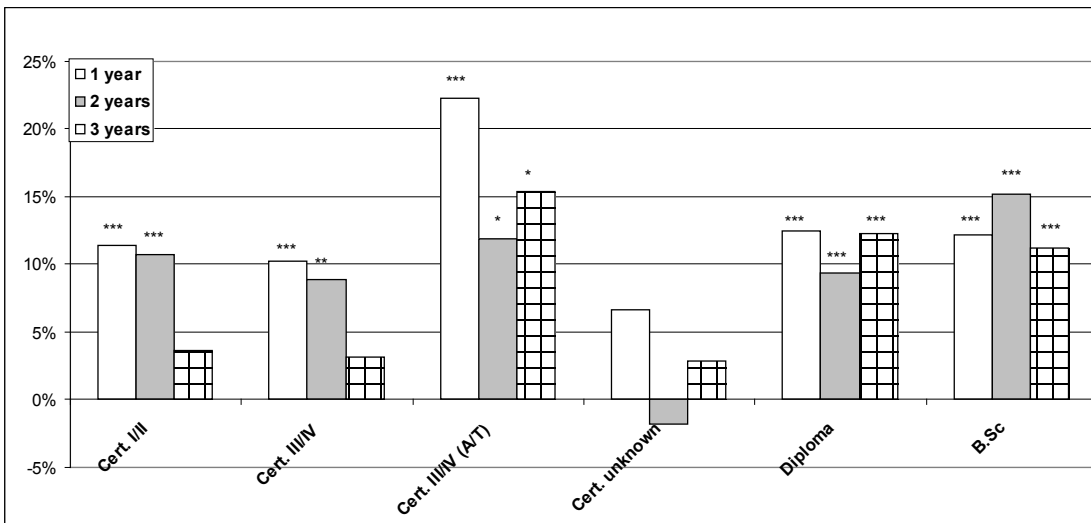
support of a selection bias may stem from the relatively large employment rates among young people (see table 1), which should limit the impact of any potential bias due to selection into employment.<sup>30</sup>

**Figure 3 Estimated completion wage premiums one, two and three years after the course (females, Heckman model)**



Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Figure 4 Estimated enrolling wage premiums one, two and three years after the course (females, Heckman model)**



Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

<sup>30</sup> Although we do not report OLS estimates for the other models, the comparison with the Heckman estimates also shows very little difference.

**Table 4 Selected coefficient estimates of the (log) wage equation (Heckman model, males)**

Model's specification	Heckman		Heckman		Heckman	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
<i>Number of years after last course</i>	<i>One</i>		<i>Two</i>		<i>Three</i>	
Completion premiums by course level						
Certificate I/II	0.030	0.93	0.023	0.58	0.051	1.14
Certificate III/IV	-0.093**	-2.02	0.039	0.86	0.000	0.01
Certificate III/IV (A/T)	-0.012	-0.16	0.015	0.23	0.063	0.56
Certificate (level unknown)	0.088	1.21	0.038	0.41	0.173	1.54
Diploma	0.007	0.21	0.065	1.64	0.080	1.62
Bachelor's degree	0.074***	3.37	0.069***	2.73	0.119***	3.61
Enrolling premiums by course level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.138***	4.02	0.156***	3.81	0.058	1.29
Certificate III/IV	0.198***	4.29	0.078*	1.74	0.023	0.30
Certificate III/IV (A/T)	0.233***	3.25	0.186***	3.10	0.091	0.81
Certificate (level unknown)	0.156**	2.53	0.184**	2.28	0.070	0.71
Diploma	0.123***	3.54	0.076*	1.95	0.015	0.32
Bachelor's degree	0.077**	2.43	0.122***	3.68	0.100**	2.37
Field of study (ref. is <i>Hard science</i> )						
Soft science	-0.094***	-4.62	-0.11***	-5.34	-0.098***	-3.63
Arts & Hospitality	-0.094***	-5.65	-0.110***	-5.66	-0.136***	-5.09
Missing	-0.057***	-2.85	-0.048**	-2.26	-0.030	-1.10
Prior education level (ref. is <i>No post-school study</i> )						
Certificate I/II	-0.042	-1.35	-0.099**	-2.13	0.016	0.26
Certificate III/IV	0.022	0.67	-0.003	-0.07	0.026	0.52
Certificate (level unknown)	0.030	1.37	0.000	-0.02	0.055*	1.77
Diploma	-0.051	-1.14	-0.052	-1.08	-0.047	-0.95
Bachelor's degree	0.180***	3.30	0.151**	2.37	0.039	0.23
School level						
Year 12	0.060***	3.36	0.023	1.23	-0.009	-0.38
Number of observations (males and females)						
	10 570		7012		4608	
Lambda						
	0.008		-0.035		-0.026	
Wald test of independent equations and p-value						
	0.5	0.48	4.1**	0.04	0.5	0.50
Instruments in selection equation						
Chi-square test and p-value	307.8***	0.00	376.2***	0.00	303.8***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Table 5 Selected coefficient estimates of the (log) wage equation (Heckman model, females)**

Model's specification	Heckman		Heckman		Heckman	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
<i>Number of years after last course</i>	<i>One</i>		<i>Two</i>		<i>Three</i>	
Completion premiums by course level						
Certificate I/II	0.032	1.16	0.019	0.53	0.031	0.81
Certificate III/IV	0.023	0.69	0.002	0.05	0.021	0.38
Certificate III/IV (A/T)	-0.106**	-1.98	-0.015	-0.22	-0.128	-1.43
Certificate (level unknown)	0.016	0.22	0.097	1.01	-0.062	-0.51
Diploma	0.019	0.71	0.024	0.73	-0.040	-1.00
Bachelor's degree	0.096***	5.04	0.104***	4.53	0.160***	5.03
Enrolling premiums by course level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.114***	3.64	0.107***	2.79	0.036	0.85
Certificate III/IV	0.102***	3.13	0.089**	2.27	0.032	0.55
Certificate III/IV (A/T)	0.223***	4.23	0.119*	1.76	0.154*	1.65
Certificate (level unknown)	0.066	1.28	-0.018	-0.19	0.029	0.26
Diploma	0.124***	4.15	0.094***	2.67	0.123***	2.73
Bachelor's degree	0.122***	4.75	0.152***	5.02	0.112***	2.87
Field of study (ref. is <i>Hard science</i> )						
Soft science	-0.034**	-2.19	-0.066***	-3.45	-0.023	-0.87
Arts & Hospitality	-0.072***	-4.75	-0.116***	-6.33	-0.060**	-2.45
Missing	-0.039**	-2.24	-0.075***	-3.69	0.006	0.23
Prior education level (ref. is <i>No post-school study</i> )						
Certificate I/II	-0.038	-1.30	0.024	0.60	0.014	0.39
Certificate III/IV	-0.008	-0.32	0.045	1.52	0.012	0.32
Certificate (level unknown)	-0.010	-0.55	0.009	0.42	-0.005	-0.19
Diploma	-0.046	-1.49	-0.070	-1.59	-0.071*	-1.90
Bachelor's degree	0.084***	3.02	0.067**	2.02	0.095	0.93
School level						
Year 12	0.094***	6.55	0.030*	1.70	0.001	0.06
Number of observations (males and females)						
	10 570		7012		4608	
Lambda						
	0.01		-0.03		-0.03	
Wald test of independent equations and p-value						
	0.5	0.48	4.1**	0.04	0.5	0.50
Instruments in selection equation						
	0.0	0.00	0.0	0.00	0.0	0.00
Chi-square test and p-value						
	307.8***	0.00	376.2***	0.00	303.8***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

Since the dependent variable (wage) is in log terms, while the explanatory variables are in level terms, the coefficients can be interpreted as the percentage change in wages for a unit increase in the corresponding variable.<sup>31</sup>

We first turn to the estimates based on the general sample (tables 4 and 5 and figures 1 to 4). The results show that only the completion premiums attached to university qualifications are consistently significant across the years for both males and females (in line with table 3). University completion premiums are higher for females than for males in all three years following the

<sup>31</sup> 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.



university course. Moreover, the university completion premiums tend to increase over time, so that they are higher three years after completion, at about 16% for females and 12% for males, than one year after (about 10% for females and 7% for males).

The completion premiums attached to VET courses are positive, but they are imprecisely estimated, with only two exceptions. For females, certificates level III or IV in an apprenticeship or traineeship attract a negative completion premium (that is, a wage penalty), significant only one year after completion at the 5% level (table 5). For males, the same result applies to non-apprenticeship certificates level III or IV (table 4). Although the relatively large and positive corresponding enrolling premiums more than offset the negative completion premiums, negative completion premiums appear counterintuitive. However, if non-completion signals having obtained a relatively high-paying job while enrolled (compared with jobs typically found by those who complete their course), then this would result in negative completion premiums. Therefore, in the short run, negative completion premiums may not be that uncommon, but in the long run one would expect completion premiums not to be negative. Two and three years after the course, the completion premiums become positive for males, non-significant for females and enrolling premiums (as well as their significance level) are reduced.

Other VET completion premiums are not necessarily small and the vast majority are positive but they are found to be imprecisely estimated. Further results discussed below suggest that some of these premiums can be significant for particular subgroups.

In contrast to completion premiums, we find strong and convincing evidence for positive enrolling premiums, especially in the first two years following the course. For females, in addition to the enrolling premium for certificates level III or IV in an apprenticeship or traineeship mentioned above, the results show positive enrolling premiums for certificates level I or II, non-apprenticeship certificates level III or IV and diplomas in the first two years following the end of the course (table 5). With the exception of the large enrolling premiums for apprenticeship or traineeship certificates level III or IV one year after the course, other VET enrolling premiums range between 9% and 11%. However, by the third year following the end of the course, only the enrolling premiums associated with diplomas remain significant. By comparison, enrolling premiums for bachelor's degrees are significant in all three years following the course, and range between 11% and 15%.

Results for males are comparable with female results in the sense that all enrolling premiums are significant in the first two years after the course (table 4). The largest enrolling premiums are found for apprentices and trainees at certificate level III or IV (19%–23%). Certificates level I and II attract enrolling premiums of about 14% and 16% one and two years after the course. Enrolling premiums for non-apprenticeship certificates level III or IV and for diplomas are respectively 20% and 12% one year after the course, and both are about 8% two years after.

Overall, the multivariate analysis shows that the vast majority of VET completion premiums are positive, albeit imprecisely estimated. Only bachelor's degrees attract consistently significant completion premiums. By contrast, all courses, with the exception of unknown certificates, attract substantial and robust enrolling premiums in the first two years following the end of the course. Three years after the course, only bachelor's degrees (and diplomas for females) still attract a significant enrolling premium.

The field of study is an important determinant of future wages, with significantly higher wages for 'hard' science students (the reference group) than for other students. The gaps between these groups tend to open up over time for males, whereas, for females, the effects lose most of their significance by the third year following the course. For those not in 'hard' science the negative effect on wages can be large enough to substantially reduce (or even wipe away) the enrolling (or completion) premiums.

The education level prior to enrolling in the last course only has a significant and positive effect on wages if it is a university degree, in which case it attracts a significant wage premium in the following two years after the last course for both males and females. The premium is particularly large for males but it becomes non-significant by the third year. For males, the results also point towards a negative effect on wages for those who already had a certificate level I or II prior to enrolling in another course. However, the effect is significant (at the 10% level) only in the second year following the last course.

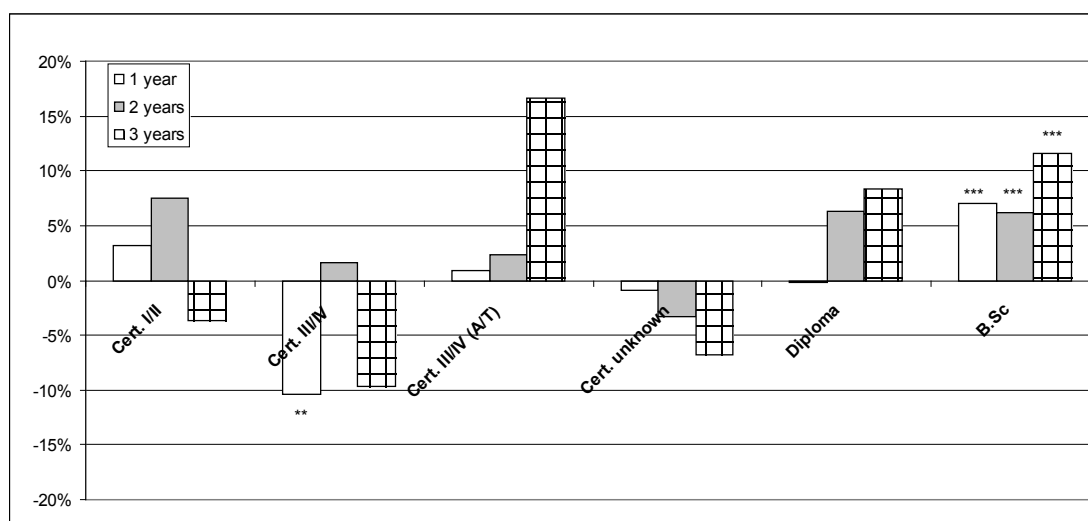
Completion of Year 12 has a positive and significant effect on wages in the first year after the last course (with premiums of about 9% for females and 6% for males), but the effect disappears in the following years.

Figures 5 to 9 present completion premiums by subgroup. The estimates produced by splitting the sample between school completers (figure 5 for males and figure 6 for females) and non-completers (figure 7), or between young people in the top and bottom 50%, according to the sum of their test scores (figures 8 and 9), leave mostly unchanged the conclusions drawn from the general sample regarding completion premiums. The few differences are as follows:

- ✧ None of the completion premiums is significant for early school leavers in the first two years following the last course, which may be due to the small sample size (figure 7). In the third year, completion premiums are significant for bachelor's degrees (at the 5% level) and for certificates level I or II (or of unknown level), but only at the 10% level.
- ✧ The completion wage penalty that appeared for females one year after an apprenticeship or traineeship at certificate level III or IV is not significant for female school completers (figure 6). By contrast, the wage penalty found for males who completed a non-apprenticeship certificate level III or IV remains significant among school completers (figure 5).
- ✧ For those in the top 50% of test scores, a few VET courses attract positive and significant completion premiums (figure 8). This concerns certificates level I or II and diplomas one year after completion, as well as non-apprenticeship certificates level III or IV and diplomas two years after completion. These premiums are of similar size to university completion premiums and range from about 7% to 9%.

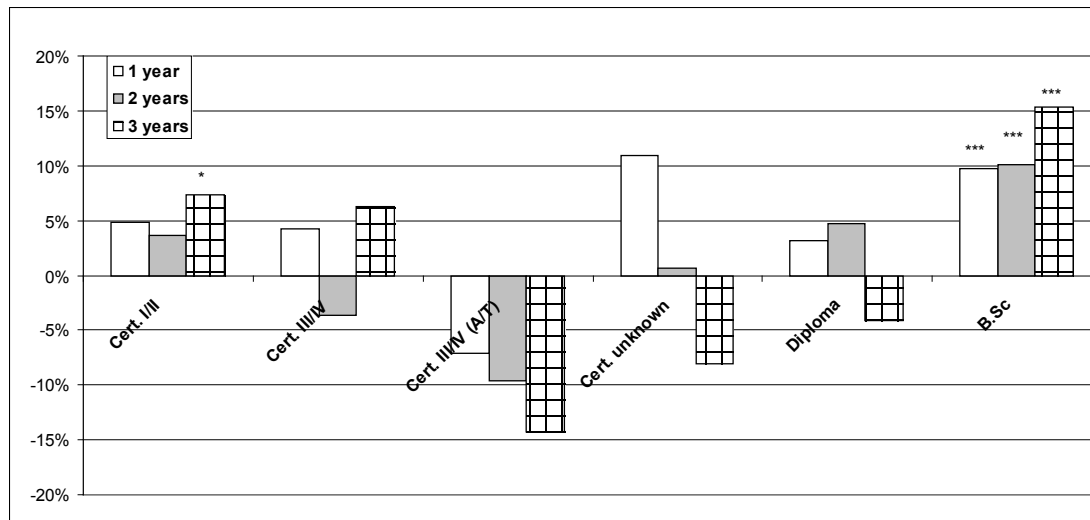
This last result indicates that those in the top 50% of test scores tend to benefit more, in terms of wages, from the completion of VET courses than those in the bottom 50%.

**Figure 5 Estimated completion wage premiums for Year 12 graduates one, two and three years after the course (males, Heckman model)**



Note: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

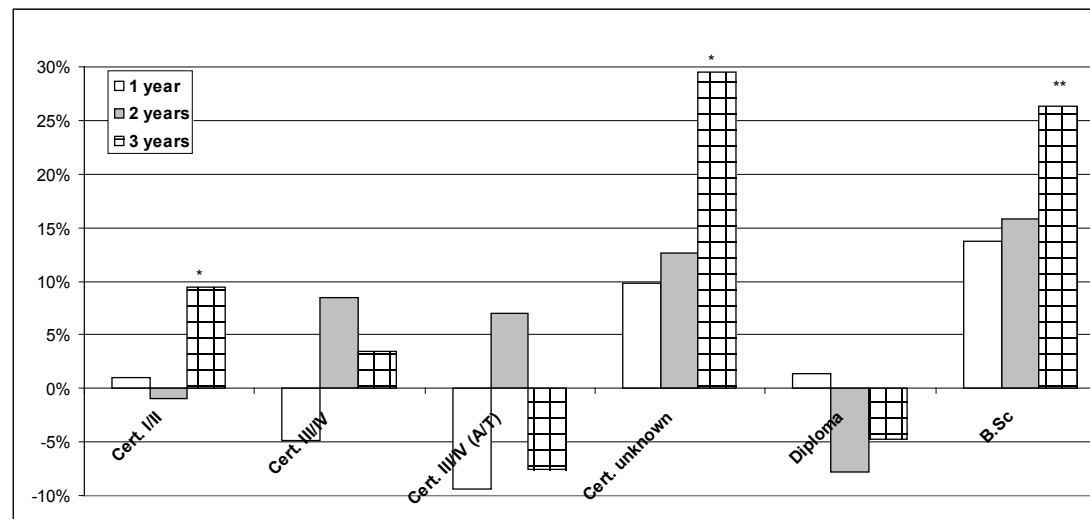
**Figure 6 Estimated completion wage premiums for Year 12 graduates one, two and three years after the course (females, Heckman model)**



Note: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

For these subgroups, other coefficient estimates are presented in appendix tables E1 to E4. Appendix table E2 shows that the enrolling premiums for female school completers are in line with the previous results for all females (table 5), with significant premiums for all VET courses (and bachelor's degrees) one and two years after the course, while three years after only the premiums associated with diplomas and bachelor's degrees remain significant.

**Figure 7 Estimated completion wage premiums one, two and three years after the course (early school leavers, Heckman model)**



Note: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

For male school completers (appendix table E1), the enrolling premiums one year after the end of the course are also in line with those found for all males in table 4. Then the results differ in the following two years. In the second year after the course, the enrolling premiums associated with VET courses become largely non-significant for male school completers, whereas they remained significant for the general sample. Although the significance level is reduced, the premiums remain in the same order of magnitude as for the general sample. Hence, it is possible that this loss of significance is due to the reduced sample size. In the third year after the course, the results indicate

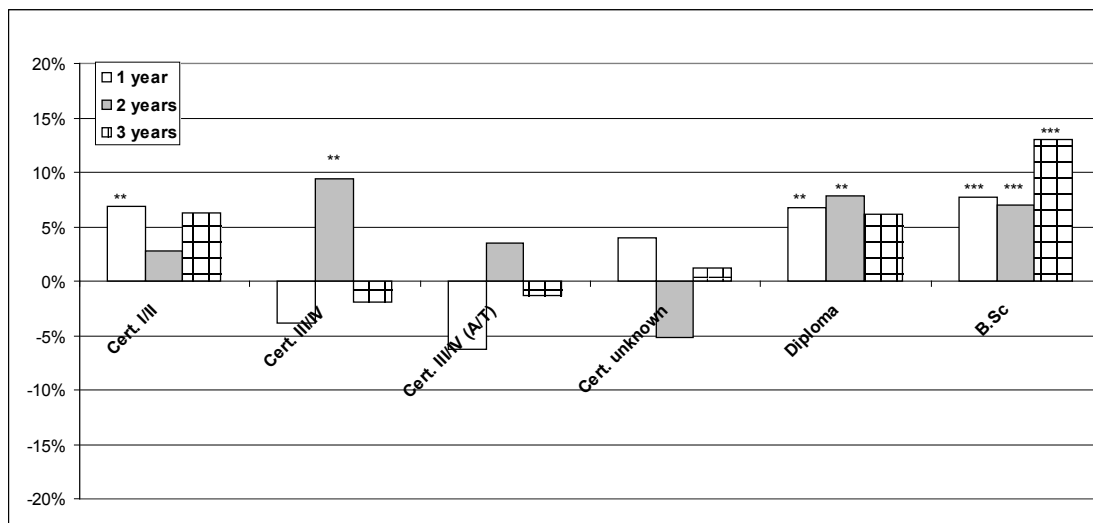
positive enrolling premiums for certificates level I or II (or unknown) for school completers, while there was no evidence of significant VET enrolling premiums for the general sample.

In the first year after a VET course, enrolling premiums are particularly large for early school leavers (appendix table E3), ranging from about 17% for a certificate level I or II, to 29% for a certificate level III or IV in an apprenticeship or traineeship. However, one year later, only the premiums for diplomas and certificates level I or II remain significant (as well as those for certificates level III or IV in an apprenticeship or traineeship but only at the 10% level). In the third year after the course, early school leavers still benefit from positive enrolling premiums of about 20% for certificates level III or IV in an apprenticeship or traineeship and for diplomas.

The picture emerging from the comparison of school completers and non-completers is mixed. As for the general sample, none of these groups experiences significant completion premiums for any qualifications other than for a bachelor's degree. In relation to VET enrolling premiums, school non-completers seem to enjoy larger premiums than school completers in the year following the course, whereas the evidence is mixed in subsequent years.

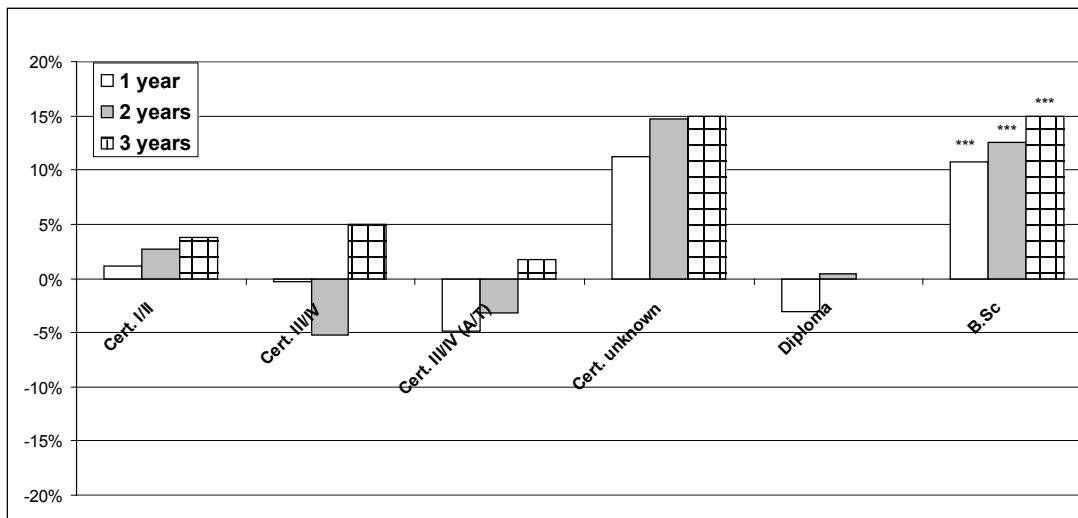
The comparison of enrolling premiums for those in the top and bottom 50% of test scores in appendix tables E4a and E4b does not reveal any clear pattern. As with the general sample, VET enrolling premiums are largely significant in the first two years following the course, while by the third year significance levels are substantially reduced.

**Figure 8 Estimated completion wage premiums one, two and three years after the course (top 50% by literacy and numeracy test scores, Heckman model)**



Note: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Figure 9 Estimated completion wage premiums one, two and three years after the course (bottom 50% by literacy and numeracy test scores, Heckman model)**



Note: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

Tables 6 and 7 present the results from the Heckman IPW estimator, which controls for attrition bias. The results of the same model estimated separately for male and female school completers and for school non-completers are presented in appendix tables E5, E6 and E7 respectively. The main conclusion is that controlling for attrition only brings marginal changes to previous results. In addition to the completion premiums for bachelor’s degrees, a few additional VET completion premiums now appear to be significant at the 5% or 10% level. For males, table 6 shows that diplomas attract a completion premium of about 7% and 9% two and three years after the course. All other VET completion premiums for males (with the exception of non-apprenticeship certificates level III or IV) are positive but not statistically different from zero.

For females, changes concern school completers. Appendix table E6 reveals a positive completion premium of about 6% in the year following a certificate level I or II and a wage completion penalty of about 11% in the second year following an apprenticeship or traineeship certificate level III or IV. All other VET completion premiums are positive in the first two years following the course, although they are not statistically significant. In the third year, VET completion premiums are still not statistically significant but they become negative for all VET courses except certificates level I or II and non-apprenticeship certificates level III or IV. Appendix table E6 also shows that the completion premium found for female school completers three years after a certificate level I or II (appendix table E2) is no longer significant when controlling for attrition.

Controlling for attrition reinforces virtually all enrolling premiums, as well as the effects of the field of study. Other effects regarding prior education level and schooling remain largely unaffected.

Finally, the use of an employment equation in the context of the Heckman approach allows us to consider the effect of completion (and other variables) on employment outcomes.<sup>32</sup> The coefficient estimates of the selection equations reveal that, although the completion of VET qualifications may increase employment probabilities in one or two of the three years following the course, none has a consistently significant effect in all three years. The same conclusion applies to bachelor’s degrees. Focusing on the year following the course, completion of a certificate level I or II, a diploma or a bachelor’s degree significantly increases employment probabilities for males. However, when

<sup>32</sup> As mentioned above, these results are not the main focus to this research and are thus not reported here to limit the size and number of tables.

further restricting the male sample to school leavers, this effect is significant only for diplomas and bachelor's degrees. For females, the only VET qualification to increase employment probabilities upon completion is an apprenticeship or traineeship certificate III or IV. We also note that, independent of completion, enrolling in any post-school qualification has a positive effect on subsequent employment probabilities for females, whereas there is little effect for males.

**Table 6 Selected coefficient estimates of the (log) wage equation (Heckman IPW model, males)**

Model's specification	Heckman IPW		Heckman IPW		Heckman IPW	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
<i>Number of years after last course</i>	<i>One</i>		<i>Two</i>		<i>Three</i>	
<i>Completion premiums by course level</i>						
Certificate I/II	0.032	0.99	0.026	0.62	0.056	1.17
Certificate III/IV	-0.089*	-1.85	0.040	0.87	-0.027	-0.34
Certificate III/IV (A/T)	0.000	0.00	0.027	0.40	0.080	0.61
Certificate (level unknown)	0.084	1.14	0.053	0.58	0.180	1.58
Diploma	0.016	0.47	0.072*	1.76	0.089*	1.73
Bachelor's degree	0.079***	3.64	0.072***	2.84	0.116***	3.40
<i>Enrolling premiums by course level (ref. is No post-school study)</i>						
Certificate I/II	0.155***	4.48	0.161***	3.77	0.055	1.14
Certificate III/IV	0.224***	4.77	0.097**	2.15	0.059	0.73
Certificate III/IV (A/T)	0.243***	3.21	0.183***	2.92	0.063	0.47
Certificate (level unknown)	0.185***	2.98	0.192**	2.45	0.088	0.90
Diploma	0.146***	4.34	0.097**	2.37	0.037	0.76
Bachelor's degree	0.106***	3.44	0.142***	4.27	0.111***	2.65
<i>Field of study (ref. is Hard science)</i>						
Soft science	-0.098***	-4.76	-0.121***	-5.49	-0.100***	-3.57
Arts & Hospitality	-0.102***	-6.18	-0.117***	-5.97	-0.151***	-5.63
Missing	-0.088***	-5.44	-0.074***	-4.11	-0.085***	-3.48
<i>Prior education level (ref. is No post-school study)</i>						
Certificate I/II	-0.046	-1.48	-0.100**	-2.07	0.035	0.52
Certificate III/IV	0.025	0.75	-0.005	-0.14	0.033	0.64
Certificate (level unknown)	0.023	1.02	-0.012	-0.43	0.042	1.31
Diploma	-0.057	-1.30	-0.059	-1.13	-0.059	-1.18
Bachelor's degree	0.178***	3.16	0.156**	2.38	0.055	0.37
<i>School level</i>						
Year 12	0.066***	3.68	0.026	1.35	-0.006	-0.23
Number of observations (males and females)	10 570		7012		4608	
Lambda	0.010		-0.031		-0.042	
Wald test of independent equations and p-value	0.81	0.37	3.05*	0.08	0.72	0.39
<i>Instruments in selection equation</i>						
Chi-square test and p-value	311.6***	0.00	352.5***	0.00	293.5***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Table 7 Selected coefficient estimates of the (log) wage equation (Heckman IPW model, females)**

Model's specification	Heckman IPW		Heckman IPW		Heckman IPW	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
<i>Number of years after last course</i>	<i>One</i>		<i>Two</i>		<i>Three</i>	
Completion premiums by course level						
Certificate I/II	0.043	1.53	0.020	0.59	0.045	1.12
Certificate III/IV	0.026	0.78	0.010	0.27	0.001	0.01
Certificate III/IV (A/T)	-0.121**	-2.24	-0.037	-0.57	-0.138	-1.43
Certificate (level unknown)	0.035	0.52	0.086	0.91	-0.110	-0.92
Diploma	0.029	1.09	0.031	0.91	-0.047	-1.15
Bachelor's degree	0.101***	5.17	0.099***	4.24	0.158***	4.88
Enrolling premiums by course level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.118***	3.75	0.108***	2.85	0.048	1.08
Certificate III/IV	0.118***	3.56	0.092**	2.43	0.087*	1.70
Certificate III/IV (A/T)	0.253***	4.77	0.144**	2.29	0.174*	1.72
Certificate (level unknown)	0.074	1.41	-0.017	-0.19	0.092	0.88
Diploma	0.135***	4.67	0.091***	2.64	0.159***	3.52
Bachelor's degree	0.141***	5.67	0.163***	5.52	0.152***	3.87
Field of study (ref. is <i>Hard science</i> )						
Soft science	-0.038**	-2.42	-0.068***	-3.62	-0.027	-1.02
Arts & Hospitality	-0.075***	-4.98	-0.117***	-6.50	-0.079***	-3.14
Missing	-0.060***	-3.82	-0.080***	-4.61	-0.045*	-1.84
Prior education level (ref. is <i>No post-school study</i> )						
Certificate I/II	-0.035	-1.27	0.025	0.59	0.008	0.22
Certificate III/IV	-0.013	-0.57	0.039	1.32	0.007	0.20
Certificate (level unknown)	-0.009	-0.49	0.009	0.40	-0.006	-0.26
Diploma	-0.045	-1.49	-0.067	-1.51	-0.078**	-2.03
Bachelor's degree	0.079***	2.79	0.076**	2.25	0.109	1.01
School level						
Year 12	0.090***	6.34	0.029*	1.65	-0.018	-0.78
Number of observations (males and females)	10 570		7012		4608	
Lambda	0.010		-0.031		-0.042	
Wald test of independent equations and p-value	0.81	0.37	3.05*	0.08	0.72	0.39
Instruments in selection equation						
Chi-square test and p-value	311.6***	0.00	352.5***	0.00	293.5***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

# Concluding remarks

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Based on the 1995 and 1998 cohorts of the LSAY data, this project examined the effects of VET and higher education qualifications on wages, explicitly distinguishing between enrolment and completion effects.

The descriptive statistics reveal that, although completion premiums can be observed for some VET and university courses in the few years following the course, these premiums are not consistently significant, or tend to disappear over time for VET qualifications, whereas they remain positive and significant for university degrees. In particular, we observe a positive completion premium of 11.9% and 16.7% one year after finishing a certificate I or II as an apprentice or trainee for school completers and non-completers, respectively. Other VET qualifications do not seem to attract any significant completion wage premium.

The multivariate analysis is based on wage equations, estimated one, two and three years after the last education spell in order to assess the persistence of the wage effects. Two alternative approaches are implemented to account for two potential selection problems. First, we follow the approach suggested by Heckman (1976) to account for the fact that wages are only observed for young people who are working. Second, we use an inverse probability weighted estimator to deal with the potential selection bias due to attrition in LSAY data.

The application of these two methodologies to the general sample and also separately to school completers and non-completers and to those in the top and bottom 50% according to their literacy and numeracy test scores reveals a consistent picture. After controlling for a range of individual characteristics and for potential selection biases, only the completion premiums attached to university qualifications remain consistently significant across the years for both males and females. The completion premiums attached to VET courses tend to be positive but they are imprecisely estimated. One exception is the significant premium of about 7% to 8% obtained one and two years after completing a diploma for those in the top 50% of test scores. The other few exceptions do not hold for more than one year (either the first or the second year following completion).

The fact that there is little evidence of robust and lasting positive completion wage premiums for VET qualifications does not mean that completion decisions are irrational, as there could be other non-pecuniary payoffs associated with completion. Higher wages are only one way by which young people may benefit from VET qualifications. In other words, completion may still be a rational decision in the absence of wage premiums if VET qualifications lead to higher employment probabilities or better jobs in a qualitative sense. Although some of the findings of this report suggest that the effect on employment probabilities may be limited, this should be a topic of interest for further research. More broadly, society may benefit from a more qualified workforce in various ways, even though benefits are difficult to identify at the individual level.

Finally, it should be emphasised that the non-significance of the VET completion premiums may simply indicate that our sample is too small to precisely estimate VET completion premiums, given the important diversity of VET courses. In this regard, the findings of Karmel and Mlotkowski (2010) suggest that, given the great diversity of VET qualifications, a finer distinction may be required to identify the particular VET qualifications attracting a significant wage premium upon completion. Using such detailed information on the type of course, while controlling for individual characteristics, would require larger sample sizes and better data on VET students.



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# Appendix A

**Table A1 An overview of the literature**

Study	Earnings measure	Data	Sample of analysis	Type of analysis	Comparison (or reference) group	Findings
<b>Completion vs non-completion</b>						
Curtis (2008)	Weekly earnings	LSAY 95	VET students and early school leavers	Descriptive	VET non-completers	<ul style="list-style-type: none"> <li>◇ Very small wage premium associated with VET completion</li> <li>◇ Small non-completion penalty for traineeships (males &amp; females)</li> <li>◇ Largest wage penalty is for male apprenticeship non-completers</li> </ul>
Karmel and Nguyen (2007)	Weekly earnings	2003 Student Outcomes Survey and 2002 National VET Provider Collection	Trainees gaining full-time employment	Multivariate	Completers of certificate I or II	<ul style="list-style-type: none"> <li>◇ Analysis is done by previous qualification level</li> <li>◇ Certificate IV or above: no significant effect of further VET qualifications</li> <li>◇ Certificate III: no effect of further VET qualifications for males but wage premiums as follows for females               <ul style="list-style-type: none"> <li>★ 5.6% for completion of certificate IV or above</li> <li>★ 1.9% for completion of certificate III</li> <li>★ No significant effect for non-completion or for certificate II and below</li> </ul> </li> <li>◇ Certificate II and below:               <ul style="list-style-type: none"> <li>★ Further certificate IV and above qualifications: for males, 10.1% if completed, 8.2% if not completed; for females, 10.3% and 8.4% respectively</li> <li>★ Further certificate III qualifications: for males, 18.5% if completed, 8.1% if not completed; for females, 3.8% and 2.2% respectively</li> </ul> </li> <li>★ Certificate II qualifications and below: not significant</li> </ul>
Karmel and Mlotkowski (2010)	Annual earnings	NCVER Apprentice and Trainee Destination Survey	VET students	Multivariate	VET completers vs VET non-completers	<ul style="list-style-type: none"> <li>◇ Analysis focuses on the impact of wages on completion probabilities</li> <li>◇ No direct estimation of wage premiums</li> <li>◇ Main finding: only for trade apprentices do expected wages on completion significantly exceed expected wages in alternative employment</li> </ul>

Study	Earnings measure	Data	Sample of analysis	Type of analysis	Comparison (or reference) group	Findings
<b>Effects of education on wages</b>						
Preston (1997)	Weekly earnings	1981 and 1991 censuses	Males	Multivariate	Year 12 or early school leavers	<ul style="list-style-type: none"> <li>◇ Compared with early school leavers, wage premium of 20 to 25% for VET graduates</li> <li>◇ Compared with Year 12, wage premium of 10% for VET qualifications</li> </ul>
Budd and Madden (1999)	Weekly earnings	1990 Survey of Income and Housing Costs and Amenities	Males	Multivariate	Year 12 or early school leavers	<ul style="list-style-type: none"> <li>◇ Compared with early school leavers, wage premium of 8.5% for VET graduates</li> <li>◇ Compared with Year 12, wage premium of 4% for VET qualifications</li> </ul>
Miller and Mulvey (1996)	Hourly wage	1993 ABS Survey of Training and Education	No selection	Multivariate	Year 12 or left school before 15	<ul style="list-style-type: none"> <li>◇ The analysis controls for both post-school qualifications and years of schooling</li> <li>◇ Compared with those who left school before age 15, the wage premium is 8% for males and 12% for females with trade qualifications</li> </ul>
Borland et al. (2000)	Weekly earnings	1997 Survey of Education and Training Experience	Males	Multivariate	Year 12 or early school leavers	<ul style="list-style-type: none"> <li>◇ The authors do not report the effects of VET on wages but Ryan (2002a) computed them based on their wage equation</li> <li>◇ Compared with early school leavers, wage premium of 14% for trade qualifications</li> <li>◇ Compared with Year 12 graduates, wage premium of 13% for non-trade VET qualifications but no wage premium for trade qualifications</li> </ul>
Ryan (2002b)	Not specified	1993 Survey of Training and Education Experience & 1997 Survey of Education and Training Experience	Full-time workers	Multivariate	Year 12 or early school leavers	<ul style="list-style-type: none"> <li>◇ Compared with early school leavers, wage premium of 10% for basic and skilled vocational qualifications</li> <li>◇ Compared with Year 12 graduates, wage premium of 10% for associate diplomas</li> <li>◇ These effects disappear over time (i.e. wages converge with age)</li> </ul>
Coelli and Wilkins (2009)	Total income	1981, 1986, 1991, 1996 and 2001 censuses	Full-time employees aged 25 to 59	Multivariate	No post-school qualification	<ul style="list-style-type: none"> <li>◇ In 1981, wage premiums of about 15% for a certificate for both male and females</li> <li>◇ In 2001, wage premiums of about 10% for males and less than 10% for females (for a certificate)</li> </ul>
Coelli and Wilkins (2009)	Weekly earnings	1994–1995, 1995–1996, 1996–1997, 1997–1998, 1999–2000, 2000–2001 ABS Income Surveys	Full-time employees aged 25 to 60	Multivariate	No post-school qualification	<ul style="list-style-type: none"> <li>◇ Between 1994 and 2001, wage premiums are stable at about 13% for males with a certificate or a diploma</li> <li>◇ For females, the corresponding wage premiums drop from 21 to 8% between 1994 and 2001</li> </ul>

# Appendix B

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## Additional information about vocational education and training (VET) courses in Australia

Certificate I–IV courses are typically provided at a technical and further education (TAFE) institute. According to the Australian Qualifications Framework (2007) courses for a certificate I would teach skills that would prepare a person to perform a defined range of activities, most of which may be routine and predictable. Applications may include a variety of employment-related skills, including preparatory access and participation skills, broad-based induction skills and/or specific workplace skills. Certificate II courses would teach skills preparing a person to perform in a range of varied activities or knowledge application, where there is a clearly defined range of contexts, in which the choice of actions required is usually clear and there is limited complexity in the range of options to be applied; performing a prescribed range of functions involving known routines and procedures and some accountability for the quality of outcomes. Applications may include some complex or non-routine activities involving individual responsibility or autonomy and/or collaboration with others.

Certificate III competencies would cover selecting, adapting and transferring skills and knowledge to new environments and providing technical advice and some leadership in resolution of specific problems. This would be applied across a range of roles in a variety of contexts with some complexity in the extent and choice of options available; performing a defined range of skilled operations, usually within a range of broader related activities involving known routines, methods and procedures, where some discretion and judgment is required in the selection of equipment, services or contingency measures and within known time constraints.

Certificate IV competencies would cover a broad range of varied activities or application in a wider variety of contexts, most of which are complex and non-routine. Leadership and guidance are involved when organising activities of self and others as well as contributing to technical solutions of a non-routine or contingency nature; performing a broad range of skilled applications including requirements to evaluate and analyse current practices, develop new criteria and procedures for performing current practices and provision of some leadership and guidance to others in the application and planning of the skills.

Diplomas and advanced diplomas are generally one- to two-year programs with practical courses. Associate degrees take about equally long, but the program is of a more academic than practical nature. Graduate certificates and diplomas require a bachelor's degree or higher as a prerequisite. An example is a Graduate Certificate of Education, which many teachers in Australia hold.

# Appendix C

Summary statistics for the samples based on those in work two years and three years after the last education spell

**Table C1 Employment rates two years after last education spell (completed or not) by school-completion status (weighted)**

Last course started	Early school leavers			Year 12 graduates			All		
	Share (%)	Employment rate (%)	No. of obs	Share (%)	Employment rate (%)	No. of obs	Share (%)	Employment rate (%)	No. of obs
No post-school study	49.9	-	1056	24.1	-	1537	30.5	-	2593
Certificate I/II	5.0	76.6	106	3.1	84.1	201	3.6	81.5	307
A/T: Certificate I/II	17.4	82.5	369	9.4	94.1	599	11.4	89.7	968
Certificate III/IV	8.1	80.3	171	7.8	90.4	497	7.9	87.8	668
A/T: Certificate III/IV	8.5	90.6	180	3.6	91.7	232	4.9	91.2	413
Certificate (level unknown)	2.8	80.0	59	1.8	86.1	112	2.0	84.0	171
A/T: Certificate (level unknown)	2.7	96.9	58	0.6	91.8	39	1.1	94.8	96
Diploma	4.1	87.0	88	12.4	93.8	790	10.3	93.1	877
Bachelor or higher	1.5	95.7	31	37.2	96.0	2378	28.3	96.0	2409
<b>Total</b>	<b>100</b>	<b>84.3</b>	<b>2117</b>	<b>100</b>	<b>93.9</b>	<b>6385</b>	<b>100</b>	<b>92.2</b>	<b>8502</b>
<b>All VET</b>	<b>48.7</b>	<b>84.0</b>	<b>1030</b>	<b>38.7</b>	<b>91.8</b>	<b>2470</b>	<b>41.2</b>	<b>89.5</b>	<b>3500</b>
<b>All VET A/T</b>	<b>28.7</b>	<b>86.3</b>	<b>607</b>	<b>13.6</b>	<b>93.4</b>	<b>870</b>	<b>17.4</b>	<b>90.5</b>	<b>1477</b>

Notes: The table is based on a sample of non-students. The sample can contain multiple observations for the same individual. All numbers are weighted, including the number of observations. A/T = apprenticeship/traineeship.

**Table C2 Employment rates three years after last education spell (completed or not) by school-completion status (weighted)**

Last course started	Early school leavers			Year 12 graduates			All		
	Share (%)	Employment rate (%)	No. of obs	Share (%)	Employment rate (%)	No. of obs	Share (%)	Employment rate (%)	No. of obs
No post-school study	52.5	-	800	29.8	-	1318	35.6	-	2117
Certificate I/II	4.6	80.6	70	3.2	89.7	142	3.6	86.7	212
A/T: Certificate I/II	16.1	86.6	245	8.1	89.8	358	10.1	88.5	603
Certificate III/IV	6.9	75.7	105	7.5	89.5	333	7.4	86.2	438
A/T: Certificate III/IV	8.9	90.4	136	4.1	88.1	180	5.3	89.1	315
Certificate (level unknown)	3.0	85.4	46	2.0	95.3	90	2.3	92.0	136
A/T: Certificate (level unknown)	3.0	96.4	46	0.5	92.4	20	1.1	95.2	66
Diploma	3.8	81.6	58	12.4	93.3	549	10.2	92.2	607
Bachelor or higher	1.2	54.8	18	32.4	95.5	1429	24.4	95.0	1448
<b>Total</b>	<b>100</b>	<b>84.5</b>	<b>1524</b>	<b>100</b>	<b>93.1</b>	<b>4418</b>	<b>100</b>	<b>91.5</b>	<b>5942</b>
<b>All VET</b>	<b>46.3</b>	<b>85.3</b>	<b>706</b>	<b>37.8</b>	<b>91.0</b>	<b>1671</b>	<b>40.0</b>	<b>89.3</b>	<b>2377</b>
<b>All VET A/T</b>	<b>28.0</b>	<b>88.9</b>	<b>427</b>	<b>12.6</b>	<b>89.3</b>	<b>557</b>	<b>16.6</b>	<b>89.1</b>	<b>984</b>

Notes: The table is based on a sample of non-students. The sample can contain multiple observations for the same individual. All numbers are weighted, including the number of observations.

**Table C3 Completion rates by last education spell and school-completion status for non-students working two years after the last education spell (weighted)**

Last course started	Early school leavers			Year 12 graduates			All		
	Share (%)	Completion rate (%)	No. of obs	Share (%)	Completion rate (%)	No. of obs	Share (%)	Completion rate (%)	No. of obs
No post-school study	45.6	-	627	23.2	-	1161	28.0	-	1788
Certificate I/II	4.9	70.4	67	2.8	79.5	142	3.3	76.6	209
A/T: Certificate I/II	18.8	65.7	258	9.7	74.1	486	11.7	71.2	745
Certificate III/IV	8.6	66.1	118	7.4	74.9	370	7.6	72.7	489
A/T: Certificate III/IV	9.6	78.6	133	3.6	85.2	178	4.9	82.4	311
Certificate (level unknown)	2.4	67.2	33	1.3	67.4	67	1.6	67.3	100
A/T: Certificate (level unknown)	3.8	79.6	52	0.5	59.8	27	1.2	72.9	79
Diploma	4.6	60.9	63	12.6	59.5	629	10.8	59.6	692
Bachelor or higher	1.8	43.6	24	39.0	79.3	1954	31.0	78.9	1978
<b>Total</b>	<b>100</b>	<b>68.4</b>	<b>1376</b>	<b>100</b>	<b>74.9</b>	<b>5015</b>	<b>100</b>	<b>73.9</b>	<b>6391</b>
<b>All VET</b>	<b>52.7</b>	<b>69.2</b>	<b>725</b>	<b>37.9</b>	<b>70.4</b>	<b>1900</b>	<b>41.1</b>	<b>70.1</b>	<b>2625</b>
<b>All VET A/T</b>	<b>32.2</b>	<b>71.2</b>	<b>443</b>	<b>13.8</b>	<b>76.4</b>	<b>691</b>	<b>17.7</b>	<b>74.4</b>	<b>1134</b>

Notes: The table is based on a sample of non-students in work two years after the last education spell and for whom valid wage information is available. The sample can contain multiple observations for the same individual. All numbers are weighted, including the number of observations.

**Table C4 Completion rates by last education spell and school-completion status for non-students working three years after the last education spell (weighted)**

Last course started	Early school leavers			Year 12 graduates			All		
	Share (%)	Completion rate (%)	No. of obs	Share (%)	Completion rate (%)	No. of obs	Share (%)	Completion rate (%)	No. of obs
No post-school study	48.4	-	470	29.6	-	1005	33.8	-	1475
Certificate I/II	4.9	73.5	47	3.3	77.6	112	3.7	76.4	160
A/T: Certificate I/II	19.7	69.9	192	7.6	69.9	257	10.3	69.9	449
Certificate III/IV	6.4	70.1	62	7.5	78.6	256	7.3	76.9	319
A/T: Certificate III/IV	9.6	85.2	93	3.8	84.2	130	5.1	84.6	223
Certificate (level unknown)	2.9	85.6	28	1.5	69.5	51	1.8	75.3	79
A/T: Certificate (level unknown)	3.6	79.5	35	0.4	62.3	14	1.1	74.5	49
Diploma	3.6	77.1	35	12.5	65.2	425	10.5	66.1	460
Bachelor or higher	0.8	34.5	8	33.8	78.9	1148	26.5	78.6	1156
<b>Total</b>	<b>100</b>	<b>74.6</b>	<b>971</b>	<b>100</b>	<b>75.4</b>	<b>3400</b>	<b>100</b>	<b>75.3</b>	<b>4370</b>
<b>All VET</b>	<b>50.8</b>	<b>75.2</b>	<b>493</b>	<b>36.7</b>	<b>72.2</b>	<b>1246</b>	<b>39.8</b>	<b>73.0</b>	<b>1739</b>
<b>All VET A/T</b>	<b>32.9</b>	<b>75.4</b>	<b>319</b>	<b>11.8</b>	<b>74.3</b>	<b>401</b>	<b>16.5</b>	<b>74.7</b>	<b>721</b>

Notes: The table is based on a sample of non-students in work three years after the last education spell and for whom valid wage information is available. The sample can contain multiple observations for the same individual. All numbers are weighted, including the number of observations.



# Appendix D

## Average hourly wage rates by last education spell, completion status and school level

**Table D1 Average hourly wages by last education spell, completion status and school level, one year after the last education spell (weighted, in 2008 dollars)**

Last course started	Early school leavers			Year 12 graduates			All					
	Not completed	Completed	All	Completion premium	Not completed	Completed	All	Completion premium	Not completed	Completed	All	Completion premium
No post-school study	13.3	.	13.3	.	14.2	.	14.2	.	13.9	.	13.9	.
<i>Standard error</i>	0.3	.	0.3	.	0.1	.	0.1	.	0.1	.	0.1	.
Certificate I/II	15.1	13.2	13.8	-13%	18.4	18.0	18.1	-2%	17.4	16.7	16.9	-4%
<i>Standard error</i>	1.2	0.8	0.7	.	1.1	0.9	0.7	.	0.9	0.7	0.5	.
A/T: Certificate I/II	17.5	20.4	19.3	17%	18.5	20.7	20.1	12%	18.0	20.6	19.8	14%
<i>Standard error</i>	0.7	0.6	0.5	.	0.5	0.3	0.3	.	0.4	0.3	0.3	.
Certificate III/IV	17.4	16.8	17.0	-3%	18.5	18.5	18.5	0%	18.2	18.2	18.2	0%
<i>Standard error</i>	1.1	0.5	0.5	.	0.5	0.4	0.3	.	0.5	0.3	0.3	.
A/T: Certificate III/IV	21.4	18.5	19.2	-13%	20.4	19.4	19.6	-5%	20.9	19.0	19.4	-9%
<i>Standard error</i>	1.6	0.7	0.7	.	1.4	0.5	0.5	.	1.1	0.4	0.4	.
Certificate (level unknown)	15.6	19.6	17.8	26%	17.3	18.0	17.8	4%	16.6	18.4	17.8	11%
<i>Standard error</i>	1.2	2.7	1.5	.	0.9	1.0	0.7	.	0.7	1.0	0.7	.
A/T: Certificate (level unknown)	17.0	22.0	20.5	29%	15.1	23.0	20.3	52%	16.2	22.4	20.4	38%
<i>Standard error</i>	2.1	1.3	1.1	.	1.0	1.6	1.3	.	1.3	1.0	0.8	.
Diploma	17.1	19.6	18.5	15%	18.5	18.6	18.5	0%	18.3	18.6	18.5	2%
<i>Standard error</i>	0.8	1.2	0.8	.	0.4	0.3	0.2	.	0.4	0.3	0.2	.
Bachelor or higher	19.2	18.6	18.9	-3%	18.3	21.7	20.9	19%	18.3	21.7	20.9	19%
<i>Standard error</i>	0.9	0.7	0.6	.	0.3	0.1	0.1	.	0.2	0.1	0.1	.
<b>All</b>	<b>14.8</b>	<b>19.0</b>	<b>16.4</b>	.	<b>15.9</b>	<b>20.7</b>	<b>18.5</b>	.	<b>15.8</b>	<b>20.3</b>	<b>18.1</b>	.
<i>Standard error</i>	0.2	0.3	0.2	.	0.1	0.1	0.1	.	0.1	0.1	0.1	.

Notes: The sample can contain multiple observations for the same individual.

**Table D2 Average hourly wages by last education spell, completion status and school level, two years after the last education spell (weighted, in 2008 dollars)**

Last course started	Early school leavers				Year 12 graduates				All			
	Not completed	Completed	All	Completion premium	Not completed	Completed	All	Completion premium	Not completed	Completed	All	Completion premium
No post-school study	14.8	.	14.8	.	15.9	.	15.9	.	15.5	.	15.5	.
<i>Standard error</i>	0.3	.	0.3	.	0.2	.	0.2	.	0.1	.	0.1	.
Certificate I/II	16.0	16.0	16.0	0%	17.8	17.5	17.5	-2%	17.1	17.0	17.0	0%
<i>Standard error</i>	1.4	1.1	0.9	.	0.6	0.4	0.4	.	0.7	0.5	0.4	.
A/T: Certificate I/II	18.9	20.9	20.2	10%	19.6	21.2	20.8	8%	19.3	21.1	20.6	9%
<i>Standard error</i>	0.7	0.6	0.5	.	0.8	0.5	0.4	.	0.5	0.4	0.3	.
Certificate III/IV	16.1	17.5	17.1	9%	18.6	18.3	18.4	-1%	17.8	18.1	18.0	2%
<i>Standard error</i>	0.8	0.6	0.5	.	0.5	0.4	0.3	.	0.4	0.4	0.3	.
A/T: Certificate III/IV	18.9	21.3	20.8	12%	21.4	20.2	20.3	-6%	20.1	20.6	20.5	2%
<i>Standard error</i>	1.3	1.0	0.8	.	1.4	0.6	0.5	.	1.0	0.5	0.5	.
Certificate (level unknown)	15.5	17.7	17.0	14%	17.7	19.5	19.0	10%	17.0	18.9	18.3	11%
<i>Standard error</i>	1.4	1.3	1.0	.	0.7	1.3	0.9	.	0.7	0.9	0.7	.
A/T: Certificate (level unknown)	25.8	25.4	25.5	-2%	20.3	24.5	22.8	20%	23.1	25.1	24.6	9%
<i>Standard error</i>	5.8	2.2	2.1	.	4.4	2.6	2.3	.	3.6	1.7	1.6	.
Diploma	18.5	18.5	18.5	0%	19.1	19.0	19.0	-1%	19.0	18.9	19.0	0%
<i>Standard error</i>	0.9	0.9	0.6	.	0.5	0.3	0.3	.	0.5	0.3	0.3	.
Bachelor or higher	19.0	24.0	21.6	27%	19.7	23.2	22.5	18%	19.7	23.2	22.5	18%
<i>Standard error</i>	1.2	1.6	1.1	.	0.3	0.2	0.1	.	0.3	0.2	0.1	.
<b>All</b>	<b>16.0</b>	<b>20.1</b>	<b>17.6</b>	.	<b>17.6</b>	<b>22.0</b>	<b>19.8</b>	.	<b>17.1</b>	<b>21.3</b>	<b>19.3</b>	.
<i>Standard error</i>	0.2	0.4	0.2	.	0.1	0.1	0.1	.	0.1	0.1	0.1	.

Notes: The sample can contain multiple observations for the same individual.

**Table D3 Average hourly wages by last education spell, completion status and school level, three years after the last education spell (weighted, in 2008 dollars)**

Last course started	Early school leavers				Year 12 graduates				All			
	Not completed	Completed	All	Completion premium	Not completed	Completed	All	Completion premium	Not completed	Completed	All	Completion premium
No post-school study	15.6	.	15.6	.	17.6	.	17.6	.	16.9	.	16.9	.
<i>Standard error</i>	0.3	.	0.3	.	0.2	.	0.2	.	0.2	.	0.2	.
Certificate I/II	15.1	18.2	17.3	20%	17.7	18.7	18.5	6%	16.8	18.5	18.1	10%
<i>Standard error</i>	1.7	1.0	0.9	.	0.7	0.5	0.5	.	0.8	0.5	0.4	.
A/T: Certificate I/II	17.9	23.4	21.7	31%	19.9	20.1	20.1	1%	19.0	21.5	20.8	13%
<i>Standard error</i>	0.7	1.1	0.8	.	0.8	0.6	0.5	.	0.5	0.6	0.4	.
Certificate III/IV	17.9	18.2	18.1	2%	18.9	18.6	18.7	-2%	18.6	18.5	18.6	-1%
<i>Standard error</i>	1.1	0.7	0.6	.	0.7	0.4	0.3	.	0.6	0.3	0.3	.
A/T: Certificate III/IV	20.9	21.7	21.6	4%	19.4	20.6	20.4	6%	20.0	21.1	20.9	5%
<i>Standard error</i>	1.2	1.2	1.0	.	1.5	0.7	0.6	.	1.1	0.6	0.5	.
Certificate (level unknown)	15.7	19.3	18.7	22%	20.2	19.4	19.7	-4%	19.2	19.4	19.3	1%
<i>Standard error</i>	2.6	1.7	1.5	.	1.4	1.5	1.1	.	1.3	1.1	0.9	.
A/T: Certificate (level unknown)	17.0	32.3	29.2	90%	16.5	23.5	20.9	42%	16.8	30.2	26.8	80%
<i>Standard error</i>	3.2	4.5	3.8	.	2.0	2.6	2.0	.	2.0	3.4	2.7	.
Diploma	18.2	19.2	19.0	6%	19.8	20.3	20.2	3%	19.7	20.2	20.1	3%
<i>Standard error</i>	2.0	0.8	0.8	.	0.6	0.5	0.4	.	0.6	0.4	0.3	.
Bachelor or higher	19.2	21.1	19.9	10%	21.3	25.2	24.4	18%	21.2	25.2	24.3	19%
<i>Standard error</i>	1.3	1.4	0.9	.	0.5	0.2	0.2	.	0.4	0.2	0.2	.
<b>All</b>	<b>16.6</b>	<b>21.7</b>	<b>18.6</b>	.	<b>18.5</b>	<b>22.9</b>	<b>20.7</b>	.	<b>18.0</b>	<b>22.4</b>	<b>20.2</b>	.
<i>Standard error</i>	0.3	0.6	0.3	.	0.2	0.2	0.1	.	0.2	0.2	0.1	.

Notes: The sample can contain multiple observations for the same individual.

# Appendix E

## Estimation results

**Table E1 Selected coefficient estimates of the (log) wage equation (Heckman model, male Year 12 graduates)**

Model's specification	Heckman		Heckman		Heckman	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
<i>Number of years after last course</i>	<i>One</i>		<i>Two</i>		<i>Three</i>	
Completion premiums by course level						
Certificate I/II	0.032	0.83	0.075	1.33	-0.037	-0.68
Certificate III/IV	-0.104**	-2.01	0.016	0.31	-0.097	-1.35
Certificate III/IV (A/T)	0.009	0.07	0.024	0.21	0.167	1.07
Certificate (level unknown)	-0.009	-0.11	-0.034	-0.26	-0.068	-0.72
Diploma	-0.002	-0.07	0.063	1.49	0.083	1.61
Bachelor's degree	0.070***	3.10	0.062**	2.36	0.116***	3.41
Enrolling premiums by course level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.139***	3.30	0.101*	1.72	0.113**	2.22
Certificate III/IV	0.206***	4.27	0.084	1.62	0.118	1.62
Certificate III/IV (A/T)	0.213*	1.92	0.160	1.43	0.021	0.13
Certificate (level unknown)	0.167***	3.25	0.197*	1.91	0.177***	2.86
Diploma	0.120***	3.23	0.064	1.51	0.024	0.48
Bachelor's degree	0.089***	2.61	0.118***	3.22	0.107**	2.34
Field of study (ref. is <i>Hard science</i> )						
Soft science	-0.084***	-3.86	-0.099***	-4.10	-0.068**	-2.34
Arts & Hospitality	-0.080***	-4.44	-0.103***	-4.71	-0.130***	-4.50
Missing	-0.045**	-2.14	-0.027	-1.15	-0.011	-0.37
Prior education level (ref. is <i>No post-school study</i> )						
Certificate I/II	-0.069**	-2.07	-0.090*	-1.81	-0.036	-0.45
Certificate III/IV	0.018	0.55	-0.013	-0.31	0.002	0.04
Certificate (level unknown)	0.047*	1.94	0.002	0.06	0.056	1.58
Diploma	-0.077*	-1.69	-0.062	-1.24	-0.070	-1.33
Bachelor's degree	0.185***	3.35	0.150**	2.35	0.038	0.23
Number of observations (males and females)	8187		5322		3518	
Lambda	0.022		-0.014		-0.025	
Wald test of independent equation and p-value	3.0*	0.08	0.1	0.71	0.1	0.71
Instruments in selection equation						
Chi-square test and p-value	203.1***	0.00	259.2***	0.00	165.5***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Table E2 Selected coefficient estimates of the (log) wage equation (Heckman model, female Year 12 graduates)**

Model's specification	Heckman		Heckman		Heckman	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
<i>Number of years after last course</i>	<i>One</i>		<i>Two</i>		<i>Three</i>	
Completion premiums by course level						
Certificate I/II	0.048	1.42	0.037	0.90	0.074*	1.68
Certificate III/IV	0.042	1.12	-0.037	-0.97	0.062	0.85
Certificate III/IV (A/T)	-0.071	-1.11	-0.096	-1.63	-0.143	-1.20
Certificate (level unknown)	0.109	1.48	0.006	0.09	-0.081	-0.59
Diploma	0.032	1.12	0.047	1.34	-0.041	-0.98
Bachelor's degree	0.097***	4.96	0.101***	4.20	0.153***	4.62
Enrolling premiums by course level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.123***	3.16	0.098**	2.18	-0.023	-0.49
Certificate III/IV	0.111***	2.85	0.160***	4.21	-0.022	-0.29
Certificate III/IV (A/T)	0.218***	3.44	0.210***	3.81	0.154	1.26
Certificate (level unknown)	0.000	-0.01	0.073	1.38	0.007	0.05
Diploma	0.132***	4.01	0.102***	2.73	0.105**	2.16
Bachelor's degree	0.143***	5.12	0.174***	5.54	0.103**	2.48
Field of study (ref. is <i>Hard science</i> )						
Soft science	-0.034**	-2.10	-0.064***	-3.27	-0.016	-0.59
Arts & Hospitality	-0.073***	-4.51	-0.127***	-6.72	-0.061**	-2.38
Missing	-0.033*	-1.75	-0.077***	-3.59	0.018	0.62
Prior education level (ref. is <i>No post-school study</i> )						
Certificate I/II	-0.111***	-3.41	-0.023	-0.60	-0.031	-0.78
Certificate III/IV	-0.014	-0.55	0.021	0.60	0.017	0.41
Certificate (level unknown)	0.006	0.30	0.016	0.68	0.004	0.15
Diploma	-0.060*	-1.92	-0.075	-1.63	-0.069*	-1.69
Bachelor's degree	0.094***	3.37	0.069**	2.02	0.087	0.85
Number of observations (males and females)	8187		5322		3518	
Lambda	0.02		-0.01		-0.03	
Wald test of independent equations and p-value	3.0*	0.08	0.1	0.71	0.1	0.71
Instruments in selection equation						
Chi-square test and p-value	203.1***	0.00	259.2***	0.00	165.5***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Table E3 Selected coefficient estimates of the (log) wage equation (Heckman model, early school leavers)**

Model's specification	Heckman		Heckman		Heckman	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
<i>Number of years after last course</i>	<i>One</i>		<i>Two</i>		<i>Three</i>	
Completion premiums by course level						
Certificate I/II	0.010	0.24	-0.010	-0.23	0.095*	1.85
Certificate III/IV	-0.048	-0.83	0.084	1.31	0.034	0.38
Certificate III/IV (A/T)	-0.094	-1.28	0.070	0.94	-0.076	-0.86
Certificate (level unknown)	0.098	1.12	0.126	0.97	0.296*	1.84
Diploma	0.014	0.20	-0.078	-1.10	-0.048	-0.42
Bachelor's degree	0.138	1.58	0.158	1.56	0.263**	2.51
Enrolling premiums by course level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.168***	4.10	0.192***	4.05	0.090	1.47
Certificate III/IV	0.193***	3.30	0.024	0.35	0.060	0.52
Certificate III/IV (A/T)	0.293***	4.15	0.120*	1.65	0.205**	2.52
Certificate (level unknown)	0.194***	2.72	0.093	0.72	-0.014	-0.10
Diploma	0.241***	4.22	0.178***	2.85	0.197*	1.74
Bachelor's degree	0.109	1.50	0.092	1.08	0.044	0.41
Field of study (ref. is <i>Hard science</i> )						
Soft science	-0.084**	-2.56	-0.144***	-4.24	-0.159***	-3.57
Arts & hospitality	-0.120***	-3.95	-0.111***	-2.93	-0.115***	-2.60
Missing	-0.136**	-2.47	-0.102**	-2.11	-0.114**	-2.07
Prior education level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.033	0.82	-0.015	-0.21	0.094	1.56
Certificate III/IV	0.012	0.25	0.091**	2.29	0.031	0.48
Certificate (level unknown)	-0.068	-1.48	-0.015	-0.36	0.021	0.48
Diploma	0.081	0.82	-0.039	-0.33	-0.106	-1.21
School level						
Year 11	0.074***	4.04	0.038*	1.71	-0.053**	-1.96
Female	-0.073***	-3.82	-0.071***	-3.31	-0.076***	-2.96
Number of observations	2383		1690		1090	
Lambda	0.062		-0.094		0.106	
Wald test of independent equations and p-value	0.83	0.36	5.37**	0.02	1.10	0.29
Instruments in selection equation	0	0	0	0	0	0
Chi-square test and p-value	120.1***	0.00	122.9***	0.00	104.7***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Table E4a Selected coefficient estimates of the (log) wage equation for the top and bottom 50% by literacy and numeracy test scores (one and two years after the last education spell)**

<i>Sample of analysis</i> <i>Number of years after last course</i>	Heckman		Heckman		Heckman		Heckman	
	Coef.	z-val.	Coef.	z-val.	Coef.	z-val.	Coef.	z-val.
	<i>Top</i>		<i>Bottom</i>		<i>Top</i>		<i>Bottom</i>	
	<i>One</i>		<i>One</i>		<i>Two</i>		<i>Two</i>	
Completion premiums by course level								
Certificate I/II	0.068**	2.45	0.012	0.36	0.028	0.69	0.027	0.77
Certificate III/IV	-0.039	-1.00	-0.004	-0.09	0.094**	2.40	-0.053	-1.22
Certificate III/IV (A/T)	-0.062	-0.84	-0.049	-0.77	0.034	0.58	-0.031	-0.44
Certificate (level unknown)	0.040	0.57	0.112	1.42	-0.051	-0.61	0.147	1.56
Diploma	0.067**	2.51	-0.031	-0.96	0.079**	2.22	0.004	0.12
Bachelor's degree	0.077***	4.49	0.107***	3.90	0.070***	3.56	0.125***	3.62
Enrolling premiums by course level (ref. is <i>No post-school study</i> )								
Certificate I/II	0.103***	3.36	0.160***	4.44	0.133***	3.10	0.136***	3.50
Certificate III/IV	0.205***	5.13	0.097***	2.61	0.074*	1.87	0.106**	2.41
Certificate III/IV (A/T)	0.256***	3.55	0.230***	3.90	0.167***	2.93	0.163**	2.47
Certificate (level unknown)	0.170***	3.51	0.081	1.17	0.167**	2.36	0.071	0.82
Diploma	0.104***	3.52	0.161***	4.52	0.082**	2.20	0.091**	2.44
Bachelor's degree	0.125***	4.87	0.105***	2.93	0.168***	5.76	0.093**	2.40
Field of study (ref. is <i>Hard science</i> )								
Soft science	-0.084***	-5.62	-0.058***	-2.95	-0.104***	-5.88	-0.097***	-4.42
Arts & Hospitality	-0.099***	-7.09	-0.083***	-4.54	-0.119***	-7.30	-0.130***	-5.93
Missing	-0.071***	-4.56	-0.038	-1.51	-0.082***	-4.52	-0.047*	-1.90
Prior education level (ref. is <i>No post-school study</i> )								
Certificate I/II	-0.024	-0.97	-0.054	-1.56	-0.003	-0.06	-0.077**	-2.03
Certificate III/IV	-0.014	-0.48	0.012	0.47	0.010	0.29	0.042	1.31
Certificate (level unknown)	0.025	1.34	-0.011	-0.49	-0.003	-0.12	0.011	0.41
Diploma	-0.058*	-1.76	-0.044	-1.02	-0.018	-0.44	-0.153***	-2.99
Bachelor's degree	0.114***	3.95	0.124**	2.50	0.118***	3.46	0.014	0.27
School level								
Year 12	0.047***	2.61	0.095***	6.06	-0.002	-0.11	0.034*	1.89
Number of observations	5857		4713		3876		3136	
Lambda	-0.002		0.014		-0.028		-0.057	
Wald test of independent equations and p-value	0.01	0.92	0.38	0.54	0.48	0.49	5.76**	0.02
Instruments in selection equation								
Chi-square test and p-value	149.1***	0.00	163.7***	0.00	194.0***	0.00	185.0***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Table E4b Selected coefficient estimates of the (log) wage equation for the top and bottom 50% by literacy and numeracy test scores (three years after the last education spell)**

Model's specification	Heckman		Heckman	
	Coef.	z-val.	Coef.	z-val.
<i>Sample of analysis</i>		<i>Top</i>	<i>Bottom</i>	
<i>Number of years after last course</i>		<i>Three</i>	<i>Three</i>	
Completion premiums by course level				
Certificate I/II	0.062	1.20	0.038	1.10
Certificate III/IV	-0.019	-0.47	0.050	0.61
Certificate III/IV (A/T)	-0.014	-0.12	0.017	0.19
Certificate (level unknown)	0.012	0.14	0.149	1.18
Diploma	0.061	1.51	-0.001	-0.02
Bachelor's degree	0.130***	4.76	0.150***	3.23
Enrolling premiums by course level (ref. is <i>No post-school study</i> )				
Certificate I/II	0.030	0.57	0.083**	2.13
Certificate III/IV	0.074*	1.75	0.007	0.07
Certificate III/IV (A/T)	0.131	1.12	0.116	1.31
Certificate (level unknown)	0.121*	1.82	0.023	0.21
Diploma	0.042	0.97	0.115**	2.16
Bachelor's degree	0.109***	2.94	0.144***	2.78
Field of study (ref. is <i>Hard science</i> )				
Soft science	-0.061***	-2.60	-0.101***	-3.41
Arts & Hospitality	-0.117***	-5.59	-0.088***	-2.94
Missing	-0.028	-1.23	-0.006	-0.19
Prior education level (ref. is <i>No post-school study</i> )				
Certificate I/II	-0.008	-0.18	0.026	0.47
Certificate III/IV	0.009	0.23	0.016	0.35
Certificate (level unknown)	0.036	1.41	0.004	0.13
Diploma	-0.056	-1.36	-0.084*	-1.84
Bachelor's degree	0.067	0.74	0.201	0.57
School level				
Year 12	-0.034	-1.31	0.004	0.17
Number of observations	2491		2117	
Lambda	-0.012		-0.017	
Wald test of independent equations and p-value	0.04	0.83	0.15	0.69
Instruments in selection equation				
Chi-square test and p-value	139.9***	0.00	184.0***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.



**Table E5 Selected coefficient estimates of the (log) wage equation (Heckman IPW model, male Year 12 graduates)**

Model's specification	Heckman IPW		Heckman IPW		Heckman IPW	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
<i>Number of years after last course</i>	<i>One</i>		<i>Two</i>		<i>Three</i>	
Completion premiums by course level						
Certificate I/II	0.031	0.79	0.076	1.27	-0.034	-0.63
Certificate III/IV	-0.096*	-1.75	0.017	0.32	-0.128	-1.51
Certificate III/IV (A/T)	0.016	0.13	0.025	0.22	0.179	0.93
Certificate (level unknown)	0.004	0.05	-0.028	-0.23	-0.073	-0.78
Diploma	0.007	0.20	0.068	1.56	0.087	1.62
Bachelor's degree	0.075***	3.37	0.067**	2.58	0.108***	3.08
Enrolling premiums by course level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.158***	3.69	0.114*	1.87	0.121**	2.34
Certificate III/IV	0.230***	4.60	0.119**	2.24	0.169**	2.06
Certificate III/IV (A/T)	0.228**	1.98	0.176	1.53	-0.011	-0.06
Certificate (level unknown)	0.186***	3.84	0.225**	2.39	0.181***	2.74
Diploma	0.147***	4.07	0.103**	2.34	0.053	1.03
Bachelor's degree	0.118***	3.62	0.150***	4.12	0.124***	2.71
Field of study (ref. is <i>Hard science</i> )						
Soft science	-0.092***	-4.22	-0.110***	-4.49	-0.071**	-2.37
Arts & Hospitality	-0.090***	-5.08	-0.117***	-5.36	-0.144***	-4.97
Missing	-0.081***	-4.87	-0.076***	-4.02	-0.066***	-2.60
Prior education level (ref. is <i>No post-school study</i> )						
Certificate I/II	-0.066*	-1.89	-0.095*	-1.80	-0.009	-0.10
Certificate III/IV	0.018	0.51	-0.029	-0.66	-0.009	-0.14
Certificate (level unknown)	0.039	1.59	-0.015	-0.49	0.044	1.20
Diploma	-0.082*	-1.88	-0.066	-1.20	-0.077	-1.46
Bachelor's degree	0.181***	3.17	0.146**	2.24	0.049	0.32
Number of observations (males and females)	8187		5322		3518	
Lambda	0.021		-0.018		-0.091	
Wald test of independent equations and p-value	2.66	0.10	0.17	0.68	2.19	0.14
Instruments in selection equation						
Chi-square test and p-value	210.8***	0.00	251.5***	0.00	149.2***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Table E6 Selected coefficient estimates of the (log) wage equation (Heckman IPW model, female Year 12 graduates)**

Model's specification	Heckman IPW		Heckman IPW		Heckman IPW	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
<i>Number of years after last course</i>	<i>One</i>		<i>Two</i>		<i>Three</i>	
Completion premiums by course level						
Certificate I/II	0.058*	1.67	0.032	0.82	0.071	1.48
Certificate III/IV	0.043	1.13	-0.031	-0.81	0.029	0.47
Certificate III/IV (A/T)	-0.087	-1.37	-0.113*	-1.90	-0.165	-1.27
Certificate (level unknown)	0.140**	1.97	-0.003	-0.04	-0.131	-0.94
Diploma	0.039	1.42	0.050	1.41	-0.045	-1.06
Bachelor's degree	0.101***	5.07	0.095***	3.92	0.145***	4.24
Enrolling premiums by course level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.122***	3.13	0.101**	2.33	0.011	0.22
Certificate III/IV	0.122***	3.15	0.155***	4.02	0.058	0.90
Certificate III/IV (A/T)	0.239***	3.77	0.224***	4.10	0.186	1.37
Certificate (level unknown)	-0.009	-0.15	0.066	1.30	0.081	0.71
Diploma	0.136***	4.30	0.096**	2.58	0.148***	3.02
Bachelor's degree	0.152***	5.67	0.177***	5.68	0.149***	3.50
Field of study (ref. is <i>Hard science</i> )						
Soft science	-0.038**	-2.30	-0.067***	-3.42	-0.018	-0.63
Arts & Hospitality	-0.076***	-4.72	-0.126***	-6.78	-0.081***	-3.06
Missing	-0.052***	-3.22	-0.081***	-4.52	-0.041	-1.57
Prior education level (ref. is <i>No post-school study</i> )						
Certificate I/II	-0.105***	-3.42	-0.021	-0.53	-0.032	-0.77
Certificate III/IV	-0.019	-0.76	0.019	0.54	0.003	0.07
Certificate (level unknown)	0.004	0.21	0.015	0.67	0.003	0.10
Diploma	-0.056*	-1.81	-0.069	-1.50	-0.076*	-1.80
Bachelor's degree	0.090***	3.14	0.078**	2.25	0.104	0.96
Number of observations (males and females)	8187		5322		3518	
Lambda	0.021		-0.018		-0.091	
Wald test of independent equations and p-value	2.66	0.10	0.17	0.68	2.19	0.14
Instruments in selection equation						
Chi-square test and p-value	210.8***	0.00	251.5***	0.00	149.2***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.

**Table E7 Selected coefficient estimates of the (log) wage equation (Heckman IPW model, early school leavers)**

Model's specification	Heckman IPW		Heckman IPW		Heckman IPW	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
<i>Number of years after last course</i>	<i>One</i>		<i>Two</i>		<i>Three</i>	
Completion premiums by course level						
Certificate I/II	0.019	0.48	-0.007	-0.17	0.085	1.53
Certificate III/IV	-0.056	-0.96	0.087	1.38	-0.020	-0.23
Certificate III/IV (A/T)	-0.097	-1.34	0.066	0.89	-0.096	-1.21
Certificate (level unknown)	0.094	1.09	0.123	0.96	0.233	1.46
Diploma	0.047	0.64	-0.055	-0.74	-0.051	-0.43
Bachelor's degree	0.102	1.25	0.145	1.51	0.231**	2.15
Enrolling premiums by course level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.200***	4.95	0.203***	4.16	0.095	1.48
Certificate III/IV	0.232***	3.84	0.032	0.46	0.115	1.05
Certificate III/IV (A/T)	0.338***	4.85	0.136*	1.90	0.228***	2.99
Certificate (level unknown)	0.243***	3.37	0.117	0.94	0.057	0.38
Diploma	0.259***	4.53	0.171***	2.72	0.207*	1.80
Bachelor's degree	0.191***	3.01	0.129	1.62	0.088	0.82
Field of study (ref. is <i>Hard science</i> )						
Soft science	-0.111***	-3.42	-0.174***	-5.03	-0.184***	-4.27
Arts & Hospitality	-0.150***	-5.16	-0.138***	-3.55	-0.158***	-3.97
Missing	-0.162***	-3.17	-0.111**	-2.37	-0.166***	-3.17
Prior education level (ref. is <i>No post-school study</i> )						
Certificate I/II	0.025	0.64	0.015	0.21	0.098*	1.80
Certificate III/IV	0.003	0.06	0.091**	2.27	0.062	0.86
Certificate (level unknown)	-0.072	-1.61	-0.009	-0.22	-0.001	-0.02
Diploma	0.053	0.50	-0.098	-0.79	-0.193**	-1.97
School level						
Year 11	0.089***	4.91	0.041*	1.78	-0.038	-1.42
Number of observations	2383		1690		1090	
Lambda	0.017		-0.122		-0.025	
Wald test of independent equations and p-value	0.09	0.77	10.92***	0.00	0.09	0.76
Instruments in selection equation						
Chi-square test and p-value	115.6***	0.00	147.8***	0.00	128.9***	0.00

Notes: \* indicates significance at the 10% level, \*\* at the 5% level and \*\*\* at the 1% level.



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