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Abstract

We provide estimates of the effects of completing a Vocational Education and Training (VET) qualification on several labour market outcomes: earnings from employment, plus the probabilities of being employed, being employed full-time if employed, and being employed in a permanent position. Estimates are provided for 1993, 1997, 2001 and 2005. The estimation methodology is based on matched comparisons of persons at each level of VET qualifications separately with Year 12 completers and non-completers. We find that compared to Year 12 completers, there is little benefit from obtaining certificate level qualifications, but there are positive employment and earnings outcomes associated with obtaining diploma level qualifications. Compared to non-completers of Year 12, however, there are benefits from obtaining any kind of VET qualification, including the lower level Certificate I/II qualifications.

1. Introduction

According to the 1999 *Adelaide Declaration on National Goals for Schooling in the Twenty-First Century*, Vocational Education and Training (VET) plays an important role in the Australian education system. In particular, VET can be helpful in developing employment related skills and an understanding of the work environment, providing foundation building pathways for alternative career options, and providing opportunities for lifelong learning.

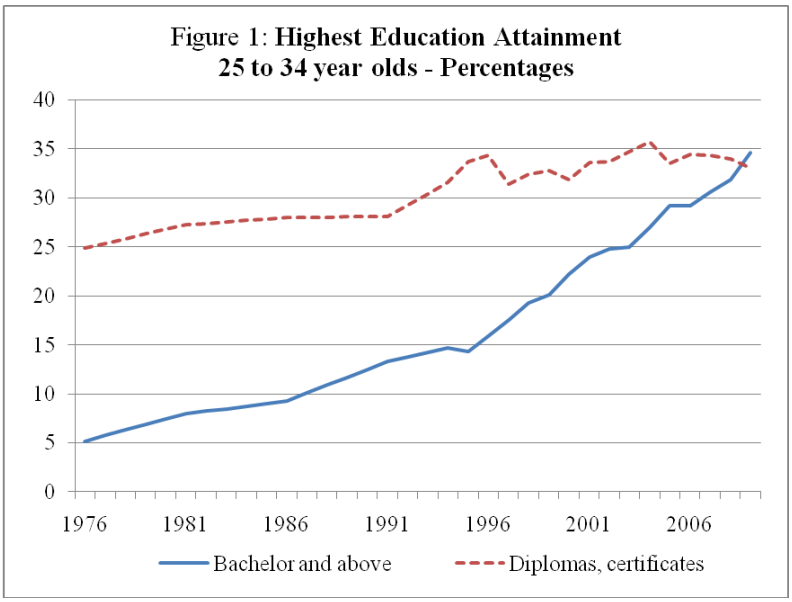
This paper provides up to date estimates of the effects of completing a VET qualification on several employment and earnings outcomes. The benefits of obtaining a VET qualification may manifest itself not just via higher earnings rates among full-time workers, but also via higher probabilities of obtaining work, of obtaining full-time versus part-time work, and of obtaining permanent rather than casual employment. Studies of the effect of education attainment on earnings are prevalent, whereas estimates of the effect of education on these other important labour market outcomes have been relatively rare.

Our empirical strategy for estimating the labour market effects of VET is a combination of regression and propensity score matching. This study extends the analysis in Ryan (2002b) by examining more recent data, and by using an alternative more rigorous and flexible statistical procedure, with the emphasis placed on the creation of appropriate comparison groups. The methodology used to construct the estimates in this paper is one based on matched comparisons of persons at each level of VET qualifications with Year 12 completers, and with non-completers of Year 12. These are the appropriate comparison groups because it is precisely persons who complete Year 12 or less that would be most interested in the potential benefits from obtaining VET qualifications. We find that the choice of comparison group is critical when constructing impact estimates. We provide our estimates over time, from 1993 to 2005, using Survey of Education and Training (SET) data for four time periods. By doing so, we can see what the trend has been in terms of impacts, and perhaps understand why growth in VET has not matched growth in university-level education over the past two decades. We also provide impact estimates by field of study, which is a relatively unexplored area. Impact estimates by field can be helpful in shedding more light on the heterogeneous effects for different sub-populations.

The outline for the remainder of the paper is as follows. In Section 2, we briefly place our study in the context of the Australian literature. Section 3 discusses the estimation methodology we employ in this paper. The data employed in the analysis are described in Section 4. Section 5 provides some descriptive statistics of the variables that are used in the multivariate analysis. Section 6 provides estimates of the effects of VET by level of qualification and field of study. Finally, Section 7 concludes.

2. Previous Research on the Effects of VET

There has been considerable growth in enrolment and attainment at the university level over the past twenty years, but considerably slower growth at VET level (see Figure 1). This is despite Australian employers citing considerable skills shortages in the trades in particular at the end of the most recent economic expansion.



Sources: Australian Bureau of Statistics, 1994 to 2008 from 6227.0, "Education and Work"; 1991 from 2821.0, "Australia in profile, Census data"; 1986 from 2498.0 and 1981 from 2452.0, "Cross-classified characteristics of persons and dwellings"; 1976 from 2426.0, "Population and Dwellings, Cross-classified Tables". Other years are linear interpolations.

If we are to motivate individuals to participate in VET by convincing them that it is worth their while investing their time and resources, then reliable estimates of the labour market impacts of obtaining VET qualifications must be well-known and explicit. If it is clear to individuals what the expected benefits of acquiring certain types of qualifications are, informed decisions can be made.

The issue of estimating the impacts of VET by level of qualification is not new and has been addressed by many Australian researchers in the past. In general, two main approaches have been used to provide estimates of the labour market effects of obtaining certain educational qualifications (including VET) in Australia. The first approach is based on calculating the internal rate of return (IRR) of an investment in education. This calculation involves obtaining estimates of the streams of the costs and benefits over an individual's lifetime of making an investment in education. The IRR is the interest or discount rate that equates the present discounted value of the streams of costs and benefits. The second main approach is to estimate a Mincer (1974) equation for labour market earnings. This approach

involves estimating some variation of a log earnings regression using years of schooling and years of post-school work experience as regressors, and interpreting the coefficient on schooling as the return to schooling.[1]

More recent Australian research based on the IRR approach of estimating the labour market effects of VET include Ryan (2002a), Chapman et al. (2007) and Long and Shah (2007). Borland (2002) constructed IRR measures at the university level for Australia. Overviews of Australian research on the labour market effects of VET qualifications conducted prior to these studies are provided in Ryan (2002a) and Long and Shah (2007). The findings of the various IRR-based studies have been quite variable, with the size of estimated returns varying considerably from study to study. This variation is most likely due to both different data sets being employed that use earnings information at different points in time, and to variations in the specific choices made by researchers when estimating the costs and benefits of education.

Over the years, many variations of the Mincer equation approach to estimating the effects of schooling have been employed in the Australian literature. This approach focuses on identifying the average relationship between earnings and schooling and not on constructing an internal rate of return.[2] For example, in estimating the economic effects of obtaining various levels of education in Australia, Leigh (2008) first identified appropriate comparison groups for individuals with certain educational qualifications and restricted his sample accordingly before proceeding with his analysis. In addition, as standard linear OLS regression estimates of the coefficient on schooling are likely to be biased because of self-selection into schooling (i.e., individuals do not choose their level of schooling at random), Australian researchers have attempted to circumvent the potential endogeneity of schooling issue by using instrumental variable techniques (e.g., Leigh and Ryan, 2008), or by using a sample of twins (e.g., Miller, Mulvey and Martin, 1995, 2005, 2006). This small Australian literature has found 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. In the US literature, however, causal estimates have been found to be on average the same or even slightly larger than those based on OLS. Card (1999, 2001) provides a review of the

[1] The justification for using such an approach comes from the fact that this type of specification can be derived from a simple model where individual decision makers choose years of schooling to maximize the present discounted value of lifetime net income.

[2] Heckman, Lochner and Todd (2008) highlight the fact that strong assumptions are required to claim that the coefficient on education from a Mincer model can be interpreted as an internal rate of return. These include: (i) there is no direct or psychic costs of schooling; (ii) there are no income taxes; (iii) there is no loss of working life with additional years of schooling; (iv) earnings functions are multiplicatively separable in experience and schooling; and (v) marginal returns to schooling equal average returns to schooling.

international literature and an overview of the econometric challenges in attempting to estimate the causal effects of schooling.

The general finding in the Australian literature is that the labour market benefits of VET participation are larger when compared to the labour market outcomes of early school leavers (non-completers) than when compared to the outcomes of those who complete school (year 12) without undertaking further study. In other words, selection of an appropriate comparison group is important. Ryan (2002b) found that there was a positive effect of completion of a VET qualification on the employment outcomes for individuals when compared to individuals who did not complete Year 12. In particular, he found that for males, skilled vocational qualifications and associate diplomas had larger effects on the probability of being employed full-time than basic vocational qualifications. He also found that business courses provided better employment outcomes for both males and females than other fields.

One important component of this study is the construction of estimates of the labour market effects of VET over time. There have been several Australian studies of changes in the relationship between earnings levels and education over time in the past few decades. Coelli and Wilkins (2009) construct estimates of earnings and income differences by education attained over the period 1981/82 to 2003/4. The authors find that the percentage gap in weekly full-time earnings between individuals with non-university post-secondary qualifications (Certificates I to IV and undergraduate diplomas) and those with no post-secondary qualifications has remained quite stable for males but fallen for females over this period. This study updated earlier work by Borland (1999), Gregory (1995), Karmel (1994) and others. The earlier work found that earnings gaps for both males and females had fallen over the period from 1968/69 to 1981/82. These studies did not, however, break down the earnings gap by field of study or pay particularly close attention to the appropriate choice of comparison group (year 12 completers versus non-completers). These studies also did not focus on labour market outcomes apart from earnings, such as employment status, full-time status and permanent employment status.

A small amount of research on the relationship between VET qualifications and employment outcomes other than earnings has been conducted for Australia. Studies of the relationship between employment rates and VET include Ryan (2000, 2002a), Marks et al. (2003), and Gørgens and Ryan (2006), among others. A review of such studies is provided in Long and Shah (2007). These studies generally find that such qualifications do raise the probability of being employed relative to those without such qualifications. Kennedy and Hedley (2003) examine movements over time in labour force participation rates by educational attainment. The authors find that participation rates of prime age males fell for all

educational attainment groups between 1981 and 2001, but the fall for males with no post-school qualifications was particularly dramatic.

3. Methodology

Assume that each individual has two potential outcomes: Y(1) in the case that he or she obtained a VET qualification and Y(0) if the same person did not. The latter is often referred to as the 'counterfactual' in the evaluation literature for those who obtained VET qualifications. The causal effect is then given by the comparison of Y(1) and Y(0). Let D represent the treatment variable, taking a value of 1 if the individual has a VET qualification and 0 otherwise. One parameter of interest for policy makers is referred to as the average treatment effect on the treated (ATT) and can be expressed as:

$$\text{ATT} = E(Y(1) - Y(0) \mid D = 1) = E(Y(1) \mid D = 1) - E(Y(0) \mid D = 1)$$

In our setting, this would be the effect of a VET qualification on labour market outcomes for those who undertook VET studies. To estimate the ATT, one needs to have an estimate of $E(Y(0) \mid D = 1)$. A naïve approach uses $E(Y(0) \mid D = 0)$ as an estimate for $E(Y(0) \mid D = 1)$.[3] However, simply comparing people with VET qualifications and those without VET qualifications is a potentially biased approach because it is likely that certain individuals self-select themselves into the vocational education system, while others choose not to obtain any more schooling after a certain point or choose to pursue a university education instead. These groups of individuals are potentially quite different. In the econometrics literature, this is known as the problem of selection bias and exists because

$$E(Y(0) \mid D = 1) \neq E(Y(0) \mid D = 0)$$

Under a randomized experiment, because assignment to either the treatment or comparison group is random, characteristics of both groups should be on average very similar. Both groups would be similar in age, have a similar proportion of males, a similar proportion from each state etc. The only difference is that one group is exposed to treatment while the other is not. As a result, taking the simple difference in outcomes between the two groups without any adjustments for covariates can be interpreted as the ATT.

In the case of non-experimental data like the SET, however, it is unlikely that the two groups will be similar in terms of characteristics. As differences in group characteristics do

[3] Incidentally, this is often the approach used in most IRR studies.

exist (see below), it is unlikely that a simple comparison in group mean outcomes can be meaningfully interpreted as a causal effect of VET. Any differences in group mean outcomes could be the result of the treatment, or due simply to differences in the characteristics of the two groups.

One econometric approach to solving the problem of selection bias involves the use of matching methods. Matching estimators are justifiable when an assumption that potential outcomes are independent of treatment receipt conditional on a set of observable characteristics is satisfied. More formally, this important condition is known as the Conditional Independence Assumption:

$$Y(0) \perp D \mid X$$

The fulfilment of this assumption helps solve the problem of selection bias because after conditioning on the covariates,

$$E(Y(0) \mid X, D = 1) = E(Y(0) \mid X, D = 0) = E(Y(0) \mid X)$$

In this paper, our empirical strategy for estimating the impacts of VET is a combination of regression and propensity score matching. More specifically, we use the method of propensity score matching to pre-process the data before applying standard regression analysis, in order to make less model dependent causal inferences (e.g., see Ho et al., 2007 or section 5.8 in Imbens and Wooldridge, 2009).[4] Unlike a standard matching approach, this involves conducting a two-stage analysis rather than matching in a single step on a single set of covariates. Matching in a single step is not desirable in our context because our treatment-comparison group assignment variable in the SET data is retrospective, and we cannot use variables measured after the decision on whether to undertake VET has been made (e.g., current marital status) to predict the probability of undertaking VET.

In the first step of our two-step process, matching is conducted using covariates that can plausibly affect the decision to undertake VET. In the second step, we use an augmented set of variables for the regression analysis: variables from the first step, the weights obtained from matching in the first step, plus additional variables that might plausibly affect the

[4] Black and Smith (2004) applies the propensity score method approach to the related issue of examining the labour market effects of college quality. Cobb-Clark and Crossley (2003) provide a useful discussion of the differences in assumptions underlying standard linear regression, matching and instrumental variable approaches when these methods are used for evaluation purposes.

outcome of interest but not the decision to undertake VET. Details on the variables we use for each step are included in the appendix.

The two-step statistical procedure we undertake is best explained using a simple example. Suppose there are 2,000 persons with Certificates III or IV (the treatment group) and 8,000 persons with no VET qualifications (the comparison group). While ordinary regression analysis will simply use the entire sample of 10,000 to estimate the effect of having a Certificate III or IV qualification, matching in the first step will eliminate the least comparable comparison group members. Suppose in this case that with nearest neighbour matching, only 1,500 of the 8,000 comparison group members are kept in the sample (with some being paired with more than one treatment group member – a technique known as "matching with replacement"). In other words, the total sample size now is not 10,000 but 3,500 (i.e., 2,000 + 1,500). The second stage regression is then performed using this smaller sample. The idea of using only comparable individuals in the statistical analysis is an attempt to mimic a randomized experiment.

The approach we use in this paper is essentially a weighted regression approach, with weights corresponding to the number of times a comparison group observation is used as a match. The motivation behind discarding comparison group observations in the matching process is that these observations are likely to be outliers relative to the treatment group observations, and may unduly affect the least squares estimates.

4. Data

The data employed in the analysis were taken from four separate Survey of Education and Training (SET) datasets collected by the Australian Bureau of Statistics (ABS): 1993, 1997, 2001 and 2005. These are national household surveys that collected detailed information on individual socio-demographic characteristics, employment characteristics and educational qualifications obtained. The strength of these datasets for the purposes of this analysis lies in the extensive information they contain on individual educational attainment. Individuals report details of their three highest post-school qualifications, as well as the age at which they left school and whether they had completed the highest level of schooling possible. The qualification details include the provider type, when the qualification was completed, its field and level.

As we are interested in the labour market outcomes of individuals who have completed different levels of education and have potentially entered the labour market, we exclude from the analysis any individuals who were full-time or part-time students during the survey year. In addition, we are interested in the effects of VET education undertaken in

Australia and not in any similar qualifications obtained in other countries. We therefore exclude individuals with their highest qualification obtained overseas to allow us to obtain an estimate of the effects of an Australian education. We also exclude individuals who were born overseas and were over the age of 15 upon arrival in Australia, as such individuals were likely to have completed their secondary schooling outside Australia. Due to data limitations in the 1993 SET, however, we could only exclude overseas born who had arrived after the age of 18.

Note that we are interested in the labour market effects of VET resulting from obtaining formal qualifications only. The analysis of the effects of over time (the period 1993 to 2005) is complicated by the fact that in the late 1990s, the Australian Qualifications Framework (AQF) was introduced which changed the categorisation of educational qualifications that were awarded. With the AQF, basic vocational, skilled vocational, and associate diplomas have since been categorised as Certificates at levels I through IV, diplomas and advanced diplomas. In this paper, we put considerable effort into constructing a concordance between the pre-AQF credentials and AQF credentials using the SET data.

The population of individuals included in the analysis are those aged 15 to 64 who were either a wage or salary earner in the 12 months prior to survey date, employers or self-employed at survey date, plus individuals unemployed or marginally attached to the labour force. This was the population sampled from in the 1993 SET data. Those individuals out of the labour force were not surveyed in 1993. Note also that the surveys cover members of private dwellings only, not members of group dwellings (hotels, hostels etc.). The later years of SET data had an expanded scope of population surveyed, including those not in the labour force. In order to conduct our analyses over time on a consistent population, we ensured that the samples employed in the 1997, 2001 and 2005 SET were comparable to the 1993 SET data.

In attempting to estimate the labour market effects of obtaining different levels of VET qualifications, different treatment/comparison group pairs will be assembled in the SET data. These pairs are formed using information regarding the highest level of qualification obtained. The comparisons are partly driven by what categories are available in the SET data. For example, even though it would be interesting to split up Certificate III and IV qualifications, this is not possible as both qualifications were recorded as one category in the SET data.

For the 1993 and 1997 SET, prior to the introduction of the AQF, four different treatment groups (D = 1) were created: (i) bachelor degree and above; (ii) associate diploma; (iii) skilled vocational qualifications; and (iv) basic vocational qualifications. Individuals

with undergraduate diplomas in the 1993 and 1997 SET were excluded from the analyses. These treatment groups will each be compared with two comparison groups (D = 0): (i) school completers (= year 12); and (ii) non-completers (< year 12).

For the 2001 and 2005 SET, after the Australian Standard Classification of Education (ASCED) replaced the Australian Bureau of Statistics Classification of Qualifications (ABSCQ), the following different treatment groups were created: (i) bachelor degree and above; (ii) advanced diploma/diploma; (iii) certificate III/IV; and (iv) certificate I/II. As with the 1993 and 1997 SET, these treatment groups will be compared to year 12 completers and non-completers.

The 2001 SET data are unique in that they report education levels using both the ABSCQ and ASCED. This allows the impacts of VET to be estimated in 2001 using both classification schemes, thus inferences can be made regarding the differences the change in classification may make.

We analyse four specific labour market outcomes:

(1) Weekly earnings from employment[5], conditional on being a full-time employee (not self-employed);
(2) The probability of being employed, conditional on being in the labour force or marginally attached to the labour force (our population was described in Section 3 above);
(3) The probability of being employed full-time, conditional on being employed; and
(4) The probability of being employed in a permanent position rather than a casual position, conditional on being employed.

5. Descriptive Statistics

The means of the covariates for the various treatment and comparison groups for each of the SET data sets are assembled in Table 1. Covariate means for the four treatment groups (bachelor degree and above, associate diploma, skilled vocational qualifications or Certificate III/IV, basic vocational qualifications or Certificate I/II) are provided in the first four columns of each panel, while covariate means for the two comparison groups (Year 12 and less than Year 12) are given in the last two columns.

[5] For weekly earnings, it was necessary to impute values for the top category because the ABS top-coded high values of earnings for confidentiality purposes. Based on assuming a log-normal distribution of wages for each of the SET years, we used the following imputations. For 1993, males with earnings > $1160 - imputed value of $1401, females with earnings > $1160 - imputed value of $1338. Similarly, for the 1997 (2001) SET, the corresponding numbers were $1430 ($1468) and $1323 ($1380) for males and females respectively. Finally, for the 2005 SET where the number of earnings categories was increased, males with earnings > $2000 - imputed value of $2422, females with earnings > $2000 - imputed value of $2291.

Table 1: Covariate Means for the Treatment and Comparison Groups

1993 SET (ABSCQ)

	Bachelor's Degree and Above	Associate Diploma	Skilled Vocational Qualifications	Basic Vocational Qualifications	Year 12	Less than Year 12
Age 20 to 24	0.095	0.095	0.116	0.154	0.214	0.110
Age 25 to 29	0.133	0.139	0.147	0.156	0.152	0.120
Age 30 to 34	0.176	0.157	0.156	0.137	0.129	0.132
Age 35 to 39	0.202	0.153	0.146	0.154	0.129	0.123
Age 40 to 44	0.144	0.149	0.135	0.139	0.103	0.126
Age 45 to 49	0.108	0.129	0.113	0.093	0.077	0.126
Age 50 to 54	0.075	0.080	0.086	0.068	0.041	0.093
Age 55 to 64	0.067	0.091	0.096	0.054	0.046	0.117
Male	0.529	0.688	0.836	0.213	0.503	0.478
Capital city	0.770	0.691	0.592	0.648	0.682	0.581
Non-English speaking country	0.079	0.077	0.062	0.061	0.087	0.087
English is first language	0.892	0.904	0.924	0.910	0.891	0.901
NSW	0.231	0.260	0.253	0.300	0.185	0.198
VIC	0.214	0.218	0.201	0.160	0.228	0.209
QLD	0.133	0.157	0.194	0.163	0.172	0.205
SA	0.114	0.119	0.109	0.123	0.131	0.123
WA	0.124	0.106	0.114	0.123	0.126	0.136
Married	0.674	0.731	0.729	0.663	0.533	0.674
Child aged 0 to 2	0.163	0.128	0.142	0.134	0.126	0.117
Child aged 3 to 4	0.057	0.062	0.055	0.057	0.050	0.053
Child aged 5 to 9	0.101	0.106	0.103	0.113	0.081	0.101
Child aged 10 to 14	0.081	0.110	0.095	0.092	0.063	0.096
Union member	0.367	0.258	0.274	0.214	0.244	0.231
N	1689	792	2569	1001	2201	6788

1997 SET (ABSCQ)

	Bachelor's Degree and Above	Associate Diploma	Skilled Vocational Qualifications	Basic Vocational Qualifications	Year 12	Less than Year 12
Age 20 to 24	0.099	0.160	0.099	0.140	0.234	0.075
Age 25 to 29	0.151	0.166	0.136	0.141	0.164	0.122
Age 30 to 34	0.134	0.146	0.169	0.138	0.122	0.125
Age 35 to 39	0.164	0.139	0.162	0.147	0.121	0.141
Age 40 to 44	0.166	0.124	0.125	0.136	0.100	0.137
Age 45 to 49	0.128	0.115	0.111	0.114	0.070	0.131
Age 50 to 54	0.094	0.086	0.094	0.080	0.044	0.108
Age 55 to 64	0.043	0.038	0.067	0.048	0.020	0.068
Male	0.021	0.022	0.030	0.021	0.012	0.034
Capital city	0.501	0.514	0.879	0.396	0.522	0.486
Non-English speaking country	0.898	0.886	0.930	0.919	0.897	0.927
English is first language	0.065	0.054	0.041	0.045	0.058	0.048
NSW	0.230	0.267	0.205	0.271	0.200	0.184
VIC	0.234	0.200	0.191	0.167	0.220	0.184
QLD	0.166	0.168	0.214	0.188	0.211	0.219
SA	0.096	0.128	0.119	0.120	0.096	0.139
WA	0.105	0.112	0.129	0.129	0.123	0.132
Married	0.679	0.616	0.737	0.656	0.525	0.676
Child aged 0 to 2	0.139	0.141	0.170	0.124	0.129	0.114
Child aged 3 to 4	0.053	0.054	0.052	0.052	0.034	0.057
Child aged 5 to 9	0.104	0.065	0.093	0.114	0.080	0.110
Child aged 10 to 14	0.116	0.094	0.095	0.109	0.067	0.101
Union member	0.311	0.254	0.233	0.206	0.211	0.207
Has disability	0.144	0.214	0.229	0.235	0.160	0.245
N	2032	555	1986	1967	1807	5566

2001 SET (ASCED)

	Bachelor's Degree and Above	Associate Diploma	Skilled Vocational Qualifications	Basic Vocational Qualifications	Year 12	Less than Year 12
Age 20 to 24	0.082	0.067	0.087	0.101	0.175	0.065
Age 25 to 29	0.138	0.131	0.138	0.139	0.189	0.085
Age 30 to 34	0.145	0.129	0.138	0.133	0.157	0.113
Age 35 to 39	0.141	0.116	0.147	0.135	0.119	0.149
Age 40 to 44	0.147	0.159	0.161	0.140	0.108	0.143
Age 45 to 49	0.137	0.133	0.121	0.111	0.073	0.134
Age 50 to 54	0.127	0.126	0.094	0.118	0.051	0.123
Age 55 to 64	0.055	0.094	0.076	0.065	0.028	0.087
Male	0.027	0.038	0.030	0.032	0.009	0.043
Capital city	0.476	0.456	0.760	0.331	0.516	0.485
Non-English speaking country	0.916	0.904	0.923	0.910	0.911	0.931
English is first language	0.052	0.058	0.046	0.053	0.055	0.049
NSW	0.220	0.237	0.208	0.239	0.183	0.190
VIC	0.235	0.203	0.204	0.173	0.223	0.190
QLD	0.157	0.177	0.196	0.196	0.222	0.206
SA	0.113	0.112	0.125	0.132	0.108	0.143
WA	0.114	0.141	0.138	0.136	0.130	0.137
Father born overseas	0.307	0.290	0.289	0.288	0.286	0.256
Mother born overseas	0.268	0.255	0.249	0.254	0.272	0.232
Married	0.693	0.723	0.719	0.682	0.579	0.670
Child aged 0 to 2	0.130	0.112	0.126	0.119	0.139	0.103
Child aged 3 to 4	0.045	0.061	0.060	0.060	0.057	0.053
Child aged 5 to 9	0.101	0.096	0.125	0.108	0.098	0.112
Child aged 10 to 14	0.097	0.105	0.090	0.107	0.063	0.108
Union member	0.276	0.204	0.195	0.122	0.158	0.162
Has disability	0.182	0.217	0.272	0.277	0.210	0.320
N	2403	1090	2566	1247	1635	4530

2005 SET (ASCED)

	Bachelor's Degree and Above	Associate Diploma	Skilled Vocational Qualifications	Basic Vocational Qualifications	Year 12	Less than Year 12
Age 20 to 24	0.063	0.064	0.092	0.075	0.161	0.070
Age 25 to 29	0.113	0.090	0.115	0.074	0.157	0.066
Age 30 to 34	0.160	0.134	0.138	0.132	0.154	0.081
Age 35 to 39	0.139	0.135	0.139	0.147	0.120	0.137
Age 40 to 44	0.132	0.160	0.134	0.150	0.090	0.147
Age 45 to 49	0.160	0.148	0.144	0.152	0.085	0.141
Age 50 to 54	0.114	0.101	0.105	0.105	0.061	0.130
Age 55 to 64	0.080	0.108	0.084	0.091	0.042	0.109
Male	0.039	0.058	0.039	0.041	0.016	0.067
Capital city	0.456	0.462	0.697	0.374	0.546	0.511
Non-English speaking country	0.930	0.934	0.962	0.936	0.929	0.960
English is first language	0.066	0.059	0.041	0.056	0.061	0.045
NSW	0.204	0.231	0.218	0.287	0.183	0.208
VIC	0.241	0.212	0.187	0.184	0.213	0.184
QLD	0.178	0.193	0.230	0.169	0.228	0.208
SA	0.107	0.124	0.124	0.118	0.121	0.142
WA	0.117	0.124	0.121	0.125	0.131	0.125
Father born overseas	0.306	0.311	0.264	0.273	0.303	0.244
Mother born overseas	0.270	0.290	0.226	0.240	0.274	0.221
Married	0.731	0.727	0.713	0.691	0.568	0.656
Child aged 0 to 2	0.144	0.100	0.115	0.096	0.126	0.083
Child aged 3 to 4	0.049	0.038	0.049	0.048	0.054	0.043
Child aged 5 to 9	0.105	0.122	0.103	0.112	0.085	0.103
Child aged 10 to 14	0.097	0.106	0.096	0.115	0.067	0.098
Union member	0.278	0.211	0.197	0.157	0.159	0.170
Has disability	0.165	0.223	0.270	0.272	0.183	0.322
N	2487	1115	2573	1061	1582	3534

Notes: Omitted groups in the covariates are age 15 to 19, ACT, NT and TAS, and have no children.

In all of the panels in Table 1, it is clear that there are many differences in mean characteristics across groups of persons with different educational qualifications. For example, comparing individuals with a bachelor degree and above (the treatment group) with individuals with a Year 12 education (the comparison group) in the 1993 SET, it is clear that the age distribution in the two groups is quite different. The treatment group is older on average as there is a significantly smaller proportion of individuals with a bachelor degree and above in the 20 to 24 age group (0.095 vs. 0.214). This difference is not unexpected given that most people graduate with a bachelor degree in their early twenties.

The treatment groups are more likely to reside in a capital city and more likely to be married than the comparison groups. Persons with the lowest educational qualifications (Year 12, less than Year 12) have slightly higher proportions of individuals with English as the first language, when compared to those with higher qualifications. This suggests language is not a significant barrier to educational attainment in the Australian context, and perhaps reflects the preferences of immigrants for further education. There is strong gender sorting into the lower level VET qualifications. Males are more likely to have skilled vocational or Certificate III/IV qualifications, whereas females are more likely to have basic vocational or Certificate I/II qualifications. There is also a reduction over time in the proportion of individuals with bachelor degrees and above that are male, as females now are much more likely to attend university than males.

The differences in covariates observed in Table 1 by education group could be driven by differences in the core characteristics of persons with different educational qualifications. They could also be the result of the sampling scheme. As a person's chance of selection in the survey varied depending on the state or territory or, in some cases, area of state/territory in which they lived, differences in characteristics of survey respondents could therefore also be related to one’s educational qualifications if certain areas had a higher proportion of people with certain qualifications. If we were solely interested in describing differences in the characteristics across these groups, it would be important to take into account the method of sample selection and to use the corresponding sample weights provided with the SET data to adjust for this. However, for our purposes, as we are pre-processing the data using the matching technique to make the treatment and comparison groups similar on average, such weighting is not necessary.

6. Estimates of labour market effects of VET

Before proceeding to the results of the multivariate analysis, we first provide the raw or unadjusted mean values of the outcome variables for each of the treatment and comparison

groups in Table 2. Across all the years of SET data we analyse, it is clear that persons with a bachelor degree and above are more likely than all other groups to be employed, more likely to be in permanent employment, and to have relatively higher earnings. It is not always the case, however, that persons with a bachelor degree and above are more likely to be working full-time. In 1993, 1997 and 2001, for example, a higher proportion of males with diploma level qualifications were more likely to be working full-time.

In the results in the remainder of the paper, we present treatment/comparison group differences in labour market outcomes after statistically adjusting for differences in observable characteristics across groups. These results comprise our estimates of the labour market impacts of vocational education based on the SET data.

Table 2a: Unadjusted Mean Outcomes by Education Group - Males

	1993 (ABSCQ)	1997 (ABSCQ)	2001 (ABSCQ)	2001 (ASCED)	2005 (ASCED)
Weekly Earnings (employees) – 2005 dollars					
Bachelor plus	1197.36	1242.15	1274.38	1273.53	1418.22
Diplomas	986.62	1027.26	1077.73	1154.31	1183.91
Skilled Voc / Cert III, IV	810.39	879.22	918.55	926.69	1002.71
Basic Voc / Cert I, II	876.84	890.95	852.21	847.54	941.73
Year 12	804.38	854.33	887.12	889.57	855.59
< Year 12	737.16	768.20	797.94	799.66	958.86
Proportion Employed (if in LF or marginally attached)					
Bachelor plus	0.952	0.958	0.965	0.965	0.960
Diplomas	0.934	0.933	0.919	0.922	0.957
Skilled Voc / Cert III, IV	0.906	0.932	0.938	0.936	0.951
Basic Voc / Cert I, II	0.883	0.870	0.849	0.838	0.892
Year 12	0.875	0.899	0.917	0.917	0.875
< Year 12	0.796	0.823	0.839	0.841	0.919
Proportion Employed Full-time (if employed)					
Bachelor plus	0.932	0.749	0.728	0.728	0.726
Diplomas	0.941	0.840	0.758	0.743	0.679
Skilled Voc / Cert III, IV	0.942	0.692	0.638	0.640	0.671
Basic Voc / Cert I, II	0.905	0.726	0.657	0.666	0.736
Year 12	0.892	0.732	0.737	0.739	0.685
< Year 12	0.908	0.709	0.685	0.685	0.680
Proportion Permanently Employed (if employed)					
Bachelor plus	0.898	0.901	0.916	0.916	0.864
Diplomas	0.897	0.880	0.837	0.869	0.815
Skilled Voc / Cert III, IV	0.857	0.834	0.814	0.811	0.782
Basic Voc / Cert I, II	0.794	0.786	0.724	0.723	0.794
Year 12	0.785	0.764	0.784	0.787	0.737
< Year 12	0.787	0.759	0.738	0.738	0.733

Table 2b: Unadjusted Mean Outcomes by Education Group - Females

	1993 (ABSCQ)	1997 (ABSCQ)	2001 (ABSCQ)	2001 (ASCED)	2005 (ASCED)
Weekly Earnings (employees) – 2005 dollars					
Bachelor plus	956.63	983.44	1042.39	1039.60	1108.35
Diplomas	666.57	714.66	786.79	838.22	885.53
Skilled Voc / Cert III, IV	708.25	621.33	639.92	676.43	720.47
Basic Voc / Cert I, II	626.54	651.73	705.61	704.89	759.36
Year 12	635.99	655.06	734.18	736.12	705.99
< Year 12	590.64	631.91	671.98	673.31	745.34
Proportion Employed (if in LF or marginally attached)					
Bachelor plus	0.913	0.921	0.928	0.925	0.937
Diplomas	0.838	0.841	0.891	0.889	0.882
Skilled Voc / Cert III, IV	0.825	0.817	0.831	0.844	0.882
Basic Voc / Cert I, II	0.788	0.809	0.809	0.797	0.816
Year 12	0.763	0.843	0.819	0.820	0.782
< Year 12	0.703	0.734	0.719	0.719	0.857
Proportion Employed Full-time (if employed)					
Bachelor plus	0.679	0.619	0.583	0.579	0.564
Diplomas	0.674	0.658	0.540	0.486	0.491
Skilled Voc / Cert III, IV	0.558	0.417	0.487	0.480	0.494
Basic Voc / Cert I, II	0.549	0.499	0.452	0.453	0.449
Year 12	0.630	0.539	0.529	0.528	0.389
< Year 12	0.535	0.423	0.394	0.393	0.543
Proportion Permanently Employed (if employed)					
Bachelor plus	0.806	0.818	0.812	0.809	0.837
Diplomas	0.683	0.746	0.724	0.773	0.788
Skilled Voc / Cert III, IV	0.649	0.640	0.648	0.673	0.733
Basic Voc / Cert I, II	0.695	0.664	0.668	0.654	0.713
Year 12	0.692	0.675	0.677	0.677	0.648
< Year 12	0.623	0.586	0.584	0.586	0.688

6.1 Impacts of Post-secondary Qualifications, using Year 12 Completers as the Comparison Group

Tables 3 to 6 below provide one set of estimates of the labour market effects that use individuals who have completed 12 years of schooling as the comparison group. At this point, the focus is on educational qualifications prior to being broken down by field of study. Disaggregated results by field of study are presented in Sub-section 6.4 below.

The estimates in these tables are mean differences in outcomes between the respective treatment and comparison groups, after accounting for differences in individual characteristics. For example, in the first row and column of Table 3, we can see that the weekly earnings of males with a bachelor degree and above are 0.292 log points higher on

average than the weekly earnings of males with a Year 12 qualification only in 1993. These differences in the log of weekly earnings can be interpreted approximately as percentage differences i.e. the approximate difference in earnings is roughly 29 per cent.[6] For the remaining labour market outcomes – being employed, employed full-time and employed in a permanent position – the estimates can be interpreted as the difference in the probability of the outcome between those with each level of post-secondary education and those with a Year 12 qualification only. For example, in the first row and column of Table 4, males with a bachelor degree or higher have a 3.6 percentage point higher probability of being employed, conditional on being in the labour force or marginally attached to the labour force, relative to males with a Year 12 qualification only.

When comparisons are made relative to having completed Year 12, the results in Tables 3 to 6 make it clear that by obtaining a bachelor degree or higher, an associate diploma (ABSCQ) or an advanced diploma/diploma (ASCED), both males and females can generally expect to have higher weekly earnings, to be employed, to be in full-time employment, and to be in permanent employment. For example, in 2005, females with advanced diplomas/diplomas earn 11 per cent higher wages and have a 5.4 percentage point higher probability of being in permanent employment than females who completed Year 12 only.

[6] The actual difference in percentage terms is 33.9%, calculated using the standard formula of $100\times(e^{\beta} - 1)$, where β is the difference in log points of 0.292.

Table 3: Log Weekly Earnings Impacts, conditional on being an employee - Relative to Year 12 Completers

	1993 (ABSCQ)	1997 (ABSCQ)	2001 (ABSCQ)	2001 (ASCED)	2005 (ASCED)
			Males		
Bachelor plus	0.292***	0.243***	0.254***	0.257***	0.278***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[1,204]	[1,423]	[1,591]	[1,591]	[1,578]
Associate Diplomas / Advanced Diploma or Diploma	0.075***	0.068**	0.055*	0.126***	0.071**
	(0.008)	(0.041)	(0.094)	(0.000)	(0.017)
	[664]	[438]	[474]	[687]	[649]
Skilled Vocational / Certificates III, IV	-0.028*	-0.072***	-0.074***	-0.074***	-0.036**
	(0.053)	(0.000)	(0.000)	(0.000)	(0.030)
	[2,380]	[2.186]	[2,145]	[2,361]	[2,228]
Basic Vocational / Certificates I, II	0.069	-0.041	-0.095***	-0.105***	-0.070**
	(0.157)	(0.107)	(0.002)	(0.002)	(0.050)
	[240]	[982]	[545]	[478]	[527]
			Females		
Bachelor plus	0.299***	0.276***	0.274***	0.263***	0.321***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[858]	[1,116]	[1,308]	[1,338]	[1,417]
Associate Diplomas / Advanced Diploma or Diploma	-0.036	0.022	0.049	0.029	0.113***
	(0.490)	(0.507)	(0.148)	(0.269)	(0.000)
	[222]	[292]	[268]	[490]	[511]
Skilled Vocational / Certificates III, IV	0.057*	-0.142***	-0.143***	-0.096***	-0.036
	(0.098)	(0.001)	(0.000)	(0.000)	(0.119)
	[278]	[166]	[339]	[505]	[672]
Basic Vocational / Certificates I, II	0.003	-0.051***	-0.071***	-0.095***	-0.021
	(0.916)	(0.001)	(0.004)	(0.000)	(0.481)
	[554]	[970]	[713]	[612]	[481]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

Table 4: Probability of being Employed Impacts, conditional on being in the Labour Force or marginally attached - Relative to Year 12 Completers

	1993 (ABSCQ)	1997 (ABSCQ)	2001 (ABSCQ)	2001 (ASCED)	2005 (ASCED)
			Males		
Bachelor plus	0.036***	0.039***	0.025***	0.027***	0.035***
	(0.002)	(0.000)	(0.006)	(0.002)	(0.000)
	[1,787]	[2,036]	[2,284]	[2,290]	[2,262]
Associate Diplomas / Advanced Diploma or Diploma	0.032*	0.025	-0.006	-0.016	0.047***
	(0.051)	(0.265)	(0.778)	(0.327)	(0.002)
	[1,085]	[570]	[670]	[992]	[1,022]
Skilled Vocational / Certificates III, IV	-0.005	0.015*	-0.004	0.000	0.036***
	(0.547)	(0.090)	(0.580)	(0.957)	(0.000)
	[4,294]	[3,491]	[3,534]	[3,878]	[3,586]
Basic Vocational / Certificates I, II	-0.021	-0.039**	-0.056***	-0.068***	-0.011
	(0.462)	(0.010)	(0.005)	(0.002)	(0.616)
	[425]	[1,557]	[952]	[825]	[788]
			Females		
Bachelor plus	0.105***	0.046***	0.067***	0.067***	0.038***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
	[1,590]	[2,019]	[2,407]	[2,488]	[2,706]
Associate Diplomas / Advanced Diploma or Diploma	0.065*	-0.010	0.050*	0.026	0.013
	(0.056)	(0.737)	(0.072)	(0.168)	(0.472)
	[493]	[535]	[549]	[1,174]	[1,195]
Skilled Vocational / Certificates III, IV	0.058**	-0.030	-0.029	-0.013	0.030*
	(0.029)	(0.356)	(0.233)	(0.502)	(0.069)
	[844]	[480]	[826]	[1,232]	[1,553]
Basic Vocational / Certificates I, II	0.030	-0.043***	-0.024	-0.031*	-0.041**
	(0.124)	(0.003)	(0.150)	(0.085)	(0.030)
	[1,574]	[2,371]	[1,918]	[1,656]	[1,325]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

Table 5: Probability of being Employed Full-time Impacts, conditional on being employed - Relative to Year 12 Completers

	1993 (ABSCQ)	1997 (ABSCQ)	2001 (ABSCQ)	2001 (ASCED)	2005 (ASCED)
			Males		
Bachelor plus	0.006 (0.617) [1,740]	0.066*** (0.000) [1,968]	-0.010 (0.577) [2,242]	-0.008 (0.664) [2,247]	0.056*** (0.003) [2,213]
Associate Diplomas / Advanced Diploma or Diploma	0.018 (0.238) [1,044]	0.129*** (0.000) [550]	0.027 (0.424) [633]	0.034 (0.230) [938]	0.017 (0.551) [990]
Skilled Vocational / Certificates III, IV	0.016** (0.046) [4,062]	-0.002 (0.904) [3,386]	-0.072*** (0.000) [3.416]	-0.093*** (0.000) [3,754]	-0.005 (0.720) [3,482]
Basic Vocational / Certificates I, II	0.003 (0.931) [399]	0.013 (0.558) [1,444]	-0.068** (0.025) [862]	-0.042 (0.201) [741]	0.054 (0.103) [742]
			Females		
Bachelor plus	0.033 (0.163) [1,485]	0.046** (0.030) [1,888]	0.027 (0.161) [2,276]	0.041** (0.033) [2,344]	0.039** (0.029) [2,576]
Associate Diplomas / Advanced Diploma or Diploma	0.042 (0.325) [430]	0.060 (0.148) [484]	0.029 (0.455) [500]	0.020 (0.456) [1,068]	0.020 (0.464) [1,080]
Skilled Vocational / Certificates III, IV	-0.013 (0.713) [724]	-0.115** (0.013) [411]	-0.044 (0.191) [706]	-0.040 (0.142) [1,065]	0.003 (0.901) [1,408]
Basic Vocational / Certificates I, II	-0.045* (0.074) [1,294]	-0.002 (0.907) [2,014]	-0.013 (0.555) [1,593]	-0.017 (0.498) [1,364]	-0.012 (0.674) [1,116]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

Table 6: Probability of Permanent Employment Impacts, conditional on being Employed - Relative to Year 12 Completers

	1993 (ABSCQ)	1997 (ABSCQ)	2001 (ABSCQ)	2001 (ASCED)	2005 (ASCED)
			Males		
Bachelor plus	0.032**	0.077***	0.058***	0.044***	0.059***
	(0.046)	(0.000)	(0.000)	(0.002)	(0.000)
	[1,465]	[1,642]	[1,789]	[1,801]	[1,905]
Associate Diplomas / Advanced Diploma or Diploma	0.024	0.050*	-0.021	0.045*	0.030
	(0.263)	(0.098)	(0.498)	(0.070)	(0.270)
	[812]	[496]	[521]	[780]	[833]
Skilled Vocational / Certificates III, IV	0.010	0.021	-0.026*	-0.042***	-0.009
	(0.421)	(0.170)	(0.083)	(0.003)	(0.564)
	[3,029]	[2,446]	[2,410]	[2,655]	[2,729]
Basic Vocational / Certificates I, II	-0.025	-0.010	-0.079**	-0.056	0.021
	(0.515)	(0.665)	(0.011)	(0.103)	(0.522)
	[349]	[1,142]	[687]	[600]	[582]
			Females		
Bachelor plus	0.047**	0.049**	0.065***	0.067***	0.091***
	(0.025)	(0.011)	(0.000)	(0.000)	(0.000)
	[1,425]	[1,797]	[2,141]	[2,203]	[2,336]
Associate Diplomas / Advanced Diploma or Diploma	-0.040	0.003	0.059	0.045*	0.054**
	(0.350)	(0.929)	(0.146)	(0.095)	(0.049)
	[398]	[483]	[472]	[957]	[932]
Skilled Vocational / Certificates III, IV	-0.010	-0.070	-0.067*	-0.048*	0.066**
	(0.771)	(0.147)	(0.060)	(0.091)	(0.011)
	[615]	[348]	[635]	[979]	[1,205]
Basic Vocational / Certificates I, II	0.018	-0.032	-0.023	-0.045*	0.035
	(0.463)	(0.120)	(0.344)	(0.079)	(0.219)
	[1,240]	[1,883]	[1,432]	[1,213]	[960]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

On the other hand, there is no strong evidence in Tables 3 to 6 that obtaining basic and skilled vocational qualifications (ABSCQ) or Certificate I/II and III/IV qualifications (ASCED) confer positive labour market outcomes, relative to completing Year 12. In most cases, the estimated impacts are negative, which suggest that such qualifications actually lead to relatively worse labour market outcomes. In particular, weekly earnings (if employed full-

time) are often significantly lower. There is some positive effect of holding a skilled vocational or Certificate III/IV qualification on the probability of employment, but that is all.

6.2 Impacts of Post-secondary Qualifications, Using non-completers of Year 12 as the Comparison Group

In Tables 7 to 10, instead of using persons who completed Year 12 as the comparison group, we use persons with less than a Year 12 qualification. The motivation for using this alternative comparison group is to highlight what differences in labour market impacts persons with less than 12 years of schooling might expect if they obtained VET qualifications. Note that in the SET data, approximately three quarters of individuals with certificate level qualifications had not completed Year 12. Conversely, essentially all individuals with bachelor degrees or above had completed Year 12, while approximately three quarters of diploma holders had also completed Year 12.

Tables 7 to 10 correspond directly with Tables 3 to 6, the only difference being that a different comparison group is being used. Not surprisingly, we see that when comparisons are made to this less educated group, the estimated impacts of VET and higher education are higher. Using non-completers as the comparison group, it appears that obtaining lower level qualifications also lead to significant beneficial labour market effects. This appears particularly true for females obtaining basic vocational or Certificate I/II qualifications. For example, females with Certificate I/II qualifications in 2005 have weekly earnings that are 9 per cent higher than females who did not complete Year 12. Furthermore, females with such qualifications had a 6.9 percentage point higher probability of being employed full-time and a 10 percentage point higher probability of being in permanent employment, relative to non-completers of Year 12.

Table 7: Log Weekly Earnings Impacts, conditional on being an employee - Relative to Non-completers of Year 12

	1993 (ABSCQ)	1997 (ABSCQ)	2001 (ABSCQ)	2001 (ASCED)	2005 (ASCED)
			Males		
Bachelor plus	0.437***	0.426***	0.451***	0.448***	0.454***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[1,203]	[1,424]	[1,596]	[1,599]	[1,581]
Associate Diplomas / Advanced Diploma or Diploma	0.220***	0.256***	0.301***	0.350***	0.285***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[663]	[436]	[474]	[694]	[652]
Skilled Vocational / Certificates III, IV	0.093***	0.118***	0.139***	0.129***	0.125***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[2,375]	[2,206]	[2,154]	[2,374]	[2,268]
Basic Vocational / Certificates I, II	0.142***	0.126***	0.084***	0.073**	0.050
	(0.002)	(0.000)	(0.007)	(0.032)	(0.144)
	[246]	[1,009]	[549]	[483]	[527]
			Females		
Bachelor plus	0.451***	0.421***	0.413***	0.406***	0.436***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[856]	[1,134]	[1,329]	[1,360]	[1,390]
Associate Diplomas / Advanced Diploma or Diploma	0.067	0.141***	0.197***	0.181***	0.240***
	(0.218)	(0.000)	(0.000)	(0.000)	(0.000)
	[222]	[299]	[266]	[498]	[499]
Skilled Vocational / Certificates III, IV	0.167***	0.028	-0.011	0.035	0.110***
	(0.000)	(0.575)	(0.745)	(0.179)	(0.000)
	[277]	[166]	[344]	[507]	[647]
Basic Vocational / Certificates I, II	0.075***	0.088***	0.058**	0.041	0.092***
	(0.007)	(0.000)	(0.020)	(0.131)	(0.008)
	[547]	[971]	[712]	[616]	[487]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

Table 8: Probability of Employment Impacts, conditional on being in the Labour Force or marginally attached - Relative to Non-completers of Year 12

	1993 (ABSCQ)	1997 (ABSCQ)	2001 (ABSCQ)	2001 (ASCED)	2005 (ASCED)
			Males		
Bachelor plus	0.127***	0.105***	0.079***	0.079***	0.051***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[1,783]	[2,035]	[2,281]	[2,287]	[2,266]
Associate Diplomas / Advanced Diploma or Diploma	0.105***	0.086***	0.046**	0.033*	0.053***
	(0.000)	(0.001)	(0.048)	(0.074)	(0.001)
	[1,087]	[569]	[666]	[991]	[1,030]
Skilled Vocational / Certificates III, IV	0.098***	0.090***	0.072***	0.066**	0.050***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[4,294]	[3,491]	[3,536]	[3,894]	[3,584]
Basic Vocational / Certificates I, II	0.079**	0.032*	0.023	0.017	-0.003
	(0.021)	(0.056)	(0.305)	(0.479)	(0.870)
	[426]	[1,557]	[945]	[821]	[794]
			Females		
Bachelor plus	0.149***	0.142***	0.165***	0.166***	0.152***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[1,589]	[2,028]	[2,433]	[2,516]	[2,684]
Associate Diplomas / Advanced Diploma or Diploma	0.097***	0.103***	0.197***	0.143***	0.087***
	(0.006)	(0.002)	(0.000)	(0.000)	(0.000)
	[494]	[539]	[552]	[1,186]	[1,200]
Skilled Vocational / Certificates III, IV	0.115***	0.111***	0.101***	0.125***	0.123***
	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)
	[843]	[479]	[826]	[1,234]	[1,553]
Basic Vocational / Certificates I, II	0.082***	0.090***	0.095***	0.089***	0.033
	(0.000)	(0.000)	(0.000)	(0.000)	(0.107)
	[1,567]	[2,376]	[1,930]	[1,668]	[1,327]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

Table 9: Probability of being Employed Full-time Impacts, conditional on being employed - Relative to Non-completers of Year 12

	1993 (ABSCQ)	1997 (ABSCQ)	2001 (ABSCQ)	2001 (ASCED)	2005 (ASCED)
			Males		
Bachelor plus	0.008	0.059***	0.037**	0.040**	0.046**
	(0.500)	(0.002)	(0.045)	(0.028)	(0.014)
	[1,740]	[1,976]	[2,242]	[2,248]	[2,218]
Associate Diplomas / Advanced Diploma or Diploma	0.019	0.116***	0.080**	0.088***	0.018
	(0.214)	(0.001)	(0.020)	(0.002)	(0.531)
	[1.043]	[549]	[632]	[937]	[1,002]
Skilled Vocational / Certificates III, IV	0.021***	-0.023	-0.044***	-0.050***	-0.033**
	(0.007)	(0.114)	(0.003)	(0.000)	(0.027)
	[4,061]	[3,386]	[3,418]	[3,759]	[3,479]
Basic Vocational / Certificates I, II	-0.015	0.003	-0.034	-0.009	0.048
	(0.591)	(0.898)	(0.270)	(0.793)	(0.125)
	[399]	[1,443]	[857]	[738]	[742]
			Females		
Bachelor plus	0.078***	0.120***	0.098***	0.094***	0.143***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
	[1,486]	[1,893]	[2,305]	[2,375]	[2,574]
Associate Diplomas / Advanced Diploma or Diploma	0.090**	0.129***	0.063	0.048*	0.103***
	(0.037)	(0.002)	(0.127)	(0.073)	(0.000)
	[429]	[485]	[497]	[1,082]	[1,078]
Skilled Vocational / Certificates III, IV	0.020	-0.036	-0.006	-0.007	0.070***
	(0.550)	(0.434)	(0.868)	(0.796)	(0.005)
	[721]	[411]	[705]	[1,065]	[1,406]
Basic Vocational / Certificates I, II	-0.016	0.037*	0.028	0.043*	0.069**
	(0.539)	(0.075)	(0.227)	(0.082)	(0.014)
	[1,287]	[2,022]	[1,602]	[1,377]	[1,118]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

Table 10: Probability of Permanent Employment Impacts, conditional on being Employed - Relative to Non-completers of Year 12

	1993 (ABSCQ)	1997 (ABSCQ)	2001 (ABSCQ)	2001 (ASCED)	2005 (ASCED)
			Males		
Bachelor plus	0.066***	0.130***	0.134***	0.143***	0.101***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[1,466]	[1,642]	[1,794]	[1,798]	[1,909]
Associate Diplomas / Advanced Diploma or Diploma	0.057**	0.095***	0.053	0.106***	0.066**
	(0.015)	(0.003)	(0.110)	(0.000)	(0.019)
	[810]	[499]	[521]	[778]	[842]
Skilled Vocational / Certificates III, IV	0.047***	0.049***	0.044***	0.036**	0.019
	(0.000)	(0.002)	(0.006)	(0.017)	(0.220)
	[3,029]	[2,478]	[2,410]	[2,662]	[2,729]
Basic Vocational / Certificates I, II	-0.012	0.015	-0.022	0.001	0.047
	(0.774)	(0.516)	(0.501)	(0.986)	(0.173)
	[349]	[1,175]	[684]	[595]	[581]
			Females		
Bachelor plus	0.109***	0.176***	0.164***	0.165***	0.151***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[1,423]	[1,814]	[2,187]	[2,251]	[2.324]
Associate Diplomas / Advanced Diploma or Diploma	0.031	0.129***	0.136***	0.170***	0.122***
	(0.487)	(0.002)	(0.001)	(0.000)	(0.000)
	[397]	[488]	[475]	[980]	[934]
Skilled Vocational / Certificates III, IV	0.028	0.063	0.053	0.057**	0.105***
	(0.444)	(0.219)	(0.145)	(0.047)	(0.000)
	[613]	[349]	[641]	[984]	[1,208]
Basic Vocational / Certificates I, II	0.074***	0.074***	0.102***	0.106***	0.100***
	(0.004)	(0.000)	(0.000)	(0.000)	(0.001)
	[1,261]	[1,908]	[1,448]	[1,226]	[959]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

The results in Tables 7 to 10 therefore suggest that in terms of labour market impacts, any person who has less than 12 years of formal schooling could stand to benefit by enrolling in VET. However, for persons who have completed high school, obtaining lower level qualifications (less than a diploma) is of little or no benefit.

6.3 Labour Market Outcomes over Time

The estimates in Tables 3 to 10 allow us to see if the impacts of qualifications have changed over time. Focusing first on the earnings premium among full-time workers (Tables 3 and 7), the earnings premium of individuals holding a bachelor degree or above relative to Year 12 completers and non-completers has remained quite stable from 1993 to 2005. This is consistent with Coelli and Wilkins (2009) using alternative data sets and using the total of year 12 completers and non-completers as the comparison group. For diploma holders, earnings returns have remained reasonably flat for males, but appear to have risen for females, particularly relative to non-completers of Year 12. This latter finding for females is not consistent with Coelli and Wilkins (2009) who found falling returns for this group, which may reflect a different choice of sample for diploma holders i.e. advanced diploma holders under ASCED were not excluded in the early years in the Coelli and Wilkins analysis. For skilled vocational or Certificate III/IV holders, earnings returns have remained quite flat for males, and show a U-shape for females, first falling then rising. For basic vocational or Certificate I/II holders, earnings returns have fallen significantly for males, less so for females.

Turning now to the probability of employment trends in Tables 4 and 8, the positive effects for the bachelor plus group has remained stable for males but fallen for females relative to Year 12 completers (Table 4). Relative to non-completers, however, the probability of employment has fallen for males in the bachelor plus group, but remained constant for females. Similar trends are observed for the other post-secondary education groups also. This implies that the probability of employment for year 12 completer males has remained relatively stable, but has improved on a relative basis for non-completers. This may reflect the growth in aggregate employment over the period, which has affected the least educated group the most, given their weak employment prospects during downturns. For females, on the other hand, economic growth appears to have helped the year 12 completers more than the non-completers in gaining employment.

With regards to the probability of being employed full-time, no trends over time are readily apparent when using Year 12 completers as the comparison group (Table 5). When using the non-completers as the comparison group (Table 9), however, impacts for the bachelor plus group have increased over time for both males and females, but have been volatile for diploma holders. Full-time employment impacts appear to have improved over time for skilled and basic vocational or Certificate I/IV holder females, but not for males.

Finally, regarding the probability of permanent employment, impacts appear to have improved over time for females with skilled vocational or Certificates III/IV, but deteriorated

for males with such qualifications, relative to non-completers only. No other trends were readily apparent for this outcome.

6.4 Outcomes by Field of Study

In Tables 11 to 14, we provide estimates of the labour market impacts of VET qualifications for three broad groups: (i) business; (ii) engineering, architecture and building; and (iii) other. Examining impacts for these sub-groups by field of study is useful in helping to provide a sense of the heterogeneity of impacts associated with different levels of qualifications. We focus on labour market outcomes in 2005, the most recent year of SET data available.[7] When interpreting these results, it should be kept in mind that sample sizes separately by field of education are small, lowering the precision of the estimates.

[7] Estimates by field of study for other SET years are available upon request.

Table 11: Impacts of VET Qualifications by Field of Study, Males in 2005 - Relative to Year 12 Completers

	Log Weekly Earnings	Employed	Full-Time Employment	Permanent Employment
		Advanced Diploma or Diploma		
Business	0.142***	0.043	0.080	0.027
	(0.008)	(0.125)	(0.131)	(0.598)
	[217]	[322]	[312]	[267]
Engineering, Architecture and Building	0.064	0.043	0.008	0.011
	(0.265)	(0.166)	(0.877)	(0.815)
	[181]	[272]	[270]	[244]
Other	0.065	0.037	-0.062	0.015
	(0.199)	(0.102)	(0.173)	(0.722)
	[253]	[427]	[413]	[323]
		Certificates III, IV		
Business	0.030	0.067**	0.070	0.084
	(0.656)	(0.028)	(0.230)	(0.125)
	[174]	[245]	[243]	[202]
Engineering, Architecture and Building	-0.029	0.042***	-0.018	0.000
	(0.128)	(0.000)	(0.294)	(0.979)
	[1,633]	[2,713]	[2,638]	[2,030]
Other	-0.112***	0.010	0.046	-0.013
	(0.004)	(0.656)	(0.210)	(0.725)
	[426]	[625]	[600]	[494]
		Certificates I, II		
Business	0.007	0.061	0.121*	0.086
	(0.925)	(0.152)	(0.073)	(0.146)
	[138]	[199]	[192]	[158]
Engineering, Architecture and Building	-0.121**	0.012	0.064	0.054
	(0.045)	(0.717)	(0.224)	(0.321)
	[212]	[309]	[297]	[222]
Other	-0.039	-0.095**	0.025	-0.078
	(0.522)	(0.014)	(0.670)	(0.202)
	[175]	[275]	[249]	[201]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

Table 12: Impacts of VET Qualifications by Field of Study, Females in 2005 - Relative to Year 12 Completers

	Log Weekly Earnings	Employed	Full-Time Employment	Permanent Employment
		Advanced Diploma or Diploma		
Business	0.160*** (0.002) [171]	0.050 (0.182) [313]	0.092* (0.076) [285]	0.160*** (0.002) [253]
Engineering, Architecture and Building	0.194 (..) [17]	0.011 (0.979) [25]	0.382 (0.593) [26]	-0.036 (0.942) [26]
Other	0.128*** (0.001) [316]	0.010 (0.644) [857]	-0.018 (0.587) [764]	0.064* (0.053) [652]
		Certificates III, IV		
Business	0.019 (0.527) [330]	0.051* (0.059) [551]	0.161*** (0.000) [511]	0.173*** (0.000) [461]
Engineering, Architecture and Building	-0.053 (0.763) [34]	0.061 (0.370) [94]	-0.020 (0.849) [90]	-0.010 (0.935) [80]
Other	-0.087** (0.018) [294]	0.004 (0.869) [910]	-0.096*** (0.003) [804]	-0.016 (0.659) [667]
		Certificates I, II		
Business	0.023 (0.504) [355]	-0.022 (0.315) [933]	0.005 (0.878) [806]	0.061* (0.067) [698]
Engineering, Architecture and Building	-0.707 (..) [5]	0.007 (0.966) [31]	-0.234 (0.517) [25]	-0.040 (0.925) [22]
Other	-0.084 (0.158) [119]	-0.085** (0.026) [354]	-0.063 (0.269) [280]	-0.001 (0.988) [236]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

Table 13: Impacts of VET Qualifications by Field of Study, Males in 2005 - Relative to Non-completers of Year 12

	Log Weekly Earnings	Employed	Full-Time Employment	Permanent Employment
		Advanced Diploma or Diploma		
Business	0.366*** (0.000) [218]	0.053* (0.077) [320]	0.101* (0.054) [312]	0.074 (0.173) [267]
Engineering, Architecture and Building	0.282*** (0.000) [182]	0.048 (0.128) [278]	0.058 (0.283) [271]	0.083 (0.111) [247]
Other	0.209*** (0.000) [252]	0.072*** (0.005) [430]	-0.084* (0.058) [417]	0.046 (0.321) [327]
		Certificates III, IV		
Business	0.130* (0.056) [172]	0.058* (0.071) [246]	0.062 (0.290) [242]	0.106* (0.062) [204]
Engineering, Architecture and Building	0.157*** (0.000) [1,670]	0.048*** (0.000) [2,702]	-0.042** (0.0.013) [2,632]	0.011 (0.530) [2,023]
Other	0.001 (0.975) [425]	0.045* (0.054) [625]	0.004 (0.904) [600]	0.007 (0.863) [494]
		Certificates I, II		
Business	0.120 (0.110) [136]	0.032 (0.442) [200]	0.070 (0.283) [191]	0.167*** (0.007) [157]
Engineering, Architecture and Building	0.050 (0.386) [212]	0.033 (0.313) [314]	0.060 (0.237) [297]	0.042 (0.439) [221]
Other	0.035 (0.564) [174]	-0.072* (0.071) [280]	0.047 (0.411) [248]	-0.057 (0.365) [202]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

Table 14: Impacts of VET Qualifications by Field of Study, Females in 2005 - Relative to Non-completers of Year 12

	Log Weekly Earnings	Employed	Full-Time Employment	Permanent Employment
		Advanced Diploma or Diploma		
Business	0.236*** (0.000) [168]	0.152*** (0.001) [314]	0.206*** (0.000) [283]	0.196*** (0.000) [253]
Engineering, Architecture and Building	0.072 (..) [18]	0.162 (0.521) [26]	0.249 (0.463) [26]	-0.062 (0.878) [24]
Other	0.245*** (0.000) [315]	0.065*** (0.007) [859]	0.052 (0.122) [767]	0.091*** (0.009) [653]
		Certificates III, IV		
Business	0.114*** (0.001) [319]	0.150*** (0.000) [553]	0.236*** (0.000) [505]	0.237*** (0.000) [458]
Engineering, Architecture and Building	0.092 (0.510) [34]	0.161** (0.041) [94]	0.021 (0.851) [88]	0.010 (0.937) [78]
Other	0.102** (0.026) [306]	0.096*** (0.000) [912]	-0.019 (0.564) [802]	0.038 (0.296) [664]
		Certificates I, II		
Business	0.122*** (0.002) [355]	0.064*** (0.008) [940]	0.114*** (0.001) [807]	0.106*** (0.002) [700]
Engineering, Architecture and Building	-0.088 (..) [7]	-0.028 (0.881) [34]	-0.226 (0.505) [26]	-0.165 (0.706) [22]
Other	0.129 (0.107) [126]	-0.034 (0.407) [353]	-0.014 (0.810) [281]	0.014 (0.820) [238]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

The results in Tables 11 to 14 suggest that in 2005, individuals that obtained business qualifications had the largest estimated labour market effects. A number of estimated impacts were positive and statistically significant even for certificate holders relative to individuals completing high school (Tables 11 and 12), if the individual studied for a business qualification. The labour market effects of obtaining qualifications in "other" fields (e.g., agriculture, creative arts, education, health, hospitality, society and culture etc.) were generally the lowest, and were often insignificant or negative for certificate holders relative to individuals who had not completed Year 12.

6.5 ABSCQ versus ASCED classification schemes

According to the ABS Australian Standard Classification of Education released in 2001, the following ABSCQ-ASCED level correspondence exists:

ABSCQ	**ASCED**
Bachelor Degree	Bachelor (Honours) Degree
	Bachelor (Pass) Degree
Undergraduate Diploma	Advanced Diploma
Associate Diploma	Diploma
	Certificate IV
Skilled Vocational Qualifications	Certificate III
Basic Vocational Qualifications	Certificate II

Recall that the 2001 SET data are unique in that they provide education level information using both the ABSCQ and the ASCED classification schemes. To see what effect the change in classification may have on the estimates, we provide estimates under both frameworks in Tables 3 to 10 for 2001. Due to the way educational categories are grouped together in the SET, we are not able to precisely use the correspondence proposed by the ABS in our analysis. Our comparison of the estimates based on the ABSCQ and the ASCED classification schemes should therefore take this into consideration.

Looking at these comparisons, for bachelor degrees and above, both schemes essentially use a similar definition, and this is reflected in that fact that the sample sizes and impact estimates on the four outcomes are similar under either the ABSCQ or the ASCED. As our advanced diploma/diploma grouping under the ASCED is on average a higher qualification level than the associate diploma grouping under the ABSCQ (because we

include advanced diploma holders in the ASCED grouping), we should not be surprised if the estimates were higher when we use our ASCED definition. In most cases, the estimates are quite similar, but are indeed higher in a few cases, namely for log weekly earnings and the probability of permanent employment for males only.

Similarly, as our Certificate III/IV grouping under the ASCED is on average a higher qualification level than the skilled vocation qualification grouping under the ABSCQ (because Certificate IV is of a higher level than skilled vocational qualifications), we also should not be surprised if the estimates were larger when the ASCED is used. The results in Tables 3 to 10, however, do not provide strong evidence that this is the case, as the estimates appear to be very similar across the board. This could possibly be an indication that the labour market does not sufficiently distinguish Certificate IV qualifications from Certificate III qualifications.

Turning to the lowest qualification level, the basic vocational qualification grouping under the ABSCQ is comparatively superior to the Certificate I/II grouping we use under the ASCED because it omits individuals with Certificate I qualifications. Comparing the results in Tables 3 to 10, although the estimated effects are all negative and very similar relative to Year 12 completers, under the ABSCQ scheme they are in most cases slightly less negative.

6.6 Conditioning on School Completion in the Treatment Groups

As noted above, approximately three quarters of individuals with certificate level qualifications had not completed Year 12, while approximately three quarters of diploma holders had completed Year 12. Year 12 completion is generally not a pre-requisite for certificate level study, whereas diploma level study increasingly requires either Year 12 completion or completion of Year 10 plus an appropriate certificate level course. The results presented thus far have not taken into account the school completion status of individuals with VET qualifications. Those comparisons essentially reflect the impacts for the highest level of educational qualifications, and not the total package of qualifications (or the route used to get there). For instance, it may be of interest to see if there are labour market impacts to certificate level study for those who have already completed Year 12. The results above compare all certificate and diploma holders, irrespective of Year 12 completion, with Year 12 completers and non-completers with no post-secondary qualifications.

We constructed a full set of alternative estimates of the labour market impacts of VET qualifications after conditioning on Year 12 completion among the treatment groups. In other words, when Year 12 completers are used as the comparison group, only VET completers who have also completed Year 12 are included. Similarly, when persons with less than Year

12 are used as the comparison group, only VET completers who have also not completed Year 12 are used.

The estimates of labour market impacts conditioning on Year 12 completion for 2005 are presented in Tables B.1 and B.2 in the appendix.[8] In general, for comparisons relative to Year 12 completers, removing non-completers from the treatment groups increased the estimated size of the effects. For comparisons relative to persons with less than Year 12, removing Year 12 completers from the treatment groups reduced the estimated effects. These findings were as expected. Note also, that when conditioning on Year 12 completion, several of the negative estimated impacts to certificate level studies have disappeared, to be replaced by essentially zero estimated effects. Thus VET study of any level is not a detriment for Year 12 completers. It only leads to positive impacts, however, if completed at the diploma or advanced diploma level.

7. Conclusion

This paper provides a large set of estimates of the effects of completing VET qualifications on employment outcomes and earnings, using four different years of data from the ABS Surveys of Education and Training. To provide useful information to persons with less than 12 years of schooling and school completers who are contemplating the decision to invest in VET qualifications, comparisons in labour market outcomes are made relative to both these groups throughout the paper.

By and large, across the four different years of SET data, a consistent finding emerged. If an individual already has completed high school, then obtaining low level VET qualifications is unlikely to be beneficial in terms of labour market outcomes. Only obtaining qualifications at the diploma level and above are likely to provide a positive impact. On the other hand, if an individual has not completed high school (Year 12), then there are some concrete benefits from obtaining all levels of VET qualifications, including the lower level Certificate I/II qualifications.

In terms of choosing the field of study that is likely to provide the highest labour market effects, it appears that business as well as specific trade studies (engineering, architecture, building, and automotive) are all fields that lead to tangible positive impacts.

It should be noted that the estimates specifically of weekly earnings benefits of VET qualifications do not include earnings of the self-employed. Only those employed by others

[8] Similar estimates for other years are available upon request. Note, however, it was not possible to construct such estimates using the 1993 SET data as only information on the highest level of post-school qualifications was available. It was not possible to determine if a person with post-school qualifications such as VET qualifications had completed Year 12.

are included in these estimates, as constructing the pure labour market earnings of the self-employed, as opposed to the returns on capital the self-employed may obtain, is not at all straightforward. Such self-employed earnings may be quite important for individuals with trade skills, but not for those with a year 12 education only, or less. Thus the earnings estimates presented here may only be a lower bound estimate on the labour market effects of VET qualifications. This may be an area for fruitful future research.

Appendix A: The Two-Step Matching/Regression Approach

In the first step, matching is done using covariates that can plausibly affect the decision to undertake VET. The propensity score is estimated using a probit model, where the dependent variable is VET participation (Section 4 discusses in detail how this binary variable denoting the various treatment and comparison groups is defined) and the independent variables are given below. For each of the SET years, the following variables have been identified:

1993

Age (20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-64), gender, area of usual residence (=1 if capital city), birthplace (=1 if non-English speaking country), English language background (=1 if English is first language), and state.

1997

Age (20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-64), gender, birthplace (=1 if non-English speaking country), English language background (=1 if English is first language), and state.

2001

Age (20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-64), gender, birthplace (=1 if non-English speaking country), English language background (=1 if English is first language), father born overseas, mother born overseas, and state.

2005

Age (20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-64), gender, birthplace (=1 if non-English speaking country), English language background (=1 if English is first language), father born overseas, mother born overseas, and state.

Although state and area of residence at the time of the survey, and at the time they were deciding whether or not to undertake VET, is likely to be different for some people, we assume they are the same in order to use the area variables as matching variables.

In the second step, we use an augmented set of variables for the regression analysis – variables from the first step, the weights obtained from matching in the first step, and variables that might plausibly affect the outcome of interest (but not the decision to undertake VET).

1993

Marital status (=1 if married), Age of youngest child (0-2, 3-4, 5-9, 10-14), and union status.

1997

Marital status (=1 if married), Age of youngest child (0-2, 3-4, 5-9, 10-14), union status, and disability status.

2001

Marital status (=1 if married), Age of youngest child (0-2, 3-4, 5-9, 10-14), union status, and disability status.

2005

Marital status (=1 if married), Age of youngest child (0-2, 3-4, 5-9, 10-14), union status, and disability status.

The second stage regression in the paper is based on OLS, regardless of whether the outcome is binary or continuous. This is the standard practice in randomized experiments and matching studies, where the purpose of the regression is to soak up any residual variation in the covariates. One might view it as an augmented two-sample *t*-test with covariates. This combination of matching and regression using appropriate comparison groups help us obtain estimates of the effects of VET qualifications.

Appendix B: Impacts of VET Qualifications Conditioning on Year 12 Completion

Table B.1: Impacts of VET Qualifications in 2005 Conditioning on Year 12 Completion - Relative to Year 12 Completers

	Log Weekly Earnings	Employed	Full-Time Employment	Permanent Employment
		Males		
Advanced Diploma or Diploma	0.142*** (0.000) [421]	0.052*** (0.001) [634]	0.012 (0.738) [623]	0.062* (0.065) [547]
Certificates III, IV	0.050 (0.121) [573]	0.042*** (0.007) [831]	0.021 (0.505) [816]	0.039 (0.225) [676]
Certificates I, II	0.015 (0.811) [186]	0.007 (0.844) [275]	0.065 (0.244) [265]	0.036 (0.504) [224]
		Females		
Advanced Diploma or Diploma	0.117*** (0.000) [358]	0.023 (0.292) [790]	0.013 (0.684) [728]	0.084** (0.011) [632]
Certificates III, IV	-0.008 (0.807) [310]	0.033 (0.190) [607]	0.010 (0.796) [560]	0.107*** (0.007) [509]
Certificates I, II	0.035 (0.447) [184]	-0.031 (0.373) [410]	0.052 (0.296) [347]	0.099* (0.053) [314]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

Table B.2: Impacts of VET Qualifications in 2005 Conditioning on Year 12 Non-completion - Relative to non-completers of Year 12

	Log Weekly Earnings	Employed	Full-Time Employment	Permanent Employment
		Males		
Advanced Diploma or Diploma	0.298*** (0.000) [138]	0.019 (0.503) [395]	0.011 (0.827) [374]	0.043 (0.365) [293]
Certificates III, IV	0.113*** (0.000) [1,691]	0.036*** (0.000) [2,751]	-0.032* (0.063) [2,660]	0.001 (0.977) [2,039]
Certificates I, II	0.038 (0.389) [330]	-0.010 (0.696) [510]	0.066* (0.096) [469]	0.011 (0.792) [357]
		Females		
Advanced Diploma or Diploma	0.171*** (0.004) [152]	0.026 (0.448) [403]	0.055 (0.290) [356]	0.100* (0.054) [299]
Certificates III, IV	0.102** (0.010) [349]	0.084*** (0.000) [952]	0.047 (0.143) [849]	0.104*** (0.003) [699]
Certificates I, II	0.066 (0.120) [303]	0.030 (0.214) [918]	0.036 (0.295) [769]	0.068* (0.063) [646]

Notes: P-values of tests against the null of a zero effect of education are provided in parentheses (..). One, two and three asterisks (*) denote statistical significance at the 10, 5 and 1 per cent levels respectively. Number of observations used in constructing estimates are provided in brackets [..].

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