Final Report

The Role of VET-in-Schools in School Completion and Post-School Outcomes

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Executive summary

Increasing engagement in education and improving transitions to work and post-school courses is an important priority of the Australian Government, as outlined in the Council of Australian Governments (COAG) target of 90% secondary school completion (or equivalent) for 20 to 24 year olds by 2015. Meeting this target is no trivial matter given that the school completion rate in 2010, the year after the implementation of the Learn or Earn requirements, was 78%.[1]

'VET-in-schools' activities represent an important element in the set of policies implemented to achieve this aim. VET-in-schools was introduced in the mid 1990s to retain less academic youth in school, to develop job-ready skills and open up alternative post-school paths that may or may not involve further training (Ministerial Council on Employment Education and Training and Youth Affairs 1999). Since its inception, there have been a number of changes to the design of the activities. The most important change was the introduction of the *Framework for Vocational Education in Schools* in 2001, which sought to bring greater uniformity in the program by aiming to make VET-in-schools a dual output activity study to contribute to both a nationally recognised VET qualification and a secondary school certificate.

The aim of this study is to examine the role of VET-in-schools in meeting its stated objectives to improve engagement in school and post-school transitions. We do this by asking three key research questions: does undertaking VET-in-schools improve the chances of school completion and engagement in post-school education? Does participation in VET-in-schools improve the chances of *completing* post-school courses? What are the labour market outcomes of VET activities and do they depend on time spent in structured workplace learning?

The findings from this study build on previous studies on VET-in-schools (Fullarton 2001, Anlezark, Karmel and Ong 2006 and Nguyen 2010) in several important ways. First, and most importantly, we control for self-selection into VET which occurs when there are differences in characteristics that affect both the choice of VET-in-schools and post-school outcomes.[2] Controlling for self-selection is important because those who participate are very

[1] Under the Learn or Earn requirements, those under 21 on income support without a Year 12 qualification or equivalent are required to be in full-time study, employment or a combination of the two.

[2] These papers do use regression type analysis with considerable controls, but are still likely to suffer from selection bias where outcomes are compared across incompatible people because of a lack of common support (Heckman et al. 1989).

different to those who do not (Bishop and Mane 2004; Meer 2007). For example, those who participate generally have lower academic achievement and have different education aspirations. Failure to account for these differences will bias the estimated effects of participating in VET-in-schools to some extent. Second, we examine a broader range of outcomes than previously examined, including post-course completion and job satisfaction. Third, we estimate outcomes before and after the changes stemming from the *Framework for Vocational Education in Schools* were implemented, which gives some perspective on the effects of the changes. Finally, we examine outcomes for a range of VET-in-schools models: apprenticeships/traineeships, other VET without structured workplace learning, other VET with high intensity workplace learning (on average 20 days a year or more), other VET with low intensity workplace learning and other VET without workplace learning. In order to evaluate both the short and the longer-term effects of VET-in-schools activities, the outcomes are studied in the first and in the third year after school.

When estimating the effect of each VET-in-schools model, we control for self-selection by using propensity score matching methods. Propensity score matching is a quasi-experimental technique that is used to generate a 'like' or 'matched' control group among those who do not participate in VET-in-schools. In essence, the effect of a VET-in-schools model is estimated by comparing outcomes of those who participate in a VET model to outcomes of matched individuals who (within a certain bound) share the same characteristics, but did not participate in any VET-in-schools. A feature of the analysis is the use of three cohorts of the Longitudinal Survey of Australian Youth (LSAY) (1998, 2003 and 2006), a longitudinal survey that tracks youth from compulsory education (around age 15) through to age 24. For the 2003 and 2006 cohorts, we link LSAY data to information from the OECD Program for International Student Assessment (PISA), which produces an extremely rich dataset.

Key results

We find that regardless of the VET model and the LSAY cohort of analysis, participation in VET-in-schools is estimated to improve the chances of school completion. This result supports previous studies by Bishop and Mane (2004) who show, using cross-country comparisons, that the school completion rates are positively related to participation rates in school VET activities.

In terms of post-school outcomes, participating in VET-in-schools is estimated to have positive labour market outcomes in the first and third year after school. Overall, VET-in-schools is estimated to improve the chances of finding employment, especially full-time

employment, increase weekly wages and improve the chances that youth will find a job they like as a career. Importantly however, we find that the estimated labour market benefits are strongly linked to VET-in-schools courses that include a sizeable workplace learning component — apprentices/trainees and other VET with intensive workplace learning. Workplace learning might be particularly important to labour market outcomes because it provides opportunities for youth to learn hard and soft skills and develop employer contacts.

We do not find similar benefits from VET-in-schools for post-school study. Overall, improved employment prospects from participating in VET-in-schools are estimated to marginally reduce the chances of enrolling in a post-school education course. The more noticeable effect of VET-in-schools is the switch in choice from higher education courses to VET courses in the first three years out from school. In terms of post-school course outcomes, participating in intensive workplace learning while still at school is estimated to have a negative effect on post –school course completion, while participating in a program *without* workplace learning is estimated to have a positive effect. Discrepancy in the estimated effects between these two groups can be attributed to differences in labour market outcomes that affect incentives to complete.

Policy implications

From a policy perspective, these results have important implications. First, they suggest that existing VET-in-schools activities are meeting some of the objectives that they were originally designed for, namely to help retain less academically inclined youth in school and improve their post-school transitions to work.

The importance of workplace learning in producing positive outcomes for students highlights the need to ensure student access to these activities. Workplace learning opportunities are not evenly distributed, with schools having more difficulty supplying placements than VET providers (Barnett and Ryan 2005)[3]. Non-school VET providers may be better positioned than schools in offering work placements because they generally have better employer networks and are more experienced in employer collaboration.

In light of current reforms in the VET sector, improving links between schools and employers is likely to become increasingly important. Current VET reforms are aimed at making the

[3] A distinction can be made between schools that organize work placement as schools and those that manage work placement as fully Registered Training Organizations (and are therefore identical to other RTOs). Nonetheless, the LSAY data do not allow for such a distinction, so that we can only be able to estimate average effects of VET-in-schools activities that include workplace learning opportunities.

sector more responsive to demand, especially student demand.[4] In Victoria, the first state to implement the reforms, students are able to choose the government funded position of their choice with no overall cap and with providers competing to attract students and funding.[5] Similar reforms are planned for South Australia (2012) and given the overall direction of policy in this area we can expect other states to follow in subsequent years. Matched with increased freedom of choice, students need better information on the demand for course graduates to make the student-driven market work. VET-in-schools work placements may help provide the connections between students and employers that are important in conveying demand signals at a time when students are making post-school career choices. Not only may the signals come via information from employers, but also by the rationing of work placements (OECD 2010c). All else being equal, assuming that employers will only offer work placements if they intend to hire graduates from a course, their availability may be a signal of employer demand.

[4]As outlined in Australian Government policy documents Skilling Australia for the Future and the National Agreement for Skills and Workforce Development.

[5] See Victorian Government (2008) for further details of the reform package.

1. Introduction

While the global economy is struggling to recover from the effects of the financial crisis, youth unemployment rates in the OECD area continue to rise (OECD 2010a). In 2010, 18% of 15-29 year olds (who had left school) in the OECD area were unemployed, compared to 10% for the working age population as a whole (OECD 2010a). As recent riots in London have highlighted, high rates of youth unemployment have the potential to scar the life prospects of many youth, with long-run consequences for social cohesion.

To deal with youth unemployment, governments around the world have focussed on improving education and training, especially for those who are less academically inclined. One commonly used measure to achieve this end is to raise the minimum school leaving age. While this has been shown to lead to net benefits (Acemoglu and Angrist 2001, Oreopoulos 2004 and Oreopoulos 2006), the benefits may be even greater if those who are retained in upper-secondary school are engaged in high quality education that not only helps them get a job, but equips them for life-long learning and a sustainable career. This is where competency based, hands-on, work focussed, vocational education and training (VET) courses in schools can play an important role. OECD statistics suggests that the labour market disadvantage of youth is lower in countries, where the participation in school vocational courses is highest, such as Germany or Austria (OECD 2010b).

The aim of this study is to add to the literature on the outcomes of school VET courses and we do this by asking the following three questions. First, does undertaking VET-in-schools improve the chances of school completion and engagement in post-school education? Improving engagement in education among less academically oriented youth is a key motivation for the introduction in school of VET activities. All else being equal, students have a range of preferences and abilities and offering a greater range of courses should induce a larger share to remain in school (Bishop and Mane 2004). However, in countries, like Australia, where VET activities in school are much the same as those offered after school, greater engagement in school through VET may mean less engagement in VET after school. If this is the case, school VET activities that lead to qualifications may simply bring the study forward.

The second question we pose is whether participation in VET-in-schools improves the chances of *completing* post-school courses. Typically, youth who do not follow a higher education pathway are required to make vocational decisions from a young age. Often the

early decisions turn out to be a mistake, which may explain the high rates of VET course non-completion among under 25 year-olds in Australia (65% of all full-time students in 2005 (Mark and Karmel 2010)). If early exposure to VET helps them to make better initial vocational choices then we may expect participation in VET-in-schools to improve the chances of completing post-school VET courses.

The final question addressed in this report is whether employment outcomes of VET activities depend on time spent in structured workplace learning. According to a recent report by the OECD (2010b), workplace learning is a crucial component of school VET activities. In fact, not only it provides students with technical skills that they may not attain in the classroom, for example through access to up-to-date equipment and people who know how to use it, but it also provides an environment to develop soft skills. For example, workplace learning may help students develop problem solving skills by giving them opportunities to apply theory learnt in the classroom and help them develop interpersonal skills, through interactions with customers and trained professionals in their field. The extent to which workplace learning develops soft skills determines whether any benefits are generic or job specific (Ryan 2002).

We undertake the analysis of the Australian 'VET-in-schools' model by evaluating outcomes up to three years after exit from school. There are two main reasons why the Australian context is particularly useful in answering the outlined questions. First, the majority of VET-in-schools courses are vocationally orientated, that is they are designed for work in a specific occupation, in much the same way as post-school courses. Study in both VET pathways contribute towards nationally recognised vocational qualification, although in school courses are generally taken at a lower level (OECD 2010c).[6] Therefore, if vocational courses in school are substitutes for those outside of school, we should see evidence in Australia. Second, a key feature of the Australian VET-in-schools is its use of structured workplace learning.[7] Despite school-based apprenticeships/traineeships being relatively unimportant compared to countries where dual education systems operate (such as in Germany, Austria

[6] According to OECD (2008) statistics, 62% of all upper-secondary vocational enrollments are 'vocationally orientated', or designed to prepare youth for entry into an occupation. The highest OECD rates are in the Czech Republic (79%), Austria (72%) and Belgium (69%). The Australian rate is comparable to rates in Switzerland (64%), Germany (59%) and Finland (65%).

[7] Structured workplace learning gives students the opportunity to gain industry-specific skills from spending time in a workplace. The skills learned in the workplace relate to units of competency in training packages and accredited courses, which makes it different from work experience where students spend time to familiarise themselves with a work environment, but not necessarily to acquire skills. Often the workplace related units of competency are also assessed in workplace conditions.

and Switzerland), hours in workplace learning are among the highest in the OECD (OECD 2010c).[8]

The main feature of our analysis is the use of propensity score matching to control for self-selection into VET-in-schools. Controlling for self-selection is important because all else equal, differences in the characteristics of those who do and do not choose VET-in-schools are likely to also affect their school and post-school outcomes (Bishop and Mane 2004; Meer 2007). Failure to control for selection is likely to bias results. The analysis is undertaken using three cohorts of the Longitudinal Survey of Australian Youth (LSAY) (1998, 2003 and 2006), a longitudinal survey that tracks youth from compulsory education (around age 15) through to age 24. A feature of the LSAY 2003 and 2006 cohorts is that it uses the same sample of 15 year olds from the OECD Program for International Student Assessment (PISA), which enables us to link the two datasets together to produce an extremely rich dataset. In controlling for selection, we match on a range of important factors including academic performance at 15 (numeracy, literacy and problem solving scores), own, parent and peer education aspirations at age 15 and school, home and regional factors.

This analysis makes a number of contributions to the literature. First, the finding that after controlling for self-selection, participating in school VET activities increases the chances of school completion adds weight to the previous finding by Bishop and Mane (2004) that school VET activities improve school completion rates. Second, we show for the first time that school VET activities do improve the chances of acquiring further qualifications, although the effect is because of an improved chance of completion rather than an improved chance of participation. Finally, our results support previous findings on the positive wage effects of completing a VET qualification (Kang and Bishop 1989; Bishop and Mane 2004; Meer 2007), but a new result is that the benefits depend on whether the course includes an intensive workplace learning component. Moreover, those who participate in VET with intensive workplace learning are shown to have more successful transitions, with greater effects estimated on the chances of finding full-time employment and a career job.

These results point to the role of school VET activities in not only improving school retention, but also in supporting successful transitions to further study and employment. However, our results underline the importance of incorporating workplace learning into VET activities. This may be a challenge for schools and VET providers alike because of difficulties in finding

[8] The OECD (2010c) estimates that between 25% and 50% of VET in school students spend 75% or more of their course time in workplace learning.

employers who are willing to offer work placements. Offering work placements can be an expensive for employers because it involves a commitment of training that they may not recoup if they have no intension of hiring graduates.

In the following sections, we present an overview of the VET-in-schools system and the LSAY data (Section 2), the methodology (Section 3), results (section 4) and a technical appendix.

2. Data and definitions

Vocational activities in schools vary widely across countries (OECD 2010c) and even across states and schools. Below is a discussion of the VET-in-schools system and how it has changed, key VET-in-schools models and information available in LSAY and how it is used.

2.1 VET-in-schools

VET-in-schools was introduced in Australian schools in the mid 1990s to retain less academic youth in school, to develop job-ready skills and open up alternative post-school paths that may or may not involve further training (Ministerial Council on Employment Education and Training and Youth Affairs 1999). The majority of VET-in-schools activities are offered at the upper-secondary level (typically students aged 16 or 17) and can be part of a school-based apprenticeship or traineeship. These courses combine attendance at school in general courses, such as mathematics and English with vocational study and at least 15 hours per week of workplace learning. Depending on the course, students may complete an apprenticeship/traineeship while at school or they may have to enrol with a Registered Training Organisation to complete the qualification post-school. VET courses that are not part of an apprenticeship or traineeship are often called 'other VET' and differ from apprenticeships and traineeships in that they do not involve an employment contract. However, some of these VET activities involve a structured workplace learning component, or on the job training to attain a set of course competencies. If the course does not involve workplace learning, then the same competencies are achieved in the classroom under simulated work conditions.

There have been some important changes to the VET-in-schools system since its introduction in the mid 1990s. First, it has steadily become more integrated into the upper-secondary school curriculum. Currently, over 95% of schools offer VET courses and around 40% of all

upper secondary students take part in these courses.[9] Moreover, reforms following the 2001 *New Framework for Vocational Education in Schools*, have increasingly made VET-in-schools a dual system —participating in a VET course in school counts towards both a nationally recognised qualification and a secondary school certificate.[10] [11] Prior to the *New Framework*, many VET-in-schools courses, either did not count towards a secondary school certificate because they did not meet academic criteria or did not count towards a national qualification because they were not compatible with the Australian Qualifications Framework (AQF). [12] The response has been to make VET-in-schools courses more vocational, so that they count towards a nationally recognised qualification and for state Boards of Studies, who control school curriculum, to accredit these courses as part of a secondary school certificate. Recent data shows that almost all courses now count towards an AQF qualification (NCVER 2011), and in most jurisdictions, all courses above AQF certificate I (International Standard Classification of Education (ISCED) level 2C) count towards a secondary school certificate.

VET-in-schools activities vary from school to school. Some schools offer courses on-campus using their own equipment with the school as the Registered Training Organisation that is subject to the same quality standards and requirements as other Registered Training Organisations, others offer only courses through their local VET provider, which is often a Technical and Further Education (TAFE) institute and others offer a combination. A major point of variation between VET-in-schools courses is the extent to which VET activities involve structured workplace learning to achieve AQF competency-based requirements for qualification attainment. Especially for schools that run their own programs, finding work placements for all their VET-in-schools students poses logistical problems and, where allowed by the training package, they often provide school-based learning with a simulated workplace component (Barnett and Ryan 2005). Whether workplace learning improves the outcomes of VET-in-schools is a key question addressed in this study.

[9] Data from the Ministerial Council on Employment, Education and Training and Youth Affairs (MCEETYA) 2003 and National Centre for Vocational Education Research (NCVER) 2011.
[10] Depending on the course and the jurisdiction, VET in school courses can also count towards university entry.
[11] The New Framework for VET in Schools was developed by the Federal-State Ministerial Council on Education, Employment, Training and Youth Affairs' (MCEETYA) with input from the Australian Curriculum Assessment and Certification Authority. It is a framework for developing a national approach to the implementation of VET in schools.
[12] The Australian Qualifications Framework is the national policy for regulated qualifications in Australia. It sets out the minimum standards for attainment of different higher education and vocational education and training qualification levels.

2.2 Longitudinal survey of Australian youth (LSAY)

The empirical analysis in this study is based on data from the Longitudinal Survey of Australian Youth (LSAY). LSAY is a longitudinal dataset that collects information on the same cohort of individuals (panel dataset) from around age 15 to around age 24. In order to examine the impacts of changes in VET-in-schools activities, we use information from three LSAY cohorts for which there is information on VET-in-schools: 1998, 2003 and 2006. For the 2003 and 2006 cohorts, we also combine LSAY to data from the OECD Program for International Student Assessment (PISA), which derived from the same sample of 15 year olds. This section describes the VET-in-schools information in LSAY and how it is used in this analysis. Because participation in VET-in-schools is generally limited to the last two years of school, the sample for analysis is restricted to those who enrol in at least Year 11.

Participation in VET-in-schools in LSAY is identified in this study by whether students answer 'yes' to one of these two questions in either Year 11 or Year 12:

- as part of your schooling, are you doing, or have you done, study at TAFE or TAFE subjects at school?
- as part of your schooling, are you doing, or have you done, any non-TAFE VET subjects or courses at school, that is, Vocational Education and Training?

As discussed in section 2.1, over time VET-in-schools has become a dual program, with participation contributing to both a nationally recognised vocational qualification and a secondary school certificate. However, in LSAY, we cannot identify which courses count towards qualification or a secondary school qualification. This means there is a discrepancy in the definition of VET-in-schools between LSAY and between that used in Australian Vocational Education and Training Management Information Statistical Standard (AVETMISS), which is used in the National VET-in-schools collection. Under the AVETMISS definition, VET-in-schools is restricted to any activity undertaken as part of a student's senior school certificate that provides credit towards a nationally recognised VET qualification (NCVER 2011).[13] Any discrepancy in data due to definitional differences between LSAY and the national collection will be greater for data from the 1998 cohort, which was collected prior to the *New Framework.*

[13] Accreditation is according to the Australian Qualifications Framework (AQF). VET in school qualifications may be Certificate level I to IV or Diploma level or higher. According to NCVER (2011), 20% level I, 56% are level II, 19% level III, 2% level IV or Diploma and 3% non-AQF qualification (such as TAFE taster courses).

Table 1
Total number of VET-in-schools subjects undertaken by individuals during Years 11 and 12 – Individuals who take at least 1 VET-in-schools course (%)

	Y03 cohort	Y06 cohort
1 subject	54.2	57.7
2 subjects in same area	18.1	21.9
2 subjects from different areas	12.4	8.1
3 or more subjects, with at least 2 in same area	11.2	10.5
3 or more subjects, all from different areas	4.2	1.8
Total	100.0	100.0
Sample size (N)	2,341	2,093

Notes: Information on VET-in-schools subjects by area only collected in Waves 2 – 4 for the Y03 and Y06 cohorts of the LSAY data; this information is not collected for the Y98 cohort.
Subject areas defined as in Tables 3-5 below (based on subjects/courses as listed in LSAY questionnaires).

In examining the outcomes from VET-in-schools, we focus just on the outcomes of participation and do not take into consideration the number of courses taken. This is not a limit of our study because data presented in Table 1 shows that most students only take one course, mostly in Year 11.

By using the school identifiers, we are able to construct data on the proportion of schools in LSAY that offer VET-in-schools, which are presented by state, excluding Tasmania and the ACT, in Table 2.[14] The data shows that states with a high proportion in 1995 maintain these high proportions in subsequent cohorts, while in the other regions (Victoria, Western Australia and, most notably, Northern Territory) the proportions have increased dramatically, especially in the 2006 cohort.

Table 2
VET-in-schools: proportion of schools offering VET-in-schools classes by state, LSAY

Cohort		NSW	Vic	QLD	SA	WA	NT
LSAY95	# of schools observed	61	56	50	35	37	9
	% with students taking VET	*93.7*	*83.1*	*96.2*	*94.4*	*87.2*	*40.0*
LSAY98	# of schools observed	62	63	61	30	31	8
	% with students taking VET	*86.2*	*79.4*	*96.8*	*100.0*	*86.1*	*87.5*
LSAY03	# of schools observed	78	56	57	43	37	16
	% with students taking VET	*93.8*	*92.9*	*100.0*	*95.3*	*92.1*	*63.6*
LSAY06	# of schools observed	65	60	47	33	41	16
	% with students taking VET	*93.8*	*93.3*	*97.9*	*97.0*	*100.0*	*87.5*

Source: The LSAY 1995, 1998, 2003, 2006 surveys

[14] This is due to the different educational system in place in these two states. In these two states, many students move to secondary colleges at the end of Year 10 (Lamb and Vickers 2006).

VET-in-schools models

In this paper we examine the outcomes from the three main types of VET-in-schools models:

- school based apprenticeship/traineeship;
- other VET-in-schools without workplace learning;
- other VET with workplace learning;
    - — high intensity workplace learning; and
    - — low intensity workplace learning.

Allocation into one of these models involves two steps. First, we distinguish between those involved in a school-based apprenticeship and those who are in other VET based on whether or not individuals participating in VET-in-schools report that their program is part of an apprenticeship/traineeship. Those who change between apprenticeship/traineeship and other VET are omitted from the analysis — 518 individuals from the 1998 cohort, 365 individuals from the 2003 cohort and 380 from the 2006 cohort. In the second step of the allocation, those in other VET are allocated to a model based on information on the average hours spent in workplace learning per year in training. Time in workplace learning in LSAY is identified in Year 11 and Year 12 of the 2003 and 2006 cohorts by asking those in a VET-in-schools activity how many days in total they did/will spend in workplace learning as part of their course in the current year. In the 1998 cohort, information on workplace learning is only collected in Year 12 and we do not use this information in the analysis. Those who spend time in workplace learning over the duration of their VET course are allocated to the high intensity group if over the duration of their course they spend more than the than the median time in workplace learning (20 days per year on average), otherwise they are allocated to the low intensity group.

Participation rates in the various models of VET-in-schools examined in this paper are presented in Table 3. We can see that most students participate in other VET-in-schools courses rather than in school-based apprenticeships/traineeships. However, there is a clear and steady increase in the popularity of school-based apprenticeships/traineeships, with a marked increase between 2003 and 2006. The rise in the popularity of apprenticeships/traineeships appears to have come mainly at the expense of other VET with workplace learning.

Table 3
Participation in various VET-in-schools models, LSAY data

	Y98 cohort		Y03 cohort		Y06 cohort	
	Year 11	Year 12	Year 11	Year 12	Year 11	Year 12
All VET-in-schools						
Number	2,096	1,478	1,925	1,614	2,321	1,580
Participation rate (%)	*25.2*	*21.0*	*28.1*	*21.1*	*25.1*	*21.2*
School based apprenticeships/traineeships						
Number	273	177	317	257	531	340
Proportion of all VET-in-schools (%)	*13.0*	*12.0*	*16.5*	*15.9*	*22.9*	*21.5*
Other VET with workplace learning						
Number	1,098	730	947	823	1,039	726
Proportion of all VET-in-schools (%)	*52.4*	*49.4*	*49.2*	*51.0*	*44.8*	*46.0*
Other VET with high intensity workplace learning						
Number	-	-	316	338	319	254
Proportion of all VET-in-schools (%)	-	-	*16.4*	*20.9*	*13.7*	*16.1*
Other VET with low intensity workplace learning						
Number	-	-	631	485	720	472
Proportion of all VET-in-schools (%)	-	-	*32.8*	*30.1*	*31.2*	*29.9*
Other VET with no workplace learning						
Number	857	674	744	576	801	529
Proportion of all VET-in-schools (%)	*40.9*	*45.6*	*38.7*	*35.7*	*34.5*	*33.5*

Source: LSAY 1998, 2003, 2006. Note: There is no workplace learning information in the 1998 cohort. High intensity workplace learning is at least 20 days a year on average and low intensity is less than 20 days.

When comparing outcomes across different models of VET-in-schools, it is important to consider any association between subject area choice and the VET model. All else being equal, we would expect subject areas associated with skill shortages, such as computing, technology and health, may have a greater pool of employers willing to offer workplace learning. Employers who face skill shortages may be more likely to form connections with schools and TAFE institutes to offer workplace learning positions in an attempt to gain an advantage in recruiting newly skilled graduates. Therefore, any difference in employment outcomes between those who have a workplace learning component and those who do not may be related to the subject area of the courses undertaken.

However, from the data presented in Tables 4 and 5, we find only minor discrepancies in course subject areas across models with different levels of workplace learning intensity. The discrepancies that do exist between the models, for example, a lower association of workplace

learning with computer courses, do not appear to be explained by differences in employer demand for subject areas. Hence, the availability of workplace learning positions by subject area may not reflect relative employer demand for different subject areas.

Table 4
VET subject enrolments by VET-in-schools models (Y03 cohort), LSAY

Subject area	Any VET	School based apprenticeship /traineeship	Other VET with WPL	Other VET with high intensity WPL	Other VET with low intensity WPL	Other VET with no WPL
	%	%	%	%	%	%
English	6.8	5.4	5.6	10.4	2.0	7.9
Foreign Languages	0.2	0.0	0.0	0.0	0.0	0.6
Mathematics	4.4	3.4	3.9	5.8	2.5	4.2
Science	1.3	0.9	0.4	0.4	0.3	2.5
Business Studies	14.4	19.1	14.6	15.2	14.1	9.3
Humanities/Social Studies	1.3	0.3	1.0	1.0	0.9	2.1
Creative/Performing Arts	7.9	2.6	6.5	5.2	7.4	11.2
Health/Physical Education	8.3	8.3	9.2	11.5	7.5	6.8
Computing	14.0	10.6	10.9	9.8	11.8	17.3
Home Economics	26.4	19.4	30.6	27.3	33.1	20.3
Technology	16.2	20.3	15.0	14.6	15.2	14.6
Other	18.3	15.1	21.3	30.6	14.3	14.9
No. individuals	2,724	350	1,117	480	637	892

Source: LSAY 2003

Table 5
VET subject enrolments in Year 12 (2006), LSAY

Subject area	Any VET	School based apprenticeship /traineeship	Other VET with WPL	Other VET with high intensity WPL	Other VET with low intensity WPL	Other VET with no WPL
	%	%	%	%	%	%
English	1.5	1.8	1.3	2.3	0.7	1.4
Foreign Languages	0.2	0.0	0.2	0.0	0.3	0.5
Mathematics	1.2	1.6	1.1	1.9	0.6	0.8
Science	0.3	0.4	0.2	0.5	0.0	0.3
Business Studies	13.3	15.7	12.5	13.3	12.0	11.5
Humanities/Social Studies	0.8	0.7	0.5	0.9	0.3	0.8
Creative/Performing Arts	6.8	1.1	5.1	4.9	5.2	12.8
Health/Physical Education	6.1	3.0	6.3	7.5	5.5	7.1
Computing	8.3	5.2	8.1	6.5	9.0	9.9
Home Economics	23.0	12.3	29.3	27.3	30.4	17.9
Technology	19.4	24.5	18.3	22.4	15.8	14.5
Other	15.7	17.0	17.4	25.2	12.6	11.0
No. individuals	2,945	559	1,118	428	690	888

Source: LSAY 2006

Outcomes from VET-in-schools

A feature of this study is that we examine the impacts of VET-in-schools on both school completion and on a wide range of post-school outcomes including enrolment in a course, completion of a course, school employment status, wages and job satisfaction. Post-school employment outcomes are examined in the first year after exiting school and in the third year after exit.

The definition of school completion is based on whether a student receives a secondary school certificate upon leaving school. A secondary school certificate is a credential awarded to students who successfully meet the academic requirements of upper secondary school (Year 11 and Year 12). This means that students who remain in education until the end of the final year of secondary school, but did not attain a secondary school certificate because they did not meet the academic requirements are treated as early school leavers.

Participation in post-school education is measured by whether or not an individual reports enrolling in one or more post-school courses that led to a qualification (VET or higher education) since leaving school. Course completion on the other hand is whether or not an individual has enrolled and acquired one or more post-school qualifications since leaving school. By definition, course completion is highly correlated with course enrolment, but differences between the two may be interpreted as the effect that VET-in-schools has on the probability of completion, conditional on enrolling in a course. All else being equal, a significantly higher effect on completion than on enrollment would suggest that participation in VET-in-schools helps improving the likelihood of course completion.

Employment status is defined by whether or not an individual who has left school is either full-time employed, part-time employed or not employed. An individual is employed if they respond 'yes' to the question: "*Do you currently work in a job, in your own business or on a farm?"*. Among those employed, the distinction between full-time and part-time employment depends on the average hours worked per week. If an individual reports working 35 hours or less on average per week, they are treated as part-time, otherwise they are full-time.

To measure any effect of VET-in-schools on wages, we use weekly wages for a restricted sample of those in full-time employment. We prefer the use of weekly wages for full-time over hourly wage rate because the latter has to be derived as the ratio of reported average weekly wage by the reported average weekly hours of work. Such a measure is subject to error because many individuals work in jobs where their hours vary from week to week and find it difficult to report average hours worked in a week. Also, hourly wage rate is difficult to

interpret because in most cases wages are linked to full-time or part-time status and not to hours in work.

One outcome that has not been examined in previous studies is the impact on job satisfaction, measured by whether the individual in employment reports their job is one that they would like as a career (career job) or not. For youth who are starting out in a career, such a variable reflects to what extent the transition from school has been successful.

3. Multivariate Approach

As discussed in the introduction, a key contribution of this report is to estimate causal impacts from VET-in-schools programs by controlling for self-selection. In the analysis of the impacts of VET-in-schools, our study will deal with the presence of self-selection using propensity score matching (PSM). Matching is a quasi-experimental technique that compares outcomes for participants in a treatment group, (VET-in-schools participants), to outcomes of 'matched' or 'like' members of a control group (those who did not participate in any VET-in-schools). In other words, it uses data on outcomes of like control group members to estimate counterfactual outcomes - outcomes if participants had not participated in the program.

When dealing with self-selection, matching methods have two major advantages over (parameteric) regression models. First, they are not subject to functional misspecification and second, they do not rely on valid exclusion restrictions that in practice are hard to find (see Dustmann and Rochina-Barrachina 2000 for a review).

Matching gives causal estimates of the treatment effects if two conditions are met:

1. Conditional Independence Assumption (CIA): after conditioning on covariates, assignment between program participation and non-participation is effectively random; that is, there are no unobserved differences between the two groups.

2. Common Support Assumption (CSA): for each program participant, there is some individual with the same (or sufficiently similar) characteristics who does not participate, and hence who can be used as the matched counterfactual observation.

A limitation of matching is that it is demanding of the data in that it requires a rich set of covariates to control for self-selection and there must be adequate numbers of like individuals in the control group. Rather than finding exact matches amongst the control group (which is extremely demanding of the data), we use Kernel and Nearest Neighbour propensity score

matching techniques which rely on a function to choose individuals who are estimated to have the same, within some range, propensity to participate in VET-in-schools, but did not.[15] Nearest Neighbour is the simpler technique and selects for each VET-in-schools participant, the individual in the control group who has the closest propensity score".[16] The drawback of Nearest Neighbour is that it discards information on other control group members and uses only information from the individual with the closest propensity score. The Kernel method, first developed by Heckman et al. (1998) uses weighted averages of control group individuals who, subject to some criteria, have a propensity score that is close to that of a given VET-in-schools participant. Because the Kernel method generates multiple comparisons for a given individual, it produces more consistent results and hence is chosen as the standard in this paper. We present results from the Nearest Neighbour in Appendix C as a test of robustness.

In this study, the propensity score for each individual is derived using predicted values from a logit model of VET activity participation. Logit functions are estimated for each model of VET-in-schools. For each model, the dependent variable is coded 1 if they participated in the model in Year 11 or Year 12 and is coded 0 if they did not participate in any VET-in-schools during senior school. Those who participated in different models to the one being investigated are omitted. Further, to ensure that the outcomes of the VET-in-schools are over the same time period as the outcomes from the matched control group, we conduct separate matching for the 1998, 2003 and 2006 cohorts. If we were to match on a pooled sample, it is possible that any estimated effects may be contaminated by differences in circumstances between time periods in which the two groups were observed. When estimating the effects of VET-in-schools on wages and post-school VET course completion, we conduct separate matching on the samples for which individuals are observed to have these outcomes, namely samples of individuals in full-time employment and enrolled full-time in a VET course respectively.

The justification for the CIA holding is based on the use of a rich set of covariates from LSAY and PISA surveys. In particular, we choose variables for the logit models that may affect both the likelihood of participating in VET-in-schools and school and post-school outcomes. These variables include academic performance at age 15, jurisdictional and regional differences, parental SES, parental aspirations, student education aspirations and school characteristics, including measures of VET activities availability. A full list of the

[15] Following Borland and Tseng (2007), we choose members of the control group within a 5% confidence interval around the treatment observation's linear predicted score. We use the linear predicted score rather than around their predicted probability because it allows symmetry in selection of control observations.
[16] Caliendo and Kopeining (2008), p. 41.

variables used in the matching and how they were derived is presented in Table C.1 of Appendix C. Factors that affect the likelihood of choosing a VET-in-schools model, but not school and post-school outcomes are excluded because they interfere with our ability to meet the CSA (Blundell and Costa Dias 2009). As well as standard variables, a number of interaction terms were trialled, but were insignificant and were removed.

To help with choosing the logit model specification, we use a balancing test, to check whether the mean values of the treatment and matched control group are the same for each variable in the probit model, as proposed by Rosenbaum and Rubin (1985). If the mean values are significantly different, then we can conclude that the distribution of the propensity scores between the VET-in-schools and matched control groups is different as well and hence the CIA will be violated. The balancing tests are performed by conducting t-tests of the difference in mean values between the treatment and matched control groups. All of the variables in the final specification pass the balancing test (refer to Appendix C for the results of the balancing tests for the Kernel matching).

Once the matched control group is formed, average treatment effects on the treated (ATET) are estimated as the weighted differences in outcomes between the VET-in-schools group and matched control groups. Using Kernel matching, the weights are assigned according to how close the propensity score from the matched control group is to the treated individual's score. For the Nearest Neighbour approach, the closest propensity score from the matched control group is given a weight of 1 and the others are assigned a weight of 0.

4. Results

4.1 Logit model results

Our first step in the empirical analysis is the estimation of the logit models of participation for each of the VET models. Results from these models (Table 6) are used in deriving propensity scores to select matched control groups for each of the VET model groups. Although we estimate separate logit models for each of the VET models, for ease of comparison, we present only results for all VET-in-schools participants.

Results from the logit models are presented as model coefficients with accompanying standard errors. The magnitude of the coefficients have no clear interpretation, but their sign and significance, represented by the number of asterisks, do. Generally speaking, positive and significant coefficients mean that the variable has a positive association with the chances of

participating in a given model of VET-in-schools, whereas a significant negative effect means the opposite. For variables with no asterisks, there is estimated to be no relationship with participation in VET.

Overall, results from the logit models suggest that VET-in-schools is fulfilling its purpose, that is to offer an alternative pathway for less academically inclined students. We find a significant negative relationship between participation and PISA numeracy and reading test scores at age 15. Similarly, those who do not aim to go onto university study and those whose parents do not want them to go onto university are more likely to participate in VET-in-schools.

We also find that school level effects are important in explaining the chances of participation. In particular, an individual's chances of participating are positively linked to the proportion of peers who participate. This may be because schools with higher participation rates offer better courses or it may be the influence of peers or uncontrolled for characteristics of the school's local area.

Table 6
Propensity score model results for analysis of outcomes 1 year after leaving school (All individuals) – Logit models for probability participated in any VET-in-schools course

***Dependent variable*: Participated in VET-in-schools course**	**Y98 cohort**		**Y03 cohort**		**Y06 cohort**	
Explanatory variables	***Coeff.***	***S.E***	***Coeff.***	***S.E***	***Coeff.***	***S.E***
Gender (base: Male)						
Female	0.019	0.058	0.050	0.060	0.012	0.067
Ethnicity (base: Migrant)						
Australian-born	-0.091	0.117	-0.063	0.104	-0.168	0.118
ATSI	-0.219	0.192	-0.004	0.120	-0.043	0.123
English main language	0.173	0.118	0.179	0.124	-0.119	0.126
School Year level in Wave 1 (base: Year 10)						
Year 11 in W1			-0.303**	0.082	0.276**	0.085
Year 9 or below in W1			-0.288**	0.106	-0.715**	0.176
State of residence (at Wave 1) (base: N.S.W)						
Victoria	-0.047	0.100	-0.064	0.097	0.121	0.106
Queensland	-0.002	0.101	0.190*	0.115	-0.010	0.115
South Australia	0.095	0.112	0.011	0.117	0.061	0.112
Western Australia	0.049	0.105	0.200*	0.109	0.003	0.118
Tasmania	0.166	0.138	0.137	0.124	0.124	0.125
A.C.T	0.078	0.150	-0.090	0.139	0.180	0.140
N.T	0.046	0.195	-0.096	0.169	0.244	0.174
Region of school (at Wave 1) (base: Major city or metropolitan area)						
Regional	0.019	0.076	0.055	0.072	0.006	0.073
Rural	0.062	0.082	0.058	0.121	-0.135	0.192
Father Australian-born	0.200**	0.078	0.056	0.075	0.112	0.079
Mother Australian-born	-0.108	0.081	-0.024	0.077	0.126	0.081
Father's highest education (base: Below Year 11)						

Father Year 11-12			0.093	0.156	-0.134	0.157
Father completed Year 12	-0.058	0.090	-0.073	0.073	0.072	0.076
Father VET qualification	-0.070	0.077	-0.062	0.103	0.058	0.106
Father Higher qualification	-0.423**	0.098	-0.097	0.087	-0.108	0.092
Mother's highest education (base: Below Year 11)						
Mother Year 11-12			-0.187	0.170	0.147	0.152
Mother completed Year 12	-0.179**	0.079	0.097	0.074	0.047	0.079
Mother VET qualification	0.015	0.087	0.122	0.098	0.108	0.101
Mother Higher qualification	-0.019	0.093	0.019	0.087	0.089	0.092
Intentions for work/study post-school (at Wave 1) (base: Intend University study)						
Intend other study	0.744**	0.097	1.087**	0.094	0.997**	0.100
Intend work	0.389**	0.134	0.559**	0.114	0.593**	0.134
Intend other	0.580**	0.106	0.489**	0.095	0.440**	0.091
Parents' intentions for work/study post-school (at Wave 1) (base: Parents intend University study)						
Parents intend other study	0.071	0.106	0.208*	0.111	0.185*	0.105
Parents intend work	0.382**	0.148	0.209*	0.126	0.170	0.144
Parents intend other	0.177*	0.092	0.151**	0.075	0.076	0.086
School type/sector (at Wave 1) (base: Government school)						
Catholic school	0.009	0.080	0.021	0.074	0.146*	0.079
Independent school	-0.001	0.110	0.007	0.105	0.148	0.108
Proportion of students at individual's school who participate in VET-in-schools courses						
% in App./Tr.	3.026**	0.792	3.198**	0.633	4.002**	0.501
% in other VET with WPL	4.454**	0.344	3.942**	0.299	4.114**	0.319
% in other VET with no WPL	4.133**	0.359	4.221**	0.323	4.537**	0.343
Proportion of students at individual's school whose parents' occupation status in various quartiles						
% parents' occ. status in lowest quartile	-0.684**	0.346	-0.640**	0.290	-0.768**	0.335
% parents' occ. status in 3rd quartile	-0.247	0.360	-0.239	0.354	-0.636	0.500
% parents' occ. status in 2nd quartile	-0.641	0.499	-0.161	0.406	-0.485	0.516
Intend undertake Year 12	0.430**	0.074	1.473**	0.108	0.347**	0.088
Year 9 numeracy test results (by quintile) (base: Numeracy ability lowest quintile)						
Numeracy ability 4th quintile	-0.149*	0.086	-0.033	0.095	0.034	0.111
Numeracy ability 3rd quintile	-0.071	0.089	-0.190*	0.110	-0.104	0.130
Numeracy ability 2nd quintile	-0.148	0.098	-0.296**	0.124	-0.215	0.149
Numeracy ability highest quintile	-0.265**	0.103	-0.761**	0.149	-0.633**	0.180
Year 9 reading test results (by quintile) (base: Reading ability lowest quintile)						
Reading ability 4th quintile	0.103	0.087	0.145	0.096	0.192*	0.113
Reading ability 3rd quintile	-0.015	0.095	-0.017	0.111	0.065	0.136
Reading ability 2nd quintile	-0.148	0.099	-0.082	0.127	-0.208	0.156
Reading ability highest quintile	-0.436**	0.114	-0.453**	0.154	-0.381**	0.184
Intercept term	-2.416**	0.268	-3.703**	0.289	-2.528**	0.319
Pseudo R-squared	0.1287		0.1675		0.1626	
No. observations	7,867		8,207		7,420	

Note: ** and * indicate statistical significance at the 5% and 10% levels.

4.2 Estimated school and post-school effects from VET-in-schools

In this section we present the estimated average treatment effects on the treated (ATET), which can be interpreted as the average causal impacts of participating in VET-in-schools, for the first year after school (Table 7) and for the third year after school (Table 8). It is important to keep in mind that these estimated effects are only for those who completed a course. Caution should be exercised when extrapolate these estimated impacts to assess the likely benefits of expanding the treatment group membership, for example, by introducing policies to increase participation in VET. All else being equal, it is likely that the estimated benefits of completing a VET course are highest for those who are observed to participate and therefore, the average benefits from expanding participation may not be as high.

For all ATETs we calculated the standard error, which represents the average error, or degree of uncertainty, surrounding the estimated effect.[17] To gauge how confident we are that the estimated parameter is different from zero (or the degree of confidence that the effect is significant) we use asterisks to denote significance at 10% and 5% level. Significance at 10% (1 asterisk) roughly means that there is at least a 90% chance that the estimated effect is not zero, 5% (2 asterisks) roughly means that there is at least a 95% chance.

At this point, we remind the readers that there is little information on workplace learning related to VET-in-schools in the 1998 and hence, we do not produce any results on this model using the 1998 cohort. Also worth keeping in mind are the considerable changes to the VET-in-schools activities between the 1998 and 2003 cohorts. In particular, as spelt out in section 2, VET-in-schools became more vocational, with courses increasingly leading to AQF qualifications. Changes in the nature of VET may be responsible for differences in the estimated outcomes across the three cohorts, but so may differences in economic conditions.

School completion

Results presented in Table 7 show that participating in VET-in-schools is estimated to increase the chances of completing school, which is consistent with the evidence presented by Bishop and Mane (2004), who find using cross-country comparisons that countries with higher rates of VET participation in school have higher rates of completion. From results estimated on the 2003 and 2006 cohorts, we find that the positive effect on completion is

[17] Standard errors were generated using a bootstrap procedure. Bootstrapping is a way to estimate the variance of parameter estimates (used to derive t-statistics) that is obtained by generating a distributions of parameter estimates by taking repeated draws, with replacement, from individuals in the sample – each draw will generate a different parameter estimate. In this case, we used 200 draws from the sample. The standard errors are not reported in the proposed tables, but can be made available by the authors.

consistent across all models of VET. Overall, using data from the 2003 and 2006 cohorts, we estimated that participating in VET-in-schools increases the chances of completion by around 10 percentage points. Given that less academic students are more likely to participate in VET-in-schools, this results highlights the importance of the program in retaining them in school.

Labour market outcomes

We find strong evidence to suggest that participating in VET-in-schools significantly improves labour market outcomes in not only the initial foray into work, but also up to three years out from leaving school. In general, participating in VET-in-schools is estimated to increase the rate of employment, especially full-time employment, improve pay and increase the chances of transiting to a career job. Comparing the outcomes across models of VET, what is clearly evident is that the employment outcomes are much stronger for those whose vocational education incorporates intensive workplace learning component: apprentices/trainees and other VET with at least 20 days of workplace learning. For those respondents that took apprenticeship courses, the increase in the chances of finding a full-time job with respect to non-VET students is estimated around 12 percentage points in the first year out of school and between 9 and 12 percentage points three years after school completion. Similarly, in the first year after exit from secondary education, the likelihood of finding what can be considered as a career job is between 15 and 18 percentage points higher for those who took VET with training courses than for former non-VET students. Evidence presented in section 2 suggests that the benefits of workplace learning are not related to differences in subject areas between VET with and without workplace learning. Those who participate in low intensity workplace learning do much the same subjects as those who participate in highly intensive workplace learning.

Engagement in post-school study

Results presented in Tables 7 and 8 both point to VET-in-schools having a marginally negative effect on the likelihood of being in full-time education in the first and third years after school. Lower rates of engagement in education can take place because participation in VET-in-schools is estimated to improve students' employability and hence the need for further study to find work is reduced. Participating in VET-in-schools has a strong effect on the type of post-school education. In particular, results point to a shift in the choice of course from higher education to VET.

We find evidence that the relationship between VET-in-schools and course completion varies with the model type. In particular, we find that participating in VET-in-schools without

workplace learning increases the chances of course completion, whereas the opposite is true of VET with intensive workplace learning. For this last group of respondents, the reduction in the probability of completion varies between 9 and 13 percentage points, depending on the intensity of the workplace activities. Those who engage in workplace learning are less likely to complete their first post-school course because they are more likely to be full-time employed in a career job and hence the incentive to complete is less than for someone who participated in VET-in-schools without a workplace learning component.

Table 7
Matching estimates for effect of VET-in-schools participation on various outcomes 1 year after leaving school – LSAY Data 1998, 2003, 2006 cohorts

Outcomes	Any VET			Apprenticeship / Traineeship			Other w. No WPL			Other w. intensive WPL		Other w. non-intensive WPL	
	1998	2003	2006	1998	2003	2006	1998	2003	2006	2003	2006	2003	2006
A. All individuals													
Completed Year 12	0.2388**	0.0912**	0.0950**	0.2152**	0.0587**	0.0737**	0.1732**	0.0352**	0.0416**	0.0931**	0.0965**	0.0980**	0.0882**
F-T employed	0.0112	0.0492**	0.0330**	0.1238**	0.1240**	0.1172**	0.0020	0.0249	0.0023	0.0682**	0.0204	0.0376	0.0233
P-T employed	0.0434**	-0.0344**	-0.0195	-0.0041	-0.0957**	-0.0368	0.0227	-0.0280*	-0.0255	-0.0392	-0.0238	-0.0144	0.0032
Not employed	-0.0449**	-0.0134	-0.0168	-0.1270**	-0.0258	-0.0679**	-0.0205	0.0061	0.0133	-0.0324	0.0078	-0.0224	-0.0353*
F-T student	-0.0267**	-0.0034	-0.0270*	0.0006	0.0145	0.0014	-0.0035	-0.0107	-0.0098	-0.0241	-0.0204	-0.0082	-0.0410
F-T student - VET	0.0399**	0.0478**	0.0348**	0.0818**	0.0787**	0.0625**	0.0216	0.0319	0.0267	0.0331	0.0561**	0.0514**	0.0245
F-T student - Higher educ.	-0.0724**	-0.0530**	-0.0630**	-0.0987**	-0.0628**	-0.0739**	-0.0366*	-0.0437**	-0.0391**	-0.0674**	-0.0713**	-0.0545**	-0.0585**
Ever enrolled in course	0.0091	-0.0164	-0.0304**	0.0331	-0.0257	-0.0303	0.0112	-0.0028	-0.0085	-0.0248	-0.0220	-0.0189	-0.0289
B. Employed individuals (at time of first interview since leaving school)													
Career job	0.0360**	0.0663**	0.0635**	0.1740**	0.1875**	0.1580**	0.0336	0.0266	0.0420*	0.0687**	0.0945**	0.0591**	0.0109
C. F-T employed individuals (at time of first interview since leaving school)													
Weekly wage ($)	32.64**	-6.23	4.52	-2.95	-25.62	-34.01**	49.79**	-18.22	-0.62	33.90	2.80	9.67	14.43

Notes: ** and * indicate statistical significance at the 5% and 10% levels.

Table 8
Matching estimates for effect of VET-in-schools participation, 3 years after leaving school – LSAY Data 1998, 2003 cohorts

Outcomes	Any VET		Apprenticeship / Traineeship		Other w. no WPL		Other w. intensive WPL	Other w. non-intensive WPL
	1998	2003	1998	2003	1998	2003	2003	2003
A. All individuals								
F-T employed	0.0426**	0.0869**	0.1296**	0.0968**	0.0509**	0.0354	0.1725**	0.0860**
P-T employed	-0.0091	-0.0552**	-0.0322	-0.0400	-0.0332	-0.0254	-0.1248**	-0.0427
Not employed	-0.0269**	-0.0333**	-0.0823**	-0.0600**	-0.0046	-0.0123	-0.0382*	-0.0455*
F-T student	-0.0337**	-0.0494**	-0.0323	-0.0652*	-0.0223	-0.0387*	-0.0554	-0.0707**
F-T student – VET	0.0192	0.0248*	0.1110**	0.0364	0.0236	-0.0008	0.0650**	0.0332
F-T student - Higher educ.	-0.0533**	-0.0749**	-0.1289**	-0.0728**	-0.0475**	-0.0520**	-0.1114**	-0.0957**
Ever enrolled in course	-0.0132	-0.0150	-0.0339	-0.0064	0.0013	0.0035	-0.0165	-0.0306
B. Individuals enrolled in VET courses after school completion								
Completed course	0.0409*	-0.0249	0.0863	0.0260	0.0062	0.0539	-0.0891**	-0.1367**
C. Employed individuals (at time of first interview since leaving school)								
Career job	0.0380**	0.0673**	0.1368**	0.0897**	0.0237	0.0372	0.1008**	0.0654*
D. F-T employed individuals (at time of first interview since leaving school)								
Weekly wage ($)	28.60**	33.46**	-8.23	32.87	40.42**	9.07	52.08**	11.71

Notes: ** and * indicate statistical significance at the 5% and 10% levels.

5. Conclusions

The aim of this study is to examine the role of VET-in-schools in meeting its stated objectives to increase the levels of engagement in school and improve the quality of post-school transitions. We do this by asking three key research questions: does undertaking VET-in-schools improve the chances of school completion and engagement in post-school education? Does participation in VET-in-schools improves the chances of *completing* post-school courses? What are the labour market outcomes of VET activities and do they depend on time spent in structured workplace learning?

Our empirical analysis is based on data from the 1998, 2003 and 2006 cohorts of the Longitudinal Survey of Australian Youth. We select all the individuals in the samples that have undertaken some VET-in-schools course and we then observe their job market and educational performance one and three years after they have left school. We implement a propensity score matching strategy in order to isolate the effect of VET courses on the analysed outcomes and deal with the issue of selection into vocational education. Our control group is constituted by all the individuals that did not engage in VET courses while at school.

We find that participation in VET-in-schools does improve the chances of school completion and that this result is consistent across different models of VET-in-schools and across different LSAY cohorts. This result supports previous studies by Bishop and Mane (2004) who show that countries who have the highest participation rate in school VET activities have the highest rates of school completion.

Overall, participating in VET-in-schools is estimated to increase the chances of transiting to a full-time career job and increase wages in the first and third years out from school. However, the benefits are greater for those whose VET-in-schools course included a sizeable workplace learning component — apprentices/trainees and other VET with intensive workplace learning (more than 20 days a year on average). Workplace learning is important to employment outcomes because it provides opportunities for youth to develop hard and soft skills and employer contacts.

Finally, the improved employment prospects from participating in VET-in-schools are estimated to marginally reduce the chances of enrolling in a post-school education course. The more noticeable effect of VET-in-schools is the switch in choice from higher education courses to VET courses in the first three years out from school. We find that the chances of

completing the first VET course are linked to the type of VET-in-schools model, with participation in intensive workplace learning having a negative effect and participating in VET without workplace learning having a positive effect. The discrepancy in the effects is likely to be linked to the incentive to complete.

From a policy perspective, these results have important implications. First, they suggest that existing VET-in-schools activities are meeting some of the objectives that they were originally designed for, that is, to help retain youth in school and to improve labour market outcomes. Secondly, the importance of workplace learning in producing positive outcomes for students highlights the need to ensure student access to work placements. Workplace learning opportunities are not evenly distributed, with schools that are also Registered Training Organisations having more difficulty supplying placements than VET providers (Barnett and Ryan 2005 Schools may benefit from collaborating more with VET providers to tap into existing employer networks and at the same time reduce possible course duplication.

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Appendix A: Propensity Score Matching

Most of the theory on the implementation of propensity score matching is based on the seminal work of Rosenbaum and Rubin (1983 and 1985) and has found wide application in the economic literature. The main argument behind this method can be summarized as follows.[18]

For any student we would like to define *Y* as an outcome variable (for example earnings) specifying how much the individual would earn had they chosen the VET track and the corresponding earnings had they chosen not to attend VET courses. If we define a dummy D_i that equals one in case the student has taken VET and zero otherwise, we are interested in evaluating the treatment effect (i.e., the effect of attending VET courses) that we can express as:

$$\tau_i = Y_i(D_i = 1) - Y_i(D_i = 0) \tag{1}$$

Evidently, for each individual *i* is only one of the two outcomes that can be observed. Although the exact estimation of τ_i is not possible, it is still feasible to identify some average treatment effects.[19] In particular, most of the literature has focused on the estimation of the *average treatment effect on the treated*, which we can define as:

$$\tau_{ATT} = E(\tau \mid D = 1) = E[Y(1) \mid D = 1] - E[Y(0) \mid D = 1] \tag{2}$$

where $E[Y(0) \mid D = 1]$ is not observed. Simply approximating this last term with the average outcome observed for the untreated $E[Y(0) \mid D = 0]$ would lead to biased estimates, since:

$$E[Y_1 \mid D = 1] - E[Y_0 \mid D = 0] = \tau_{ATT} + \{E[Y_0 \mid D = 1] - E[Y_0 \mid D = 0]\} \tag{3}$$

where the term in curly brackets on the RHS represents the bias term that can be attributed to the earnings of non-VET students, it is not necessarily representative of what VET students would have earned if they had not taken the VET courses. So τ_{ATT} can be identified only if

$$E[Y_0 \mid D = 1] - E[Y_0 \mid D = 0] = 0 .$$

[18] The description of the theoretical framework for the implementation of matching estimators is largely based on Angrist (1998), Caliendo and Kopeinig (2008) and Angrist and Pischke (2009), chapter 3.

[19] For simplicity, the subscript *i* will be eliminated from the equations.

Within non-experimental frameworks, this last result can only be achieved by invoking some identifying assumptions. In particular, it is worth mentioning two crucial assumptions.

Conditional Independence Assumption (CIA): given a set of covariates *X*, not affected by the treatment, potential outcomes are independent of treatment assignment. Formally:

$$Y(0),\ Y(1) \perp D \mid X, \qquad \forall\ X\ . \tag{4}$$

Nonetheless, conditioning on a high dimensional set of variables X can be extremely demanding. In this respect, the finding of Rosenbaum and Rubin (1983) is particularly useful: if potential outcomes are independent of treatment conditional on covariates *X*, they are also independent of treatment conditional on a balancing score *b(X)*. Furthermore, within the set of possible balancing scores, Rosenbaum and Rubin identify the propensity score, i.e. the probability for an individual to participate in a treatment given their observed covariates *X*, as the coarsest balancing score. So, given the propensity score, CIA can be re-written as:

$$Y(0),\ Y(1) \perp D \mid P(X), \qquad \forall\ X\ . \tag{5}$$

Common Support (Overlap Condition):

$$0 < P(D = 1 \mid X) < 1 \tag{6}$$

This assumption "prevents *X* from being a perfect predictor, in the sense that we can find for each participant a counterpart in the non-treated population and vice versa".[20]

[20] Caliendo and Hujer (2006).

Appendix B: Other tables

Table B.1

Attrition and Early School Withdrawal

	1998 Cohort			2003 Cohort			2006 Cohort		
	1998	**1999**	**2000**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Interviewed	14110	9286	9546	10370	9378	8691	14170	9353	8380
	100.00%	*65.81%*	*67.65%*	*100.00%*	*90.43%*	*83.81%*	*100.00%*	*66.01%*	*59.14%*
At school	14110	8709	8362	10370	8078	5493	14170	8099	5423
	100.00%	*61.72%*	*59.26%*	*100.00%*	*77.90%*	*52.97%*	*100.00%*	*57.16%*	*38.27%*
ESL	0	87	827	0	1032	1568	0	955	1587
	0.00%	*0.62%*	*5.86%*	*0.00%*	*9.95%*	*15.12%*	*0.00%*	*6.74%*	*11.20%*

Source: LSAY 1998, 2003, 2005

Table B.2

Percentage of Early School Leavers

% of Early School Leavers	1998		2003		2006	
	Year 11	**Year 12**	**Year 11**	**Year 12**	**Year 11**	**Year 12**
All Students	11.89	2.66	15.54	5.17	14.53	4.60
No VET in Year 12	18.33	3.68	23.50	7.54	25.29	6.96
VET in Year 12	26.85	2.58	27.81	7.73	34.13	7.14
Apprenticeship/Traineeship	18.68	3.75	22.34	7.06	24.25	7.31
Other VET with workplace learning	14.83	3.93	26.62	8.00	21.55	6.35
Other VET no workplace learning	19.20	3.13	22.85	7.74	23.37	6.55

Source: LSAY 1998, 2003, 2006

Table B.4

Labour Market Participation and Weekly Hours of Work during Year 12

	1998		2003		2006	
	Percentage of Workers	**Average Hours Worked**	**Percentage of Workers**	**Average Hours Worked**	**Percentage of Workers**	**Average Hours Worked**
All Students	52.52	10.06	57.86	13.87	58.21	13.15
Non-VET	50.46	9.72	55.67	13.09	55.72	12.45
VET Students	60.35	11.11	66.24	16.38	67.82	15.33
On Campus	61.83	11.38	65.33	16.09	65.34	15.18
Apprenticeship/Training	72.88	12.32	74.63	19.24	79.63	16.62
Workplace Learning	62.67	11.15	65.22	15.55	64.43	15.16
No Training, No Workplace	53.69	10.55	63.23	15.28	64.78	14.56

Source: LSAY 1998, 2003, 2006

Appendix C: Additional Results

Table C.1
Definition of outcome and explanatory variables used in analyses

Variable name	Description
Outcome variables (measured at points in time 1 year and 3 years after leaving school)	
Completed Year 12	Completed Year 12 or equivalent qualification
F-T employed	Full-time employed
P-T employed	Part-time employed
Not employed	Not employed
F-T student	Full-time student
F-T student – VET	Full-time student enrolled in course for VET qualification
F-T student – Higher Educ.	Full-time student enrolled in course for Higher Education (Bachelor Degree or higher) qualification
Ever enrolled in course	Ever enrolled in a post-school course (since leaving school)
Completed course	Ever completed a post-school course (since leaving school)
Completed *first* course	Completed the first post-school course enrolled in (since leaving school)
Weekly wage ($)	Gross weekly wage in current job
Hourly wage rate ($)	Gross hourly wage rate in current job
Career job	Current job is the type of job would like as a career (proxy for individuals' job satisfaction level)
Explanatory variables (in specification of propensity score models)	
Female	Gender: Female
Australian-born	Ethnicity: Australian-born, non-ATSI
ATSI	Ethnicity: Aboriginal or Torres Strait Islander (ATSI)
English main language	English is main language spoken at home
Year 11 in W1	Year level in Wave 1 of LSAY: Year 11
Year 9 or below in W1	Year level in Wave 1 of LSAY: Year 9 or below
Victoria	State of residence (at Wave 1): Victoria
Queensland	State of residence (at Wave 1): Queensland
South Australia	State of residence (at Wave 1): South Australia
Western Australia	State of residence (at Wave 1): Western Australia
Tasmania	State of residence (at Wave 1): Tasmania
A.C.T	State of residence (at Wave 1): Australian Capital Territory (A.C.T)
N.T	State of residence (at Wave 1): Northern Territory (N.T)
Regional	Region of school (at Wave 1): Regional area
Rural	Region of school (at Wave 1): Rural area
Father Australian-born	Father is/was Australian-born
Mother Australian-born	Mother is/was Australian-born
Father Year 11-12	Father's highest education: Undertook Year 11 and/or Year 12 (but did not complete Year 12) (ISCED 3B, 3C)
Father completed Year 12	Father's highest education: Completed Year 12 (ISCED 3A, 4)
Father VET qualification	Father's highest education: Completed VET qualification (ISCED 5B)
Father Higher qualification	Father's highest education: Completed Higher Education qualification (ISCED 5A, 6)
Mother Year 11-12	Mother's highest education: Undertook Year 11 and/or Year 12 (but did not complete Year 12) (ISCED 3B, 3C)
Mother completed Year 12	Mother's highest education: Completed Year 12 (ISCED 3A, 4)
Mother VET qualification	Mother's highest education: Completed VET qualification

	(ISCED 5B)
Mother Higher qualification	Mother's highest education: Completed Higher Education qualification (ISCED 5A, 6)
Intend other study	Intentions for work/study post-school (at Wave 1): Other study (not University course) (e.g., apprenticeship, traineeship, TAFE course)
Intend work	Intentions for work/study post-school (at Wave 1): Work
Intend other	Intentions for work/study post-school (at Wave 1): Other (e.g., join defence forces, travel) or unknown
Parents intend other study	Parents' intentions for work/study post-school (at Wave 1): Other study (not University course)
Parents intend work	Parents' intentions for work/study post-school (at Wave 1): Work
Parents intend other	Parents' intentions for work/study post-school (at Wave 1): Other (including "Don't mind/My decision") or unknown
Catholic school	School type/sector (at Wave 1): Catholic
Independent school	School type/sector (at Wave 1): Independent
% in App./Tr.	Proportion of students at individual's school who participate in school based apprenticeship/traineeship (in Year 11 or 12) (based on responses of individuals from same school in LSAY data)
% in other VET with WPL	Proportion of students at individual's school who participate in other VET-in-schools with workplace learning (WPL) (in Year 11 or 12) (based on responses of individuals from same school in LSAY data)
% in other VET with no WPL	Proportion of students at individual's school who participate in other VET-in-schools with no workplace learning (WPL) (in Year 11 or 12) (based on responses of individuals from same school in LSAY data)
% parents' occ. status in lowest quartile	Proportion of students at individual's school whose parents' (highest) occupational status is in lowest (fourth) quartile (based on ANU3 scale for Y98 cohort and ISEI scale for Y03 and Y06 cohorts) (based on distributions observed in LSAY data)
% parents' occ. status in 3rd quartile	Proportion of students at individual's school whose parents' (highest) occupational status is in third quartile (based on ANU3 scale for Y98 cohort and ISEI scale for Y03 and Y06 cohorts) (based on distributions observed in LSAY data)
% parents' occ. status in 2nd quartile	Proportion of students at individual's school whose parents' (highest) occupational status is in second quartile (based on ANU3 scale for Y98 cohort and ISEI scale for Y03 and Y06 cohorts) (based on distributions observed in LSAY data)
Intend undertake Year 12	Individual intended to undertake Year 12 (at Wave 1)
Numeracy ability 4th quintile	Year 9 numeracy test score in fourth quintile of distribution of results
Numeracy ability 3rd quintile	Year 9 numeracy test score in third quintile of distribution of results
Numeracy ability 2nd quintile	Year 9 numeracy test score in second quintile of distribution of results
Numeracy ability highest quintile	Year 9 numeracy test score in highest (first) quintile of distribution of results
Reading ability 4th quintile	Year 9 reading test score in fourth quintile of distribution of results
Reading ability 3rd quintile	Year 9 reading test score in third quintile of distribution of results
Reading ability 2nd quintile	Year 9 reading test score in second quintile of distribution of results
Reading ability highest quintile	Year 9 reading test score in highest (first) quintile of distribution of results

Table C.2
Propensity score model results for analysis of outcomes 3 years after leaving school (All individuals) – Logit models for probability participated in any VET-in-schools course

***Dependent variable*: Participated in VET-in-schools course**	**Y98 cohort**		**Y03 cohort**	
Explanatory variables	***Coeff.***	***S.E***	***Coeff.***	***S.E***
Gender (base: Male)				
Female	-0.055	0.067	0.066	0.070
Ethnicity (base: Migrant)				
Australian-born	-0.146	0.136	-0.083	0.123
ATSI	-0.060	0.238	0.047	0.151
English main language	0.255*	0.138	0.201	0.145
School Year level in Wave 1 (base: Year 10)				
Year 11 in W1			-0.283**	0.096
Year 9 or below in W1			-0.124	0.121
State of residence (at Wave 1) (base: N.S.W)				
Victoria	-0.074	0.115	-0.079	0.114
Queensland	-0.088	0.117	0.220*	0.135
South Australia	0.067	0.128	-0.027	0.136
Western Australia	0.041	0.120	0.194	0.130
Tasmania	0.168	0.153	0.123	0.146
A.C.T	0.090	0.172	-0.126	0.159
N.T	0.254	0.215	-0.253	0.202
Region of school (at Wave 1) (base: Major city or metropolitan area)				
Regional	0.058	0.088	0.090	0.085
Rural	0.176*	0.094	0.117	0.142
Father Australian-born	0.174*	0.089	0.015	0.086
Mother Australian-born	-0.090	0.093	-0.003	0.089
Father's highest education (base: Below Year 11)				
Father Year 11-12			-0.127	0.200
Father completed Year 12	-0.080	0.103	-0.061	0.086
Father VET qualification	-0.119	0.088	-0.134	0.122
Father Higher qualification	-0.377**	0.110	-0.072	0.100
Mother's highest education (base: Below Year 11)				
Mother Year 11-12			-0.126	0.205
Mother completed Year 12	-0.200**	0.090	0.092	0.087
Mother VET qualification	0.051	0.100	0.076	0.116
Mother Higher qualification	-0.086	0.105	-0.013	0.101
Intentions for work/study post-school (at Wave 1) (base: Intend University study)				
Intend other study	0.773**	0.112	1.237**	0.110
Intend work	0.375**	0.151	0.672**	0.133
Intend other	0.587**	0.120	0.568**	0.110
Parents' intentions for work/study post-school (at Wave 1) (base: Parents intend University study)				
Parents intend other study	0.017	0.122	0.143	0.130
Parents intend work	0.450**	0.171	0.117	0.150
Parents intend other	0.264**	0.104	0.186**	0.087
School type/sector (at Wave 1) (base: Government school)				
Catholic school	-0.031	0.091	-0.028	0.086
Independent school	-0.056	0.125	-0.101	0.119
Proportion of students at individual's school who participate in VET-in-schools courses				
% in App./Tr.	3.279**	0.911	3.368**	0.737
% in other VET with WPL	4.434**	0.391	4.159**	0.352
% in other VET with no WPL	4.202**	0.411	4.420**	0.376

Proportion of students at individual's school whose parents' occupation status in various quartiles				
% parents' occ. status in lowest quartile	-0.543	0.397	-0.887**	0.333
% parents' occ. status in 3rd quartile	-0.225	0.414	-0.520	0.413
% parents' occ. status in 2nd quartile	-0.238	0.562	-0.527	0.464
Intend undertake Year 12	0.372**	0.087	1.490**	0.131
Year 9 numeracy test results (by quintile) (base: Numeracy ability lowest quintile)				
Numeracy ability 4th quintile	-0.258**	0.101	-0.061	0.116
Numeracy ability 3rd quintile	-0.123	0.102	-0.271**	0.130
Numeracy ability 2nd quintile	-0.187*	0.113	-0.376**	0.146
Numeracy ability highest quintile	-0.351**	0.117	-0.843**	0.172
Year 9 reading test results (by quintile) (base: Reading ability lowest quintile)				
Reading ability 4th quintile	0.118	0.103	0.148	0.116
Reading ability 3rd quintile	0.038	0.110	-0.037	0.133
Reading ability 2nd quintile	-0.071	0.114	-0.052	0.150
Reading ability highest quintile	-0.331**	0.129	-0.349**	0.178
Intercept term	-2.464**	0.308	-3.588**	0.334
Pseudo R-squared	0.1334		0.1819	
No. observations	6,095		6,369	

Note: ** and * indicate statistical significance at the 5% and 10% levels.

Table C.3
Balancing test results for analysis of outcomes 1 year after leaving school (All individuals) – Differences in means of characteristics of 'treated' and 'control' individuals pre- and post-matching (kernel matching weights); 'treatment' is participation in any VET-in-schools course

Individual characteristics	Y98 cohort		Y03 cohort		Y06 cohort	
	Pre-matching diff.s	Post-matching diff.s	Pre-matching diff.s	Post-matching diff.s	Pre-matching diff.s	Post-matching diff.s
Female	0.023*	0.006	-0.010	0.003	-0.012	0.007
Australian-born	0.018**	-0.004	0.020**	-0.003	0.021**	0.000
ATSI	0.000	-0.002	0.019**	-0.001	0.025**	0.000
English main language	0.025**	0.001	0.022**	0.001	0.022**	0.000
Year 11 in W1			-0.050**	0.003	0.035**	0.014
Year 9 or below in W1			-0.003	-0.009	-0.004	-0.004
Victoria	-0.068**	0.007	-0.045**	-0.003	-0.020**	0.003
Queensland	0.057**	-0.001	-0.007	-0.002	0.057**	0.006
South Australia	0.009	-0.003	-0.010	-0.003	-0.035**	0.002
Western Australia	-0.001	-0.001	-0.004	0.006	-0.008	0.004
Tasmania	-0.006	-0.002	0.001	0.000	-0.001	-0.002
A.C.T	0.005	0.003	-0.023**	-0.001	-0.020**	-0.004
N.T	-0.006	0.000	0.009**	-0.002	0.021**	-0.004
Regional	0.034**	-0.002	0.027**	-0.003	0.065**	-0.014
Rural	0.044**	-0.004	0.054**	0.001	0.017**	0.000
Father Australian-born	0.049**	-0.005	0.046**	0.005	0.076**	-0.004
Mother Australian-born	0.027**	-0.004	0.043**	-0.003	0.080**	-0.002
Father Year 11-12			0.009**	0.001	0.002	-0.002

Father completed Year 12	0.012	-0.002	0.028**	0.003	0.056**	0.004
Father VET qualification	0.027**	-0.005	0.002	-0.004	0.017**	-0.006
Father Higher qualification	-0.120**	0.004	-0.119**	0.002	-0.145**	0.007
Mother Year 11-12			0.002	0.002	0.011**	-0.002
Mother completed Year 12	-0.001	0.003	0.042**	0.008	0.036**	-0.001
Mother VET qualification	0.013	-0.002	0.011	-0.005	0.013	-0.003
Mother Higher qualification	-0.080**	0.002	-0.097**	0.004	-0.110**	0.010
Intend other study	0.135**	0.003	0.212**	-0.002	0.225**	0.008
Intend work	0.026**	0.002	0.027**	0.006	0.025**	0.002
Intend other	0.032**	0.004	0.021**	0.000	-0.008	-0.005
Parents intend other study	0.094**	0.000	0.111**	0.001	0.165**	0.004
Parents intend work	0.028**	0.002	0.035**	0.000	0.027**	0.003
Parents intend other	0.039**	0.007	0.067**	0.003	0.019*	-0.001
Catholic school	0.004	0.000	0.000	0.008	-0.026**	-0.004
Independent school	-0.054**	0.002	-0.084**	0.005	-0.075**	0.008
% in App./Tr.	0.017**	0.001	0.013**	0.001	0.029**	0.003
% in other VET with WPL	0.062**	0.002	0.070**	0.003	0.060**	0.002
% in other VET with no WPL	0.056**	0.001	0.048**	-0.002	0.051**	-0.002
% parents' occ. status in lowest quartile	0.031**	0.000	0.048**	-0.004	0.053**	-0.001
% parents' occ. status in 3rd quartile	0.022**	-0.001	0.015**	0.000	0.009**	0.000
% parents' occ. status in 2nd quartile	-0.004**	0.001	-0.009**	0.003	-0.005**	-0.002
Intend undertake Year 12	-0.002	0.012	0.017**	0.010	-0.073**	0.015
Numeracy ability 4th quintile	0.028**	-0.001	0.092**	-0.004	0.104**	-0.002
Numeracy ability 3rd quintile	0.012	0.005	0.029**	-0.004	0.052**	0.009
Numeracy ability 2nd quintile	-0.018*	0.004	-0.039**	0.007	-0.049**	-0.004
Numeracy ability highest quintile	-0.098**	0.003	-0.177**	0.006	-0.181**	0.007
Reading ability 4th quintile	0.054**	-0.006	0.096**	-0.003	0.120**	-0.001
Reading ability 3rd quintile	0.018*	-0.001	0.029**	0.000	0.050**	0.001
Reading ability 2nd quintile	-0.036**	0.005	-0.049**	0.001	-0.059**	-0.001
Reading ability highest quintile	-0.091**	0.008	-0.172**	0.006	-0.180**	0.006
Hotelling T-squared test for joint significance (F-statistics)	29.75**	0.25	39.41**	0.39	34.83**	0.47
No. observations	7,867	7,858	8,207	8,190	7,420	7,415
No. participated in any VET-in-schools course	2,014	2,009	2,315	2,315	2,156	2,151

Notes: Reported differences are mean (participated in any VET-in-schools course) – mean (did not participate in any VET-in-schools course).
** and * indicate statistically significant differences at the 5% and 10% levels; for 'Post-matching diff.s' columns, these represent results from Smith and Todd (2005) balancing tests.

Table C.4
Balancing test results for analysis of outcomes 3 years after leaving school (All individuals) – Differences in means of characteristics of 'treated' and 'control' individuals pre- and post-matching (kernel matching weights); 'treatment' is participation in any VET-in-schools course

Individual characteristics	Y98 cohort		Y03 cohort	
	Pre-matching diff.s	Post-matching diff.s	Pre-matching diff.s	Post-matching diff.s
Female	0.010	0.002	-0.010	-0.001
Australian-born	0.021**	-0.002	0.020**	-0.003
ATSI	0.003	-0.002	0.018**	0.001
English main language	0.030**	0.006	0.023**	0.002
Year 11 in W1			-0.055**	0.002
Year 9 or below in W1			0.008	-0.006
Victoria	-0.070**	0.001	-0.048**	0.000
Queensland	0.042**	0.002	-0.005	0.000
South Australia	0.011	-0.003	-0.013	-0.007
Western Australia	0.000	0.001	-0.005	0.005
Tasmania	-0.003	-0.001	0.002	0.000
A.C.T	0.004	0.003	-0.025**	-0.002
N.T	-0.002	0.002	0.004	-0.001
Regional	0.033**	-0.002	0.031**	-0.004
Rural	0.063**	-0.004	0.056**	0.002
Father Australian-born	0.055**	0.002	0.046**	0.004
Mother Australian-born	0.034**	-0.001	0.048**	0.000
Father Year 11-12			0.002	0.001
Father completed Year 12	0.008	0.001	0.033**	-0.002
Father VET qualification	0.023*	-0.007	-0.004	-0.002
Father Higher qualification	-0.121**	0.004	-0.123**	0.001
Mother Year 11-12			0.002	0.001
Mother completed Year 12	-0.006	0.008	0.042**	0.004
Mother VET qualification	0.023**	-0.003	0.010	0.000
Mother Higher qualification	-0.091**	0.001	-0.105**	0.004
Intend other study	0.135**	0.005	0.233**	0.004
Intend work	0.029**	0.002	0.030**	0.004
Intend other	0.036**	0.006	0.023**	-0.002
Parents intend other study	0.091**	-0.001	0.115**	-0.003
Parents intend work	0.030**	0.003	0.035**	-0.004
Parents intend other	0.048**	0.011	0.085**	0.011
Catholic school	-0.002	0.002	-0.007	0.012
Independent school	-0.060**	0.003	-0.093**	0.002
% in App./Tr.	0.017**	0.001	0.014**	0.001
% in other VET with WPL	0.064**	0.002	0.073**	0.002
% in other VET with no WPL	0.056**	0.001	0.051**	-0.002
% parents' occ. status in lowest quartile	0.034**	-0.002	0.053**	-0.003
% parents' occ. status in 3rd quartile	0.023**	-0.002	0.014**	0.000
% parents' occ. status in 2nd quartile	-0.002	0.002	-0.011**	0.002
Intend undertake Year 12	-0.016	0.012	0.005	0.011
Numeracy ability 4th quintile	0.019**	-0.001	0.095**	-0.001
Numeracy ability 3rd quintile	0.019	0.006	0.032**	-0.009
Numeracy ability 2nd quintile	-0.016	0.006	-0.039**	0.010

Numeracy ability highest quintile	-0.105**	0.002	-0.191**	0.004
Reading ability 4th quintile	0.053**	-0.002	0.102**	-0.005
Reading ability 3rd quintile	0.023**	-0.001	0.024**	-0.002
Reading ability 2nd quintile	-0.035**	0.004	-0.051**	0.005
Reading ability highest quintile	-0.095**	0.008	-0.178**	0.004
Hotelling T-squared test for joint significance (F-statistics)	23.73**	0.26	33.13**	0.34
No. observations	6,095	6,083	6,369	6,346
No. participated in any VET-in-schools course	1,526	1,523	1,698	1,698

Notes: Reported differences are mean (participated in any VET-in-schools course) – mean (did not participate in any VET-in-schools course).
** and * indicate statistically significant differences at the 5% and 10% levels; for 'Post-matching diff.s' columns, these represent results from Smith and Todd (2005) balancing tests.

Table C.5
Balancing test results for analysis of outcomes 1 year after leaving school (All individuals) – Differences in means of characteristics of 'treated' and 'control' individuals pre- and post-matching (using kernel matching weights); 'treatment' is participation in Other VET with high intensity workplace learning

Individual characteristics	Y03 cohort		Y06 cohort	
	Pre-matching diff.s	Post-matching diff.s	Pre-matching diff.s	Post-matching diff.s
Female	0.034	0.008	-0.048*	0.003
Australian-born	0.052**	-0.001	0.028*	-0.001
ATSI	0.016	-0.002	0.015	-0.002
English main language	0.036**	0.000	0.036**	0.001
Year 11 in W1	-0.028	0.009	-0.044*	0.003
Year 9 or below in W1	0.014	-0.011	-0.001	-0.003
Victoria	-0.060**	-0.006	-0.096**	0.006
Queensland	-0.100**	-0.002	-0.042**	0.001
South Australia	-0.030**	0.002	0.000	-0.001
Western Australia	0.101**	0.010	0.062**	0.001
Tasmania	0.116**	0.008	0.126**	0.012
A.C.T	-0.054**	0.000	-0.038**	-0.003
N.T	0.030**	-0.002	0.034**	-0.006
Regional	0.054**	0.001	0.071**	-0.010
Rural	0.071**	-0.004	0.033**	0.002
Father Australian-born	0.040*	-0.001	0.093**	0.005
Mother Australian-born	0.071**	0.003	0.071**	-0.001
Father Year 11-12	0.012	-0.002	-0.001	0.000
Father completed Year 12	0.061**	0.003	0.091**	-0.002
Father VET qualification	0.001	-0.002	0.050**	0.012
Father Higher qualification	-0.168**	-0.003	-0.178**	-0.003
Mother Year 11-12	0.013	-0.001	-0.002	0.004
Mother completed Year 12	0.051**	0.015	0.099**	0.011

Mother VET qualification	0.043**	-0.012	0.002	-0.003
Mother Higher qualification	-0.128**	0.003	-0.139**	-0.001
Intend other study	0.319**	0.023	0.283**	0.008
Intend work	0.010	-0.002	0.052**	0.004
Intend other	0.007	-0.006	-0.022	-0.008
Parents intend other study	0.153**	0.011	0.241**	0.009
Parents intend work	0.043**	0.004	0.042**	0.008
Parents intend other	0.055**	-0.005	-0.004	-0.009
Catholic school	0.037*	0.006	-0.032	-0.009
Independent school	-0.120**	0.001	-0.049**	0.004
% in App./Tr.	0.008**	0.000	0.025**	0.005**
% in other VET with WPL	0.098**	0.000	0.098**	0.006*
% in other VET with no WPL	0.007	-0.002	0.007	-0.001
% parents' occ. status in lowest quartile	0.058**	-0.001	0.048**	0.003
% parents' occ. status in 3rd quartile	0.016**	-0.003	0.016**	0.001
% parents' occ. status in 2nd quartile	-0.012**	0.002	-0.009**	-0.002
Intend undertake Year 12	0.010	0.009	-0.118**	0.007
Numeracy ability 4th quintile	0.161**	-0.004	0.103**	-0.008
Numeracy ability 3rd quintile	0.022	0.006	0.064**	0.003
Numeracy ability 2nd quintile	-0.088**	-0.002	-0.028	0.005
Numeracy ability highest quintile	-0.187**	0.000	-0.203**	0.005
Reading ability 4th quintile	0.113**	-0.002	0.126**	-0.005
Reading ability 3rd quintile	0.036*	0.004	0.104**	0.015
Reading ability 2nd quintile	-0.070**	0.001	-0.070**	0.001
Reading ability highest quintile	-0.187**	0.000	-0.215**	0.000
Hotelling T-squared test for joint significance (F-statistics)	18.09**	0.41	14.13**	0.53
No. observations	6,303	6301	5,596	5,491
No. participated in Other VET with high intensity workplace learning	411	411	332	331

Notes: Reported differences are mean (participated in Other VET with high intensity workplace learning) – mean (did not participate in any VET-in-schools course).
** and * indicate statistically significant differences at the 5% and 10% levels; for 'Post-matching diff.s' columns, these represent results from Smith and Todd (2005) balancing tests.

Table C.6: Nearest neighbour estimates for effect of VET-in-schools participation on various outcomes 1 year after leaving school – LSAY Data 1998, 2003, 2006 cohorts

Outcomes	Any VET			Apprenticeship / Traineeship			Other w. No WPL			Other w. intensive WPL		Other w. non-intensive WPL	
	1998	2003	2006	1998	2003	2006	1998	2003	2006	2003	2006	2003	2006
A. All individuals													
Completed Year 12	0.2259**	0.0834**	0.1074**	0.2466**	0.0790	0.0544	0.1682**	0.0442	0.0319	0.0949**	0.1067**	0.0991**	0.0718**
F-T employed	0.0343	0.0825**	0.0172	0.0959	0.1193**	0.0977**	0.0318	0.0000	-0.0339	0.0900*	0.0301	0.0539	0.0274
P-T employed	0.0437*	-0.0497**	-0.0019	0.0000	-0.0842**	-0.0401	0.0091	0.0106	0.0247	-0.0195	-0.0211	-0.0465	-0.0063
Not employed	-0.0665**	-0.0276	-0.0232*	-0.1027**	-0.0386	-0.0276	-0.0409	-0.0066	0.0077	-0.0560	-0.0060	-0.0130	-0.0337
F-T student	-0.0308	0.0173	-0.0343*	0.0205	0.0105	0.0075	0.0121	0.0146	-0.0123	-0.0292	0.0452	0.0204	-0.0547
F-T student - VET	0.0353**	0.0691**	0.0241	0.0685	0.0772	0.0526	0.0455	0.0583*	-0.0031	0.0365	0.1175**	0.0706**	0.0274
F-T student - Higher educ.	-0.0735**	-0.0540**	-0.0584**	-0.0753	-0.0596**	-0.0602**	-0.0500	-0.0490*	-0.0077	-0.0779**	-0.0633**	-0.0520**	-0.0758*
Ever enrolled in course	-0.0076	-0.0018	-0.0270	0.0021	0.0020	-0.0381	0.0294	0.0432	-0.0022	-0.0240	0.0116	0.0186	-0.0219
B. Employed individuals (at time of first interview since leaving school)													
Career job	0.0617**	0.0680**	0.0724**	0.1719**	0.2012**	0.1360**	0.0643	0.0173	0.0138	0.0453	0.0413	0.0864**	0.0788*
C. F-T employed individuals (at time of first interview since leaving school)													
Weekly wage ($)	31.11*	-10.40	-0.27	19.70	-27.98	-23.66	33.56	-7.97	41.69	24.48	5.15	-4.28	-10.83

Notes: ** and * indicate statistical significance at the 5% and 10% levels.

Table C.7: Nearest neighbour estimates for effect of VET-in-schools participation, 3 years after leaving school – LSAY Data 1998, 2003 cohorts

Outcomes	Any VET		Apprenticeship / Traineeship		Other w. no WPL		Other w. intensive WPL	Other w. non-intensive WPL
	1998	2003	1998	2003	1998	2003	2003	2003
A. All individuals								
F-T employed	0.0197	0.0925**	0.0556	0.0737*	0.0748*	0.0070	0.1267**	0.0800*
P-T employed	0.0282	-0.0554**	0.0370	-0.0046	-0.0571	0.0088	-0.1000**	-0.0427
Not employed	-0.0295	-0.0418**	-0.0648	-0.0645**	-0.0059	-0.0105	-0.0067	-0.0400
F-T student	-0.0426*	-0.0571**	-0.0278	-0.1014*	-0.0295	-0.0070	-0.0367	-0.0507
F-T student - VET	0.0164	0.0159	0.0926**	0.0000	0.0217	0.0105	0.0267	0.0347
F-T student - Higher educ.	-0.0596**	-0.0789**	-0.1111*	-0.0737*	-0.0512*	-0.0316	-0.0500**	-0.0747**
Ever enrolled in course	-0.0132	-0.0142	-0.0098	-0.0417	0.0261	0.0028	0.0162	-0.0218
B. Individuals enrolled in VET course after school completion								
Completed course	0.0501*	-0.0361	-0.0154	-0.0350	-0.0714	0.0461	-0.1135*	-0.1546**
C. Employed individuals (at time of first interview since leaving school)								
Career job	0.0439	0.0923**	0.0559	0.0466	-0.0080	0.0074	0.1217*	0.0228
D. F-T employed individuals (at time of first interview since leaving school)								
Weekly wage ($)	20.74*	15.96	-0.30	60.43	46.45**	-3.98	46.60	1.35

Notes: ** and * indicate statistical significance at the 5% and 10% levels.