

To gain, retain and retrain: the role of post-school education for people with a disability

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MELBOURNE INSTITUTE OF APPLIED
ECONOMIC AND SOCIAL RESEARCH



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EVALUATION PROGRAM

RESEARCH REPORT

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About the research

To gain, retain and retrain: the role of post-school education for people with a disability

Cain Polidano and Ha Vu, Melbourne Institute of Applied Economic and Social Research

This study extends previous work of Cain Polidano and Kostas Mavromaras (2010) which showed that VET qualifications had a positive effect on the chances of finding work for people with a disability. It teases out this earlier result by looking at whether, for those who already have a disability, completing a VET qualification improves conditions of employment – wage rates, the probability of being in full-time employment, job satisfaction – and benefits of employment, including household income and welfare dependence in comparison to those with no post-school qualification. Higher education qualifications are not considered because they are rarer for people with a disability to attain.

Polidano and Vu extend their thinking about the relationship between education, disability and labour market outcomes, by also considering what happens in situations in which the disability occurs *after* an individual is in the labour market. Their focus is the extent to which VET and higher education qualifications may reduce the disruptive effects of disability onset.

One of the difficulties in undertaking this analysis is that an individual's qualifications impact on choice of occupation and people in some occupations are more likely to be affected by a disability than in others—perhaps because of the level of physical requirements inherent in different jobs. (This study reports that physical disabilities are the most common type of disability irrespective of qualification level). In this respect, Polidano and Vu find that rates of employment in the first year of disability onset decline by nine percentage points for those with no post-school qualification and 11 percentage points for those with a VET qualification compared to only five percentage points for those with a higher education qualification. One would suggest this says more about the occupation than the possession of a qualification as such.

Key messages

A new finding is that, for people with disability who are out of work or in a part-time job, completing a VET qualification significantly improves the chances of getting a *full-time* job, compared to those with no post-school qualifications. With this comes greater financial independence.

- Completion of a VET qualification however does not necessarily lead to greater job satisfaction, job security or hourly wage rates.
- The impact of the onset of a disability changes little between one and three years after onset, irrespective of the level of qualification.
- Education begets education. People with a long term disability (onset of a three-year disability spell) who have higher education qualifications are more likely to retrain relative to those with a VET qualification, who in turn are more likely to retrain than those with no post-school qualification.

Tom Karmel
Managing Director, NCVET

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Executive summary

Disability is often associated with adverse labour market outcomes and is related to a number of factors, including lawful and unlawful discrimination, the added costs of participation, actual or perceived incapacity and poorer education outcomes (Productivity Commission 2004). In recent times, the Australian Government, as outlined in its National Mental Health and Disability Employment Strategy (2009), has identified further opportunities in education as key to addressing labour market disadvantage for people with a disability.

The focus of this report is on the role of post-school education qualifications, in particular vocational education and training (VET) qualifications, in improving the employment and working conditions of people with a disability. A previous study by Polidano and Mavromaras (2010) showed that, in addition to helping people with disabilities to return to work, VET helps to maintain them in employment for up to three years after course completion. This report builds on this work by examining, not just the potential benefits of completing a VET qualification to employment rates in the first three years, but also to a range of other labour market outcomes, including the chances of full-time employment, hourly wage rates, job satisfaction, job security, skills utilisation, reliance on the Disability Support Pension and economic disadvantage.¹ The benefits of completing a VET qualification are estimated separately for those who are out of work, in part-time work or in full-time work prior to completing a VET qualification. As a point of comparison, benefits are also estimated for those *without* disability.

This study also examines the role of previously attained qualifications acting as a buffer to the initial impacts of disability onset and in helping with adjustment up to three years later. This is done by estimating the dynamic impacts of disability onset (defined as at least two consecutive years with a disability, preceded by two consecutive years without) across groups of individuals employed prior to onset and who had no post-school qualifications or whose highest qualification is either a VET qualification or a higher education qualification.

The analysis in this study is conducted using a longitudinal dataset – the Household Income and Labour Dynamics in Australia (HILDA) survey – combined with propensity score matching techniques. Propensity score matching is used instead of typical regression methods because it is better able to deal with potential bias from self-selection, which may occur when allocation to the treatment is non-random. In the context of this study, there is evidence in the literature that both treatments of interest are non-random, with disability onset linked to prior labour market disadvantage (Jenkins & Rigg 2004) and participation in education associated with higher ability (Kenny et al. 1979). Subject to certain assumptions being met to deal with self-selection, propensity score matching estimates ‘causal’ treatment effects. To date, the vast majority of studies that have quantified the impacts of disability on labour market outcomes have been undertaken by comparing the outcomes of those with and without disability, which tells us nothing about whether disadvantage is due to disability onset or due to pre-existing disadvantage. Understanding the causes of disadvantage for people with a disability is important for policy design. For example, if disadvantage pre-dates disability, then programs to deal with the disadvantage of people with a disability may be much the same as programs that deal more generally with disadvantage in the community.

¹ Measured by whether or not their household equivalised income is in the bottom 20%.

Labour market outcomes from completing a VET course

Consistent with the findings from Polidano and Mavromaras (2010), we find that the strongest labour market benefit from completing a VET course for people with a disability is in shifting those who are out of work into employment. It is estimated that for those with a disability who are out of work, completing a VET course increases their chances of being in employment by 16 percentage points in the first year out and by 20 percentage points by the third year. Confirming the prior results using propensity score matching, which is better suited to addressing self-selection issues, adds to the robustness of the Polidano and Mavromaras (2010) findings.

A new finding is that for people with a disability who are out of work or in part-time employment, completing a VET qualification is estimated to improve their chances of attaining full-time employment by 14 percentage points and 15 percentage points respectively by the third year after completion. This reduces their reliance on the Disability Support Pension and reduces their risk of becoming economically disadvantaged. It is likely that completing a VET qualification helps people with a disability to move to a job where their disability does not affect their capacity to work full-time. The greater utilisation of skills and abilities of people with a disability following the completion of a VET course is borne out by around a ten per cent improvement in reported skills utilisation in the first year after completing the course.

Despite the estimated improvement in the skills utilisation of people with disabilities, we find no evidence that completing a VET course leads to significant improvements in job satisfaction, satisfaction with job security or hourly wage rates. Compared with those with a disability, we find similar effects, albeit lower in magnitude for people without a disability.

These results underline the importance of VET in improving the utilisation of the skills and abilities and financial independence of people with a disability.

Impacts of disability onset

Regardless of past education, we find that disability onset has a greater effect on the rates of full-time employment than on the rates of part-time employment. This may be because those in part-time employment are less affected and/or some of those previously employed full-time switch to part-time employment to help them cope with their condition. This result provides evidence in support of the explanation for the higher prevalence of part-time employment among people with a disability given by Schur (2003) and Jones (2007); namely, that part-time employment enables people with a disability to better manage their condition.

As a reflection of the more physically demanding nature of jobs likely to be performed by people with no post-school or VET qualifications, we find that their rates of employment in the first year after disability onset are more affected (nine and 11 percentage points reduction respectively) than the rates of those with higher education qualifications (five percentage points reduction). Importantly, however, in contrast to those with no qualifications, those holding VET qualifications are not estimated to experience significant knock-on effects in relation to economic disadvantage or reliance on the Disability Support Pension. Compared with those with no post-school qualifications, those with VET qualifications who temporarily cease their job following disability onset are much more likely to retain their job in the first year after onset. This greater job retention is likely to be a consequence of those with VET qualifications having a wider access to leave entitlements; furthermore, they are unlikely to incur a significant wage penalty in their return to employment because their qualification

provides them with other job options. For those without post-school qualifications, a larger proportion of their existing skills, because they are job-specific, may not be recognised by other employers. This means that to regain employment, they may have to incur a wage reduction in the short-term. If their disability prevents them from working in lines of work similar to those before onset, their wage penalty may be even greater because employers will not recognise their industry-specific skills.

Results for the third year after disability onset show differing patterns of adjustment by education qualification. For those with no qualifications, the estimated negative impacts of disability onset on employment are estimated to increase from nine percentage points in the first year, to 12 percentage points in the third. In contrast, for those with VET qualifications, the negative impact of disability onset on employment rates is estimated to fall slightly from 11 percentage points in the first year, to ten percentage points in the third. Those who hold VET qualifications may adjust at a faster rate than those without qualifications because their higher rate of job retention makes it easier for them to return to employment after recovery – or their qualifications may make it easier to find alternative employment. As a result, after three years, we observe a lower reliance on the Disability Support Pension among those with VET qualifications compared with those without post-school qualifications.

An important finding is that those with qualifications are more likely to return to study as a result of disability onset, but not until the third year after onset. The delay in retraining is likely to be because of the initial uncertainty surrounding the longer-term impacts of the disability on an individual's productivity in their pre-onset line of work. We also find that the chances of those with qualifications retraining increases with the duration of disability, with higher rates among those whose disability persists for a third consecutive year. Worryingly, we find no significant evidence that those without qualifications retrain after disability onset, which is likely to have longer-term implications for their labour market participation.

Results from this study underline the importance of post-school qualifications in moderating the labour market impacts of disability onset and, through retraining, improving the participation, skill use and economic independence of people with a disability. From a policy perspective, these results support government initiatives to improve workforce engagement in education, including for people with a disability. In particular, our findings suggest that measures aimed at improving the engagement in education of those without qualifications may help to alleviate some of the longer-term problems associated with the growing rates of disability in an aging workforce. This poses a difficult problem, because evidence suggests that, despite comparable returns from doing so, those without qualifications are estimated to be less likely to return to study than those with post-school qualifications, mainly because of personal differences, such as risk aversion and exam anxiety (Fouarge, Schils & de Grip 2010).

Introduction

A consistent finding in the literature is that people with a disability are not only less likely to be in paid employment, but also are more likely to be in jobs that may be considered less desirable. Studies by Kidd, Sloane and Ferko (2000) and DeLeire (2000) found that, overall, people with a disability receive lower wages than those without a disability, while Wilkins (2004) found that they are more likely to be in part-time employment. This is further supported by recent data from the Household Income and Labour Dynamics in Australia (HILDA) survey (2008), which shows that compared with working-age people without a disability, those with a disability earn slightly less per hour and are more concentrated in part-time employment.²

The focus of this report is on the role of post-school education qualifications in the labour market outcomes of people with a disability. In the first instance, we build on the findings of a previous study by Polidano and Mavromaras (2010) by examining not only whether completing a vocational education and training qualification improves the chances of finding work, but whether it helps to improve the conditions of employment. In particular, we estimate the effects of completing a VET qualification on wage rates, full-time employment, job satisfaction, skills utilisation, household income and welfare dependence in the first three years after completion. By examining whether completing a VET qualification improves the nature of employment and not just the chances of employment, this study helps policy-makers to better appreciate the extent to which VET improves the wellbeing of people with a disability. For example, if completing a VET course helps move people with a disability from part-time to full-time employment, then we may expect that it will also improve their financial independence and quality of life.

We focus on the outcomes from completing a VET qualification because it is the most common post-school education pathway for people with a disability.³ VET is more accessible than higher education for this group of people because it caters to a wider range of education backgrounds, including those without secondary school qualifications (Polidano & Mavromaras 2010). Also, VET courses are typically shorter and more flexible than higher education courses, making them better suited for retraining those whose careers have been interrupted by the onset of a disability. To test whether the labour market benefits of completing a VET course differ by disability status, we estimate outcomes for both those with and those without a disability. Polidano and Mavromaras (2010) found that completing a VET qualification improved the chances of people with a disability finding work, possibly because it addressed some of the specific labour market barriers faced by people with a disability. For example, completing a VET qualification may be particularly beneficial to people with disability because it helps to close the gap in education attainment and provides a signal to employers that their disability does not impair their ability to perform work-related tasks. Other studies have also shown that holding educational qualifications is more important in explaining the employment outcomes of people with a disability (Kidd, Sloane & Ferko 2000; Jones, Latreille & Sloane 2006).

In the second part of our analysis we examine whether holding post-school education qualifications acts as a buffer to the negative labour market impacts of disability in the first three years after onset.

² Inflation adjusted wage rate for all jobs worked is \$27.50 for people without a disability and \$26.30 for those with a disability. Of all employed people with a disability, 36% are in part-time employment compared with 28% of employed people without a disability.

³ Further, there are too few observations in the data to allow for a robust estimation of the benefits of completing a higher education qualification for people with a disability.

It is hypothesised that, independent of occupation type, holding post-school qualifications (VET and higher education) may help people to reduce the disruptive effects of disability onset on employment outcomes. There may be several reasons why post-school qualifications may reduce the effects of disability onset. These include: lower physical work requirements may make it easier to return to the same job; higher wages may mean added incentive to return to work rather than to rely on benefits; holding qualifications may make it easier to retrain and make it easier for those who terminated employment to find work; and employers may be willing to make greater workplace accommodations. However, it should also be kept in mind that those with qualifications are generally better paid and so may have accumulated greater wealth and hence may be better able to support themselves without working. While there is a plethora of literature on the employment benefits from attaining further qualifications, there is only one prior study examining how the impacts of disability onset vary by qualifications (Jenkins & Rigg 2004). This study did not estimate causal effects. This is a particularly pertinent public policy issue, given the rising rates of reported disability in the community, driven partly by the aging population.

The analytical framework adopted in this report is propensity score matching, which is designed to estimate 'causal' effects, in this case, the causal effects of completing a VET qualification and of disability onset on labour market outcomes. Propensity score matching is a quasi-experimental technique that is used to generate a 'like' or 'matched' control group among those who do not receive a treatment. In this analysis, we use data from the Household Income and Labour Dynamics in Australia (HILDA) survey, a longitudinal dataset that tracks the same individuals over time. The longitudinal nature of HILDA means that treatment groups are identified in each wave of the survey as those who completed a VET course and those who experienced disability onset (with various past qualifications). To avoid the influence of time trends on our post-treatment outcomes, we also generate control groups for each wave in the survey. Causal effects are estimated as the average difference in the treatment and matched control group outcomes in the three years after treatment/non-treatment. To analyse how benefits from completing a VET course differ by disability status and how the impacts of onset differ by prior qualifications, we estimate the average treatment effects on sub-groups of the sample.

Data and key definitional issues

This project uses information from the Household Income and Labour Dynamics in Australia (HILDA) survey, which is an annual survey of individuals aged 15 years and older from around 8000 nationally representative chosen households (panel dataset). At the time the analysis for this project was conducted, there were eight years of HILDA data available, from 2001 to 2008.⁴ The panel aspect of this survey enables the researcher to observe and analyse change at the individual level. In the context of this study, examining individual changes is important to be able to measure the labour market impacts of disability onset and the longer-term labour market benefits of completing a VET course. In this study a VET course is defined as an Australian Qualifications Framework (AQF) certificate I–IV, diploma and advanced diploma or ‘undefined certificate’.⁵

As well as labour market and education variables, the survey contains detailed information on disability status, disability type and work limitations. Disability status is defined as, ‘someone who has a long-term health condition, impairment or disability that restricts everyday activities, and has lasted or is likely to last, for 6 months or more’. Because we are interested in examining labour market outcomes, we omit those who are not of working age – those aged 15 and those aged 65 and older.

The sections below discuss in more detail the derivation of the samples for analysis and the types of labour market outcomes examined.

Samples for analysis

The two main topics for examination, the labour market outcomes from completing a VET qualification for people with a pre-existing disability and the role of post-school qualifications in mitigating the impacts of disability onset, are analysed using two different samples from the Household Income and Labour Dynamics in Australia survey. In both cases, individuals included in the sample will vary from wave to wave, depending on their individual circumstances. In a given wave, those in the sample comprise individuals who receive a ‘treatment’ and those in the ‘control group’ who do not.⁶

⁴ While not a limitation of using HILDA, it is important to keep in mind that, historically, the survey period 2001–08 is a period of strong economic growth in Australia. Therefore, any estimated career progression benefits of VET and impacts from disability onset in this study may not be generally applicable to periods of lower growth. For more information on the HILDA dataset and the survey design, see the HILDA manual (<http://www.melbourneinstitute.com/hilda/manual/userman_datacol.html>).

⁵ People may not be able to identify their certificate if they do not know its level, for example, if they hold a trade certificate.

⁶ Because the treatments occur in each wave of the sample, a control group is derived in each wave to ensure that the outcomes are compared over the same time periods. If the outcomes from the treatment group are from different periods from the outcomes of the control group, there is a risk that any estimated effects will include time effects, such as differences in the economic and policy environment.

Sample for estimating labour market outcomes from completing a VET qualification for people with a pre-existing disability

In a given wave, those in the treatment and control group are as follows.

- *Treatment group*: individuals aged 15–64 whose disability status in the current wave is the same as in the previous wave and who are reported to have completed a VET qualification since the previous year.
- *Control group*: Individuals aged 15–64 whose disability status in the current wave is the same as in the previous wave and who were not enrolled in tertiary study at any time in HILDA.

Because we are comparing outcomes from completing a VET course for those with and without a disability, separate treatment and control groups are generated by disability status. Restricting the sample to those whose disability status is unchanged from the previous period is the same as the approach used by Polidano and Mavromaras (2010). This rule means that if an individual's status has changed since the previous period, they are excluded, but they may return in the following year if there is no change in their status. This approach has three distinct advantages over using current status only. First, because disability status is unchanged from the previous year, we can be confident that the disability status in the first year after study is the same as its status prior to completion. If disability status was determined only by current status, there is the risk that disability status may have changed since completion, in which case the results may be biased. For example, if disability onset occurred after completion, it is likely that the employment benefits from VET would be underestimated. Second, using two consecutive periods of disability also helps to rule out transient health conditions that may not have longer-term employment impacts (Burkhauser & Daly 1996; Jenkins & Rigg 2004). Third, it reduces the risk of measurement error and 'rationalisation bias', which is present if people report a disability to justify being out of employment (Bound 1991).⁷

Control group members were not involved in any form of tertiary education during the survey, which means that the estimated benefits of completion are relative to not attempting a course while participating in the survey. While it is possible to identify all those who started but did not complete a VET course after the previous interview, at present there are too few observations in the survey to analyse the effects of partial completion for people with a disability.

The number of individuals in each wave of the sample by treatment status and prior employment status is presented for each wave in table 1. The treatment status is separated by prior employment status because we analyse separately the benefits of completing VET for those who were and were not employed prior to study. To separate the sample according to employment status prior to study, we use employment status two years prior, because the vast majority of VET completers report not being in study for one year or less. This means that we omit observations from the first two waves of the survey from the sample.

For those with a disability (upper panel of table 1) we identify 1157 individuals with a disability in wave 3, of whom 51 completed a VET course; in wave 4, the corresponding numbers are 1260 and 49 respectively and so on. A point of note from table 1 is that, in each wave, people with a disability who complete a VET qualification are more likely to be out of work two years prior than those without a disability who complete VET. This could suggest that people with a disability who complete a VET

⁷ Equally, the use of objective measures tends to severely underestimate labour market impacts because they do not capture the relationship between health and work capacity (Bound 1991).

course are more motivated to return to study to find work than people without a disability who complete a VET course.

When comparing the benefits of completing a VET qualification for people with a disability with the benefits for people without disability, an important consideration is whether they undertake different levels of study. If there are differences, then the benefits are not directly comparable because there is a difference in the nature of the treatment. From the data, we can conclude that any benefits are broadly comparable because there are only minor differences in the levels of courses completed between those with and those without a disability. For the disability group, 35% of VET completions are at certificate levels I or II, 56% are certificate levels III or IV and 9% are diploma or advanced diplomas. For the group without a disability, 28% complete certificates I or II, 58% complete certificate levels III or IV and 14% complete diplomas or advanced diplomas. Ideally, we would estimate the labour market outcomes for completing different VET qualification types. However, such analysis is not possible for the disability group, given the small number of observations, especially given that we are also estimating the outcomes separately for those in and out of employment prior to study.

Table 1 Sample of individual observations with and without pre-existing disability by prior employment status

Employment status two years prior		Current period						Total
		Treatment/ control group	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7	
<i>With disability</i>								
Employed full-time	Control	304	372	354	318	317	289	1 954
	Treatment	21	18	19	14	16	14	102
Employed part-time	Control	173	183	193	202	186	189	1 126
	Treatment	13	9	16	10	13	11	72
Unemployed	Control	59	57	41	32	33	49	271
	Treatment	1	5	2	3	5	4	20
Not in the labour force	Control	570	599	578	581	551	521	3 400
	Treatment	16	17	17	18	17	17	102
All	Control	1 106	1 211	1 166	1 133	1 087	1 048	6 751
	Treatment	51	49	54	45	51	46	296
Total		1 157	1 260	1 220	1 178	1 138	1 094	7 047
<i>Without disability</i>								
Employed full-time	Control	3 089	2 839	2 712	2 703	2 688	2 591	16 622
	Treatment	138	131	144	118	136	150	817
Employed part-time	Control	1 144	1 094	1 019	1 020	1 013	1 000	6 290
	Treatment	76	76	94	77	74	76	473
Unemployed	Control	188	144	128	111	120	120	811
	Treatment	18	16	19	16	9	13	91
Not in the labour force	Control	862	793	753	722	649	629	4 408
	Treatment	48	48	61	53	40	42	292
All	Control	5 283	4 870	4 612	4 556	4 470	4 340	28 131
	Treatment	280	271	318	264	259	281	1 673
Total		5 563	5 141	4 930	4 820	4 729	4 621	29 804

Note: Treatment group members are individuals aged 15–64 whose disability status in the current wave is the same as in the previous wave and who reported to have completed a VET study in the last year. The control group comprises individuals aged 15–64 whose disability status in the current wave is the same as in the previous wave and who have not been involved in any tertiary study since the start of HILDA.

Sample for examining the impacts of disability onset by education status

As described above, the sample for examining the impacts of disability onset varies from year to year, depending on observed individual characteristics. In a given wave, an individual is in the sample if they meet the conditions of entry in either the treatment or control group.

- *Treatment group*: individuals aged 15–64 who were employed two years prior and experienced disability onset
- *Control group*: individuals aged 15–64 who were employed two years prior and did not experience disability onset.

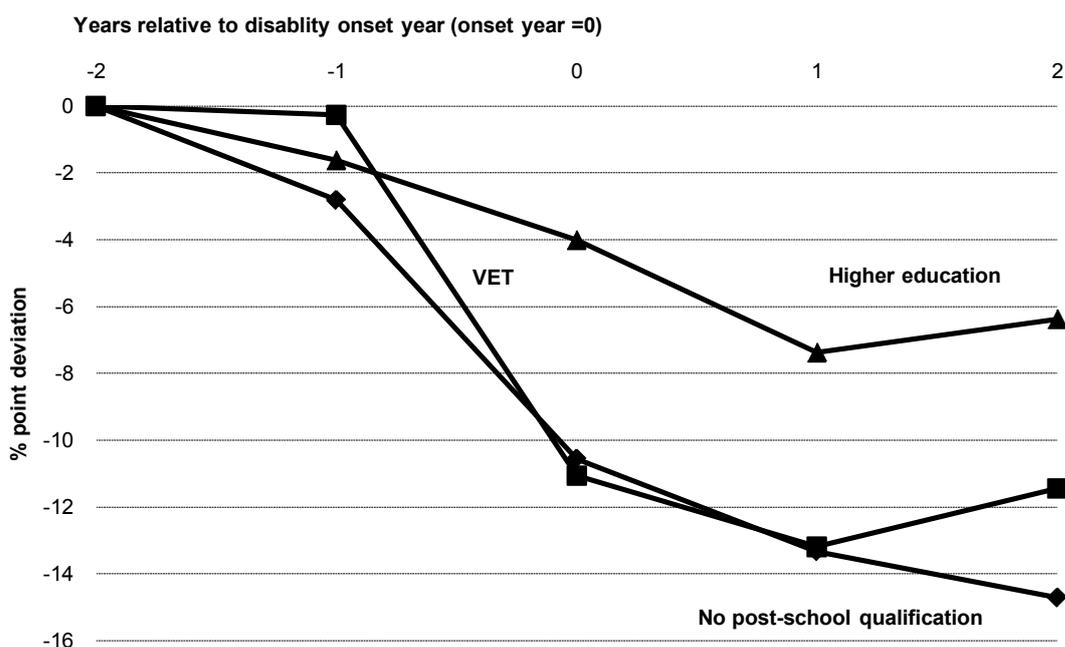
In line with previous studies on disability onset (Burkhauser & Daly 1996; Jenkins & Rigg 2004), in a given wave we assume an individual experiences disability onset if after two consecutive periods without disability they report having a disability that persists into the next period. As for the previous sample, restricting disability to two consecutive periods helps to rule out transient health conditions (Burkhauser & Daly 1996; Jenkins & Rigg 2004), reduces the risk of measurement error and the ‘rationalisation bias’ that is present if people report a disability to justify being out of employment (Bound 1991). The definition of disability onset means that, for an individual to be included in a given wave, we have to observe their status in the current wave, the next wave and the prior two waves, which means we only include observations from waves 3 to 7. The sensitivity of our findings to this definition of disability onset is tested; in particular, we re-estimate the analysis under a scenario where the disability spell length is at least three instead of at least two consecutive periods.

The sample is limited to those who are employed prior to onset to examine the disruptive effects of disability onset on labour market outcomes. We restrict the sample to those employed two years prior to fully capture the impacts of disability onset. In figure 1, employment impacts, measured as the difference in employment rates between the treatment and control group appear to occur in the year prior to onset (-1 on the x-axis). The lag between the time that impacts begin and the time of reporting is because disability onset is often a slow process and is commonly followed by a delay in time to diagnosis (Burchardt 2003; Jenkins & Rigg 2004). If we had restricted the sample to those who were in employment in the year prior to onset, it is likely that we would underestimate the employment impacts of onset, especially for those with higher education and no tertiary qualifications.

Figure 1 also highlights the importance of examining the dynamic impacts of disability onset. In the first two periods after onset (0 and 1 on the x-axis), it appears that the impacts on employment for those without any post-school qualifications are similar to the impacts for those with VET qualifications. However, the impacts between these two groups diverge in the third period after onset (2 on the x-axis), with employment impacts on those with VET qualifications declining and the impacts for those without post-school qualifications continuing to increase, albeit at a decreasing rate. This suggests that those with a VET qualification may be better able to adjust to the disruption of disability onset relative to those without any post-school qualification.

An overview of the sample is provided in table 2. On average, there are around 130 individuals who experience disability onset in any one of the five waves of analysis, with a control group of around 3900 individuals. Overall, there are 649 individuals who experience disability onset in our survey, 267 had no prior qualifications at onset, 224 held a VET qualification and 158 held a higher education qualification.

Figure 1 Impacts of disability onset on employment rates for those in employment two years prior



Notes: Impacts are estimated for those in employment two years prior as the difference in employment rates between those who experience disability onset and those who do not (control group).

Table 2 Sample of individual observations with and without disability onset who were employed two years prior

Highest qualification at disability onset	Treatment/control group	Current period					Total
		Wave 3	Wave 4	Wave 5	Wave 6	Wave 7	
Higher education	Control	1 082	1 063	1 054	1 137	1 205	5 541
	Treatment	39	31	39	27	22	158
VET	Control	1 188	1 179	1 194	1 219	1 303	6 083
	Treatment	44	40	46	47	47	224
No post-school qualification	Control	1 592	1 560	1 553	1 531	1 613	7 849
	Treatment	73	64	45	38	47	267
All	Control	3 862	3 802	3 801	3 887	4 121	19 473
	Treatment	156	135	130	112	116	649
Total		4 018	3 937	3 931	3 999	4 237	20 122

Notes: Treatment group members are aged 15–64, were employed two years prior and experienced disability onset; while control group members are aged 15–64, were employed two years prior and did not experience disability onset.

VET is defined as an AQF certificates I–IV, diploma and advanced diploma or 'undefined certificate'.

Labour market outcomes

A feature of this report is that we estimate the benefits of held qualifications and further qualifications for people with a disability by examining several different labour market outcomes over a three-year period. Estimating benefits over time gives a truer picture of the contribution of education to labour market outcomes. For example, some of the benefits of completing VET qualifications, that is, higher wages, for people with a disability may take time to filter through. The labour market outcomes of interest differ, depending on the issue being examined. For example, when examining the impacts of disability onset across education status, a key outcome that may

affect the ability of individuals to adjust is their propensity to retrain. The labour market outcomes examined are reported in table 3.

A key variable of interest is employment status, which is defined as whether or not an individual has at *any time at all in the last 7 days worked in a job, a business or farm*. An interesting part of the analysis is testing the extent to which disability onset leads to higher rates of part-time employment, which is measured by whether or not an individual spends 35 hours or more in employment per week on average. A number of authors have noted that people with a disability are far more likely to be in part-time than full-time employment (Schur 2003; Hotchkiss 2004; Jones 2007). Schur (2003) and Jones (2007) find that the greater prevalence of part-time employment for people with a disability compared with people without a disability is not related to differences in characteristics, such as differences in education. Instead, they postulate that the greater rate of part-time employment for people with a disability may be because part-time work enables them to manage their disability. If this is true, then we may expect that disability onset may lead to an increase in the rate of part-time employment. Equally interesting is whether completing a VET qualification for those with a pre-existing condition facilitates a movement to full-time employment, with flow-on benefits for job satisfaction and satisfaction with skill use. Satisfaction with job security and the job are measured on an 11-point scale from 0 to 10, where 0 is totally dissatisfied and 10 is totally satisfied. Skills utilisation is measured by the degree to which individuals agree that they use their skills and abilities in their current job, where 1 is totally disagree and 7 is totally agree.

Table 3 Labour market outcomes examined

Outcomes from completing a VET qualification	Outcomes for those who experience disability onset
Full-time employed	Full-time employed
Part-time employed	Part-time employed
Employed	Employed
Unemployed	Unemployed
Not in the labour force	Not in the labour force
Satisfaction with job (0–10)	Has a job
Satisfaction with job security (0–10)	Wants a job
Skills utilisation (1–7)	Does not want a job
Real hourly wage rate (2008\$)	Retired
Live in a low-income household (lowest 20%)	Real hourly wage rate (2008\$)
Disability support pensioner	Live in a low-income household (lowest 20%)
	Enrolled in study
	Disability support pensioner

When examining the impacts of disability onset, we also consider the extent to which it affects attachment to the labour market, which gives an indication of the longer-term likelihood of returning to work. For example, those who stop work but who still have a job may be more likely to return to work in the future than those who report no longer having a job and who no longer want to work or who retire. To measure attachment to employment, we divide those who were not employed into the following five groups.

- *Unemployed*: had looked for work in the last four weeks and who were available for work in the last seven days or were waiting to start a new job within the last four weeks and could have started in the reference week if the job was available.

- *Not in the labour force, but has a job*: did not look for work in the last four weeks because still has a job.
- *Not in the labour force and wants a job*: did not look for work in the last four weeks, but would like a job.
- *Not in the labour force and do not want a job*: did not look for work in the last four weeks, is not retired and does not want a job or would only want a job under certain circumstances.⁸
- *Not in the labour force and retired*: did not look for work in the last four weeks, is retired and does not want a job.

The benefits of holding and acquiring further qualifications may also be manifested in wage rate outcomes. Hourly wage rate is defined for those who remain in employment after onset as the ratio of average weekly gross waged salary divided by the average hours worked per week and converted into 2008 terms to correct for the effect of inflation. In a well-functioning labour market, the hourly wage rate represents how much an hour of an individual's labour is worth. All else being equal, we may expect that a reduction in productivity from disability onset would reduce the hourly wage rate, while an increase in the skills associated with completing a VET qualification would lead to an increase in the hourly wage rate.

For those whose productivity is affected to such a degree that they can no longer participate in employment, their income may be ameliorated by access to disability support payments (known as the Disability Support Pension). Because those without any post-school qualifications are more likely to be closer to the minimum wage, for any given reduction in the productivity of labour associated with disability onset, those without qualifications may be more likely to access a Disability Support Pension. (Access to the Disability Support Pension is measured by whether or not individuals report receiving such a pension, regardless of the amount they receive.)

Wage, employment and disability support outcomes are also likely to have knock-on income effects. Of particular interest is how wage and employment outcomes affect economic disadvantage, measured by living in a household with income in the bottom quintile of the working-age population. Whether or not an individual is living in a household from the bottom quintile threshold is calculated every year and household income is disposable income, equivalised to adjust for differences in the number of household members.^{9,10} Equivalised income is a measure of the resources available to a household after correcting for the number of household members.

⁸ Retired is defined as those who are 45 years and over and who report that their main activity since ending employment is retirement.

⁹ The impact of disability onset on the likelihood of being in a low-income household may be underestimated because we do not account for the extra living costs that may be associated with living with a disability.

¹⁰ Real household income is equivalised using the OECD square root scale (OECD 2008), which is derived by dividing real household income by the square root of the number of people living in the household.

Multivariate analysis

The methodology used for examining the benefits of education qualifications on career outcomes for people with a disability is centred on attempting to control for self-selection bias. In examining outcomes from completing a VET course, selection bias may arise because of likely differences in characteristics – and which are also related to employment outcomes – such as ability between those who complete a VET course and those who do not (Kenny et al. 1979). When we examine the outcomes of disability onset, selection bias may arise because of likely differences, such as prior labour market disadvantage, in those who do and do not experience onset and which also affect employment outcomes (Jenkins & Rigg 2004).

Propensity score matching

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

Matching is a quasi-experimental technique that compares outcomes for participants in a treatment group to outcomes of ‘matched’ or ‘like’ members of a control group in the periods after the program ended. 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.

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, we use kernel and ‘nearest neighbour’ propensity score matching techniques, which rely on a function (usually a probit model) to choose individuals who are estimated to have the same, within some range, propensity for treatment (complete a VET course or experienced disability onset), but who did not receive a treatment.¹¹ Because treatment occurs in each wave of the samples, we draw the control group from corresponding time periods to ensure that outcomes are compared over the same time periods. For example, the control group neighbourhood for an individual who experienced disability onset in wave 4 will be drawn from individuals who did not experience onset in wave 4. If the treatment and matched control group outcomes are from different periods, there is the risk that any estimated effects will include the desired treatment and ‘time effects’ that are related to differences in economic and policy environments.

¹¹ 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 the predicted probability because it allows symmetry in selection of control observations.

Propensity score functions are estimated using the two samples and probit models of disability onset and VET completion (coded 1 if in the treated group and 0 if in the control group). For examining the labour market outcomes from completing a VET qualification, separate analysis is undertaken for those with and those without a disability. For both of these of sub-samples, the analysis is for the whole of the sub-sample and across labour market groups prior to study (part-time employed, full-time employed and out of work). This enables us to examine whether employment benefits vary by employment status prior to study and by disability status. For examining the impacts of disability onset we estimate a probit model for all who experience onset with separate models for those with higher education qualifications, VET qualifications and no qualifications at the time of onset, to test how impacts vary by education status. A point of note is that when estimating impacts on outcomes that are only observed while in employment (wage rate, job satisfaction and satisfaction with skills utilisation), the above matching models are re-estimated with the condition that control group members must also remain in employment for three years after group assignment.

In this study, the justification for the CIA holding is based on the use of a rich set of covariates from the Household Income and Labour Dynamics in Australia survey. In particular, we choose variables that may affect both the likelihood of being in the treatment group and labour market outcomes. Factors that affect the likelihood of being in the treatment group, but not labour market outcomes are excluded because they interfere with our ability to meet the CSA (Blundell & Costa Dias 2008). When estimating the matching probit models, to avoid matching on characteristics that may be affected by onset, all variables included in the model are from prior periods. As well as standard variables, a number of interaction terms were trialled, but were insignificant and were removed. Full results of the probit models used in the matching process are presented in appendix A.

To help with choosing the probit 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 treatment 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.¹² All of the variables in the final specification pass the balancing test (refer to appendix B for the results 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 treatment 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. An advantage of using kernel weighting over nearest neighbour is that multiple comparisons may be made for a given treated individual and produces more consistent results. For more information on the weighting procedure for these techniques, see the technical discussion in appendix E.

¹² Because of the small number of observations in the treatment groups, it is overly restrictive to aim for a balanced match in each wave, especially in later waves where there are fewer observations. For kernel matching we use a series of weighted simple regressions, where in each regression the dependent variable is a different variable from the matching equation and the explanatory variable is an indicator of whether the individual is from the treatment or matched control group. The weights are from the kernel matching (see equation [2], appendix E).

Results

In this section we present the estimated average treatment effects on the treated (ATET), which represent the average causal impacts of completing a VET qualification and the average causal impacts of encountering disability onset. It is important to keep in mind that these estimated effects are only for those who completed a qualification or who experienced disability during the sample period. Caution should be exercised when extrapolating 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. Estimating the average treatment effects by expanding participation to sub-groups of the population is possible using propensity score matching, but this requires more data than are currently available.

All average treatment effects on the treated are accompanied by a standard error (s.e.), which represents the average error, or degree of uncertainty, surrounding the estimated effect.¹³ 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%, 5% and 1% level. Significance at 10% (one asterisk) roughly means that there is at least a 90% chance that the estimated effect is not zero, 5% (two asterisks) roughly means that there is at least a 95% chance and 1% (three asterisks) roughly means that there is at least a 99% chance.

Effects from completing a VET qualification

The average treatment effects on the treated of completing a VET course on labour market outcomes for people with and without disability are estimated for the first three years after completion. Because labour market outcomes are likely to vary by employment status prior to study, we estimate the effects by employment status two years prior to completion. For ease of discussion, we present only the estimated effects for the first and third year after completing a VET qualification.

A point of note is that, because the sample size decreases with years since VET completion (due mainly to data truncation), there is greater uncertainty surrounding estimated impacts two and three years after VET completion. Uncertainty surrounding the estimates is also greater for effects estimated for variables that are only observed when in employment (wage rate, job satisfaction and satisfaction with job security) because they are estimated on a smaller sample.

Effects for people with a disability

Consistent with the findings of Polidano and Mavromaras (2010), results in table 4 show that employment benefits from completing a VET qualification depend on the employment status prior to completing a VET qualification. For those out of work two years prior, we find that, in their first year after completing a VET qualification, their chances of employment are increased by 16 percentage

¹³ Standard errors were generated using a bootstrap procedure. Bootstrapping is a way to estimate the variance of parameter estimates (used to derive t-statistics) and is obtained by generating 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. We also estimated t-statistics using 500 draws, but with no noticeable difference to the results.

points on average. A new finding is that the vast majority of this estimated initial increase in employment is due to an increase in the rate of part-time employment. Three years later, completing a VET course is estimated to increase the chances of employment for those previously out of work by 20 percentage points. For those previously in full-time employment, we find no evidence that completing a VET course increases their chances of being in employment three years later.

Table 4 Average effects from completing a VET course on the labour market outcomes of people with a disability

Time since course completion	Employment status two years prior to course completion							
	Out of work		Employed part-time		Employed full-time		Employed	
	ATET	s.e.	ATET	s.e.	ATET	s.e.	ATET	s.e.
<i>First year</i>								
Full-time employed	0.033	0.034	0.146**	0.062	-0.064	0.045	0.023	0.036
Part-time employed	0.124**	0.052	-0.126*	0.072	0.013	0.032	-0.043	0.032
Employed	0.157***	0.053	0.020	0.060	-0.051	0.040	-0.020	0.033
Low-income household (lowest 20%)	-0.009	0.040	-0.034	0.063	-0.003	0.033	-0.007	0.034
DSP recipient	-0.059**	0.027	-0.038	0.037	-0.017	0.016	-0.026*	0.015
Hourly wage rate (2008\$)	-	-	-	-	-	-	-1.692	1.365
Job satisfaction (0–10)	-	-	-	-	-	-	-0.160	0.197
Satisfaction with job security (0–10)	-	-	-	-	-	-	-0.436	0.268
Skills utilisation (1–7)	-	-	-	-	-	-	0.498***	0.177
<i>Third year</i>								
Full-time employed	0.144**	0.056	0.150*	0.084	-0.053	0.055	0.045	0.049
Part-time employed	0.056	0.057	-0.024	0.090	0.057	0.051	-0.002	0.043
Employed	0.200***	0.069	0.126	0.086	0.004	0.048	0.043	0.034
Low-income household (lowest 20%)	-0.074	0.063	-0.091	0.091	-0.062	0.041	-0.068*	0.037
DSP recipient	-0.075*	0.045	-0.099**	0.050	-0.037	0.025	-0.071***	0.025
Hourly wage rate (2008\$)	-	-	-	-	-	-	0.878	2.466
Job satisfaction (0–10)	-	-	-	-	-	-	0.041	0.249
Satisfaction with job security (0–10)	-	-	-	-	-	-	0.048	0.340
Skills utilisation (1–7)	-	-	-	-	-	-	0.112	0.284

Notes: ATETs for variables that are only observed for those in employment (hourly wage rate, job satisfaction and satisfaction with job security, skills utilisation) are estimated on a smaller sample: those who were in employment two years prior and who were employed after course completion. This partly explains the large estimated standard errors for these effects.

*** significant at 1%, ** significant at 5%, * significant at 10%.

An important finding is that completing a VET qualification helps to improve the rate of full-time employment. For both those who were previously out of work and previously in part-time employment, completing a VET qualification improves their chances of being full-time employed by 14 percentage points and 15 percentage points respectively by the third year out from study. These results suggest that completing a VET qualification helps to improve the productivity of people with a disability, possibly because it helps them to move to employment where their disability does not affect their capacity to work full-time.

Related to the increased hours of work, completing a VET qualification is also estimated to improve the financial independence of those with a disability who were previously out of work or in part-time work. In the third year out from study, we estimate that completing a VET qualification reduces the chances of being on a Disability Support Pension by eight and ten percentage points for those who were previously out of work and employed part-time respectively. Transiting to full-time employment is also estimated to reduce the likelihood that those with disability are living in the poorest 20% of

households; however, because of the small number of observations, the effects are insignificant at the 10% level.

We find no evidence that, for those employed two years previously, undertaking a VET course leads to significant improvements in satisfaction with job security, job satisfaction or wage rates for people with a disability who were previously employed. In the first year, we find that completing a VET qualification increases the reported utilisation of skills and abilities by half a point on a seven-point scale for those who were previously in employment. Compared with the mean value for people with a disability in employment two years prior, this represents around a ten per cent increase. The high initial improvement in reported skills utilisation may be related to a change in the type of work performed following course completion. However, in the second and third years after completion, the effect is not significant, which may reflect a reassessment made in light of more information on how they are able to utilise skills and abilities in their job. It may take those with a disability more time to make a proper assessment of how a change in work performed affects their skills utilisation because it is likely to depend on the limitations of their condition, which are often changeable.

Effects for people without disability

The estimated benefits, measured in average treatment effects, from completing a VET qualification follow the same pattern as for those with disability, except the magnitudes are smaller (table 5). As for those with a disability, the greatest benefits of completing a VET course are in moving people out of work into employment. For those out of work two years prior, a VET qualification is estimated to increase the chances of being in employment by 15 percentage points in the first year after completion. In subsequent years, the employment benefits remain largely unchanged. As for those with a disability, the bulk of the initial gain in employment probabilities is in higher rates of part-time employment, but over time, the benefits flow through to higher rates of full-time employment.

As for those with a disability who were employed part-time two years prior, completing a VET qualification is estimated to increase the chances of moving to full-time work. For those previously working part-time, completing a VET qualification is estimated to increase the chances of being in full-time employment by six percentage points and reduce the chances of being part-time employed by four percentage points in the first year out. Not only does it help people move from part to full-time employment, it is estimated to help keep them there. Three years after course completion, it is estimated that those previously in part-time work are seven percentage points more likely to be in full-time employment from completing a VET qualification.

The smaller participation and full-time employment benefits for people *without* a disability compared with people with a disability is consistent with the findings of Polidano and Mavromaras (2010). As pointed out by Polidano and Mavromaras, completing a VET course may address some specific barriers that people with a disability face in the labour market. First, completing a VET qualification may improve their confidence and wellbeing, which may give them the impetus to look for work. Second, because VET is competency-based, it may give assurance to employers that a job candidate's disability does not hinder their ability to perform tasks that are relevant to their prospective job. Finally, because people with a disability generally have lower stocks of education, further education through VET may be more beneficial. This is likely to be especially true for those who are employed part-time prior to undertaking a VET qualification.

Table 5 Average effects from completing a VET course on the labour market outcomes of people without disability

Time since course completion	Employment status two years prior to course completion							
	Out of work		Part-time employed		Full-time employed		Employed	
	ATET	s.e.	ATET	s.e.	ATET	s.e.	ATET	s.e.
<i>First year</i>								
Full-time employed	0.052**	0.023	0.055**	0.025	-0.024**	0.012	0.004	0.011
Part-time employed	0.095***	0.027	-0.041	0.025	0.025**	0.010	0.002	0.011
Employed	0.147***	0.028	0.014	0.016	0.001	0.007	0.006	0.008
Low-income household (lowest 20%)	0.048*	0.029	0.014	0.020	0.008	0.010	0.013	0.009
Hourly wage rate (2008\$)	-	-	-	-	-	-	-1.158***	0.379
Job satisfaction (0–10)	-	-	-	-	-	-	0.014	0.063
Satisfaction with job security (0–10)	-	-	-	-	-	-	0.011	0.066
Skills utilisation (1–7)	-	-	-	-	-	-	0.203***	0.047
<i>Third year</i>								
Full-time employed	0.070**	0.032	0.071**	0.033	0.006	0.017	0.025	0.017
Part-time employed	0.085**	0.035	-0.024	0.033	0.012	0.013	0.005	0.016
Employed	0.155***	0.034	0.047**	0.019	0.018	0.012	0.030***	0.010
Low-income household (lowest 20%)	0.053	0.037	-0.015	0.027	0.033**	0.015	0.019	0.014
Hourly wage rate (2008\$)	-	-	-	-	-	-	-1.311**	0.578
Job satisfaction (0–10)	-	-	-	-	-	-	0.074	0.069
Satisfaction with job security (0–10)	-	-	-	-	-	-	0.098	0.085
Skills utilisation (1–7)	-	-	-	-	-	-	0.222**	0.067

Notes: ATETs for variables that are only observed for those in employment (hourly wage rate, job satisfaction and satisfaction with job security, skills utilisation) are estimated on a smaller sample: those who were in employment two years prior and who were employed after course completion. This partly explains the large estimated standard errors for these effects. *** significant at 1%, ** significant at 5%, * significant at 10%.

Although completing a VET course is estimated to improve participation and the rates of full-time employment among people without a disability, it is also associated with a wage penalty. For those in employment two years prior, completing a VET course is estimated to lead to a \$1.20 (in 2008 terms) lower wage rate per hour, which is estimated to persist up to three years after completion. A wage penalty may occur because a career or a job change may be the prime motivation for completing a VET course for those in employment without a disability. According to the theory of human capital, when an employee switches jobs or careers, employers are not willing to pay for the accumulated human capital from the previous job or career. Depending on the value of the skills from completing the course relative to the value of the defunct skills, the wage after a job or career change may initially be lower than before. Individuals may still be willing to complete a course and incur the wage penalty if they are compensated through higher wages or greater job satisfaction longer-term. Evidence suggests that the compensation for the wage penalty may come in the form of the higher use of an individual's skills and abilities. Completing a VET course for those previously employed is estimated to increase reported skills utilisation by a fifth of a point on a seven-point scale up until the third period after course completion. Being able to better use one's skills and abilities by completing a VET qualification may lead to higher wages longer-term.

As with those with a disability, we find no evidence that completing a VET qualification improves job satisfaction or satisfaction with job security for those without disability.

Effects of disability onset

Results presented in table 6 show that regardless of prior qualification attainment (the column titled 'All'), disability onset reduces the rates of employment by around nine percentage points in the first year. The negative impacts on employment stem from the reduced productivity associated with the condition. However, reduced rates of employment only paint part of the picture; what is important to longer-term employment participation is the degree to which those who leave employment are attached to the workplace. Results in table 6 show that, of the nine percentage point reduction in employment, two percentage points is due to individuals ceasing work, but retaining their job. Those who have not had their employment contracts terminated may receive employer entitlements such as sick pay and/or the option of returning to the same job if and when they recover. Of the remaining seven percentage point reduction in rates of employment (associated with contract termination), around half want a job or are actively looking for work (unemployed) and around half do not want a job or report being retired from the workforce.

Table 6 Estimated labour market effects from onset of a disability spell that lasts at least two years

Year after onset	All		No post-school qualification		VET		Higher education	
	ATET	s.e.	ATET	s.e.	ATET	s.e.	ATET	s.e.
<i>First year</i>								
Full-time employed	-0.065***	0.018	-0.050*	0.027	-0.078***	0.029	-0.062**	0.029**
Part-time employed	-0.021	0.016	-0.039*	0.023	-0.027	0.026	0.010	0.027
Employed	-0.086***	0.015	-0.089***	0.022	-0.105***	0.025	-0.052**	0.023
Unemployed	0.008*	0.005	0.002	0.009	0.018	0.011	0.007	0.009
Not in the labour force								
Has a job	0.019**	0.007	0.006	0.012	0.046***	0.015	-0.004	0.007
Wants a job	0.024***	0.007	0.031***	0.011	0.018*	0.010	0.023*	0.013
Does not want a job	0.028***	0.008	0.039**	0.016	0.027**	0.013	0.012	0.013
Retired	0.007	0.005	0.011	0.011	-0.006	0.007	0.014	0.011
Enrolled in study	-0.019*	0.011	-0.045**	0.018	0.013	0.021	-0.004	0.030
Disability support pensioner	0.022***	0.006	0.031***	0.011	0.017***	0.009	0.013	0.010
Real hourly wage rate (2008\$)	-1.188**	0.515	-2.707*	1.386	-0.798	0.904	-0.135	1.148
Low-income household (lowest 20%)	0.027**	0.013	0.056**	0.022	0.010	0.022	0.006	0.018
<i>Third year</i>								
Full-time employed	-0.071***	0.020	-0.083**	0.033	-0.082**	0.035	-0.048	0.036
Part-time employed	-0.028	0.018	-0.033	0.028	-0.016	0.030	-0.025	0.030
Employed	-0.099***	0.018	-0.117***	0.030	-0.098***	0.030	-0.073**	0.030
Unemployed	0.018**	0.008	0.037**	0.015	0.010	0.011	0.004	0.011
Not in the labour force								
Has a job	0.020**	0.008	0.020	0.015	0.027	0.017	0.011	0.014
Wants a job	0.017**	0.007	0.039***	0.015	-0.004**	0.002	0.009	0.011
Does not want a job	0.032**	0.011	0.022	0.016	0.065***	0.023	0.008	0.014
Retired	0.013	0.009	-0.002	0.012	0.000	0.014	0.041**	0.020
Enrolled in study	0.015	0.015	-0.011	0.020	0.027	0.026	0.053	0.038
Disability support pensioner	0.048***	0.010	0.065***	0.018	0.046***	0.017	0.023*	0.014
Real hourly wage rate (2008\$)	-0.369	0.758	-1.797***	0.673	0.723	1.484	-0.754	1.463
Low-income household (lowest 20%)	0.083***	0.017	0.098***	0.030	0.111***	0.032	0.041	0.027

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.

Results show that the impacts on the rates of full-time employment are greater than on the rates of part-time employment, possibly because those in part-time employment are less affected and/or some of those previously employed full-time switch to part-time employment to help them cope with their condition. This result provides evidence in support of the explanation for the higher prevalence of part-time employment among people with a disability given by Schur (2003) and Jones (2007); namely, that part-time employment enables people with a disability to better manage their condition.

A further consequence of the impact of disability onset on productivity is a \$1.20 reduction in the average hourly wage rate in the first year. A wage reduction may arise because workers, within the constraints of minimum wages, may negotiate a lower wage to compensate employers for their lower productivity. Alternatively, those who encounter onset may find other types of work where their productivity is not as hindered by their condition, but to do so, they may incur a wage reduction because their new employers will not recognise their job-specific skills. The combination of lower rates of employment and lower wages means an increased risk of economic disadvantage with onset is estimated to increase the chances of living in a low-income household by three percentage points in the first year after onset.

Compared with the first year after onset, we observe a small increase in the employment impacts of disability onset in the third year, with the reduction in employment rate estimated to rise to ten percentage points. There is also a growing share of those displaced from work who are detached from employment (retired or do not want a job) and also an increasing proportion on a disability pension. However, we estimate that the impacts of onset on wages are only short-term, with no significant impacts estimated in the third year. This suggests that the wage penalty may have arisen to necessitate a switch in the type of work performed. Overall, the impacts on economic disadvantage are more apparent in the third year, with onset estimated to have an eight percentage point increase in the chances of living in a low-income household. The delayed economic impact may be because the paid sick leave that provided a buffer to early impacts runs out by the third year.

Impacts of disability onset by prior education

Results presented in table 6 show that the magnitude of the initial employment impacts from onset are greater for those with VET and no qualifications than for those with higher education qualifications. Those with VET and no qualifications are initially more affected than those with higher education qualifications because they work in more labour-intensive jobs (43% and 36% compared with 5% respectively),¹⁴ which means that their productivity may be affected more by the onset of a physical condition, the most common form of disability for those who experience onset (table 7). The importance of the nature of work in explaining the differential impacts is also evidenced by the higher proportion of those with VET and no qualifications who report that their condition moderately or severely limits the amount of work they can do, despite comparable health (SF-36 health measures; see explanatory note under table 7) and measures of disability type (table 7).

Although initial employment impacts for those with VET and no qualifications appear comparable, employment outcomes alone only tell part of the story. For those with a VET qualification, just under half of their estimated employment impact is from affected workers ceasing employment to recover while retaining their job (not in the labour force, but has a job). As a result, initial employment impacts are estimated to have no significant affect on the likelihood that those with VET

¹⁴ Data from HILDA. A labour-intensive job is classified as working as a tradesman, production or transport worker or labourer.

qualifications are living in a low-income household, possibly because many are on sick leave and are still receiving pay at their pre-onset rate. In contrast, we find no evidence that employers make the same allowances for those who stop work without post-school qualifications, which is why they have an elevated risk of being in a low-income household. A likely interpretation for the different allowances is that employers are more willing to retain workers with VET qualifications because their skills are more highly valued and are harder to replace.

Table 7 Disability duration, disability type, health and work limitations for those who experience disability onset

	No post-school qualification	VET	Higher education
	%	%	%
<i>Duration of onset</i>			
2 years	50.5	54.0	54.9
3 years	22.7	22.6	24.5
4 years	12.2	10.9	11.4
At least 5 years	14.7	12.4	9.3
<i>Disability type in first year of onset</i>			
Sensory	9	9	8
Physical	34	37	40
Mental	10	6	8
Other	28	26	27
Multiple	20	22	16
<i>SF-36 health measures, first year of onset (0–100)^a</i>			
Physical functioning	75	78	82
Social functioning	72	75	76
Bodily pain	61	59	65
Mental health	66	69	69
Vitality	50	53	51
General health	57	60	59
<i>Disability limits the amount of work you can do, first year of onset</i>			
Does not affect amount of work	41	45	49
Weak limitation (1–3)	16	19	29
Moderate limitation (4–6)	27	20	12
Severe limitation (7–9)	13	11	9
Can't work	3	5	1
Sample (N)	649	224	158

Note: ^a The higher the SF-36 scale value, the better the individual health. The scales were created according to Ware, Snow and Kosinski (2000).

For those without qualifications, disability onset is estimated to reduce the real wage of those without any post-school qualifications who remain in employment by around \$3 per hour (table 6). In contrast, no significant impacts are found for those with VET or higher education qualifications who remain in employment. The greater initial impact on those without any qualifications may be because they are more likely to be forced to find alternative employment in jobs that are unrelated to their previous line of work. In such cases, employers may not recognise the experience and skills developed in previous employment and hence would not be willing to pay them as much as prior to onset. Given that a greater proportion of those without qualifications were low-pay workers to start with, the

reduction in pay associated with the productivity loss from disability onset means that they are more likely to become reliant on the Disability Support Pension.¹⁵

Despite initial evidence that disability onset impacts on the ability of individuals to use existing skills, we find no evidence that they respond by retraining in the initial year of onset. One reason for the lack of significant positive effects is that they are estimated across all individuals who experience onset, but the motivation to retrain is likely to be highest among those who exit employment because they can no longer use their existing skills. There are too few observations in these data to allow for such detailed analysis. Another explanation could be that in the first year of onset, people are still recovering and are uncertain how the disability will affect their longer-term productivity and their ability to use their existing skills.

That said, a worrying finding is that onset is estimated to significantly reduce the chances of re-engaging in education among those without post-school qualifications by around five percentage points (table 6). This impact may be a knock-on effect of the high rates of employment dislocation among those without any qualifications. In the Household Income and Labour Dynamics in Australia survey, over half of all enrolments in education and training courses for those older than 25, including those without any qualification, is work-related. The relatively high uptake of the Disability Support Pension may also be a contributing factor if assessors take an individual's education history into account when evaluating whether or not they can be retrained to work minimum hours at the award wage within two years. If this is the case, then the Disability Support Pension eligibility criteria may provide a disincentive to retrain.

Results for the third year after onset show differing patterns of adjustment by education qualification (table 6). For those without any qualifications, the estimated negative impacts of disability onset on employment are estimated to increase from nine percentage points in the first period, to 12 percentage points in the third. In contrast, for those with VET qualifications, the negative impact of onset on employment rates is estimated to fall slightly from 11 percentage points in the first period, to ten percentage points in the third. From sensitivity analysis presented in appendix D, we find no evidence to suggest that the greater ability of those with a VET qualification to adjust is related to a difference in the duration of the disability spell. In the sensitivity analysis, we extend the duration of onset from two to three years and find that, similar to the results presented in table 6, those without qualifications adjust at a slower rate than those with qualifications.

Those who hold VET qualifications may adjust at a faster rate than those without qualifications because they were initially more likely to retain their job despite ceasing to work. For those with VET qualifications who did not retain their job, holding a qualification may make it easier for them to find employment after recovering from disability onset relative to those without a qualification. This is reflected in the higher rate of people without qualifications who appear to be having trouble finding work. (Those who want a job and who are either looking [unemployed] or not [not in the labour force, but want a job].) For those with higher education qualifications, there is a decrease in the rate in employment in the third year compared with the first year after onset, mainly because of a reduction in the rate of part-time employment, possibly because many of those who downshift from full-time to part-time employment in the first year eventually retire. Higher education qualification holders may be better placed to retire after onset because they are more likely to have accumulated greater savings.

¹⁵ Eligibility for a disability support pension is based on an individual's ability to work a minimum number of hours at the minimum wage rate or be reskilled within two years because of the disability. The risk is that disability onset will reduce employers' willingness to pay (wage offer) to a level below the minimum wage rate.

Evidence suggests that those with post-school qualifications impacted by disability onset may be more likely to return to study in the third year after onset rather than in the first. However, the effects in the third period after onset are estimated with large standard errors, probably reflecting the large variation in the motivation to retrain and the small number of observations. Under the sensitivity analysis, where disability is recorded in all three periods after onset, we find much larger and significant positive effects on the chances of returning to study for those with qualifications (appendix D). The greater effect of onset on participation in education among those whose disability lasts three years is probably because by this time it is clearer that their condition and resulting productivity impact (given their existing skills) are long-lasting, which adds to the case for retraining. In contrast, regardless of the duration of the disability, we find no evidence that those without qualifications retrain after onset, which is likely to affect their long-term employment prospects. Given the estimated employment benefits of acquiring VET qualifications for those with a disability, addressing potential barriers to retraining those with low levels of education may be an effective policy response.

A final point of interest is the impact of onset on poverty rates in the third year. For those with VET qualifications, the large increase in the likelihood of living in a low-income household in the third year is because fewer of those out of work have remained attached to an employer and hence to pre-onset pay.

Conclusions

It is well known that disability is associated with a number of adverse labour market outcomes, including low employment rates (Polidano & Mavromaras 2010), wage penalties (Kidd, Sloane & Ferko 2000; DeLeire 2000) and high rates of part-time employment (Wilkins 2004). The focus of this report is on the role of attaining post-school education qualifications, in particular VET qualifications, on improving the employment and working conditions of people with a disability.

The first question addressed in this report was whether completing a VET qualification improved the employment and working conditions of people with a disability. Consistent with Polidano and Mavromaras (2010), we found that people with a disability who benefit most from completing a VET course are those who are out of work prior. Completing a VET course for those out of work is estimated to increase their chances of employment by 16 percentage points in the first year out and increases to 20 percentage points by the third year.

A new finding is that the estimated initial increase in employment is due mainly to people finding employment in part-time work. However, over time, we find strong increases in full-time employment as those who initially find part-time work move into full-time employment. Similarly, we find that, while there are no significant benefits overall for those who are already in employment, there are significant full-time employment benefits for those previously working in part-time employment. The increased rate of full-time employment from completing a VET qualification is estimated to improve the financial independence of people with a disability. For people without a disability, we find similar, albeit smaller, benefits from completing a VET course.

We find no strong evidence that completing a VET course leads to increases in job satisfaction, hourly wage rates or job security for both groups of people with and without disability. A possible explanation for the lack of positive wage effects is that VET may be associated with a change in job and or career. If this is true, then, while employers may value the skills developed through VET, they may not value the skills accumulated in previous employment or in previous training. Therefore, compared with those who do not have post-school qualifications, those who complete a VET course may experience a wage penalty if the value of the extra skills from training does not compensate for the loss in value of the accumulated skills from changing careers or jobs.

The second issue addressed was whether holding a post-school qualification, including a VET qualification, reduced the disruptive impacts of disability onset for those in employment. Reflecting the more physically demanding nature of jobs likely to be performed by people with no post-school or VET qualifications, we find that their rates of employment are more affected (nine and 11 percentage point reduction respectively) than the rates of employment for those with higher education qualifications (five percentage point reduction) in the first year after onset. Importantly however, unlike those with no post-school qualifications, those holding VET qualifications are not estimated to experience significant knock-on effects in relation to economic disadvantage or reliance on the Disability Support Pension. Compared with those with no post-school qualifications, those with VET qualifications who have to stop working temporarily due to disability onset are much more likely to retain their job. For those who remain in employment, we find that those without any post-school qualifications incur a \$3 per hour wage penalty, while those with VET qualifications incur no significant wage penalty.

For those without post-school qualifications, not only are the initial labour market and economic impacts greater, but unlike those with VET qualifications, their impacts continue to increase up to the third year after onset. Those who hold VET qualifications may adjust at a faster rate than those without qualifications because their higher rate of job retention makes it easier for them to return to employment after recovery and their qualifications may make it easier to find alternative employment. As a result, after three years, we observe a lower reliance on the Disability Support Pension among those with VET qualifications compared with those without post-school qualifications. A worrying result that is likely to have longer-term implications is that, unlike those with qualifications, those without are less likely to return to education to retrain by the third year after onset.

Overall, these results underline the importance of policies to improve engagement in education for people with a disability, particularly those who have no post-school qualifications. A recent study by Fouarge, Schils and de Grip (2010) found that those with low education qualifications, irrespective of disability status, are less likely to participate in education and training because of personal factors such as a preference for leisure, risk aversion, exam anxiety, lack of openness to new experiences and an aversion to an external locus of control, rather than because they have lower returns from training. From a policy perspective, this suggests that rehabilitation programs for people with a disability should also provide suitable support to address the issues of anxiety of retraining that those without post-school qualifications may face.

References

- Australian Government 2009, *National Mental Health and Disability Employment Strategy, discussion paper*, Australian Government, Canberra.
- Blundell, R & Costa Dias, M 2008, *Alternative approaches to evaluation in empirical microeconomics*, Institute of the Study of Labor (IZA) discussion paper no.3800, IZA, Bonn.
- Borland, J & Tseng, Y 2007, 'Does a minimum job search requirement reduce time on unemployment payments? Evidence from the jobseeker diary in Australia', *Industrial and Labor Relations Review*, vol.60, no.3, pp.357–78.
- Bound, J 1991, 'Self-reported versus objective measures of health in retirement', *Journal of Human Resources*, vol.26, no.1, pp.106–38.
- Burchardt, T 2003, *Employment retention and the onset of sickness of disability: evidence from labour force survey longitudinal datasets*, Department for Work and Pensions, London.
- Burkhauser, R & Daly, M 1996, 'Employment and economic well-being following the onset of a disability: the role for public policy', in *Disability, work and cash benefits*, eds J Mashaw, V Reno, R Burkhauser & M Berkowitz, Upjohn Institute for Employment Research, Kalamazoo, MI.
- DeLeire, T 2000, 'The wage and employment effects of the *Americans with Disabilities Act*', *The Journal of Human Resources*, vol.35, no.4, pp.693–715.
- Dustmann, C & Engracia Rochina-Barrachina, M 2000, *Selection correction in panel data models: an application to labour supply and wages*, Institute of the Study of Labor (IZA) discussion paper no.162, IZA, Bonn.
- Fouarge, D, Schils, T & de Grip, A 2010, *Why do low-educated workers invest less in further education?*, The Institute of the Study of Labor (IZA) discussion paper no.2158, IZA, Bonn.
- Heckman, J, Ichimura, H & Todd, P 1997, 'Matching as an econometric evaluation estimator: evidence from evaluation', *Review of Economic Studies*, vol.64, pp.605–54.
- Hotchkiss, J 2004, *Growing part-time employment among workers with disabilities: marginalisation or opportunity?*, Economic review, Federal Reserve Bank of Atlanta, Atlanta.
- Imai, K, King, G & Stuart, E 2008, 'Misunderstandings between experimentalists and observationalists about causal inference', *Journal of the Royal Statistical Society: Series A*, vol.171, no.2, pp. 481–502.
- Jenkins, S & Rigg, J 2004, 'Disability and disadvantage: selection, onset and duration effects', *Journal of Social Policy*, vol.33, no.3, pp.479–501.
- Jones, M, Latreille, P & Sloane, P 2006, 'Disability, gender and the British labour market', *Oxford Economic Papers*, vol.58, pp.407–49.
- Jones, M 2007, 'Does part-time employment provide a way of accommodating a disability?', *The Manchester School*, vol.75, no.6, pp.695–716.
- Kenny, L, Lee, L, Maddala, G & Trost, R 1979, 'Returns to college education: an investigation of self-selection bias based on the project talent data', *International Economic Review*, vol.20, no.3, pp.775–89.
- Kidd, M, Sloane, P & Ferko, I 2000, 'Disability and the labour market: an analysis of British males', *Journal of Health Economics*, vol.19, no.6, pp.961–81.
- OECD (Organisation for Economic Co-operation and Development) 2008, *Growing unequal? Income distribution and poverty in OECD countries*, OECD, Paris.
- Polidano, C & Mavromaras, K 2010, *The role of vocational education and training in the labour market outcomes of people with disabilities*, NCVET, Adelaide.
- Productivity Commission 2004, *Review of the Disability Discrimination Act 1992*, Productivity Commission Inquiry Report, Melbourne.
- Rosenbaum, P & Rubin, D 1985, 'Constructing a control group using multivariate matched sampling methods that incorporate the propensity score', *American Statistician*, vol.39, no.1, pp.33–8.
- Rubin, D 1979, 'Using multivariate matched sampling and regression adjustment to control bias in observational studies', *Journal of the American Statistical Association*, vol.7, no.366, pp.34–58.
- Schur, L 2003, 'Barriers or opportunities? The causes of contingent and part-time work among people with disabilities', *Industrial Relations*, vol.42, no.4, pp.589–622.
- Ware, JE, Snow, KK, Kosinski, M 2000, *SF-36 Health Survey: manual and interpretation guide*, Quality Metric Incorporated, Lincoln.
- Wilkins, R 2004, 'The effect of disability on labour force status in Australia', *Australian Economic Review*, vol.37, no.4, pp.359–82.

Appendix A: Results from the probit matching models

The estimated model coefficients are presented and not the marginal effects because results from the matching models are of only secondary interest. The model coefficients have no intuitive interpretation, but represent the effect of the variable on the underlying propensity to (enrol and) complete a VET course and to incur disability onset. Generally speaking, a positive and significant coefficient means that the variable has a positive effect on the chances that an individual completes a VET course or incurs disability onset, and a significant negative effect suggests the opposite.

To save space, we do not report results for the matching models when the sample is restricted to those in employment after completion (for examining outcomes such as wages and job satisfaction that are only observed when individuals are in employment). Suffice it to say, the results from these models are much the same as those presented in tables A1 and A2.

Probit model of VET completion

The estimated coefficients from the probit matching models for VET completion are presented in tables A1 and A2 for those with and without a disability respectively. In both cases the dependent variable is coded 1 for VET course completion and 0 for no course completion.

Table A1 Results of the matching model of VET completion for people with a disability

	Out of work		Part-time employed		Full-time employed		Employed	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Male	0.231**	0.109	0.241	0.169	0.146	0.119	0.157*	0.092
Married	-0.309***	0.108	0.072	0.164	-0.054	0.118	0.000	0.092
Born overseas	0.154	0.127	0.535***	0.175	0.074	0.142	0.209**	0.104
Percentage of time since left full-time study in:								
Employment	0.665***	0.213	-0.250	0.332	0.153	0.446	-0.057	0.251
Unemployed	0.051	0.338	-0.636	0.792	0.506	0.805	-0.200	0.537
Real household income from other sources t-2 (2008\$)	-0.002	0.003	-0.003	0.004	0.000	0.004	-0.002	0.003
Missing hourly wage rate (2008\$) t-2	-		-0.267	0.257	-0.286	0.215	-0.285*	0.155
Hourly wage rate t-2	-		-0.015	0.008	-0.003	0.006	-0.007*	0.004
Satisfaction with job security t-2 (0–10)	-		-0.019	0.028	0.000	0.022	-0.008	0.017
Job satisfaction t-2 (0–10)	-		0.021	0.038	-0.081***	0.026	-0.043**	0.020
Labour market status in t-2								
Full-time employed (ref: part-time employed)	-		-		-		-0.034	0.093
Unemployed or NLF and wants to work (ref: NLF and doesn't want to work)	0.257***	0.098	-		-		-	
Unemployment rate t-2	-0.033	0.046	-0.06	-1.02	0.00	0.07	-0.02	-0.57
State of residence (ref: NSW)								
Victoria	-0.160	0.137	-0.244	0.193	-0.202	0.150	-0.163	0.113
Queensland	-0.417***	0.140	-0.225	0.207	-0.256	0.154	-0.216	0.119
South Australia	-0.290*	0.167	-0.134	0.253	-0.048	0.173	-0.025	0.138
Western Australia	-0.265	0.188	-0.391	0.282	-0.068	0.182	-0.145	0.147

	Out of work		Part-time employed		Full-time employed		Employed	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Other states	-0.530**	0.236	-0.521	0.318	-0.229	0.243	-0.259	0.184
Live in regional area	0.364***	0.116	0.203	0.147	0.042	0.113	0.081	0.085
Highest qualification in t-2 (ref: none) (reference: no post-school qual.)								
Tertiary	0.158	0.193	0.747	0.215	0.102	0.171	0.339***	0.127
VET	0.508***	0.111	0.642	0.171	0.335	0.120	0.422***	0.095
Highest level of schooling in t-2 (ref: Year 9) (reference: Year 9 or below)								
Year 12	0.358**	0.146	0.192	0.260	0.053	0.187	0.081	0.145
Year 11	-0.069	0.189	0.670**	0.289	0.010	0.211	0.236	0.163
Year 10	0.220*	0.131	0.511**	0.258	0.067	0.180	0.237*	0.142
Work limitation from disability t-1 (ref: 0 limitation) (reference: no work limitation)								
Mild work limitation (1–3)	-0.149	0.183	-0.249	0.211	0.052	0.140	-0.032	0.114
Moderate work limitation (4–6)	-0.099	0.147	-0.037	0.177	0.117	0.134	0.085	0.103
Severe work limitation (7–10)	-0.273*	0.156	-0.179	0.228	0.183	0.163	0.045	0.128
Disability support pensioner t-1	-0.204*	0.112	-0.146	0.218	-0.008	0.310	-0.090	0.164
Age (ref: 16-24)								
25–29	-0.777***	0.266	-0.775	0.331	-0.468	0.287	-0.574	0.210
30–34	-1.151***	0.264	-1.598***	0.389	-0.378	0.242	-0.634***	0.185
35–39	-0.929***	0.227	-1.341***	0.349	-0.753***	0.259	-0.929***	0.197
40–44	-1.225***	0.224	-1.386***	0.316	-0.633***	0.241	-0.845***	0.180
45–49	-0.920***	0.197	-0.979***	0.288	-0.887***	0.246	-0.876***	0.178
50–54	-1.285***	0.216	-1.405***	0.310	-1.161***	0.268	-1.168***	0.192
55–64	-1.631***	0.206	-1.665	0.305	-1.158	0.252	-1.276***	0.185
HILDA wave (ref: wave 3)								
Wave 4	0.034	0.169	-0.194	0.244	-0.180	0.167	-0.195	0.133
Wave 5	0.025	0.180	0.074	0.230	-0.045	0.164	-0.026	0.129
Wave 6	0.076	0.194	-0.145	0.255	-0.184	0.176	-0.221	0.140
Wave 7	0.063	0.197	0.194	0.232	-0.137	0.177	-0.059	0.135
Wave 8	-0.029	0.209	0.163	0.233	-0.174	0.188	-0.070	0.140
Constant	-1.334***	0.477	-0.951	0.645	-0.598	0.607	-0.603	0.409
Sample size	3570		1164		3050		3956	

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.

Table A2 Results of the matching model of VET completion for people without disability

	Out of work		Part-time employed		Full-time employed		Employed	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Male	0.080	0.077	0.066	0.066	0.078**	0.039	0.069**	0.033
Married	-0.352***	0.074	-0.272***	0.063	-0.036	0.041	-0.116***	0.034
Born overseas	0.292***	0.076	0.027	0.070	-0.093**	0.047	-0.053	0.038
Percentage of time since left full-time study in:								
Employment	0.058	0.122	-0.309**	0.136	-0.215	0.144	-0.243**	0.097
Out of work, but looking for work	0.302	0.189	-0.656**	0.322	0.031	0.319	-0.266	0.224
Income from non-wage sources t-2 (2008\$)	-0.002	0.002	0.002*	0.001	0.001	0.001	0.002**	0.001
Missing hourly wage rate t-2 (2008\$)	-		-0.179*	0.099	-0.259***	0.077	-0.202***	0.060
Hourly wage rate t-2	-		-0.003*	0.001	-0.007***	0.002	-0.004***	0.001
Satisfaction with job security t-2 (0–10)	-		-0.044***	0.012	-0.012	0.009	-0.025***	0.007
Job satisfaction t-2 (0–10)	-		-0.001	0.015	0.016	0.011	0.009	0.009
Labour market status								
Full-time employed (ref: part-time employed)	-		-		-		-0.094***	0.035
Unemployed or NLF and wants to work (ref: NLF and doesn't want to work)	0.273***	0.061	-		-		-	
Unemployment rate t-2	0.019	0.028	-0.053	-2.29	-0.017	-1.05	-0.027	-2.09
State of residence (ref: NSW)								
Victoria	-0.146*	0.081	-0.013	0.069	-0.039	0.047	-0.028	0.039
Queensland	-0.360***	0.088	-0.047	0.072	-0.072	0.048	-0.056	0.040
South Australia	-0.378***	0.118	-0.083	0.099	-0.153**	0.070	-0.124**	0.057
Western Australia	-0.305***	0.114	-0.236**	0.101	-0.232***	0.069	-0.230***	0.057
Other states	-0.249*	0.137	-0.241**	0.118	-0.026	0.078	-0.090	0.065
Live in regional area	-0.045	0.073	0.082	0.054	0.099***	0.038	0.093***	0.031
Highest qualification in t-2 (ref: none)								
Higher education	0.005	0.120	0.221***	0.079	0.088	0.054	0.117***	0.044
VET	0.521***	0.073	0.408***	0.064	0.383***	0.041	0.386***	0.034
Highest schooling in t-2 (ref: Year 9)								
Year 12	0.221**	0.112	0.189	0.124	0.146*	0.078	0.150**	0.066
Year 11	0.058	0.128	0.323**	0.132	0.122	0.085	0.175**	0.071
Year 10	0.101	0.113	0.285**	0.124	0.023	0.079	0.094	0.067
Age (ref: 16–24)								
25–29	-0.508***	0.123	-0.470***	0.122	-0.441***	0.070	-0.475***	0.059
30–34	-0.681***	0.122	-0.570***	0.111	-0.548***	0.071	-0.588***	0.058
35–39	-0.587***	0.115	-0.683***	0.104	-0.504***	0.072	-0.592***	0.058
40–44	-0.665***	0.122	-0.751***	0.104	-0.703***	0.075	-0.750***	0.060
45–49	-0.662***	0.135	-0.766***	0.108	-0.640***	0.074	-0.709***	0.060
50–54	-1.106***	0.187	-0.816***	0.117	-0.663***	0.079	-0.735***	0.064
55–64	-1.317***	0.145	-0.999***	0.119	-0.749***	0.081	-0.856***	0.066
HILDA wave (ref: wave 3)								
Wave 4	0.007	0.105	0.013	0.086	0.015	0.058	0.017	0.048
Wave 5	0.227**	0.104	0.143*	0.084	0.091	0.058	0.107**	0.047
Wave 6	0.195*	0.118	0.056	0.087	0.005	0.060	0.024	0.049
Wave 7	0.003	0.125	0.029	0.088	0.073	0.059	0.061	0.049
Wave 8	0.113	0.132	0.049	0.088	0.141**	0.058	0.109**	0.048
Constant	-1.379***	0.304	-0.634***	0.244	-1.187***	0.205	-0.896***	0.152
Sample size	5 269		8 356		16 959		23 548	

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.

Overall, results from tables A1 and A2 suggest that the decision to complete a VET qualification is consistent with the human capital model of education acquisition. Our results suggest that those who stand to gain more from such an investment complete a VET qualification at a higher rate. We find that the lower-paid, those out of work who want to work, those less satisfied with their job security and those unsatisfied with the job overall are more likely to complete a VET qualification. Also related to future employment benefits, age is estimated to be an important factor, with the chances of completing a qualification declining with age, a proxy for the time until retirement to recoup the costs of education.

Probit model of disability onset

The model-dependent variable, disability onset, is coded 1 if onset occurs and 0 if it does not. From the results in table A3, we can say that disability onset is not totally random, but depends, to varying degrees across qualification types, on age, marital status, gender, schooling level, type of housing, health before onset, having dependent children, industry of employment, occupation, and employment conditions.

Table A3 Estimated coefficients of the probit matching model of disability onset

	No post-school qualification		VET		Higher education	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Male	0.115	0.075	0.051	0.092	-0.121	0.087
Married/defacto t-1	0.011	0.074	-0.151*	0.086	-0.074	0.102
Number of dependent children t-1 (ref: none)						
Aged 2 or less	0.023	0.098	-0.003	0.094	-0.021	0.097
Aged 2 or 4	-0.374**	0.159	-0.012	0.121	-0.079	0.134
Aged 5–9	-0.113	0.069	0.076	0.062	-0.040	0.077
Aged 10–12	-0.094	0.085	-0.093	0.087	-0.060	0.100
Aged 13–15	0.073	0.076	-0.033	0.077	0.041	0.091
Born overseas	-0.157*	0.082	-0.200**	0.089	0.069	0.085
Highest year of school completed (ref: Year 9)						
Year 12	-0.026	0.109	-0.376***	0.112	-0.332	0.304
Year 11	0.059	0.115	-0.374***	0.126	-0.531	0.359
Year 10	0.066	0.101	-0.321***	0.106	-0.244	0.325
Age t-1 (ref: 16–24)						
25–29	0.214	0.147	0.099	0.199	-0.175	0.268
30–34	0.461***	0.137	0.223	0.193	-0.327	0.273
35–39	0.280***	0.150	0.078	0.201	0.040	0.266
40–44	0.526***	0.135	0.558***	0.187	-0.053	0.272
45–49	0.548***	0.136	0.433**	0.189	0.018	0.269
50–54	0.661***	0.138	0.422**	0.197	0.048	0.274
55–64	0.795***	0.136	0.768***	0.191	0.089	0.275
Wave of sample (ref: wave 3)						
Wave 4	-0.011	0.085	-0.031	0.105	-0.095	0.111
Wave 5	-0.180*	0.097	-0.011	0.109	0.025	0.106
Wave 6	-0.253**	0.099	-0.036	0.108	-0.170	0.113
Wave 7	-0.180*	0.103	-0.067	0.115	-0.291**	0.120
How often participates in physical activity t-1 (1 not at all; 6 every day)	-0.042**	0.020	-0.014	0.022	-0.047*	0.028
Did not complete SCQ t-1	-0.080	0.126	1.042***	0.184	0.092	0.188

	No post-school qualification		VET		Higher education	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Occupation t-2 (ref: Professionals)						
Managers	0.246	0.182	-0.294*	0.158	0.007	0.120
Associate professional	0.099	0.169	-0.229	0.143	0.168	0.149
Tradesman and related workers	0.181	0.184	-0.062	0.136	-	-
Advanced clerk and service workers	-0.172	0.213	-0.176	0.218	-0.211	0.436
Intermediate clerk, sales and service workers	0.061	0.165	-0.310**	0.152	0.012	0.191
Intermediate production and transport workers	0.150	0.173	-0.187	0.163	0.117	0.467
Elementary clerk, sales and service workers	0.101	0.178	-0.531**	0.218	0.129	0.308
Labourer	0.301*	0.166	-0.015	0.169	0.820***	0.303
Industry t-2 (ref: Transport)						
Primary industries	0.004	0.169	-0.030	0.190	-0.827*	0.501
Manufacturing	0.127	0.107	0.056	0.127	-0.076	0.175
Construction	-0.096	0.144	0.077	0.126	0.080	0.205
Retail trade	0.115	0.094	0.238**	0.120	0.020	0.185
Hospitality	0.220*	0.130	0.206	0.167	0.343	0.297
Education	-0.113	0.165	-0.064	0.177	0.081	0.116
Health	0.066	0.115	-0.070	0.146	0.168	0.125
Other	0.185*	0.112	0.201	0.123	-0.055	0.130
State of residence t-1 (ref: NSW)						
Victoria	-0.005	0.082	-0.232**	0.094	-0.038	0.097
Queensland	-0.072	0.086	-0.136	0.093	-0.092	0.118
South Australia	0.086	0.106	-0.017	0.121	0.014	0.148
Western Australia	-0.162	0.114	-0.146	0.120	-0.145	0.150
ACT&NT	0.079	0.129	-0.200	0.168	0.460***	0.131
Live in rural area t-1	-0.079	0.071	-0.018	0.079	0.046	0.089
Real wage earnings (2008\$) t-2	-0.189**	0.080	-0.077	0.062	-0.001	0.050
Real household income from other sources (2008\$)	0.002	0.002	-0.001	0.002	-0.003	0.002
House ownership t-1 (ref: own home in own rite)						
Has a mortgage	-0.221*	0.126	-0.066	0.124	0.073	0.115
Rent	0.113	0.075	0.074	0.090	-0.002	0.110
Public housing	0.053	0.192	-0.321	0.306	0.059	0.384
Rent free	-0.248	0.213	0.225	0.159	-0.152	0.251
General health t-2 (0–100)	-0.107***	0.035	0.231***	0.032	-0.109**	0.047
Percentage of time employed since left F.T. education t-2 (ref: less than a third)						
Between one and two-thirds	-0.360**	0.160	-0.069	0.284	-0.003	0.304
More than two-thirds	-0.141	0.143	-0.013	0.270	-0.101	0.294
Avg. hours of work per week t-2 (ref: less than 35 hrs.)						
35–50 hours	0.073	0.076	-0.075	0.096	-0.001	0.103
More than 50 hours	0.022	0.120	-0.086	0.122	0.076	0.133
Type of work schedule t-2 (ref: regular day shift)						
Regular night/evening	-0.215	0.133	0.170	0.167	0.183	0.249
Rotating or irregular	-0.048	0.082	0.167*	0.085	-0.014	0.108
On call	-0.279	0.219	-0.150	0.241	0.198	0.283
Other	0.272*	0.160	0.282	0.179	0.314	0.275
Years experience in occupation t-2 (ref: first year)						
1–5 years	-0.117	0.083	-0.238**	0.106	0.007	0.135
6–10 years	-0.060	0.051	-0.121**	0.060	0.074	0.074
More than 10 years	-0.124**	0.049	-0.094*	0.055	0.106	0.072

	No post-school qualification		VET		Higher education	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Satisfaction with job security (1–7)	-0.040***	0.013	-0.011	0.014	-0.004	0.017
Regional unemployment rate t-1	-0.018	0.028	-0.041	0.032	0.048	0.056
Constant	-1.108***	0.395	-2.547***	0.517	-0.775	0.572

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.

Appendix B: Balancing test results

Balancing tests are used 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 treatment and matched control groups is different as well and hence the Conditional Independence Assumption (CIA) will be violated. Because of the small number of observations in the treatment groups, it is overly restrictive to aim for a balanced match in each wave, especially in later waves where there are fewer observations. For kernel matching we use a series of weighted simple regressions, where in each regression, the dependent variable is a different variable from the matching equation and the explanatory variable is an indicator of whether the individual is from the treatment or matched control group. The weights are from the kernel matching. As demonstrated in tables B1, B2 and B3 below, all of the variables in the final specification of the matching models pass a balancing test.¹⁶ Results below are for the kernel matching models.

Table B1 Balancing test results for the probit matching model of VET completion for people with a disability

	Out of work		Part-time employed		Full-time employed	
	Mean diff.	t-stat	Mean diff.	t-stat	Mean diff.	t-stat
Male	-0.031	-0.825	-0.037	-0.869	-0.023	-0.743
Married	0.025	0.488	0.011	0.184	-0.001	-0.011
Born overseas	-0.013	-0.258	-0.022	-0.339	-0.029	-0.561
Percentage of time since left full-time study in:						
Employment	0.000	-0.003	0.027	0.457	-0.011	-0.292
Out of work, but looking for work	-0.002	-0.078	0.022	0.619	-0.002	-0.131
Real household income from other sources t-2 (2008\$)	0.002	0.085	-0.004	-0.249	0.004	0.475
Missing hourly wage rate t-2	-		2.099	0.943	-0.449	-0.281
Hourly wage rate t-2 (2008\$)	-		-0.009	-0.206	-0.011	-0.392
Satisfaction with job security t-2 (0–10)	-		-0.214	-0.156	-0.064	-0.057
Job satisfaction t-2 (0–10)	-		-0.050	-0.146	-0.100	-0.350
Unemployment rate t-2	-0.990	-0.488	-0.036	-0.140	-0.169	-0.671
State of residence (ref: NSW)						
Victoria	0.017	0.113	-0.170	-0.751	0.021	0.133
Queensland	0.002	0.047	0.038	0.639	-0.017	-0.406
South Australia	-0.006	-0.150	-0.031	-0.577	-0.013	-0.352
Western Australia	0.014	0.399	0.010	0.257	0.006	0.150
Other states	-0.011	-0.405	-0.005	-0.155	0.016	0.438
Live in regional area	0.001	0.050	-0.009	-0.340	0.002	0.078
Highest qualification in t-2 (ref: no post-school qual.)						
Tertiary	0.020	0.401	-0.007	-0.104	0.009	0.182
VET	-0.005	-0.195	0.013	0.222	-0.019	-0.493
Highest level of schooling in t-2 (ref: Year 9 or below)						

¹⁶ An issue when conducting balancing tests is that their validity depends on the number of observations in control and the treatment distributions that are being compared (Imai, King & Stuart 2008). The validity of the balancing tests declines with the number of observations in the treatment and control groups because the probability of a Type II error increases – accepting the null hypothesis of no difference when there actually are differences in the means. All of the t-tests used in the balancing tests had sufficient power (80% or more).

	Out of work		Part-time employed		Full-time employed	
	Mean diff.	t-stat	Mean diff.	t-stat	Mean diff.	t-stat
Year 12	0.013	0.264	0.014	0.219	0.041	0.787
Year 11	0.025	0.488	0.019	0.282	-0.004	-0.074
Year 10	0.001	0.041	-0.007	-0.125	-0.003	-0.094
Disability rating in t-1 (ref: 0 no work limitation)						
Mild work limitation (1-3)	-0.007	-0.139	-0.003	-0.050	0.013	0.263
Moderate work limitation (4-6)	0.011	0.309	-0.013	-0.277	0.004	0.100
Severe work limitation (7-10)	0.039	0.788	0.030	0.450	-0.005	-0.114
Disability support pensioner t-1	-0.034	-0.762	-0.021	-0.459	0.013	0.325
Age (ref: 16-24)						
25-29	-0.019	-0.415	-0.004	-0.098	0.002	0.090
30-34	-0.001	-0.069	-0.015	-0.416	0.001	0.025
35-39	-0.002	-0.105	-0.010	-0.458	0.016	0.372
40-44	-0.002	-0.059	0.002	0.056	0.000	-0.011
45-49	-0.005	-0.200	-0.005	-0.110	-0.001	-0.020
50-54	0.004	0.098	0.016	0.286	-0.011	-0.315
55-64	-0.004	-0.124	-0.004	-0.079	-0.012	-0.443

Table B2 Balancing test results for the probit matching model of VET completion for people without disability

	Out of work		Part-time employed		Full-time employed	
	Mean diff.	t-stat	Mean diff.	t-stat	Mean diff.	t-stat
Male	-0.002	-0.080	-0.004	-0.155	0.001	0.043
Married	-0.013	-0.442	-0.025	-0.972	-0.008	-0.490
Born overseas	0.004	0.145	0.000	0.016	-0.003	-0.190
Percentage of time since left full-time study in						
Employment	-0.008	-0.404	0.004	0.394	-0.002	-0.347
Out of work, but looking for work	-0.005	-0.383	0.001	0.207	0.000	0.063
Real household income from other sources t-2 (2008\$)	0.185	0.165	0.250	0.176	-0.099	-0.146
Missing hourly wage rate t-2	-		-0.002	-0.159	-0.001	-0.142
Hourly wage rate t-2 (2008\$)	-		-0.355	-0.326	-0.114	-0.240
Satisfaction with job security t-2 (0–10)	-		0.004	0.031	0.000	-0.005
Job satisfaction t-2 (0–10)	-		-0.007	-0.072	0.006	0.097
Unemployment rate t-2	0.017	0.189	-0.164	-2.151	-0.041	-0.687
State of residence (NSW ref.)						
Victoria	-0.001	-0.026	-0.002	-0.109	-0.002	-0.140
Queensland	-0.007	-0.339	-0.005	-0.236	0.000	-0.010
South Australia	0.001	0.041	0.006	0.394	-0.001	-0.089
Western Australia	-0.004	-0.228	0.004	0.304	0.000	0.039
Other states	0.002	0.131	-0.003	-0.317	0.002	0.173
Live in regional area	-0.012	-0.427	-0.022	-0.848	0.002	0.110
Highest qualification in t-2 (ref: none)						
Tertiary	-0.004	-0.251	-0.002	-0.114	-0.004	-0.245
VET	0.029	1.006	0.014	0.579	0.017	0.924
Highest level of schooling in t-2 (ref: Year 9 or below)						
Year 12	0.008	0.252	0.004	0.151	0.004	0.193
Year 11	-0.006	-0.308	0.002	0.131	0.000	-0.020
Year 10	-0.001	-0.053	-0.007	-0.327	-0.001	-0.051
Age (ref: 16–24)						
25–29	0.000	-0.027	0.004	0.301	0.002	0.177
30–34	-0.006	-0.343	0.002	0.173	0.001	0.105
35–39	0.004	0.206	-0.001	-0.042	0.005	0.401
40–44	0.000	-0.025	-0.005	-0.330	-0.003	-0.232
45–49	0.000	-0.019	-0.003	-0.185	-0.001	-0.064
50–54	-0.001	-0.076	-0.006	-0.520	-0.002	-0.153
55–64	-0.007	-0.686	-0.002	-0.211	-0.002	-0.167

Table B3 Balancing test results for the probit matching model of disability onset

	No post-school qualification		VET		Higher education	
	Mean diff.	t-stat	Mean diff.	t-stat	Mean diff.	t-stat
Male	0.000	0.000	0.000	0.000	0.000	0.000
Married/defacto t-1	0.011	0.371	0.008	0.250	-0.016	-0.395
Number of dependent children t-1 (ref: none)						
Aged 2 or less	0.007	0.226	-0.005	-0.147	-0.008	-0.219
Aged 2 or 4	-0.006	-0.315	-0.013	-0.517	-0.015	-0.423
Aged 5–9	-0.003	-0.266	-0.010	-0.550	-0.002	-0.104
Aged 10–12	-0.011	-0.408	-0.006	-0.151	-0.018	-0.414
Aged 13–15	-0.009	-0.388	-0.011	-0.439	-0.004	-0.128
Born overseas	0.005	0.166	-0.003	-0.094	0.019	0.486
Highest year of school completed (ref: Year 9 or below)						
Year 12	-0.006	-0.238	-0.010	-0.379	0.020	0.529
Year 11	-0.014	-0.462	-0.016	-0.511	-0.014	-0.504
Year 10	0.004	0.151	-0.014	-0.584	-0.003	-0.201
Age t-1 (ref: 16–24)						
25–29	0.003	0.098	-0.003	-0.099	0.011	0.463
30–34	-0.004	-0.303	-0.007	-0.418	-0.013	-0.629
35–39	-0.007	-0.391	-0.008	-0.412	-0.010	-0.478
40–44	-0.006	-0.405	-0.013	-0.707	-0.008	-0.253
45–49	-0.002	-0.096	0.005	0.177	-0.004	-0.142
50–54	0.004	0.157	-0.006	-0.218	0.010	0.302
55–64	0.006	0.279	-0.001	-0.038	0.004	0.147
How often participates in physical activity t-1 (1 not at all; 6 every day)	0.024	0.889	0.033	1.119	0.021	0.703
Did not complete self-completion questionnaire t-1	-0.042	-0.365	-0.005	-0.045	-0.062	-0.483
Occupation t-2 (ref: Professionals)						
Managers	-0.004	-0.193	0.007	0.461	-0.003	-0.175
Associate professional	0.005	0.270	-0.011	-0.524	-0.024	-0.592
Tradesman and related workers	0.001	0.035	-0.004	-0.175		
Advanced clerk and service workers	-0.006	-0.344	0.001	0.031	0.011	0.402
Intermediate clerk, sales and service workers	0.000	0.023	-0.001	-0.076	-0.001	-0.104
Intermediate production and transport workers	-0.005	-0.203	0.001	0.060	-0.001	-0.044
Elementary clerk, sales and service workers	-0.003	-0.160	0.005	0.276	0.000	0.064
Labourer	-0.004	-0.211	-0.001	-0.113	0.000	-0.028
Industry t-2 (ref: Transport)						
Primary industries	0.014	0.583	0.001	0.062	0.016	1.126
Manufacturing	0.001	0.091	0.001	0.091	0.001	0.099
Construction	0.003	0.116	0.000	-0.013	0.002	0.120
Retail trade	-0.003	-0.193	-0.002	-0.068	0.001	0.071
Hospitality	-0.006	-0.230	0.008	0.307	-0.001	-0.056
Education	0.001	0.080	0.002	0.115	0.009	0.675
Health	0.000	-0.017	-0.004	-0.282	-0.006	-0.158
Other	0.004	0.173	-0.004	-0.229	0.004	0.128
State of residence t-1 (ref: NSW)						
Victoria	0.006	0.297	0.002	0.069	0.005	0.197
Queensland	-0.002	-0.086	-0.005	-0.201	-0.022	-0.624
South Australia	-0.001	-0.047	-0.012	-0.409	-0.010	-0.362
Western Australia	0.004	0.176	0.002	0.091	-0.002	-0.102
ACT&NT	-0.004	-0.217	-0.002	-0.078	-0.003	-0.155

	No post-school qualification		VET		Higher education	
	Mean diff.	t-stat	Mean diff.	t-stat	Mean diff.	t-stat
Live in rural area t-1	0.000	-0.002	-0.002	-0.168	0.045	1.519
Real earnings t-2 (2008\$)	-0.005	-0.165	-0.008	-0.238	0.027	0.725
Real household income from other sources (2008\$)	-0.012	-0.491	-0.018	-0.455	-0.006	-0.090
House ownership t-1 (ref: own home in own rite)						
Has a mortgage	-0.141	-0.114	-0.318	-0.294	-1.004	-0.604
Rent	0.000	0.031	-0.002	-0.121	0.009	0.336
Public housing	0.008	0.299	0.003	0.098	-0.009	-0.293
Rent free	0.002	0.238	0.002	0.206	0.005	0.536
General health t-2 (0–100)	-0.001	-0.089	-0.002	-0.118	-0.003	-0.239
Percentage of time employed since left F.T. education t-2 (ref: less than a third)						
Between one and two-thirds	-0.037	-0.659	-0.032	-0.529	-0.057	-0.830
More than two-thirds	-0.005	-0.285	0.003	0.168	-0.002	-0.073
Avg. hours of work per week t-2 (ref: less than 35 hrs.)						
35–50 hours	-0.001	-0.059	-0.004	-0.189	0.000	0.017
More than 50 hours	0.002	0.058	-0.018	-0.517	-0.013	-0.328
Type of work schedule t-2 (ref: regular day shift)						
Regular night/evening	0.003	0.157	-0.002	-0.079	0.009	0.279
Rotating or irregular	-0.002	-0.123	-0.002	-0.108	0.009	0.612
On call	-0.004	-0.156	0.005	0.170	0.007	0.218
Other	0.002	0.195	-0.001	-0.157	0.002	0.185
Years experience in occupation t-2 (ref: first year)						
1–5 years	0.006	0.485	0.008	0.557	0.010	0.800
6–10 years	-0.002	-0.052	-0.004	-0.134	-0.012	-0.343
More than 10 years	0.006	0.135	-0.008	-0.151	-0.011	-0.172
Satisfaction with job security (1–7)	-0.010	-0.175	0.011	0.167	0.045	0.551
Regional unemployment rate t-1	-0.153	-0.941	-0.088	-0.536	-0.015	-0.080

Appendix C: Results using nearest neighbour matching

As a test of robustness, we also estimated the impacts of completing education and training courses for people with a disability and the impacts of holding education qualifications in buffering the disruptive effects of disability onset using ‘nearest neighbour’ matching. Results from these models are presented below (tables C1, C2 and C3). Overall, the estimated impacts are consistent with those estimated using kernel matching, but with larger standard errors due to the smaller numbers in the control group.

Table C1 Average effects from completing a VET course on the labour market outcomes of people with a disability using nearest neighbour matching

Time since course completion	Employment status two years prior to course completion							
	Out of work		Part-time employed		Full-time employed		Employed	
	ATET	s.e.	ATET	s.e.	ATET	s.e.	ATET	s.e.
<i>First year</i>								
Full-time employed	0.026	0.050	0.139	0.089	-0.049	0.077	0.037	0.066
Part-time employed	0.118	0.072	-0.106	0.118	0.008	0.051	-0.052	0.055
Employed	0.144*	0.083	0.033	0.099	-0.042	0.061	-0.015	0.059
Low-income household (lowest 20%)	-0.005	0.071	-0.044	0.102	-0.015	0.061	-0.019	0.057
Disability support pensioner	-0.043	0.068	-0.042	0.075	-0.017	0.036	-0.028	0.033
Hourly wage rate (2008\$)	-		-		-		-1.523	2.719
Job satisfaction (1–10)	-		-		-		-0.142	0.341
Satisfaction with job security (1–10)	-		-		-		-0.471	0.448
Skills utilisation (1–7)	-		-		-		0.512*	0.310
<i>Third year</i>								
Full-time employed	0.140*	0.078	0.141	0.132	-0.048	0.103	0.059	0.086
Part-time employed	0.047	0.084	-0.021	0.148	0.055	0.081	-0.016	0.081
Employed	0.187*	0.098	0.120	0.140	0.007	0.085	0.043	0.069
Low-income household (lowest 20%)	-0.068	0.103	-0.090	0.135	-0.065	0.079	-0.071	0.076
Disability support pensioner	-0.057	0.097	-0.095	0.101	-0.029	0.052	-0.073	0.052
Hourly wage rate (2008\$)	-		-		-		1.113	4.276
Job satisfaction (0–10)	-		-		-		0.010	0.423
Satisfaction with job security (0–10)	-		-		-		-0.014	0.569
Skills utilisation (1–7)	-		-		-		0.116	0.473

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.

Table C2 Average effects from completing a VET course on the labour market outcomes of people without disability using nearest neighbour matching

Time since course completion	Employment status two years prior to course completion							
	Out of work		Part-time employed		Full-time employed		Employed	
	ATET	s.e.	ATET	s.e.	ATET	s.e.	ATET	s.e.
<i>First year</i>								
Full-time employed	0.050	0.038	0.054	0.040	-0.024	0.021	0.004	0.020
Part-time employed	0.098**	0.042	-0.037	0.039	0.024	0.017	0.003	0.019
Employed	0.148***	0.049	0.017	0.026	0.000	0.012	0.006	0.014
Low-income household (lowest 20%)	0.043	0.046	0.009	0.033	0.007	0.016	0.011	0.015
Hourly wage rate (2008\$)	-		-		-		-1.008	0.847
Job satisfaction (1–10)	-		-		-		0.050	0.096
Satisfaction with job security (1–10)	-		-		-		-0.001	0.106
Skills utilisation (1–7)	-		-		-		0.205**	0.085
<i>Third year</i>								
Full-time employed	0.065	0.054	0.073	0.054	0.008	0.028	0.024	0.029
Part-time employed	0.091*	0.051	-0.022	0.053	0.011	0.022	0.006	0.026
Employed	0.156**	0.061	0.050	0.038	0.018	0.022	0.030*	0.017
Low-income household (lowest 20%)	-0.056	0.064	-0.022	0.044	0.029	0.024	0.019	0.020
Hourly wage rate (2008\$)	-		-		-		-1.217	1.308
Job satisfaction (0–10)	-		-		-		0.072	0.120
Satisfaction with job security (0–10)	-		-		-		0.098	0.124
Skills utilisation (1–7)	-		-		-		0.231*	0.118

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.

Table C3 Estimated average effects of disability onset over time using nearest neighbour matching

Year after onset	No post-school qualification		VET		Higher education	
	ATET	s.e.	ATET	s.e.	ATET	s.e.
<i>First year</i>						
Full-time employed	-0.036	0.045	-0.069	0.053	-0.057	0.061
Part-time employed	-0.047	0.044	-0.036	0.049	0.003	0.055
Employed	-0.083**	0.034	-0.105***	0.037	-0.054	0.034
Unemployed	0.002	0.016	0.018	0.015	0.007	0.012
Not in the labour force						
Has a job	0.003	0.018	0.048**	0.020	-0.004	0.013
Wants a job	0.030**	0.013	0.019*	0.010	0.023*	0.013
Does not want a job	0.037*	0.021	0.028*	0.017	0.013	0.018
Retired	0.011	0.015	-0.007	0.014	0.015	0.013
Enrolled in study	-0.041	0.032	0.013	0.035	0.000	0.050
Disability support pensioner	0.031**	0.012	0.016	0.011	0.012	0.009
Real hourly wage rate (2008\$)	-2.969	5.731	-0.926	1.826	0.406	3.290
Low-income household (lowest 20%)	0.051	0.036	0.007	0.038	0.002	0.031
<i>Third year</i>						
Full-time employed	-0.070	0.052	-0.064	0.058	-0.037	0.067
Part-time employed	-0.041	0.053	-0.028	0.052	-0.029	0.061
Employed	0.038**	0.019	0.011	0.015	0.002	0.016
Unemployed	-0.110***	0.041	-0.092**	0.042	-0.065	0.043
Not in the labour force						
Has a job	0.016	0.023	0.024	0.023	0.010	0.018
Wants a job	0.037**	0.016	-0.004	0.008	0.008	0.015
Does not want a job	0.022	0.024	0.065**	0.026	0.008	0.024
Retired	-0.004	0.022	-0.004	0.025	0.037	0.026
Enrolled in study	-0.003	0.038	0.028	0.039	0.051	0.053
Disability support pensioner	0.065***	0.019	0.047**	0.019	0.021*	0.012
Real hourly wage rate (2008\$)	-1.898	1.895	0.928	2.369	-0.533	3.487
Low-income household (lowest 20%)	0.091**	0.044	0.109**	0.044	0.043	0.037

Notes: *** significant at 1%, ** significant at 5%, * significant at 10%.

a Estimated for those who are in employment one year after the reference year.

Appendix D: Duration of disability

The impacts of disability onset in this study are based on the treatment of onset being at least two consecutive years of disability preceded by two years without disability. However, because we examine the impacts over the first three years, it is possible that differences in the impacts across education cohorts may be related to differences in the rates of persistence of disability. To test this, we re-estimated the full standard kernel matching results (table D1) using a three-year spell.¹⁷ Results are presented in table D2.

Table D1 Estimated labour market effects from onset of a disability spell that lasts at least two years

Year after onset	No post-school qualification		VET		Higher education	
	ATET	s.e.	ATET	s.e.	ATET	s.e.
<i>First year</i>						
Full-time employed	-0.050*	0.027	-0.078***	0.029	-0.062**	0.029**
Part-time employed	-0.039*	0.023	-0.027	0.026	0.010	0.027
Employed	-0.089***	0.022	-0.105***	0.025	-0.052**	0.023
Unemployed	0.002	0.009	0.018	0.011	0.007	0.009
Not in the labour force						
Has a job	0.006	0.012	0.046***	0.015	-0.004	0.007
Wants a job	0.031***	0.011	0.018*	0.010	0.023*	0.013
Does not want a job	0.039**	0.016	0.027**	0.013	0.012	0.013
Retired	0.011	0.011	-0.006	0.007	0.014	0.011
Enrolled in study	-0.045**	0.018	0.013	0.021	-0.004	0.030
Disability support pensioner	0.031***	0.011	0.017***	0.009	0.013	0.010
Real hourly wage rate (2008\$)	-2.707*	1.386	-0.798	0.904	-0.135	1.148
Low-income household (lowest 20%)	0.056**	0.022	0.010	0.022	0.006	0.018
<i>Second year</i>						
Full-time employed	-0.098***	0.029	-0.080***	0.028	-0.064*	0.035
Part-time employed	-0.011	0.027	-0.040	0.024	-0.018	0.029
Employed	-0.109***	0.028	-0.120***	0.025	-0.083***	0.028
Unemployed	0.022*	0.013	0.018	0.011	0.011	0.010
Not in the labour force						
Has a job	0.030**	0.014	0.033**	0.015	0.004	0.010
Wants a job	0.025**	0.011	0.025**	0.012	0.021	0.013
Does not want a job	0.014	0.014	0.026	0.014	0.013	0.016
Retired	0.019	0.013	0.018*	0.012	0.033*	0.017
Enrolled in study	-0.004	0.022	-0.015	0.018	0.034	0.032
Disability support pensioner	0.055***	0.014	0.036***	0.012	0.013	0.009
Real hourly wage rate (2008\$)	-1.533	1.122	-0.809	0.871	0.608	1.527
Low-income household (lowest 20%)	0.087***	0.025	0.075***	0.027	0.043*	0.023
<i>Third year</i>						
Full-time employed	-0.083**	0.033	-0.082**	0.035	-0.048	0.036
Part-time employed	-0.033	0.028	-0.016	0.030	-0.025	0.030
Employed	-0.117***	0.030	-0.098***	0.030	-0.073**	0.030
Unemployed	0.037**	0.015	0.010	0.011	0.004	0.011

¹⁷ Results in table D1 are the same as those in table 7, except that we also include the results for the second period.

Year after onset	No post-school qualification		VET		Higher education	
	ATET	s.e.	ATET	s.e.	ATET	s.e.
Not in the labour force						
Has a job	0.020	0.015	0.027	0.017	0.011	0.014
Wants a job	0.039***	0.015	-0.004**	0.002	0.009	0.011
Does not want a job	0.022	0.016	0.065***	0.023	0.008	0.014
Retired	-0.002	0.012	0.000	0.014	0.041**	0.020
Enrolled in study	-0.011	0.020	0.027	0.026	0.053	0.038
Disability support pensioner	0.065***	0.018	0.046***	0.017	0.023*	0.014
Real hourly wage rate (2008\$)	-1.797***	0.673	0.723	1.484	-0.754	1.463
Low-income household (lowest 20%)	0.098***	0.030	0.111***	0.032	0.041	0.027

Notes: *** significant at 1%, ** significant at 5%, * significant at 10%.

a Estimated for those who are in employment one year after the reference year.

Table D2 Estimated labour market effects over time from the onset of a three-year disability spell

Year after onset	No post-school qualification		VET		Higher education	
	ATET	s.e.	ATET	s.e.	ATET	s.e.
First year						
Full-time employed	-0.108	0.069	-0.092**	0.040	-0.066	0.042
Part-time employed	0.006	0.068	-0.045	0.037	0.006	0.040
Employed	-0.102**	0.052	-0.137***	0.043	-0.060*	0.033
Unemployed	0.011	0.023	0.009	0.015	0.009	0.015
Not in the labour force						
Has a job	-0.002	0.029	0.042*	0.025	-0.008**	0.004
Wants a job	0.041**	0.020	0.017	0.014	0.023	0.018
Does not want a job	0.050	0.032	0.072**	0.027	0.026	0.023
Retired	0.002	0.021	-0.003	0.011	0.010	0.013
Enrolled in study	-0.035	0.047	0.017	0.032	0.005	0.043
Disability support pensioner	0.043**	0.019	0.020	0.014	0.000	0.000
Low-income household (lowest 20%)	0.044	0.060	0.054	0.040	0.027	0.032
Second period						
Full-time employed	-0.140	0.071	-0.134	0.039	-0.054	0.050
Part-time employed	-0.004	0.062	-0.041*	0.034	-0.075**	0.035
Employed	-0.144***	0.054	-0.175***	0.047	-0.129***	0.043
Unemployed	0.042	0.027	0.024	0.019	0.007	0.013
Not in the labour force						
Has a job	0.045	0.032	0.047	0.026	0.006	0.016
Wants a job	0.044**	0.021	0.048**	0.023	0.036	0.023
Does not want a job	0.003	0.026	0.030	0.023	0.032	0.027
Retired	0.010	0.024	0.025*	0.021	0.048*	0.028
Enrolled in study	0.046	0.048	-0.024	0.027	0.027	0.043
Disability support pensioner	0.074***	0.025	0.062**	0.026	0.015	0.015
Low-income household (lowest 20%)	0.124**	0.060	0.105**	0.041	0.034	0.034
Third year						
Full-time employed	-0.161	0.067	-0.150	0.044	-0.044	0.045
Part-time employed	-0.004	0.065	-0.012	0.039	-0.043	0.038
Employed	-0.164***	0.057	-0.162***	0.047	-0.087**	0.038
Unemployed	0.025	0.022	0.012	0.014	0.018	0.020
Not in the labour force						
Has a job	0.021	0.029	0.037	0.023	0.016	0.020
Wants a job	0.065	0.023	-0.002	0.001	0.022	0.020

Year after onset	No post-school qualification		VET		Higher education	
	ATET	s.e.	ATET	s.e.	ATET	s.e.
Does not want a job	0.051	0.035	0.095**	0.035	0.015	0.022
Retired	0.001	0.027	0.020	0.021	0.014	0.019
Enrolled in study	0.028	0.045	0.057*	0.032	0.096**	0.049
Disability support pensioner	0.098***	0.029	0.083***	0.029	0.029	0.019
Low-income household (lowest 20%)	0.115*	0.062	0.158***	0.044	0.018	0.028

Notes: We do not estimate effects on outcomes, such as wages, that are only estimated for those who remain in employment after onset because the small number of observations involved leads to highly imprecise estimates.
 *** significant at 1%, ** significant at 5%, * significant at 10%.

The patterns of impacts over time for the three-period disability spell (table D2) are consistent with the patterns for at least a two-period spell of disability (table D1). In particular, we can confirm that the evidence of recovery in employment rates for people with VET qualifications in the third year (relative to the second year) is found in both sets of results. This suggests that the faster rate of recovery relative to those without qualifications is not related to differences in the rates of disability persistence into the third year.

Appendix E: Technical discussion

The prime motivation for adopting a propensity score matching approach is to deal with self-selection into VET and disability onset. Self-selection occurs when there is non-random selection into control and treatment groups, so that differences in outcomes between the groups are not solely due to the effect of the treatment, but also due to differences in the characteristics of the group members. Without taking into account self-selection, differences in outcomes between these groups would not only reflect the effect of completing a VET course, but also the pre-existing labour market advantage of those who complete a VET course.

Matching attempts to deal with self-selection by reproducing the treatment group among the non-treated and in doing so, re-establish the experimental conditions in a non-experimental setting. However, matching relies on there being sufficient richness in the data to be able to control for all relevant group differences.

Matching methods have a long history in non-experimental evaluation (see Heckman, Ichimura, & Todd 1977; Rosenbaum & Rubin 1985; Rubin 1979). The aim of matching is simple: to line up comparison individuals according to sufficient observable factors to remove systematic differences in the evaluation outcome between the treated and non-treated. Multiple regression is a simple linear example of matching. For this ‘selection on observables’ approach, a clear understanding of the determinants of assignment rule on which the matching is based is essential. The measurement of returns from education, where scores from prior ability tests are available in birth cohort studies, is a good example. As we document below, matching methods have been extensively refined and their properties examined in the recent evaluation literature and they are now a part of the evaluation toolbox. Lalonde (1986) and Heckman, Ichimura, and Todd (1998) demonstrate that experimental data can help in evaluating the choice of matching variables.

In this study, we are interested in the effect of completing a VET course for those who have done so and similarly the impact of disability onset among those who have experienced onset. Thus, we are interested in computing the average treatment effect on the treated (ATET). To identify ATET, matching assumes that the set of observables, X , contains all the information about the potential outcome in the absence of treatment, y^0 , which was available to the individual at the point of deciding whether to become treated, d . This means that the econometrician has all the relevant information, namely, the information that simultaneously characterises the participation rule and the non-treated outcome. This is the Conditional Independence Assumption (CIA) and can be formally stated as follows

$$y_i^0 \perp d_i \mid X_i. \quad (1)$$

Since all the information that simultaneously characterises y^0 and d is in X , conditioning on X makes the non-treated outcomes independent from the participation status. Thus, treated and non-treated sharing the same observable characteristics, X , draw from the non-treated outcome, y^0 , from the same distribution.

The implication (1) is that treated and non-treated individuals are comparable in relation to the treated outcome, y^1 conditional on X . Thus, for each treated observation (y^1) we can look for a non-treated (set of) observation(s) (y^0) with the same X -realisation and be certain that such y^0 is a good predictor of the unobserved counterfactual.

Thus, matching is explicitly a process of rebuilding an experimental dataset. Its ability to do so, however, depends on the availability of the counterfactual. That is, we need to ensure that each treated observation can be reproduced among the non-treated. This is only possible if the observables X do not predict participation exactly, leaving some room for unobserved factors to influence the treatment status. This is a second matching assumption, required to ensure the region of X represented among the participants is also presented among the non-participants. Formally, it can be stated as follows:

$$P[d_i = 1 | X_i] < 1. \quad (1)$$

Given assumptions (1) and (2), we can now define the matching estimator. Let S represent the subspace of the distribution of X that is both represented among the treated and the control groups. S is known as the common support of X . Under (2), S is the whole domain of X represented among the treated. The ATET over the common support S is

$$\alpha^{ATT}(S) = E[y^1 - y^0 | d = 1, X \in S] \quad (2)$$

where $F_{X|d}$ is the cumulative distribution of X conditional on d and $\alpha^{ATT}(S)$ is the mean of impact on participants with observable characteristics X in S . It is obtained by averaging over S the difference in outcomes among the treated and non-treated with equal X – characteristics using the empirical weights of the distribution of X among the treated. Formally, the matching estimator of the ATET is:

$$\hat{\alpha}^M = \sum_{i \in T} \left\{ y_i - \sum_{j \in C} \tilde{w}_{ij} y_j \right\} w_i \quad (3)$$

where T and C represent the treatment and comparison groups respectively, \tilde{w}_{ij} is the weight placed on comparison observation j for the treated individual i and w_i accounts for the reweighting that reconstructs the outcome distribution for the treated sample.

The choice of the appropriate matching variables, X , is a delicate issue. Too much information and the overlapping support assumption will not hold. Too little and the CIA will not hold. With the wrong sort of information neither of the two assumptions will hold. So what is the right balance?

The appropriate matching variables are those describing the information available of assignment and simultaneously explaining the outcome of interest. Only this set of variables ensures that the CIA holds. However, the same is not necessarily true for the overlapping support assumption. It will not hold when participation is determined with a certainty within some regions of the support of X . In this case matching will identify a different parameter, namely, the average impact over the region of common support. Typically, but not necessarily, individuals gaining the most and the least from treatment will be excluded from the analysis.

However, it is rarely clear what sort of information is in the information set at assignment. What is clear is that matching variables should be determined before the time of assignment and not after, as this could compromise the CIA by having matching variables affected by the treatment status itself.

Propensity score matching

A serious limitation to the implementation of matching is the dimensionality of the space of the matching variables, X . Even if all variables are discrete with a finite domain, the dimensionality of the combined space increases exponentially with the number of variables in X , making it virtually

impossible to find a match for each observation within a finite (even if large) sample when more than a few variables are being controlled for.

A popular alternative is to match on a function of X . This is usually carried out on the probability of participation, given the set of characteristics X . Let $P(X)$ be such probability, known as the ‘propensity score’. It is defined as

$$P(X) = P(d = 1 | X) \quad (4)$$

The use of $P(X)$ has been motivated by Rosenbaum and Rubin’s results on the balancing property of the propensity score (1984). The authors have shown that if the CIA is valid for X , it is also valid for $P(X)$:

$$y_i^0 \perp d_i | X_i \Rightarrow y_i^0 \perp d_i | P(X_i) \quad (5)$$

The balancing property of the propensity score implies that, if $P(X)$ is known, it can be used to replace X in the matching procedure. Knowledge of $P(X)$ reduces the matching problem to a single dimension, thus simplifying the matching procedure significantly.

However, $P(X)$ is not known in concrete applications and needs to be estimated. Whether the overall estimation process is indeed simplified and the computing time reduced depends on what is assumed about $P(X)$. The popular procedure amounts to employing a parametric specification for $P(X)$, usually in the form of a logit or probit, or linear probability model. This solves the dimensionality problem but relies on parametric assumptions. In this study, we use a probit function to estimate the propensity score of completing VET and experiencing disability onset.

When using propensity score matching, the comparison group for each treated individual is chosen with a predefined criteria (established in terms of a predefined metric) of proximity between the propensity scores of the treated and controls. Having defined a neighbourhood for each treated observation, the next step is the choice of appropriate weights to associate with the selected set of non-treated observations to each treated observation. Several possibilities are commonly used. In this study, we use the most two commonly weighting methods as follows.

Nearest neighbour matching assigns a weight of one to the closest non-treated observation and zero to all others. In the case of few identical closest observations to the treated observation, each observation will have equal weights, and the sum of the weights is equal to one. Kernel matching defines a neighbourhood for each treated observation and constructs the counterfactual using all control observations within the neighbourhood, not only the closest observation. It assigns a positive weight to all observations within the neighbourhood and a zero weight for those outside. In this study, we use a bi-weighting scheme to determine the weight of each observation in the neighbourhood.



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