Demographic factors influencing the likelihood of success in vocational education and training

Katrina Ball
National Centre for Vocational Education Research

There have been a number of studies and reports in recent years concerned with access to vocational education and training and the under-representation of particular groups in further education (for example ANTA 1996a, 1996b; Butler & Lawrence 1996). In 1996, ANTA set out strategies to improve access and equity in vocational education and training in Equity 2001. In the report ANTA stressed that access and equity are more than providing ‘equal access’ to vocational education and training (ANTA 1996c, p3). Rather, strategies need to be able to deliver training and employment outcomes at least on a par with the community average for members of the identified disadvantaged groups.

In contrast to the number of studies that have provided information about the participation of individual client groups in vocational education and training (NVCER 1996, ANTA 1996b) there has been a dearth of quantitative evidence about the outcomes of individual client groups once they have accessed further education. Parkinson (1995) identified a need for impact studies to monitor the effects of policy decisions on access and equity.

The objective of this study is to provide quantitative evidence on the outcomes of individual client groups whose members have obtained access to the VET system. In addition, the study provides a baseline against which the impending changes to the VET training system can be measured. This will allow an assessment to be made in the future about the impact of the changes to VET delivery on the outcomes of individual client groups that have accessed vocational education and training.

The individual client groups that are identified in the analysis are:
• Aboriginal and Torres Strait Islander peoples
• people with a disability
• people from a non-English speaking background
• people living in rural and remote areas
• the unemployed
• early school leavers
• youth
• women

Methodology

Regression models were formulated to determine the specific effect, if any, of particular demographic characteristics on the probability of success in vocational education and training. The probit analysis model was used in preference to the linear probability model or the logit model. The linear probability model is not suitable because predictions need to be constrained to be non-negative and no greater than one and the least squares method is not, in general, fully efficient (Maddala 1993). The probit model was used in preference to the logit model because an extremely large data sample was used for estimation data sample and so the tails of the distribution are well defined.

Following Maddala (1983) the probit analysis model was specified as:

\[ y_i^* = \beta'x_i + u_i, \]
where $y_i^*$ is the underlying response variable defined by the regression relationship. As $y_i^*$ is unobservable in practice we observe the dummy variable $y$ defined as

$$y = 1 \text{ if } y_i^* > 0$$
$$y = 0 \text{ otherwise, and}$$

$$\text{Prob } (y_i^* = 1) = \text{prob } (u_i > -\beta'x_i)$$
$$= 1 - F(-\beta'x_i),$$

where $F$ is the cumulative normal distribution function.

This model allows hypotheses to be tested about whether a particular demographic variable has any significant effect on the probability of module success or on the probability of module completion, and provides estimates of the direction of the effect. The particular size of the effect, however, cannot be determined from the estimated coefficient per se because the derivative for the probabilities are not equal to $\beta_i$, as in the case of the linear probability model, but are of the form:

$$\frac{d}{dx_i} \Phi(x_i'\beta) = \Phi(x_i'\beta) \beta_i \neq \beta_i.$$

### Data and variables

The analysis was undertaken using the 1996 Australian Vocational Education & Training Management Information Statistical Standard (AVETMISS) data collection, managed by the National Centre for Vocational Education Research. The unit level data was used to model the probability of success in modules, where the data set comprised students that had been assessed in modules as either having 'passed', 'failed' or 'withdrew with a fail recorded'. Because there are some modules that can be completed without formal assessment by satisfactory completion of class hours, the analysis was repeated to determine the factors affecting the probability of completing a module. In this case the entire 1996 national unit level data set was used. A 'completion' of a module was defined to be those students with a recorded result of 'student assessed - passed' or 'no assessment - satisfactory completion of class hours'. A non-completion was defined to be a recorded result of 'withdrew - without failure', 'withdrew - failed', 'student assessed - failed' or 'withdrew - transferred'.

Aggregate data can hide differences that may be occurring in particular vocational areas so the regressions were run for each field of study. The field of study classification describes the course that a student or 'client' is enrolled in and is based on the intended vocational outcome and content. The coding system is based on the DEET Field of Study Classification of Tertiary Education Courses (1990). This paper reports on the analysis undertaken at the broad field of study, or two-digit level.

As the client record data is qualitative in nature, the explanatory variables were all constructed as dummy variables - ie the variable takes on the value of '1' in the presence of a particular demographic characteristic, and takes the value of '0' otherwise. The following demographic explanatory variables were included in the regressions: apprentice; age group 1 — 15 to16 years; age group 2 — 17 to19 years; age group 3 — 20-24 years; highest-school-level-completed year 10 or less; highest-school-level-completed year 11; disabled; metropolitan residence; remote residence; rural residence; male gender; Aboriginal or Torres Strait Islander descent (ATSI); unemployed; and non-English speaking background (NESB). The definitions used in the construction of the explanatory variables are described in table 1.

In situations where the client record information associated with the client's module outcome result did not provide information on the gender of the student, or the language spoken at home, the observation was deleted from the sample. In addition, if the recorded age of the student was less than 15 the observation was deleted from the sample.

As the AVETMISS data collection does not provide information about apprentices or trainees, a proxy variable was constructed to identify students likely to be undertaking apprenticeships. An apprentice was considered to be a student who was employed and enrolled in either stream-
of-study classification 3212 or 3222. Stream-of-study 3212 encompasses courses that are complete trade courses which provide initial education and training for entry to a specific trade. Such vocations require a high degree of skill, usually in a wide range of related activities, performed with minimal direction and supervision. Stream-of-study 3222 encompasses courses that are complete skills courses which provide initial education and training for entry to vocations which are not recognised trades but which require a range of skills at a similar level. Such vocations require a high degree of skill, usually in a wide range of related activities, performed with minimal direction and supervision. According to the AVETMISS classifications, in contrast to operatives, persons in such vocations are competent to carry out a broad range of related tasks.

### Table 1: Construction of explanatory variables

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Abbreviation (tables 3 &amp; 4)</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprentice</td>
<td>Appren</td>
<td>If client is enrolled in stream-of-study 3212 or 3222 and the person is employed than appren = 1; appren = 0, otherwise.</td>
</tr>
<tr>
<td>Age group 1</td>
<td>Agegrp1</td>
<td>If 15 ≤ age of client ≤ 16, then agegrp1 = 1, if age of client ≥ 17 then agegrp1 = 0.</td>
</tr>
<tr>
<td>15-16 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age group 2</td>
<td>Agegrp2</td>
<td>If 17 ≤ age of client ≤ 19, then agegrp2 = 1, if age of client ≥ 20 or 15 ≤ age of client ≤ 16 then agegrp2 = 0.</td>
</tr>
<tr>
<td>17-19 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age group 3</td>
<td>Agegrp3</td>
<td>If 20 ≤ age of client ≤ 24, then agegrp3 = 1, if age of client ≥ 25 or 15 ≤ age of client ≤ 19 then agegrp3 = 0.</td>
</tr>
<tr>
<td>20-24 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest school level completed - year 10 or less</td>
<td>YR10</td>
<td>If highest-school-level of client ≤ 10 then yr 10 = 1, yr 10 = 0, otherwise.</td>
</tr>
<tr>
<td>Highest school level completed - year 11</td>
<td>YR11</td>
<td>If highest-school-level of client = 11 then yr 11 = 1, yr 11 = 0, otherwise.</td>
</tr>
<tr>
<td>Disabled</td>
<td>Disable</td>
<td>If client is disabled (self-assessed) then disable = 1, disable = 0, otherwise.</td>
</tr>
<tr>
<td>Metropolitan residence</td>
<td>Metro</td>
<td>If the postcode of residence of the client is in a metropolitan (non-capital city) area then metro = 1; metro = 0, otherwise.</td>
</tr>
<tr>
<td>Remote residence</td>
<td>Remote</td>
<td>If the postcode of residence of the client is in a remote area then remote = 1; remote = 0, otherwise.</td>
</tr>
<tr>
<td>Rural residence</td>
<td>Rural</td>
<td>If the postcode of residence of the client is in a rural area then rural = 1; rural = 0, otherwise.</td>
</tr>
<tr>
<td>Male</td>
<td>Gender</td>
<td>If the client record reports gender as male then gender = 1; If the client record reports gender as female then gender = 0.</td>
</tr>
<tr>
<td>Aboriginal or Torres Strait Islander descent</td>
<td>ATSI</td>
<td>If client is of Aboriginal and Torres Strait Islander descent (self-assessed) then ATSI = 1, ATSI = 0, otherwise.</td>
</tr>
<tr>
<td>Unemployed</td>
<td>Unemploy</td>
<td>If the client is unemployed then unemploy = 1, unemploy = 0, otherwise.</td>
</tr>
<tr>
<td>Non-english speaking background</td>
<td>NESH</td>
<td>If another language other than english is spoken at home then NESB = 1. If english is the only language spoken at home then NESB = 0.</td>
</tr>
</tbody>
</table>

An advantage of the extensive data set used for estimation is that asymptotic tests can appropriately be used for inference purposes. The Wald test statistic for the null hypothesis is distributed Chi-squared \( (I) \).

\[
\chi^2 = a
\]

Ho: \( \beta i = 0 \sim \chi^2 (I) \).

The null hypotheses for each coefficient will be assessed at the 1 per cent level of significance. The 1 per cent point of \( \chi^2 (I) \) is 6.635 (the 5 per cent point is 3.841).
Results

The results of the probit regressions modelling demographic factors that influence the probability of success in vocational education and training modules in each field of study and the probability of completing modules in each field of study are detailed in tables 2 and 3, respectively. A separate assessment on the outcomes of each individual client group undertaking vocational education and training in 1996 will be made based on the signs of the parameter estimates and the significance, or otherwise, of the Wald test statistic, as shown in tables 2 and 3.

Aboriginal and Torres Strait Islander peoples

People of Aboriginal and Torres Strait Island descent have a significantly poorer chance of successfully 'passing' a module in vocational education and training than other Australians and a significantly poorer chance of successfully completing a module in vocational education and training studies than other Australians. This result held consistently across all field of study classifications in 1996.

Worthy of note are the extremely high Wald statistics associated with the parameter estimates of the 'ATSI' coefficients on the 'TAFE Multi-field education' field of study classification. These high test statistics indicate, with a fair degree of certainty, that the probability of Indigenous Australians succeeding in this field of study is significantly less than the probability of other Australians succeeding in such studies. This is cause for concern as almost 40 per cent of the Aboriginal and Torres Strait Islander student population in VET undertook studies in the 'TAFE Multi-field education' field of study classification in 1996.

People living in rural and remote areas

The results of the analysis suggest that the probability of rural, remote and metropolitan students who have access to vocational education and training successfully passing or completing a module in vocational education and training is as good as that of city students. The location of the student was determined by the postcode of residence.

People with a disability

People who identified themselves as being disabled (comprising a wide range of disabilities such as vision or hearing impaired, physically or intellectually disabled) were less likely to successfully pass or complete a module of vocational education and training than people without a disability. For 'education', 'veterinary science, animal care' and 'TAFE multi-field education' field of study classifications a disability did not affect the probability of success or completion of a module. For all other field of study classifications, the presence of a disability significantly reduced the probability of success or module completion in 1996.

People from a non-English speaking background

The results of the analysis suggest that people from a non-English speaking background perform better in modules that allow 'satisfactory completion of course hours' to be a sufficient requirement for course completion than courses that require a 'pass' to adequately fulfill course requirements. For all field of study classifications people from a non English speaking background had a significantly lower probability of success than people from an English speaking background. However, the probability of module completion was only significantly lower for people from a non English speaking background compared with people from an English speaking background for 'architecture, building', 'business, administration, economics', 'engineering, surveying', 'science' and 'veterinary science, animal care' field of study classifications.

The unemployed

Those students who identified themselves at enrolment in 1996 as being unemployed were less likely to successfully 'pass' a module in vocational education and training and had a significantly poorer chance of successfully completing a module in vocational education and training studies than students who did not classify themselves as being unemployed.
With the exception of the 'veterinary science, animal care' field of study classification in the 'probability of success' regressions reported in table 2, the parameter estimate for the coefficient associated with the unemployment variable was significant, at the 1 per cent level of significance, for all fields of study. The parameter estimate for the coefficient associated with the unemployment variable for the 'veterinary science, animal care' field of study classification was significant at the 5 per cent level of significance.

Early school leavers and youth

Across most field of study classifications early school leavers had a lower chance of successfully 'passing' or completing a module in vocational education and training in 1996 than students who completed year 12.

In general, students aged under 25 during 1996 had a significantly poorer chance of successfully passing or completing a module in vocational education and training than older students.

In particular, students in the age group 17 to 19 years consistently, across all field of study classifications, had a poorer chance of successfully passing or completing a module in a vocational education and training in 1996 than students aged 25 and over. With the exception of 'education' and 'veterinary science, animal care' studies, a student in the age group 20 to 24 years had a lower probability of successfully 'passing' or completing a module than an older student.

Women

The results of the analysis do not suggest that women who accessed vocational education and training had a poorer chance of successfully passing or completing a module in vocational education and training in 1996. Rather, the results of the analysis suggest that those women who accessed vocational education and training in 1996 had a higher probability of successfully passing or completing a module in a vocational education and training than men undertaking similar studies. The probability of successfully passing a module was significantly lower for men, compared to women, in the majority of field of study classifications. There was no significant difference in the probability of success for either gender in 'land and marine resources, animal husbandry' and 'education' field of study classifications. The only field of study classifications where men were more likely to successfully pass a module compared with women were 'architecture, building' and 'law, legal studies' field of study classifications.

Other groups

Apprentices have a higher probability of successfully 'passing' or completing modules in vocational education and training than other students in a number of field of study classification groups. Notably, apprentices had a higher probability of success and completion compared with other students in 'land and marine resources, animal husbandry', 'architecture, building', 'business, administration, economics', 'engineering, surveying', 'veterinary science, animal care', 'services, hospitality, transportation' and 'TAFE multi-field education' field of study classifications.

Conclusions

The results of this study suggest that the outcomes from vocational education and training in 1996 were influenced significantly by demographic factors and that some individual client groups who have accessed vocational education and training did not achieve the same outcomes from their studies as other Australians. In particular in 1996, the probability of success or completion of vocational education and training modules was significantly reduced for people of Aboriginal and Torres Strait Islander descent, people with disabilities, youth, people from a non English speaking background and the unemployed.

Editors Note: Statistical tables referred to may be obtained from the author at NCVER.
References

Australian National Training Authority (ANTA), 1996a, *An approach to achieving access and equity in vocational education and training: issues* Paper April/May.


Butler, E and Lawrence, K 1996, *Access and equity within vocational education and training for people in rural and remote Australia*, summary paper prepared for Australian National Training Authority, University of South Australia, Adelaide.

