Factors influencing completions in Australia's apprenticeship system

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Abstract

A mapping methodology has been employed to data of the national apprentice and trainee collection to identify and quantify key factors that affect apprentices' and trainees' likelihood of successfully completing their contract of training.

By carefully taking account of the expected duration of training contracts, sets of apprenticeship and traineeship commencement records are mapped to sets of completion records. This allows estimation of the proportion of apprenticeships and traineeships likely to result in completions, and the identification of characteristics of individuals and contracts influencing completions in Australia's apprenticeship and traineeship system.

The analysis suggests that the likelihood for completion declined from 1995 to 1997 and then increased again from 1998 to 2000 coinciding with the introduction of New Apprenticeships. It also indicates that contracts with a high completion likelihood are more likely to be full-time contracts, contracts of one to three year duration, contracts in trades occupations, AQF Certificate III contracts, and contracts with government employers. Indigenous people and people with a reported disability appear to have a markedly smaller likelihood of completion than people who respectively did not identify themselves as Indigenous or report a disability.

Introduction

Measuring success in Australia's apprenticeship and traineeship system is one of the most challenging tasks of quantitative VET research. It is a common misconception that the numbers of completions and non-completions in a given year provide information on the proportion of apprentices and trainees who complete (or do not complete) their contract of training. However, contract completions and non-completions relate to *past* training uptake. More importantly, they relate to *different* past training uptake: contract withdrawals or cancellations, on average, occur much earlier with respect to the date of contract commencement than completions.

In order to analyse outcomes, and factors influencing outcomes, it is necessary to take appropriate account of the duration of training contracts. It is this necessity that drove the analysis presented in this paper, and resulted in the development of an analytical framework that allows the identification and quantification of key factors that affect completions of Australian apprenticeships and traineeships.

Methodology

Underlying data

State/Territory training authorities have been reporting all apprenticeship and traineeship activity (occurring after 30 June 1994) to the national apprentice and trainee collection in compliance with the Australian Vocational Education and Training Management Information System Standard (AVETMISS). The national apprentice and trainee collection is collated by the National Centre for Vocational Education Research (NCVER) on behalf of the Australian National Training Authority (ANTA). It contains information on training contracts, their status and the characteristics of individual apprentices, trainees and employers at the unit-record level.

The data from the national apprentice and trainee collection are used in the analysis presented here. More precisely, the analysis is based on information relating to apprenticeships and traineeships that commenced after 30 June 1994 - an estimated 1.08 million commencements and an estimated 416 000 completions. To determine the parameters of the mapping model (as described below), only commencements with expected completion dates before 1 January 2002 and contract completions that occurred prior to 1 January 2002 were analysed. This means parameter determination is based on almost 670 000 commencements and an estimated 350 000 completions.

In determining the model parameters, 31 December 2001 is chosen as a cut-off date to minimise the effect of reporting lags which occur at the time of data collection and which are caused by late lodgements of training contracts, delays in contract data processing and others. Reporting lags are further minimised by employing the reporting lag estimation model as endorsed by the National Training Statistics Committee (NTSC) in March 2001.

Mapping commencements to completions

The national apprentice and trainee data collection is not a longitudinal database. Every quarter *all* unit records get updated, no matter whether a training event (such as a contract commencement, cancellation or completion) has taken place recently or dates back five or more years. This practice leads to modifications of original unit-record information over time (such as contract identifiers, effective dates etc.) and makes it difficult (and, for training activity referring to 1994-1996, virtually impossible) to find, at the unit-record level, accurate matches between records describing training uptake ('commencements' and 'recommencements') and those describing outcomes ('completions', 'withdrawals', 'cancellations', 'expiries').

The expected duration of apprenticeships or traineeships (i.e. the duration of contracts at sign-up) also varies greatly, from less than one year to over four years. Taking into account reporting lags of up to 24 months, one therefore has to wait at least six years from the date of contract commencement to make reliable and accurate statements about outcomes at the unit-record level. This means that, even though the national data collection is now in its ninth year, unit-record level outcome analyses could, at best, provide information for apprentices and trainees who commenced their training before 1 January 1997.

In the analysis presented here a different approach is taken. Instead of matching contract commencements and contract outcomes at the unit-record level, the completion likelihood of a given apprentice and trainee cohort is estimated. The completion likelihood is determined by counting all completions in the cohort characterised by occupational group, qualification, full-time status, actual duration and commencement quarter and dividing this sum by the sum of commencements with the same characteristics. However while completions of a cohort are characterised by the *actual* duration of training, cohort commencements are characterised by the *expected* duration.

For instance, there were about 42 000 full-time AQF III contracts commencements in trades occupations with *expected* training duration of more than three years, commencement dates in the March quarters of 1995, 1996, 1997 and 1998, and *expected* completion date before 1 January 2002. For the same contract type (full-time, AQF III, trades occupations, commencement date in the March quarters of 1995, 1996, 1997 and 1998, and *actual* training duration of more than three years and *actual* completion date before 1 January 2002) 25 200 completions could be identified. The completion likelihood for the cohort in this example is therefore given by 25 200 / 42 000 = 59.9%.

Overall, 16 different contract types (characterised by occupational group, qualification and full-time status), nine duration categories and four commencement quarters are distinguished. The resulting 16×9×4=576 parameters are used to predict completions likely to occur after 31 December 2001, by 1) multiplying the number of commencements in a given cohort with the cohort completion likelihood; and 2) taking the expected completion date of the commencement record as effective date for the predicted completion.

Validating basic assumptions

The two major assumptions of the mapping model are as follows:

1. Contract type and duration determine completion likelihood, independent of *when* a contract actually commences. This means that one of the basic assumptions is that, for instance, a part-time AQF II contract of one to two year duration in clerical occupations starting on 24 May *1995* has the same completion likelihood as a part-time AQF II contract of one to two year duration in clerical occupations starting on 12 April *2001*.

2. If a contract results in a successful completion then the completion date is approximately the same as the date of expected completion as set out at contract commencement.

Analysis based on a sample of over 342 000 commencement records[1] for which, at the unit-record level, a completion record could be found, indicates that for over 96% of contracts the real completion date indeed coincides *exactly* with the expected completion date. For an additional 2% of contracts real completion date and expected completion date differ by one day to at most one month.

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[1] It should be noted that this sample of commencements was extracted from a special subset of total commencements characterised by contracts of people who enter Australia's apprenticeship and traineeship system *only once*. These contracts comprise slightly more than three-quarters of all commencements. *Source: National apprentice and trainee data collection (December 2002).*

This agreement of expected and real completion dates is also reflected in the number of completions predicted from commencements by applying the described mapping model (Figure 1). Predictions are very close to actual numbers of completion (Figure 2), differing from actual values by at most 8%. This suggests that completion predictions based on employing the mapping model are associated with standard errors of about 5%.

Figure 1: Actual and predicted number of completions for all apprentices and trainees, September quarter 1994 to March quarter 2000

All apprentices and trainees
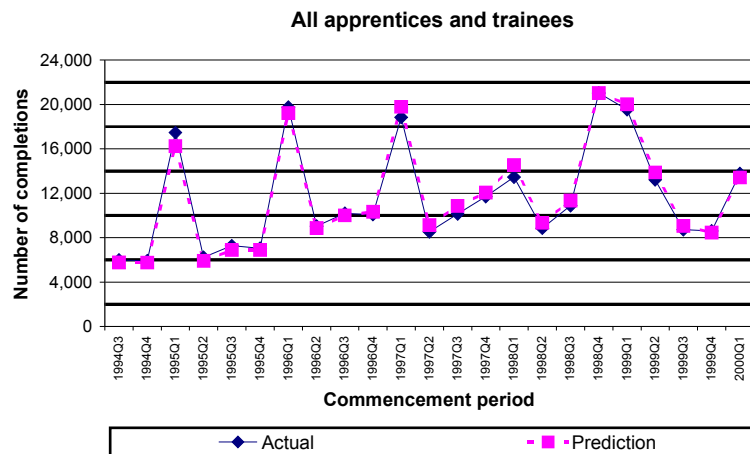
Source: National apprentice and trainee data collection (June 2002)

Figure 2: Difference (in per cent) between actual and predicted numbers of completion for all apprentices and trainees in Australia, September quarter 1994 to March quarter 2000

All apprentices and trainees
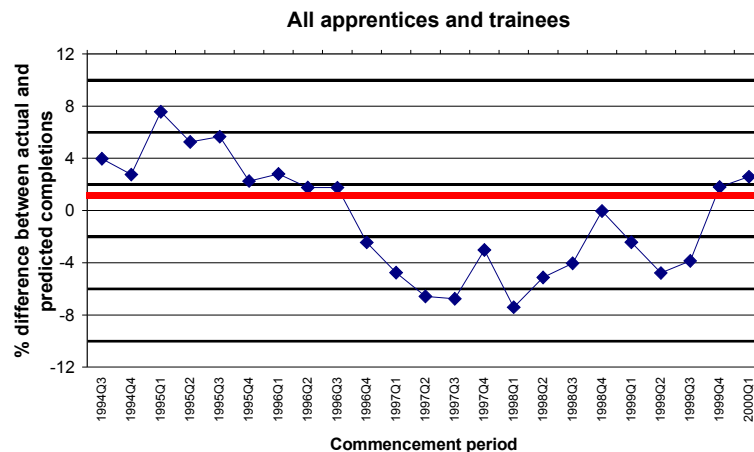
Source: National apprentice and trainee data collection (June 2002)

The first assumption of the mapping model (ie. the time-independence of model parameters) is harder to validate. However, the 5% accuracy of completion predictions (Figure 2) suggests justification of time-independence. It should be noted that the validity of the time-independence assumption is not essential for identifying factors influencing completions in Australia's apprenticeship and traineeship system.

Factors influencing completions in Australia's apprenticeship

To give an example: The mapping model tends to under-predict the number of completions for apprenticeships and traineeship that commenced after 1996 but tends to over-predict the number of completions with commencement dates in 1994, 1995 and 1996. This indicates that 'something happened' at the end of 1996 that had an overall negative effect on outcomes in Australia's apprenticeship and traineeship system. From 1998 onwards, outcomes appear to have improved (refer to discussion in the next Chapter).

Factors that influence outcomes

In order to identify factors that influence outcomes in Australia's apprenticeship and traineeship system, the data sets created by employing the described mapping methodology are used in the following ways:

1. In particular for contracts characterised by occupational group, qualification, full-time/part-time status and expected duration of training (i.e. the characteristics used as parameters in the model), the proportion of contract commencements that result (or are likely to result) in successful completions can be analysed. A large value for this *completion likelihood* identifies contracts that are more likely to result in completions than contracts with a small value for this proportion.

    It should be emphasised that *completion likelihood does not equal completion rate*. In Australia about one-fifth to one-quarter of apprenticeships or traineeships are undertaken by people re-entering the system, ie. people who change employers and/or occupation; progress into apprenticeships or traineeships at a higher qualification level; or recommence for other reasons. It would therefore be wrong to conclude from a completion likelihood of *x*% that *x*% of apprentices or trainees complete their training.

    The absolute value of completion likelihood can also be misleading for other reasons. There is evidence that some completions are not and will never be reported to the national apprentice and trainee data collection ('under-reporting of completions'). Also, a number of withdrawals and cancellations (ie. 'non-completions') reported to the national apprentice data collection are merely the result of transactions, ie. reporting practices used when reactivating contracts after longer periods of suspension or when coding changes to employer characteristics (for instance, after company mergers), etc. Transactions are administrative in nature and have nothing to do with training outcomes. However, they affect the absolute value of completion likelihood.

    While presenting absolute values of completion likelihood may encourage misinterpretations, the completion likelihood is still a useful measure in analysing factors that influence completions in Australia's apprenticeship and traineeship system. There is little evidence for under-reporting of completions or transaction practises occurring predominantly for particular subgroups of Australia's apprenticeships and traineeships. This means that the difference between two completion likelihoods, eg. those relating respectively to males and females, is actually expected to be an accurate quantitative measure for comparing outcomes.

2. In particular for characteristics associated with small commencement numbers (eg. Indigenous status, disability), one can compare the actual number of completions (as reported to the national data collection) with that estimated by employing the mapping model (ie. by calculating completions from commencements). If for a

given characteristic (such as age or disability of apprentices or trainees) there occurs, over a long period of time, a significant difference between model predictions and actual completions then a characteristic (other than occupation, qualification, full-time status and duration) has been identified that is likely to affect successful outcomes.

Findings and discussion

Trends in completion likelihood

In the three years leading up to the introduction of New Apprenticeships (1995 to 1997), the completion likelihood of apprenticeships and traineeships declined markedly by nine percentage points (Table 1). Analysis on data of the national apprentice and trainee collection suggests that this drop was caused by the rapid growth of apprenticeships and traineeships in non-trades occupations, which have a lower completion likelihood than trades occupations (see next Section).

After the introduction of New Apprenticeships on 1 January 1998 the proportion of non-trades apprenticeships continued to grow. In addition, the proportion of part-time contracts (associated with very low completion likelihood, see next Section) increased markedly, from 6% in 1997 to 22% in 2000.

One would therefore expect that the completion likelihood for contracts commencing after 1997 drops even further. However, the opposite is the case, and the overall completion likelihood increased by 4 to 6 percentage points from 1997 to 2000.

Table 1: Difference (in percentage points) between the overall completion likelihood in a given year of contract commencement and the overall completion likelihood for contracts that commenced 1997

Year of training contract commencement	1995	1996	1997	1998	1999	2000	2001
Estimated increase of completion likelihood over 1997 completion likelihood value (percentage points)	+9	+5	Reference point: 0	0 to +1	+1 to +2	+4 to +6	+1 to +4

Source: National apprentice and trainee data collection (June 2002)

Contract characteristics that influence completions

Table 2 shows, for apprenticeships and traineeships that commenced in 2000, the difference (in percentage points) between the completion likelihood for various contract types and the overall completion likelihood in 2000. It is found that:

➢ Full-time training contracts are much more likely to result in completion than part-time contracts. The difference in completion likelihood between full-time and part-time contracts is expected to be as large as 20 percentage points.

➢ Apprenticeships and traineeships undertaken in the government sector are about 12 percentage points more likely to result in a successful outcome than those in the private sector.

➢ In trades occupations, training contracts had a completion likelihood about seven percentage points larger than in non-trades occupations.

➢ Similarly, AQF III apprenticeships and traineeships who undertake AQF III training contracts are 12 percentage points more likely to end successfully than AQF II apprenticeships and traineeships.

➢ Contracts that are too long or too short have a smaller completion likelihood than contracts of one to three years duration.

Table 2: Difference (in percentage points) between completion likelihood for various contract types and overall completion likelihood for training contracts that commenced in 2000

Contract characteristic	Difference to overall completion likelihood in 2000 (percentage points)
Full-time/part-time status	
Full-time	+2 to +6
Part-time	-17 to -13
Occupational group	
Trades	+2 to +10
Other (non-trades)	-3 to 0
Qualification	
AQF Certificate II	-9 to -6
AQF Certificate III	+2 to +7
AQF Certificate IV	-6 to +3
Expected contract duration	
Up to one year	-4 to -2
More than one and up to three years	+6 to +13
Over three years	-6 to +1
Employer type	
Private sector	-3 to +1
Government sector	+8 to +17
Group Training Companies	-1 to +4

Source: National apprentice and trainee data collection (June 2002)

Characteristics of individuals that influence completions

Sex: The completion likelihood for females is about the same as that for males. However, one would expect that females show slightly lower completion likelihood than males, because females are more likely than males to undertake apprenticeships or traineeships at AQF II level, ie contracts associated with low completion likelihood (Table 2). Thus it is actually males who do not meet outcome expectations, in particular when undertaking short apprenticeships or traineeships (ie. contracts of up to one year duration, Figure 3).

Figure 3: Difference (in per cent) between actual and predicted numbers of completion for male and female apprentices and trainees undertaking training contracts of up to one year duration, September quarter 1994 to March quarter 2000
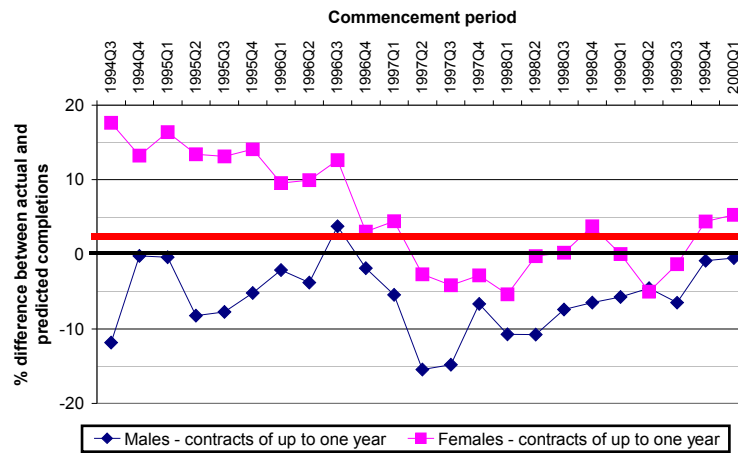
Source: National apprentice and trainee data collection (June 2002)

<u>Age</u>: The age of an apprentice or trainee appears to have some effect on the successful outcome of a training contract. Young apprentices and trainees (of age up to 19 years) are slightly less likely to complete than older apprentices and trainees, in particular those older than 34 years. The slight difference in the performance of young apprentices and trainees can mainly be attributed to the outcomes of medium-term contracts (ie. contracts of more than one year and up to three years duration, Figure 4).

Figure 4: Difference (in per cent) between actual and predicted numbers of completion for apprentices and trainees aged 19 years and younger, and over 19 years of age, who are in contracts of over one and up to three years duration, September quarter 1994 to March quarter 2000
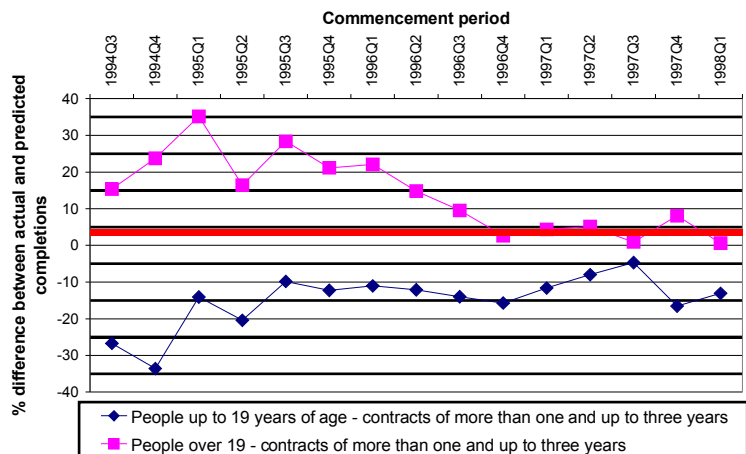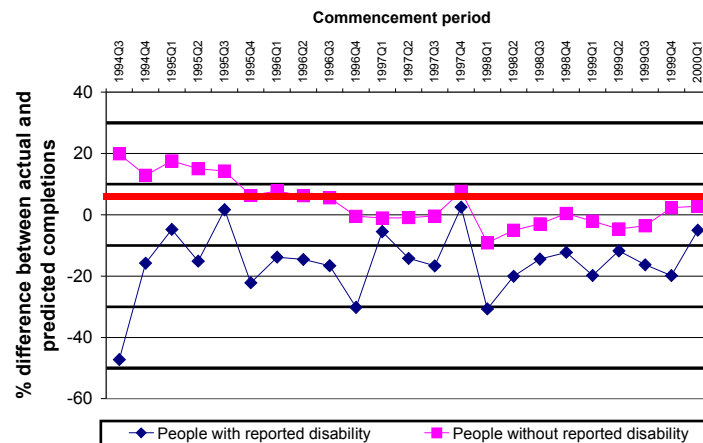

Source: National apprentice and trainee data collection (June 2002)

<u>Disability</u>: Numbers of apprentices and trainees with a reported disability are fairly low. Therefore results of statistical analyses based on these small numbers are associated with large errors.

Factors influencing completions in Australia's apprenticeship system

Nevertheless, analysis of the data suggests that apprentices and trainees who reported a disability seem less likely to complete than apprentices and trainees without a disability (Figure 5). The discrepancy between predicted and actual numbers of completion is particularly large for disabled apprentices and trainees who undertake training of relatively short duration (training contracts of up to two years duration).

Figure 5: Difference (in per cent) between actual and predicted numbers of completion for apprentices and trainees with and without reported disability, September quarter 1994 to March quarter 2000

Source: National apprentice and trainee data collection (June 2002)

Indigenous status: Numbers of apprentices and trainees of Indigenous origin are fairly low. Therefore results of statistical analyses based on these small numbers are associated with large errors.

Figure 6: Difference (in per cent) between actual and predicted numbers of completion for apprentices and trainees of indigenous and non-Indigenous origins, September quarter 1994 to March quarter 2000
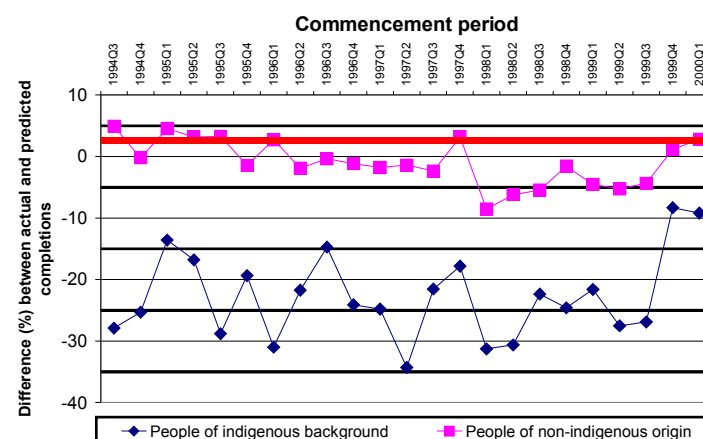
Source: National apprentice and trainee data collection (June 2002)

However, analysis of the data indicates that apprentices and trainees who reported they are of Indigenous origin seem much less likely to complete their contract of training than apprentice and trainees from non-Indigenous background (Figure 6).

Conclusions

Benefits of analytical framework

The analytical framework introduced in this paper and used in identifying factors that influence completions in Australia's apprenticeship and traineeship system has a number of advantages:

1. It is derived from the apprenticeship and traineeship population and therefore is not subject to sampling errors.

2. It accounts for the great variations in the duration of apprenticeships and traineeships. One of its main assumption, namely approximating the real completion date of a potential successful completion by the expected completion date as set out at contract commencement, has been validated, at the unit-record level, for a large subset of the national apprentice and trainee database.

3. The completion likelihood is a powerful measure when comparing outcomes of various apprenticeship and traineeship cohorts, and provides the means for identifying and quantifying factors that affect completions.

4. It has predictive power and thus provides the means to analyse potential outcomes for apprentices and trainees who are still in training.

Future research projects

The analysis presented in this paper provides some insight into factors that influence completions in Australia's apprenticeship and traineeship system. However, it does not explain the reasons for varying completion likelihoods. From a statistical point of view, the next step in gaining deeper understanding of variations in completion likelihood is to identify correlations (and possible causalities) among factors such as full-time status, qualification, occupation and employer type.

Completion likelihood does not equal completion rate. However, mapping commencements to completions is essential in any methodology that aims at determining completion rates. This means that the concept of completion likelihood can be used when determining completion rates. NCVER is currently undertaking research into apprentices and trainees who enter Australia's apprenticeship and traineeship system more than once. Also a methodology paper on completion rates is being prepared to clarify issues that relate to completion rate definitions, as well as methodologies and approximations used to determine completion rate values.

The analytical framework can also be used as a completion forecast tool. Improvements in accuracy of completion forecasts can be achieved by taking into account a larger set of characteristics, such as employer type, when determining model parameters. Enhancing the accuracy of completion forecasts, in particular at state/territory level, will potentially result in an analytical framework superior to current models used for estimating lags in the number of reported completions.