NCVER

The economics of apprenticeships and traineeships

TOM KARMEL AND JOHN RICE

Report 4

ISBN PDF 978-0-642-78013-3

ISBN RTF 978-0-642-78014-0

Some preliminary data has been used in this publication and is subject to further checking once final data is released in forthcoming NCVER publications. Should errors arise NCVER will update and replace this version.

For best results print in colour.

NCVER ref: DMS# 99132

January 2011

Contents

Tables and figures

Introduction[1]

This report has a rather grandiose title, which might well give the impression that it will cover everything of an economic nature related to apprenticeships and traineeships. Its aim is a little more modest. Its intention is to bring together some of the more important economic considerations: some theory; evidence on costs and benefits; and sustainability, by which we mean whether there are issues that might impact on the long-term future of the apprenticeship and traineeship system.

We divide the report into three sections.

The first looks at apprenticeships and traineeships from a theoretical perspective: to look at the economic theory that lies behind them and to discuss the nature of the benefits they bring to individuals, employers and industry more broadly, and the community at large.

The second brings together some data on the costs and benefits of apprenticeships and traineeships. This focuses on the individual apprentice or trainee, employers and also includes a little data focused on the community dimension. It reports on some new data on the cost of traineeships to complement some earlier work undertaken by Nechvoglod, Karmel and Saunders (2009).

The third looks at sustainability. Here we focus on two long-term issues: whether the relationship between the economic cycle and the apprenticeship and traineeship system poses particular issues; and whether there are any long-term structural issues of which we should be aware. In relation to the latter we look at two aspects. First, based on historical experience we consider whether the output of the apprenticeship and traineeship system is likely to be a constraint on the economy in the medium to longer term. Second, we consider long-term trends within the education and training system itself. The higher education sector has being growing faster than the vocational education sector and we wonder whether the push to expand higher education will have unintended negative consequences for the apprenticeship and traineeship system. Our conclusion is that we have escaped the recent downturn relatively unscathed and there are no compelling reasons to be concerned about the medium-term labour supply of the trades in particular.

We end with some final observations on what might be the focus for government investment, based on our understanding of which parts of the system are working well and which parts are not. In brief, we argue that there is lack of clarity on whether the apprenticeship and traineeship system is concerned with skills acquisition or with assisting disadvantaged groups into employment. Parts of the system are working reasonably well but the level of skills acquisition is poor in some occupations. There is little reason to think that the apprenticeship and traineeship system should have a monopoly on training—there are ways of complementing the system with other options.

In thinking about any changes to the system, it is worth noting that there are four important elements to the model: it enables access to training wages; it has (or should have) a skills acquisition element; the off-the-job training element is government-subsidised; and apprenticeships and traineeships attract government benefits. Therefore in relation to a particular

[1] The authors would like to thank Kostas Mavromaras and the Australian Treasury for constructive and useful comments on a draft.

apprenticeship or traineeship (that is, occupation, whether it is a new worker or an existing worker and whether it is full-time or part-time), it is worth asking whether each of these elements makes sense.

We suggest four ideas to think about:

- ✧ In occupations where the apprenticeship/traineeship model has a near monopoly in entry-level training, reduce the risk of having an inadequate labour supply by supplementing the model with an institution-based one, perhaps with some sort of provisional qualification that is completed with work experience.
- ✧ Look at the possibility of abandoning the model in occupations where it is clearly not working. In these cases, an apprenticeship or traineeship would be replaced by an institutional path.
- ✧ Question the merits of having traineeships for existing workers and part-time workers. Many of these seem to be about reducing wage costs to employers and getting a government subsidy rather than skills acquisition. On-the-job training will provide the necessary skills for most of these workers.
- ✧ Being clear about which policies are concerned with skills acquisition and which are concerned with assisting entry into the labour market. Perhaps government incentives should go to individuals rather than occupations.

Some theoretical considerations

Apprenticeships are one of the most enduring forms of training. Their roots lie in the times of the Roman Empire, and they became increasingly popular in the Middle Ages in Europe. They are one of the few social structures of medieval times that are still observable today. Originally, a master tradesman employed an apprentice at a minimal or no wage, with that apprentice expected to undertake work for his master. Importantly, a psychological contract (a set of values and informal obligations) existed that suggested that in exchange for lower or no wages, the apprentice would receive training and support in the development of valuable skills, and at the completion of the apprenticeship some formal and valuable recognition of the apprentice's skills would exist, allowing them to practise their learned trade.

An enduring element of the apprenticeship model since its inception is this sense of mutual obligation that extends beyond the 'usual' employer–employee transactional relationship. For example, the apprentice receives enculturation into the values of the trade, learns valuable behavioural norms necessary for participation in an industry, receives transferable (general) as well as firm-specific skills, and within the supervisory relationship receives both a transfer of practical knowledge and skills and also (perhaps ideally) some element of pastoral guidance and care.

An important part of the implicit contract that supports training, discussed above, is the eventual earnings premium that flows to the qualified apprentice after the completion of his or her training. The qualification that marks the completion of the period of training should thus have some tangible and enduring value for the apprentice. Part of the value of completion of an apprenticeship flows directly from the skills acquired. In addition, apprenticeships may operate to restrict supply by imposing a barrier to entry into the occupation and therefore increase wages. This is one reason why unions are generally in favour of apprenticeships.

This nexus between wage sacrifices during training and concomitant wages premium post-training has come under question in recent years. Within the licensed trades, where this equation was once most observable, the deregulation of the centralised wage-fixation system and the reduction of occupational demarcations within organisations have tended to reduce the occupational premia for licensed tradespersons over their working lives. For some licensed trades, this premium has always been low, and recent research within NCVER (Karmel & Mlotkowski 2010) suggests that it is the absence of this premium that tends to reduce apprenticeship completions.

Some essential elements of the traditional apprenticeships model endure in Australia, and yet the Australian system of apprenticeships has seen much change in recent decades. Principal among these changes was the introduction of traineeships in the 1980s. The traditional apprenticeship model (to some degree) was extended to non-trade occupations under the banner of 'traineeships'. As the skill requirements were usually much less than in traditional trades the duration of the training contract for traineeships was much less—six months to two years but typically a year—and the level of training was lower, usually the equivalent of AQF certificate II (although certificate III has become dominant in recent years). In other respects traineeships operated in much the same way as traditional apprenticeships, including government funding for the off-the-job training and wages set lower than the award—even for older adults undertaking this form of training.

As the Australian economy has grown and changed since the Second World War, the traditional trades have remained relatively static in terms of employment share, while the service industries, and especially professional roles, have increased in prevalence. This strong trend has changed the demand for training in the traditional trades and in the service sector.

The number of traineeships (generally for service-sector jobs) was slow to grow until the Australian Government introduced incentive payments to employers of trainees in the 1990s. Many have observed that the wage discounts and employer subsidies created a form of dual labour markets for young, unskilled and unemployed persons—in which those eligible for subsidy find employment in traineeships where they otherwise would not in the wider labour market. This pattern tends to be far less observed in the traditional apprenticeships, where course duration is longer and, at least towards the latter stages of the apprenticeship, wages tend to exceed the mandated minima.

A model of training

Gary Becker, a Nobel laureate in economics, was one of the first to propose a dualism in the nature of training between general skills formation (which are understood to be transferable between firms) and firm-specific skills formation. Traditionally, the skills garnered in an apprenticeship are understood to be general in nature, leading to a capacity to operate as a qualified tradesperson in a variety of organisational settings. Becker suggested that, in the presence of efficient labour markets, the cost of general training (training of relevance to many firms) will be met by the employee, as the employee receiving such training will be the full residual claimant of the returns, through higher wages, from these skills.

Becker's (1964) analysis suggested two investors in the training process relevant for apprenticeships (which are considered to be general in nature), with the costs of training balanced by the apprentice (in the form of a discounted training wage) and the employer (in the form of a variety of training costs, and higher wastage). Hence in Becker's model, the cost of general skills formation was met by the employee, and the cost of firm-specific skills formation was met by the employer. In an economic sense, the two main actors—the employer and the apprentice—are acting rationally, in that each accrues costs and benefits from the form and mode of the apprenticeship model. The employer balances the cost of supervision against the benefits from the presence of increasingly skilled labour over the duration of the training contract or indenture.

Becker's stylised model used a two-period approach, where workers receive training during a non-productive period and then move to a productive period while using the new skills. In practice, the two phases overlap to a great degree during apprenticeships. The apprentice subsidises the employer's supervision and training costs through an acceptance of lower earnings in the training phase, with compensation for higher earnings after completion of the trade qualification. In terms of productivity, this generally starts low during the early stages of an apprenticeship, and increases, such that towards the end of the training duration, apprentice productivity generally equates to other skilled workers.

Becker's model assumes efficient and frictionless labour markets, where employees are paid the marginal value of their labour. As such, trainees are able to rationally assess the net present value of future earnings premia flowing from the accumulation of general skills during apprenticeships, and finance this through either lower training-period earnings or through borrowing. In reality, many of these assumptions do not hold in practice.

Acemoglu and Pischke (2000) noted a variety of drivers of labour market inefficiency relating to investments in training. Primary among these are transaction costs in the labour market, some borne by employers and others by employees. As turnover costs are shared by both parties

(related to both job/worker search and matching), avoiding turnover creates a 'match-specific surplus' that may be shared by both parties—perhaps in the form of higher employee earnings and employer rents, or (perhaps less commonly) in the investment in general training by the employer.

Information asymmetries, between employers, employees and indeed other firms are also evident. These tend to compress earnings as they generally favour the current employer, who has more complete information regarding their employees (Leuven 2005). Furthermore, there are complementarities between general and specific skills that may make investment in general skills necessary and profitable for firms. The existence of friction in the labour market also may make it worthwhile for firms to invest in general training (because there is a cost to the employee to changing employers). Firms may seek to establish an optimal mix of the general and specific skills of most relevance to their productive and operational needs. Also, as firms engage in complex value chains and partnerships, the need for industry-specific skills is increasing.

The duration of the apprenticeship arrangements (generally lasting for four years, combining productive work, workplace training and off-site training) provides some certainty within which the two parties may assess the economics of the arrangement from their respective points of view. During this time, the apprentices' productivities gradually increase, and the employers' costs (relating to training and supervision) fall. Proposals to move from a time-based system to a competency-based arrangement may cause some fundamental changes in the nature of the economics of the training arrangement from the perspective of the two parties, perhaps creating an adversarial relationship.

Generally, these changes would favour the apprentice, at the expense of the training firm, as they would increase the opportunity for the apprentice to establish themselves as qualified early. For highly competent apprentices, this would tend to reduce the duration of their semi-skilled and skilled work contribution towards the end of their training contract, reducing the period during which employers can derive rents from the skilled labour provided at a reduced level of earnings.

Becker's simple model of training does not cover the role of government. Economists who argue the virtue of markets as an efficient way of allocating resources typically point to three reasons why there is a role for government. These are:

- *Externalities*: benefits that extend more broadly than the individual concerned. An obvious example is that a skilled worker is likely to increase the productivity of fellow workers.
- *Imperfect information*: markets do not work optimally if all actors do not have access to all the necessary information about the market. This is a particular issue for training markets, in which the nature of the service provided is relatively intangible.
- *Imperfect capital markets*: these occur because it is very difficult to borrow to invest in human capital (primarily because we no longer have slavery). This is relevant to apprentices and trainees because of the existence of training wages.

These three factors imply that an apprenticeship and traineeship system with no government support would provide less than the optimal level of training. There is an additional argument for government support—a social equity argument along the lines that in a civil society each individual should be entitled to support for initial education. Historically, this sort of idea underpinned compulsory schooling but in recent years the idea is being extended to initial post-school education and training. An example is the entitlement funding model in Victoria.

The nature of benefits of apprenticeships and traineeships

Apprentices choose to pursue careers in the trades for a variety of reasons. Recent research among Australian apprentices (Gow et al. 2008) indicates that apprentices achieve high levels of

'intrinsic motivation' from their work. This may be indicative that students sort themselves into the career paths they see as most suitable for their unique combination of interests and aptitudes, and that apprenticeship- and traineeship-based careers are generally well suited to students with a practical, rather than academic, bent.

Programs of apprenticeships and traineeships have, as their essential aim, the creation of job-ready skills. For skills to have value, they must be beneficial to the economy. These benefits and values can be observed by higher wages (to individuals) and higher productivity (to organisations). Thus, the primary benefit of an apprenticeship or traineeship for an individual should be the creation of valuable skills that will be reflected in higher earnings.

Workers with VET-based qualifications generally see earnings premia by comparison with the unskilled, and relatively desirable working conditions. Indeed, the greatest potential positive impact of apprenticeship training and trade qualifications would be observed among those for whom alternative forms of employment would be most limited.

The primary benefit for employers is the creation of a skilled and productive employee, and the contribution to the supply of skilled employees. As was clear from the earlier theoretical discussion, an important attraction to the employer in the apprenticeship or traineeship system is the ability to form a relationship with the individual over the lengthy period of time of the contract of training. This allows the employer to assess the ability of the apprentice or trainee but also allows the employer to fashion the training the individuals receive.

Orthodox economics suggests that employers continue to employ workers while the employees' marginal product exceeds its marginal cost. Apprentices' marginal product tends to start low (by comparison with skilled and qualified employees) and, depending on the task and role complexity, soon increases. Toner (2005) has suggested that employers take on apprentices as a partial replacement for qualified tradespersons—to manage rising workloads, and due to the shortages in the available labour market of these skills. Lower skills and higher supervisory costs tend to be counterbalanced by lower wages. Evidence would suggest, however, that the decision to employ apprentices follows the rational orthodox assumption presented above.

Developing a skilled workforce is also a strategic issue for firms. There is strong empirical evidence to suggest a correlation between human capital and productivity—at firm, regional and national levels (Iranzo, Schivardi & Tosetti 2008; Haskel, Hawkes & Pereira 2005). Among firms, there is a variance in the required mix of skills. In some sectors of the economy, skills requirements are quite rudimentary (for example, in fast food and retail), while in others, elaborate skills are required (software development, information technology). The nature of the production function of each firm will determine what combination of skills, and at what level of complexity, is optimally required and how those skills are obtained.

Generally, firms benefit most when their skills requirements can be met relatively easily, without the requirement to invest heavily in in-house training and without being required to bid up wages in the labour market. Participating in workplace-based VET (through the offering of apprenticeships and traineeships) is one means by which firms can create a group of employees with a suitable mix of specific and generic skills for their requirements.

Providing apprenticeships is a major expense for organisations (direct wages or group training fees, supervision, administration and extra maintenance and wastage), and the fact that so many Australian organisations offer so many apprenticeships is indicative of the benefits that organisations accrue from the presence of apprentices.

- ✧ Apprentices provide a direct 'productive contribution', in that their work contributes to the value-creation processes of the organisation, often in the form of skilled and semi-skilled work.

- ✧ Further, in training apprentices, organisations contribute to the future pool of skilled employees from which they will later draw. Training apprentices is an important investment in continued labour supply for an organisation and its industry (hence lowering the cost of skilled labour in the medium- and longer-term). 'Poaching' by firms who do not train apprentices is a cost to industry in this context.
- ✧ Firms may take on apprentices or trainees because they want to be seen to conform to social norms.
- ✧ Finally, governments often provide some direct and indirect earnings and training cost subsidy for firms employing apprentices, although these benefits are generally minor and thus rarely decisive (Nechvoglod, Karmel & Saunders 2009).

The real cost to organisations of apprenticeships is the subject of current debate. In Europe, the traditional understanding has been that employers subsidise investments in training apprentices as a contribution to the 'common good'. Much empirical work has been undertaken assessing the net cost of apprenticeship training provision incurred by sponsoring firms in both the German-speaking and Nordic countries of Europe. These regions arguably have the most elaborate and well-supported apprenticeships systems currently. These nations also share highly regulated labour markets where minimum wages are high, and hence the earnings differentials between apprentices and unskilled workers are minimal.

There are also some subtler dynamic benefits. For industry, skilled employees drive innovation and act as catalysts for organisational and industrial innovation and 'absorptive capacity' (Cohen & Levinthal 1990), a notion that entails an ability to absorb and transform new knowledge and to sustain continuous innovation and lifelong learning. Many authors have emphasised the causal link between a skilled workforce and investments in training to organisational performance and positive competitive heterogeneity (Henderson & Cockburn 1994; Rice, Liao & Martin forthcoming). However, the research on this type of issue has tended to focus on skills and training in general rather than on the apprenticeship and traineeship in particular. On the other hand, Ruth and Deitmar (2010) argue that the apprenticeship model has particular benefits because it promotes the acquisition of skills in the work context, and this aids innovation at the firm level.

The benefits to the government and the community more broadly are rather less tangible. Obviously, the whole society benefits from having a workforce that is highly skilled and productive, and socially engaged. But putting self-evident truths to one side, we can point to a number of potential benefits that go well beyond the individual and his or her employer. These revolve around the benefits for groups of individuals and communities and can be thought of as providing social mobility for lower socioeconomic groups (Hall, Joslin & Ward 2010). The particular benefit of apprenticeships and traineeships is that at the same time as increasing human capital they provide a job, by definition, and thus provide a pathway into the labour market for disadvantaged individuals. Government subsidies, training wages and the fixed-term nature of the training contract make it easier for employers to take on individuals who may struggle in the open labour market. Indigenous people and people with a disability come to mind as groups who benefit from the apprenticeship and traineeship system. This type of benefit focuses on pathways into employment. If that pathway involves significant skill acquisition, then all to the better.

We could also argue that particular communities benefit from the apprenticeship and traineeship system. What we have in mind here is the importance of apprenticeships and traineeships in regional and rural areas. One of the attributes of an apprenticeship or traineeship is that it involves a job, and in rural and regional areas that means a job with a local employer. Such an arrangement must be of assistance to the local community when compared with the alternative of institution-based training. If individuals need to leave their region to be trained in a city, then there must be a considerable chance that the person will not return to their region. If the training is available in the region, then it may be problematic for individuals who would need to support

themselves while studying (we know that part-time work is harder to get in regional and rural areas).

The above has focused on the nature of benefits. These need to be balanced against costs. For individuals there are two types of costs: direct costs and the opportunity cost. Direct costs cover items such as tuition fees and equipment that has to be hired (traditionally tradesmen have bought their own tools). The opportunity cost covers the wages foregone in an alternative job—essentially the discount associated with training wages. For employers, the costs are direct costs (such as supervision, or materials wasted) and costs that are incurred if the training wage is above the productive output of the apprentice or trainee.

At a macro-level we can also ask the question whether the apprenticeship and traineeship system is meeting industry demands. What we have in mind here is the alignment between the output of the apprenticeship and traineeship system and where the graduates (that is, people with specific occupational qualifications) work.

In the next section we bring together the evidence there is on benefits and costs.

Evidence on costs and benefits

Individuals

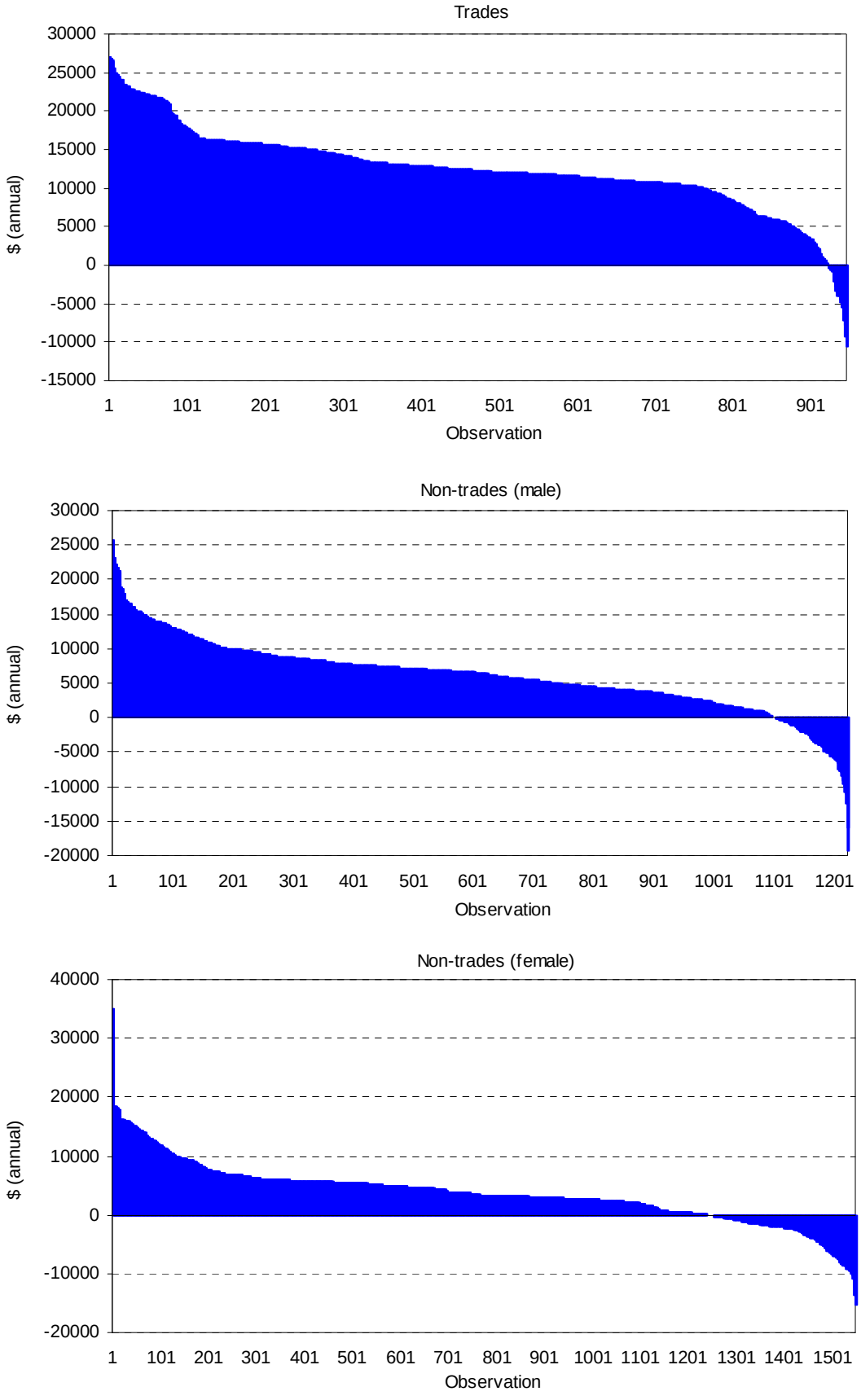
An analysis of the beneficial outcomes emanating from the completion of an apprenticeship or traineeship would, at first, seem to be a relatively simple task. This would involve assessing the life earnings premia accrued by skilled workers, less the costs involved in the provision of these skills. In truth, however, assessing the impact of apprenticeship and traineeship pathways is a complex task.

First and foremost, there are some significant differences between the prototypical apprentice and trainee and those who choose, say, a university pathway. This means that we need to be rather careful in making naive comparisons between the earnings of those who have completed apprenticeships and traineeships and those who have undertaken a different pathway. This is a long-standing issue in the economics of education and there is a huge literature on this topic (referred to as 'ability bias'). While not all studies have given the same answer, the consensus would be that the returns from a university degree are biased upwards. For apprenticeships and traineeships in particular, it does imply that comparison groups need to be carefully chosen. For example, it may be more appropriate to compare those who have completed an apprenticeship or traineeship with those who have not completed Year 12, rather than those who have completed Year 12.

A second issue is that much of the evidence is indirect, because earnings data tend to use standard classifications of occupation or level of education. That is, often we are inferring that a group in question has done an apprenticeship or traineeship rather than knowing it with any degree of certainty. In the same vein many of the studies on the returns from education and training focus on broad education levels (for example, the return from a degree, or the return from a certificate). This is a particular issue for apprenticeships and traineeships, where the outcomes by trade and occupation differ very significantly.

Enough of caveats and now for some evidence. The source we initially turn to is the NCVER Survey of Apprentice and Trainee Destinations (NCVER 2009). The great advantage of this survey is that it collects data on actual apprentices and trainees and includes both those who do and those who do not complete their apprenticeship or traineeship. By considering those who do not complete we have a ready-made comparison group. The jobs that a 'dropout' gets is a pretty good indicator of what apprentices and trainees would do if they had not done an apprenticeship or traineeship. The survey can also provide direct estimates of the opportunity cost of an apprenticeship or traineeship, by comparing the wages of apprentices and trainees with those who have dropped out and found alternative employment. Karmel and Mlotkowski (2010) have modelled the data and we report their findings here. The data were modelled for three specific groups—the trades, non-trades (males) and non-trades (females). First we present the opportunity cost, that is, the wage that would be received in an alternative job less the training wage. The graph displays the opportunity cost of each individual in the sample (expressed as annual earnings), with the sample ordered by size of the opportunity cost. The modelling implies that we are taking each individual's characteristics into account (age, educational background, trade or occupation, how long the individual has been in training etc.). For apprentices, in particular, the training wage increases with duration of training.

Figure 1 Difference between expected wage in alternative employment and wage during training, trades and non-trades (male/female)

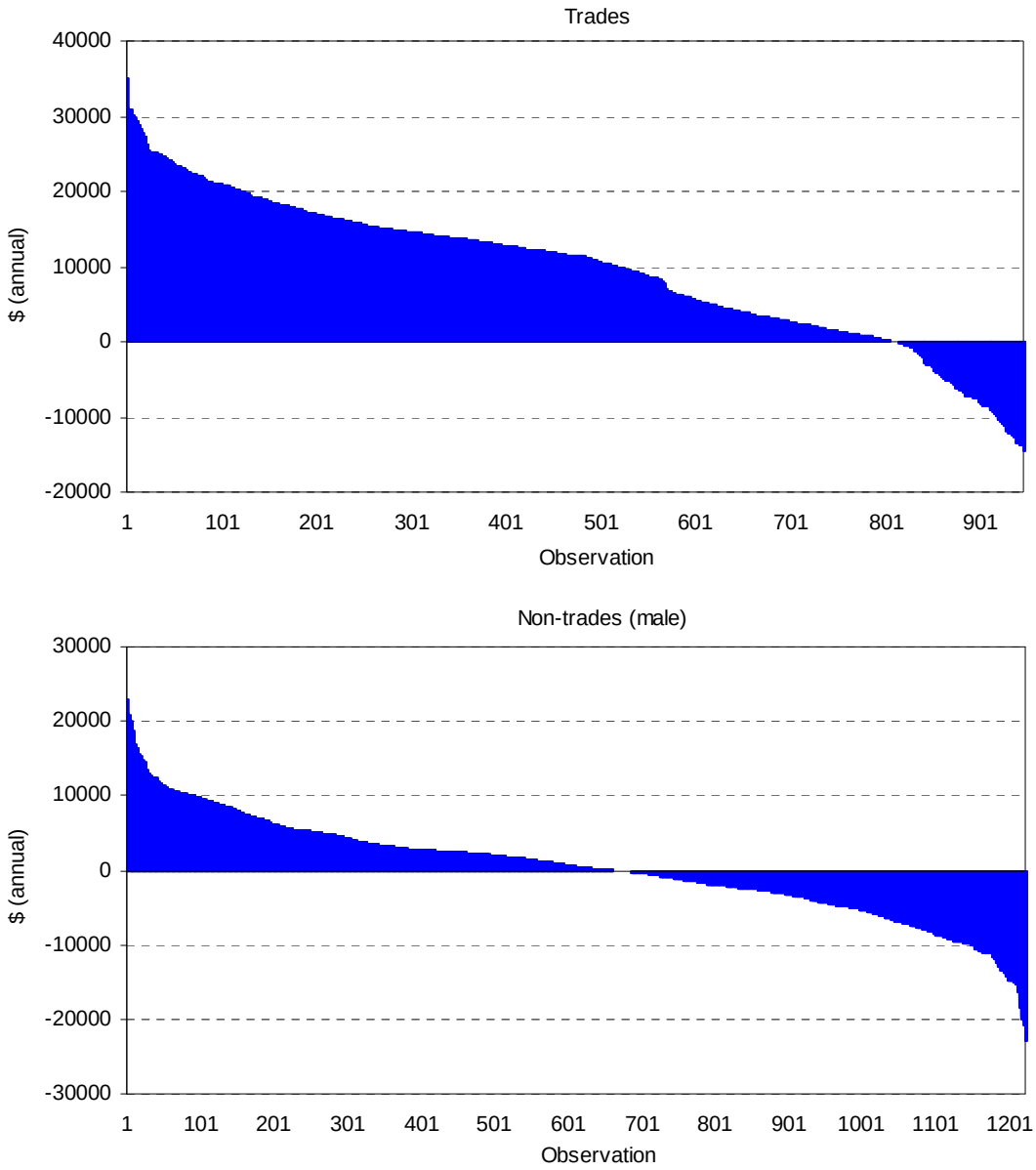


Note: A positive wedge implies that expected wages in alternative employment are greater than wages during training.
Source: Karmel and Mlotkowski (2010).

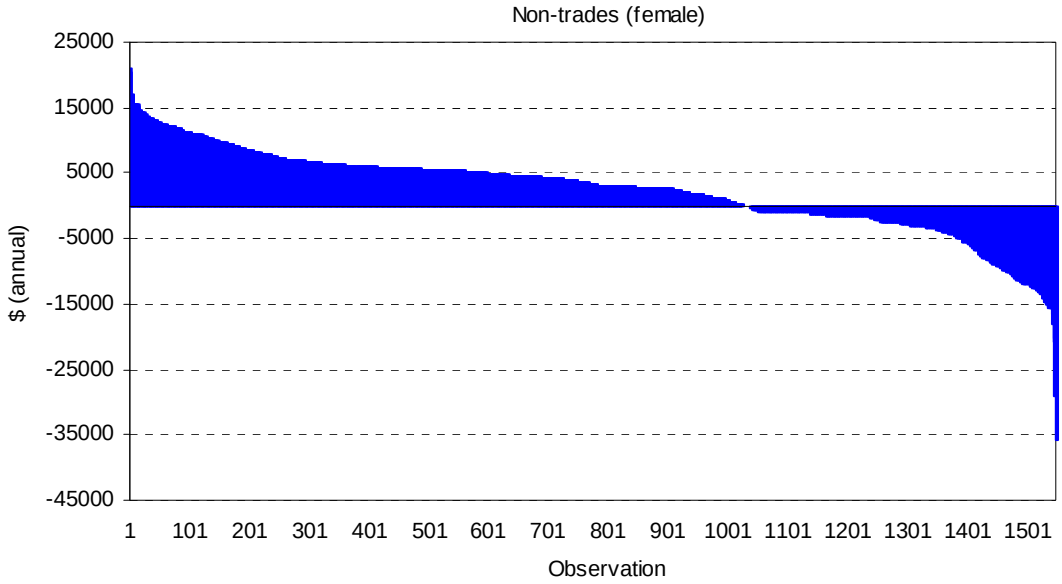
From the figure it can be seen that undertaking an apprenticeship or traineeship comes at a cost for most, but not all, individuals. In the trades the bulk of the sample were foregoing an annual earnings of $10 000 to $15 000, with some individuals up to $25 000. In other occupations the bulk were in the range $5000–$10 000, with males on average foregoing slightly higher amounts that females.

By comparing the earnings on completion with the earnings in alternative employment we can similarly estimate the benefit of the apprenticeship or traineeship relative to the earnings of an unqualified person (figure 2).[2]

Figure 2 Difference between expected wage on completion and expected wage in alternative employment, trades and non-trades (male/female)



[2] The wages are measured approximately nine months after completion or cessation of training. Thus the analysis does not capture lifetime benefits, nor does it capture differences in employment rates. In respect of the latter, 92.9% completers and 76.0% of non-completers were employed at the time of the survey (NCVER 2009)



Note: A positive wedge implies that expected wages on completion are greater than expected wages in alternative employment.

Source: Karmel and Mlotkowski (2010).

For the trades, around 90% of the sample has a positive benefit from completion, ranging up to $30 000 in annual earnings. The picture is not as positive in the non-trades, with about 50% of the males sample having a positive benefit and about two-thirds of the female sample. Where there is a positive benefit, the amount tends to be lower than in the trades. The best way of understanding this is to look at the pay-off of completion by occupation, and this is what is done in table 1, excluding those who are existing workers or part-time.

Table 1 Mean, and proportion above zero, of wage premium on completion of an apprenticeship or traineeship, trades and non-trades (male/female)—excluding part-timers and existing workers

	Trades		Non-trades (male)		Non-trades (female)	
	Mean ($)	% above zero	Mean ($)	% above zero	Mean ($)	% above zero
Trades:						
31 Engineering, ICT and science technicians	6 329.1	100.0	-	-	-	-
32 Automotive and engineering	13 724.4	100.0	-	-	-	-
33 Construction trades workers	16 867.8	100.0	-	-	-	-
34 Electrotechnology and telecommunications trades workers	23 232.1	100.0	-	-	-	-
35 Food trades workers	6 228.8	94.5	-	-	-	-
391 Hairdressers	631.7	73.4	-	-	-	-
All other trade occupations	6 158.7	100.0	-	-	-	-
Total	12 105.0	96.4	-	-	-	-
Non-trades:						
1+2 Managers and professionals	-	-	7 937.6	91.7	5 363.9	93.3
4 Community and personal service workers	-	-	-832.7	46.4	6 428.1	92.7
5 Clerical and administrative workers	-	-	4 911.2	82.9	6 007.1	95.9
6 Sales workers	-	-	-5 088.3	8.6	-4 426.5	6.5
7 Machinery operators and drivers	-	-	1 319.0	54.6	6 452.7	100.0
8 Labourers	-	-	2 551.9	70.2	-12 667.2	0.0
Total	**-**	**-**	**1 624.1**	**59.8**	**2 403.9**	**68.2**

For the trades, the wage premiums are quite handsome, except for hairdressers. Of the other trade occupations, premiums range from around $6000 for food and 'all other ' trades up to $23 000 for electrotechnology and telecommunications.

Among the non-trade occupations the picture is rather mixed. No occupation group commands the same sort of premium as the trade occupations with the highest premium. Both males and females who complete manager and professional traineeships command a healthy premium, as do clerical and administrative workers, machinery operators and drivers, and female community and personal service workers.

What stands out from the table is the number of the non-trades occupations for which there is a negative premium attached to completion. This means that those who complete on average get paid less than those who do not complete, at least at nine months after training. Occupations in this category are sales (both males and females), community and personal service workers (males), and labourers (females). These negative premiums suggest that there is a range of traineeships for which there is apparently little skills acquisition during the traineeship, or if there is skills acquisition, the skills are not valued by the labour market over the general work experience obtained during the traineeship.

Table 1 excludes part-time and existing workers. Analogous tables are at appendix 1 and it can be seen that in general the premium on completion for part-time and existing workers are inferior to full-time, new entrant apprenticeship and traineeships.

The major point to emerge is that apprenticeships and traineeships are a bit of a mixed bag. The theoretical model in which individuals invest in their skills development by taking a training wage in order to reap the rewards of their investment through a wage premium on completion is certainly the case for some apprenticeships and traineeships. But it is not the case for all, and therefore the value of the training must be questioned for those occupations.

Karmel and Mlotkowski's (2010) work focuses on earnings a little after the completion of an apprenticeship or traineeship. Such a focus does not take into account the impact of experience on relative earnings. We know that experience is highly valued in the labour market but what counts here is whether the pay-off to experience varies greatly by occupation. We commence this broader focus by looking at hourly earnings from one of the Australian Bureau of Statistics (ABS) cross-sectional surveys. Table 2 presents evidence of the position of the skilled trades in the Australian labour market, vis-a-vis total hourly earnings. As this is a cross-section, it relates to the full mix of experience within each occupation.

Table 2 Total hourly wages of various occupational groups—disaggregated for technicians and trades workers

ANZSCO group	Total hourly earnings
2 Professionals	**39.10**
3 Technicians and trades workers	**29.20**
31 Engineering, ICT and science technicians	35.60
311 Agricultural, medical and science technicians	26.70
312 Building and engineering technicians	38.80
313 ICT and telecommunications technicians	34.40
32 Automotive and engineering trades workers	29.00
321 Automotive electricians and mechanics	26.70
322 Fabrication engineering trades workers	29.00
323 Mechanical engineering trades workers	32.10
324 Panelbeaters, and vehicle body builders, trimmers and painters	25.80
33 Construction trades workers	27.20
331 Bricklayers, and carpenters and joiners	28.30
332 Floor finishers and painting trades workers	25.10
333 Glaziers, plasterers and tilers	24.20
334 Plumbers	26.40
34 Electrotechnology and telecommunications trades workers	30.50
341 Electricians	31.70
342 Electronics and telecommunications trades workers	28.70
35 Food trades workers	20.80
351 Food trades workers	20.80
36 Skilled animal and horticultural workers	20.90
361 Animal attendants and trainers, and shearers	19.40
362 Horticultural trades workers	21.30
39 Other technicians and trades workers	25.90
391 Hairdressers	16.90
392 Printing trades workers	26.80
393 Textile, clothing and footwear trades workers	21.60
394 Wood trades workers	22.10
399 Miscellaneous technicians and trades workers	32.20
4 Community and personal service workers	**26.70**
5 Clerical and administrative workers	**26.10**
6 Sales workers	**24.50**
7 Machinery operators and drivers	**27.90**
8 Labourers	**23.10**
Total (National average)	**30.10**

Source: ABS (2008).

The variance between ANZSCO groups, and within the *Technicians and trade workers* ANZSCO group, are both large. Technicians (ANZSCO 31) receive rates approaching those of professionals . Of the other trades, we see a very large variance, from $16.90 for hairdressers to $31.70 for electricians and $32.10 for mechanical engineering trades.

A major point to emerge from the above discussion is that there is little point in estimating the benefits to apprenticeships and traineeships in aggregate. The benefits depend greatly on the individual occupation. Thus to conclude we present a little more evidence that focuses on individual fields of study or occupation. Karmel (2008) fitted simple earnings equations to data from the 2005 ABS Income and Housing Costs Survey (table 3).

Table 3 Weekly wages for full-time wage and salary earners, by level and field of qualification, 2005

	Full-time wage and salary earners	
	Weekly $s	Relative to Year 12
Year 11 or below	687	0.90
Year 12	765	1.00
Certificate I/II		
Science, IT, engineering	715	0.93
Architecture, building, agriculture	667	0.87
Health, education, society and culture, creative arts	723	0.94
Management and commerce	734	0.96
Food, hospitality, personal services	770	1.01
Certificate III/IV		
Science, IT, engineering	798	1.04
Architecture and building	873	1.14
Agriculture	630	0.82
Health	745	0.97
Education, society and culture, creative arts	719	0.94
Management and commerce	800	1.04
Food, hospitality, personal services	760	0.99
Diplomas and degrees		
Science	1 071	1.40
Information technology	1 210	1.58
Engineering	978	1.28
Architecture and building	787	1.03
Agriculture	788	1.03
Health	1 086	1.42
Education	1 022	1.34
Management and commerce	1 040	1.36
Society and culture, food, hospitality and personal services	1 000	1.31
Creative arts	838	1.10

Notes: Calculated for a male, age 30, working 40 hours (for the hourly rate). The relativity to Year 12 is not affected by this assumption.

Source: Karmel (2008, derived from ABS Income and Housing Costs Survey 2005).

While this table does not identify apprenticeships and traineeships specifically, we can take the certificate III/IV as a proxy for the completion of an apprenticeship or traineeship. This analysis uses Year 12 as the comparator group. We see that the architecture and building certificate IIIs are the best rewarded, and this would largely correspond to some traditional trade areas (but not food trades or hairdressing). Science, IT, engineering and management and business certificate II/IVs also command a premium relative to Year 12.

Of course, a large part of the reward from education and training is caught up in the occupation that is obtained. Many of the occupations in which some apprentices (food trades, for example) and most trainees are trained employ both qualified and non-qualified people. So another way of looking at the premium from completing an apprenticeship or traineeship is to look at the return within an occupation (again taking a certificate III/IV as a proxy for the apprenticeship or traineeship). Table 4 concentrates on occupations relevant to trainees in particular.

Table 4 Weekly wages for full-time wage and salary earners, by qualification level and occupation, 2005

	Full-time wage and salary earners	
	Weekly $s	Relative to Year 12
5 Advanced clerical and service workers		
Left school before Year 12	832	0.95
Year 12	879	1.00
Certificate I/II	**639**	0.73
Certificate III/IV	897	1.02
Diploma or degree	990	1.13
61+81 Clerical workers		
Left school before Year 12	**697**	0.97
Year 12	**721**	1.00
Certificate I/II	**717**	0.99
Certificate III/IV	**708**	0.98
Diploma or degree	811	1.12
62+82 Sales workers		
Left school before Year 12	700	1.03
Year 12	678	1.00
Certificate I/II	651	0.96
Certificate III/IV	725	1.07
Diploma or degree	651	0.96
63+83 Service workers		
Left school before Year 12	**570**	0.98
Year 12	**583**	1.00
Certificate I/II	608	1.04
Certificate III/IV	685	1.18
Diploma or degree	737	1.26
71+72 Machine and plant operators		
Left school before Year 12	811	0.93
Year 12	868	1.00
Certificate I/II	767	0.88
Certificate III/IV	885	1.02
Diploma or degree	804	0.93
73+79 Transport workers		
Left school before Year 12	737	0.95
Year 12	776	1.00
Certificate I/II	738	0.95
Certificate III/IV	838	1.08
Diploma or degree	770	0.99
9 Labourers and related workers		
Left school before Year 12	552	0.92
Year 12	602	1.00
Certificate I/II	654	1.09
Certificate III/IV	674	1.12
Diploma or degree	577	0.96

Notes: Bold signifies a statistically significant difference relative to an individual with a diploma or degree.
Calculated for a male, age 30, working 40 hours (for the hourly rate). The relativity to Year 12 is not affected by this assumption.

Source: Karmel (2008 derived from regression model, appendix table A2).

The value of a certificate III/IV varies by occupation. In the clerical occupations it does not do much relative to a reasonable level of generic education. Similarly with machine and plant

operators. However, the specific training that a certificate III/IV gives provides a premium among sales workers, service workers, transport workers and labourers and related workers.

The above calculations control for age (as a proxy for experience) within each occupational group. We provide a further table showing the importance of this experience. These figures capture the skills that are learned on the job, on top of the skills learned in formal education and training. As can be seen from the table, the skills learned on the job are very considerable.

In the table below we show the increase in weekly wages associated with ten years experience.

Table 5 Increase in weekly wages due to 10 years experience by selected occupations, 2005

	Increase in weekly wages	
	($s)	%
5 Advanced clerical and service workers	148	17.6
61+81 Clerical workers	165	25.5
62+82 Sales workers	173	36.2
63+83 Service workers	107	17.0
71+72 Machine and plant operators	131	19.5
73+79 Transport workers	159	26.1
9 Labourers and related workers	148	34.5

Notes: Compares expected earning of a 30-year-old male with a 20-year-old.
Source: Karmel (2008 derived from regression model, appendix table A2).

Thus a 30-year-old driver, for example, earns 26.1 % more than a 20-year-old. The conclusion we draw is that qualifications in low-skilled occupations have relatively little value and that requisite skills can be learned on the job.

To complete this evidence we refer to Lee and Coelli (2010), who have analysed the various Surveys of Education and Training. Because of sample size limitations they restricted themselves to three fields of study: engineering, architecture, building and automotive; business studies; and other. The returns relative to Year 12 tend to be negative, and so we present the returns relative to lower schooling than Year 12.

Table 6 Returns from skilled vocational qualifications by field of education, less than Year 12 as a comparison group

	1993 [(a)]	1997 [(a)]	2001 [(b)]	2001 [(a)]	2005 ;
Males					
Business	0.181	0.209	0.154	-0.087	0.130
Engineering	0.082	0.125	0.145	0.150	0.157
Other	0.084	0.072	0.009	0.006	0.001
Total		0.107	0.114	0.116	0.113
Females					
Business	0.223	0.115	0.044	0.054	0.114
Engineering	0.258	0.018	0.003	0.034	0.092
Other	0.133	0.015	-0.011	-0.083	0.102
Total		0.043	0.003	-0.058	0.102

(a) ABS Classification of Qualifications (b) Australian Standard Classification of Education.
Source: Lee and Coelli (2010).

Employers

In terms of the benefits, we cannot really go much further than our earlier theoretical discussion. Apprenticeships and traineeships are a contribution to skills acquisition within a firm, and human capital is one input into the production process. When looking at the benefits to individuals, we could look at the earnings on completion of an apprenticeship or traineeship relative to an alternative; however, this type of approach is not available in relation to apprenticeships and traineeships (or at least we are not aware of any). There is a large literature on the return from investment on training but this is of limited use in looking at the return from hosting an apprentice or a trainee.

What research there is tends to look at the relative benefits and costs to the employer during the time of the apprenticeship or traineeship.

Recent research from Switzerland (Wolter, Mühlemann & Schweri 2006) and Germany (Zwick 2007) (using multivariate profit estimation, rather than company provided training cost data) suggests that net costs at the early stages of an apprenticeship are generally recouped during its later stages, allowing the employing firm to recoup all direct and indirect costs of employing apprentices during the life of the apprenticeship. This paints a different picture from recent Australian research (Nechvoglod, Karmel & Saunders 2009), which tends to emphasise very high supervision costs incurred by employing firms. While the relative labour markets of Australia and Europe are different, such findings would suggest that employer firms may overstate the indirect costs of employing apprentices. Noting this caveat, we still think it is worth reporting Nechvoglod, Karmel and Saunders's calculations and some similar work commissioned for this project. Before we do so, however, it is worth noting that Australian employers who take on apprentices or trainees tend to be pretty happy with the apprenticeship and traineeship system (see table 7).

Table 7 Employer views of VET training

	2005	2007	2009
Apprenticeships and traineeships (Base: all employers with apprentices/trainees)			
▪ Employers who consider it important	88.4	91.1	89.7
▪ Employers who are satisfied	79.1	83.3	83.2

Source: NCVER Survey of Employer Use and Views, 2009.

While employers seem most happy with unaccredited (generally in-house) training, there is also widespread satisfaction with the quality of vocational qualifications, support for apprenticeships and traineeships and also for nationally accredited training arrangements.

However, it is clear from Nechvoglod, Karmel and Saunders's work that hiring an apprentice is a substantial undertaking, even if we think the supervision costs might be overstated.

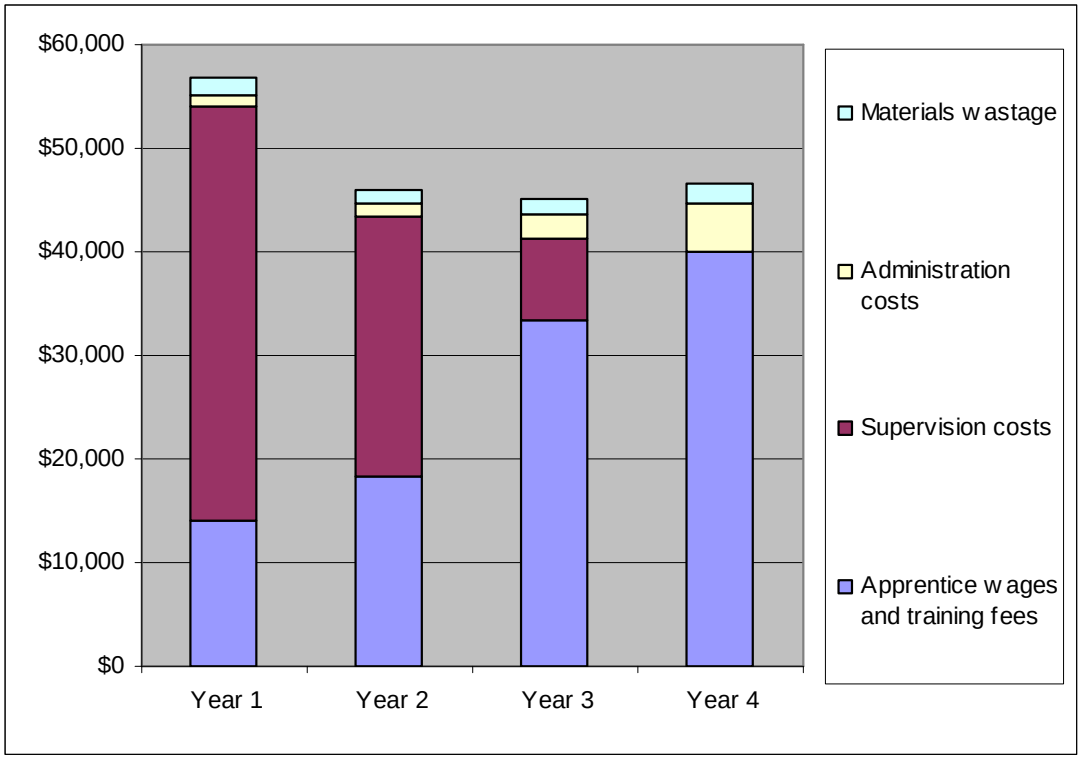
Table 8 Ledger of employer costs for hiring an apprentice in the electrical industry through direct hire: case study three

Employer costs		Employer benefits	
Apprentice wages	$109 872.00	Government incentives	$5 250.00
Training fees	$1 550.00	Other incentives	$0
Apprentice supervision costs	$72 853.00	Productive contribution of apprentice	$120 950.00
Administration costs	$9 696.00	Implicit benefits	$74 171.00
Extra maintenance and materials wastage	$6 400.00		
Total costs	**$200 371.00**	**Total benefits**	**$200 371.00**

Source: Nechvoglod, Karmel and Saunders (2009).

Moreover, the supervision costs tend to be concentrated early on in the apprenticeship, as can be seen from figure 3.

Figure 3 Pattern of employers' typical costs associated with directly hiring an apprentice over four years



Source: Nechvoglod, Karmel and Saunders (2009).

There are a number of implications flowing from this pattern. The first is that the cost of non-completion to an employer is very high, because they incur much of the cost and little of the benefit at the beginning of the apprenticeship. A second implication is that any increase to training wages (as is often suggested by those who point to the cost to the apprentice of undertaking the training) will directly affect employers with a flow-on to employment levels. profits and prices. Finally, the sums in the above table and figure indicate that the government subsidies make only a small contribution to the cost of hosting an apprentice (although the government subsidy figures do not take into account the subsidy going to the cost of tuition in the off-the-job training component).

McNaughton (forthcoming) has collected similar data for traineeships (table 9). The results indicate that the provision of a traineeship is far less onerous. Indeed, Cully (2008) argues that in many cases the traineeship acts as a wage subsidy to the employer, and, depending on the

circumstances of the individual, a very sizable wage subsidy. This is consistent with McNaughton's data for retail, clerical and community services (disability) that suggest that some employers 'make a profit' from the employment of a trainee.

Table 9 Indicative employer costs/benefits for retail, hospitality, clerical and community services

Occupation area	Retail	Hospitality	Clerical
Nominal term of traineeship	24 months	24 months	12 months
Annual wage of fully qualified worker	$43,976.40	$42,858.40	$47,429.20
Annual unskilled worker's wage – 18 yrs	$20,410.00	$20,410.00	$20,410.00
Annual trainee award wage	$16,815.76	$16,815.76	$16,815.76
Employer costs and benefits			
Costs			
Trainee's wages	$51,340.00	$77,301.12	$16,815.76
Allowances	$0.00	$0.00	$0.00
Super, WC and payroll tax	$10,648.00	$6,957.10	$1,513.42
GT fee / costs	$0.00	$0.00	$0.00
Training costs (off-job)	$1,000.00	$1,585.00	$500.00
Other direct costs	$0.00	$0.00	$0.00
Supervisory costs	$8,795.28	$16,547.63	$9,485.84
Wage of fully qualified worker over period of traineeship	*$87,952.80*	*$100,288.66*	*$47,429.20*
%Supervisory time	*10.0%*	*16.5%*	*20.0%*
Administration costs	$2,000.00	$160.00	$6,100.00
Other indirect costs	$0.00	$0.00	$0.00
Total costs	**$73,783.28**	**$102,550.85**	**$34,415.02**
Benefits			
Government incentives	$4,000.00	$4,000.00	$4,000.00
Productive contribution of the trainee	$83,555.16	$80,230.92	$37,943.36
Wage of fully qualified worker over period of traineeship	*$87,952.80*	*$100,288.66*	*$47,429.20*
Average % productivity	*95.0%*	*80.0%*	*80.0%*
Implicit benefits	-$13,771.88	$18,319.92	-$7,528.34
Total benefits	**$73,783.28**	**$102,550.85**	**$34,415.02**

Occupation area	Community services (aged care)	Community services (children's services)	Community services (disability)
Nominal term of traineeship	24 months	24 months	24 months
Annual wage of fully qualified worker	$43,643.60	$43,643.60	$43,643.60
Annual unskilled worker's wage – 18 yrs	$20,410.00	$20,410.00	$20,410.00
Annual trainee award wage	$16,815.76	$16,815.76	$16,815.76
Employer costs and benefits			
Costs			
Trainee's wages	$45,552.00	$22,048.00*	$53,129.00
Allowances	$0.00	$0.00	$0.00
Super, WC and payroll tax	$4,099.68	$2,052.00	$4,781.17
GT fee / costs	$0.00	$0.00	$0.00
Training costs (off-job)	$1,000.00	$1,320.00	$680.00

Costs			
Other direct costs	$0.00	$0.00	$0.00
Supervisory costs	$46,611.36	$21,821.80	$4,364.36
Wage of fully qualified worker over period of traineeship	*$87,287.20*	*$43,643.60*	*$87,287.20*
%Supervisory time	*53.4%*	*50.0%*	*5.0%*
Administration costs	$1,300.00	$0.00	$1,320.00
Other indirect costs	$0.00	$0.00	$0.00
Total Costs	**$98,563.04**	**$47,241.80**	**$64,274.53**
Benefits			
Government Incentives	$4,000.00	$4,000.00	$4,000.00
Productive contribution of the trainee	$68,084.02	$37,097.06	$75,939.86
Wage of fully qualified worker over period of traineeship	*$87,287.20*	*$43,643.60*	*$87,287.20*
Average % productivity	*78.0%*	*85.0%*	*87.0%*
Implicit benefits	$26,479.03	$6,144.74	-$15,665.34
Total benefits	**$98,563.04**	**$47,241.80**	**$64,274.53**

Source: McNaughton (forthcoming).

Cully (2008) argues that incentives have underpinned growth in traineeships through their role as an implicit wage subsidy and demonstrates that the wage subsidy from incentives could be as high as 20% for trainees. He notes that the structure of junior and training wages is complex. His work in this area showed that junior rates of pay can apply up to age 21 years, but in many instances a worker becomes eligible for the full adult rate of pay at 18 years. The span of junior rates is wide, and at age 16 years they may span from 40 to 80% of the adult rate.

Cully goes on to note that apprenticeship wages are relatively uniform in their structure, in that wage is tied to progression through the apprenticeship and rises each year until completion, when they become eligible for the full skilled rate. Apprentice wages therefore are independent of age.

By contrast, many trainee wages are set by reference to the National Training Wage (NTW) Award of 2001. Cully notes that this is important, as the trainee wages in the award are dependent upon both age and the time elapsed since leaving school. Training wages for juniors are generally lower, and sometimes equal to, junior wages. Adults, 21 years and older, are paid at the highest training wage rate, regardless of the age or time elapsed since leaving school. However, an existing adult employee who takes up a traineeship with the same employer does not have their pay reduced.

The National Training Wage Award was originally implemented in 1994 after much industrial dispute and was intended to be an incentive to employ young and inexperienced workers over older and more experienced workers. The National Training Wage was based on the presumed lower productivity of new entrants. If in fact there is little difference in productivity between the trainees and other workers, the effect of the wage is to lower wage costs (assuming that there is a plentiful supply of potential trainees willing to work for the training wage). The key point in this argument is the difference in productivity between the trainees and other workers. In the trades it is clear that qualified tradespeople are more productive than apprentices but the differential is less obvious in the lower-skilled occupations such as sales and hospitality.

Cully's approach to Australian Apprenticeship Incentives payments was to view them as a proportion of wages. These proportions are described as wage subsidies, on the basis that the incentive payments have the same effect as a reduction in the wage paid to the trainee. His key findings were:

- The wage subsidy to employers is greater for younger workers than it is for adult workers, and it is greater still if the apprenticeship or traineeship is commenced as a formal school-based apprenticeship. In some circumstances the wage subsidy can be more than 20%, a very considerable reduction in wage costs to the employer. This is because incentive payments are

unrelated to age, whereas the training wage for young people is very low relative to adult wages.

- ✧ The wage subsidy to employers is, by definition, greater for higher skill levels—the standard incentive payment for a certificate II is $1250 (commencement incentive, with no associated completion incentive), compared with $4000 for a certificate III ($1500 commencement and $2500 completion incentive). A consequence of this is that the proportion of certificate II commencements has declined markedly and a certificate III apprenticeship has become the default qualification throughout the occupational structure—even in occupations where it would not appear to be merited (for example, cleaning). The exception to this is school-based trainees, the majority of whom commence at certificate II level, as they attract an additional $750 commencement bonus.
- ✧ Although $2500 of the standard incentive payment for certificate III qualifications is held over until completion, in most instances the implicit wage subsidy to the employer is greater if the apprentice quits (or is sacked) after one year than if they go on to complete. The only cases where this is not true relates to short-duration traineeships. In these instances only do employers have a genuine financial incentive for the trainee to complete the traineeship.
- ✧ The structure of wages in awards and enterprise agreements provides an incentive for employers to hire trainees at as young an age as possible, as wages are tied to age.
- ✧ Implicit wage subsidies are higher for trainees than apprentices. This is because traineeships are of a much shorter duration (typically two years) than apprenticeships (typically four years). As the incentive payment is an absolute sum unrelated to duration, the shorter the duration, the greater the subsidy.

It can thus be argued that the Australian Apprenticeship Incentives, in conjunction with the National Training Wage, act to reduce the cost of employing trainees and there is little doubt that this has been instrumental in the growth in the numbers of trainees.

We have been focusing on costs and benefits to individuals and individual employers. One can also think of the benefits to employers as a group. What we have in mind here is the extent to which the apprenticeship and traineeship system is producing qualified workers for the relevant industry. If few of those who complete an apprenticeship or traineeship stay in the occupation in which they trained, then it could be said that the system is not really meeting industry needs. Using data from the Student Outcomes Survey we can judge the match between training and the destination occupation. We use the work of Karmel, Mlotkowski and Awodeyi (2008), who present results from the 2007 survey.

Table 10 Matches between intended and destination occupations for apprentices and trainees who have completed their training and are employed, by selected ANZSCO, 2007

Intended occupation of training activity	Match at major group	Match at sub-major group
	%	%
1 Managers	**11.7**	**11.7**
12 Farmers and farm managers	14.5*	14.5*
13 Specialist managers	8.8*	8.8*
2 Professionals	**22.6***	**21.9***
3 Technicians and trades workers	**88.6**	**84.6**
31 Engineering, ICT and science technicians	58.3	48.6
32 Automotive and engineering trades workers	92.1	87.0
33 Construction trades workers	90.1	87.7
34 Electrotechnology and telecommunications trades workers	94.7	89.5
35 Food trades workers	92.7	91.2
36 Skilled animal and horticultural workers	63.4	61.6
39 Other technicians and trades workers	86.6	82.1
4 Community and personal service workers	**69.3**	**62.0**
41 Health and welfare support workers	66.1	28.4*
42 Carers and aides	86.9	81.5
43 Hospitality workers	46.5	41.3
44 Protective service workers	73.8	68.2
45 Sports and personal service workers	39.7	35.0
5 Clerical and administrative workers	**68.1**	**32.1**
51 Office managers and program administrators	50.7	10.5*
53 General clerical workers	71.2	31.4
54 Inquiry clerks and receptionists	62.2	47.3
55 Numerical clerks	82.6	53.1
59 Other clerical and administrative workers	55.1	27.6
6 Sales workers	**53.4**	**49.0**
61 Sales representatives and agents	76.2	68.1
62 Sales assistants and salespersons	51.9	47.7
7 Machinery operators and drivers	**57.6**	**47.0**
71 Machine and stationary plant operators	49.6	33.4
72 Mobile plant operators	34.1	24.6*
73 Road and rail drivers	81.1	78.6
74 Storepersons	51.2	38.7
8 Labourers	**48.2**	**39.3**
81 Cleaners and laundry workers	83.2	78.6
82 Construction and mining labourers	19.2*	10.1*
83 Factory process workers	58.0	48.5
84 Farm, forestry and garden workers	53.7	40.4
85 Food preparation assistants	42.6*	21.3*
89 Other labourers	16.0	11.2
Total	**70.8**	**60.7**

Notes: Base is all apprentice and trainee graduates who were employed as at May 2007, excluding those from the ACE sector and unknown intended ANZSCO.
Some sub-major group level occupations are not presented due too few numbers in sample cells.
* Relative standard error greater than 25%; estimate should be used with caution.

Source: Karmel, Mlotkowski and Awodeyi (2008).

We see a high degree of alignment from most of the trades, carers and aides, protective service workers, sales representatives and agents, road and rail drivers and cleaners and laundry workers. But the majority of non-trade occupations have a very poor match between the area of training and the occupation in which they end up six months after completion. The conclusion surely is

that in these occupations the apprenticeship and traineeship system is not producing skilled workers in the way that the traditional model embodies.

Benefits to the government and the community

We put aside the general benefits accruing through benefits to the economy and focus on the take-up of apprenticeships and traineeships by three groups associated with labour market disadvantage, and the outcomes from those apprenticeships and traineeships. The three groups we look at are Indigenous people, people with a disability, and rural and remote people (relative to those living in metropolitan areas). The two aspects we concentrate on are the extent to which apprenticeships and traineeships provide opportunities for these groups, and the outcomes.

We present average data for 2007–09. The averaging process does two things: it ensures the numbers are more robust and it abstracts from the downturn.

Table 11 shows that an average of 3.8% of the commencements over the period identified themselves as Indigenous. This compares with a population share of less than 2.6%.[3] Hence apprenticeships and traineeships are important for Indigenous people. However, the shares of completions are considerably lower, suggesting that completion rates are about 70% of the corresponding rates for non-Indigenous apprentices and trainees. On the positive side the completions are still on or above the population share, indicating that apprenticeships and traineeships are playing an important part in providing Indigenous people with qualifications.

Table 11 Apprentices and trainee commencements and completions, Indigenous, average annual, 2007–09

	Commencements		Completions	
	Number	%	Number	%
1 Managers	141	2.7	35	1.7
2 Professionals	165	4.1	73	2.8
3 Technicians and trades workers	2532	3.1	841	1.9
4 Community and personal service workers	1860	4.4	818	3.4
5 Clerical and administrative workers	2319	4.4	1013	3.4
6 Sales workers	892	2.2	367	1.8
7 Machinery operators and drivers	742	2.9	334	2.0
8 Labourers	1961	7.9	752	5.4
Total	10611	3.8	4233	2.8

Source: NCVER National Apprentice and Trainee collection, June 2010 estimates, unpublished DMS #99790

Table 12 shows similar data for apprentices and trainees reporting that they had a disability.

3 <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4713.0.55.0012006?OpenDocument>.

Table 12 Apprentices and trainee commencements and completions, those reporting a disability, average annual, 2007–09

	Commencements		Completions	
	Number	%	Number	%
1 Managers	63	1.2	23	1.1
2 Professionals	59	1.5	26	1.0
3 Technicians and trades workers	1206	1.5	446	1.0
4 Community and personal service workers	623	1.5	322	1.3
5 Clerical and administrative workers	707	1.3	359	1.2
6 Sales workers	458	1.1	205	1.0
7 Machinery operators and drivers	428	1.7	242	1.4
8 Labourers	603	2.4	353	2.5
Total	**4147**	**1.5**	**1976**	**1.3**

Source: NCVER National Apprentice and Trainee collection, June 2010 estimates, unpublished DMS #99790

The numbers are not large, but we have no real idea of the corresponding proportion of the population. One of the difficulties here is that few would disclose a disability if they thought it might affect the probability of an employer taking them on, although special assistance is available (funded workplace modification, access to the Disabled Australian Apprentice wage support and assistance for tutorial support).

Finally, we present apprenticeship and traineeship data by region.

Table 13 Apprentice and trainee commencements by occupation (ANZSCO) and region, average, 2007–09

	Major cities	Inner regional	Outer regional and remote/ very remote	Outside Australia and not known	Total
1 Managers	51.3	25.6	22.7	0.4	100.0
2 Professionals	71.0	20.1	8.6	0.3	100.0
3 Technicians and trades workers	55.0	25.9	18.9	0.2	100.0
4 Community and personal service workers	62.6	23.1	14.1	0.2	100.0
5 Clerical and administrative workers	65.7	20.4	13.7	0.2	100.0
6 Sales workers	60.9	24.6	14.3	0.2	100.0
7 Machinery operators and drivers	60.9	22.4	16.5	0.2	100.0
8 Labourers	45.2	29.0	25.5	0.3	100.0
Total	58.9	24.1	16.8	0.2	100.0

Table 14 Apprentice and trainee completions by occupation (ANZSCO) and region, average 2007–09

	Major cities	Inner regional	Outer regional and remote/ very remote	Outside Australia and not known	Total
1 Managers	50.6	27.3	21.7	0.3	100.0
2 Professionals	72.2	21.3	6.2	0.3	100.0
3 Technicians and trades workers	53.5	26.1	20.2	0.2	100.0
4 Community and personal service workers	61.2	25.2	13.4	0.2	100.0
5 Clerical and administrative workers	63.8	21.6	14.2	0.3	100.0
6 Sales workers	58.4	26.1	15.2	0.2	100.0
7 Machinery operators and drivers	61.9	24.4	13.5	0.2	100.0
8 Labourers	46.1	29.4	24.3	0.3	100.0
Total	57.9	25.1	16.8	0.2	100.0

These proportions need to be compared with the population distribution. Using ABS census data[4] we calculated that the relative percentages of the population are 68.6% in major cities, 19.7% as inner regional and 11.7% as outer regional or remote. It is obvious that apprenticeship and traineeships are extremely important to the regional and remote areas. This is also borne out by the ratio of completions to commencements, which show that that the completion rates are lower than average in the major cities, presumably because the cities have more alternative opportunities.

We have presented data on the extent to which various groups undertake apprenticeship and traineeships. Appendix 2 presents a series of tables of outcomes from the Student Outcomes Survey. Tables 15 and 16 extract a small number of key indicators for Indigenous people and for those with a disability, centred on employment.

Table 15 Selected indicators for Indigenous people undertaking training, 2009

	Apprentices and trainees who have completed their training	Others who have completed their training	Apprentices and trainees who did not complete their training	Others who did not complete their training
Employed after training	75.4	64.1	63.1	55.5
Employed in 1st full-time job after training	21.9	12.1	15.7	9.1
Undertook training for employment-related outcome	87.6	69.1	86.0	68.2
Undertook training for personal development outcome	11.8	26.9	12.6	28.7
Achieved their main reason for doing training	91.0	86.7	75.9	68.5
Received at least one job-related benefit	88.7	73.0	72.3	58.1
Of those not employed before training: employed after training	49.9	29.6	37.0	20.9

Source: appendix 2.

4 <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/3218.0Main%20Features32008-09?opendocument&tabname=Summary&prodno=3218.0&issue=2008-09&num=&view=#PARALINK2>.

Table 16 Selected indicators for people with a disability undertaking training, 2009

	Apprentices and trainees who have completed their training	Others who have completed their training	Apprentices and trainees who did not complete their training	Others who did not complete their training
Employed after training	76.8	51.3	52.1	46.7
Employed in 1st full-time job after training	23.9	6.8	6.9	6.8
Undertook training for employment-related outcome	88.8	66.0	82.7	60.2
Undertook training for personal development outcome	10.5	28.7	16.6	36.5
Achieved their main reason for doing training	89.7	77.8	76.9	70.0
Received at least one job-related benefit	83.3	67.8	64.1	49.5
Of those not employed before training: employed after training	46.3	22.9	20.3	16.1

Source: appendix 2.

In brief, we observe that graduates have on average better outcomes relative to those who do not complete their training, and that those undertaking apprenticeships or traineeships have better outcomes relative to those who undertake training not part of an apprenticeship or traineeship. One reason for this is that those undertaking an apprenticeship or traineeship are clearly focused on employment, while a considerable proportion of the other group give 'personal development' as the reason for undertaking training. This focus makes the apprenticeship and traineeship very appealing for governments promoting employment as an instrument of social inclusion. The tables also indicate that there is a clear benefit from completion, whether the training is part of an apprenticeship or traineeship or not.

In the previous two tables we have not made a comparison with either non-Indigenous people or with people not reporting a disability. It can be seen from the appendix 2 that, while the outcomes are good for Indigenous apprentices and trainees and apprentices and trainees with a disability, they are not as good as for the wider population. By contrast, the outcomes for apprentices and trainees from outer regional, remote and very remote areas are at least as good as the outcomes for those from major cities or inner regional areas (table 17).

Table 17 Selected indicators for those who complete an apprenticeship or traineeship, by region, 2009

	Major cities	Inner regional	Outer regional, remote and very remote
Employed after training	86.0	89.4	88.2
Employed in 1st full-time job after training	25.3	28.7	28.6
Undertook training for employment-related outcome	90.4	91.6	90.7
Undertook training for personal development outcome	8.0	7.5	8.0
Achieved their main reason for doing training	93.1	95.5	95.4
Received at least one job-related benefit	85.9	87.5	86.4
Of those not employed before training: employed after training	65.2	75.8	74.8

Source: appendix 2

The sustainability of apprenticeships and traineeships

There are two aspects of 'sustainability' we wish to consider. The first is the extent to which apprenticeships and traineeships are resilient to economic downturn. The second is to take a more medium-term, structural view and ask whether the apprenticeship and traineeship system supplies sufficient skilled individuals for the long-term needs of the economy, and whether structural trends in the provision of education and training pose a challenge for the apprenticeship and traineeship system.

Apprenticeships and traineeships and the economic cycle

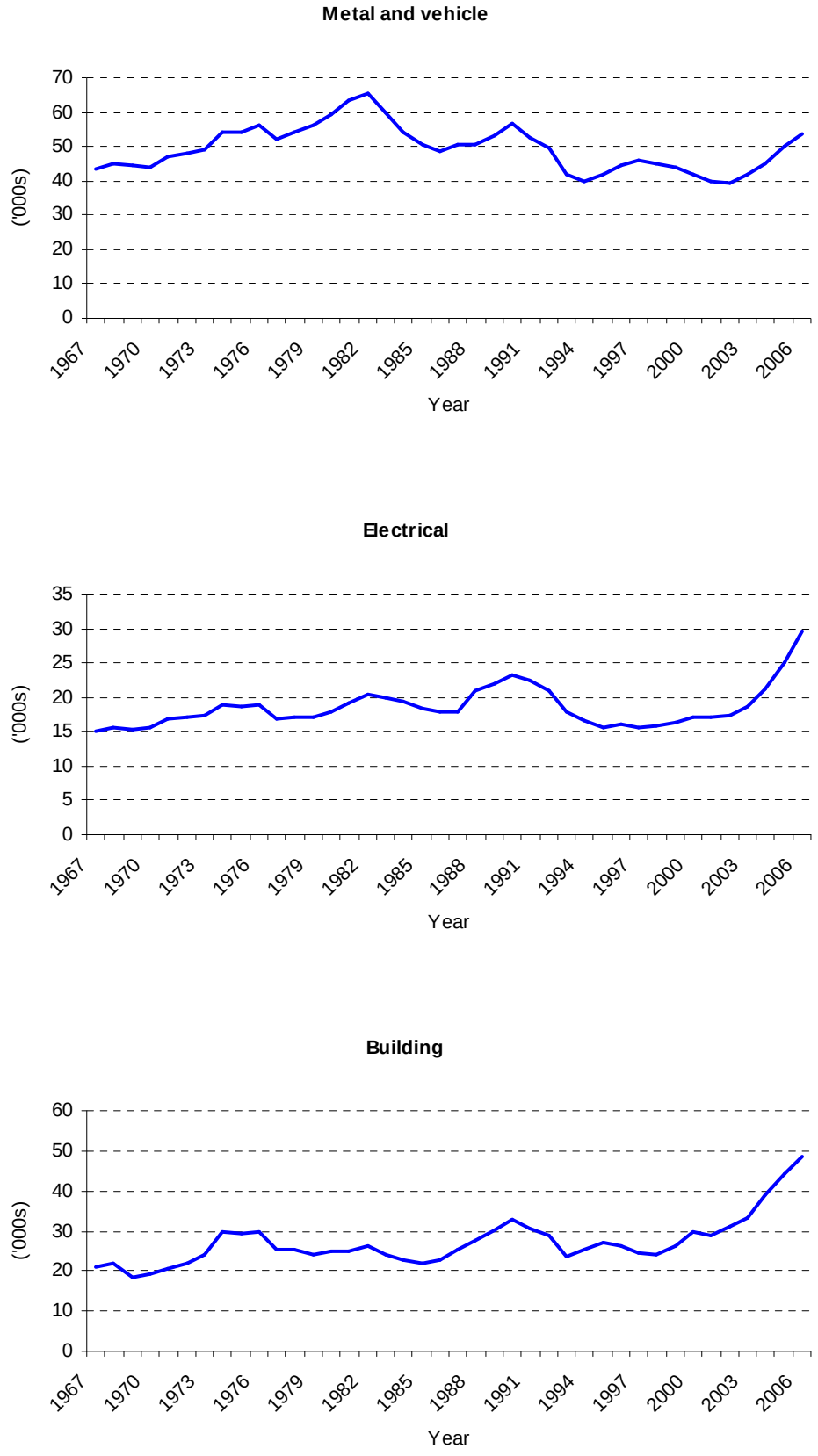
The relationship between apprenticeships and the economic cycle has been the subject of a considerable amount of study in recent years, and we have a long period of experience to draw on. By contrast, traineeships only came into their own in the mid-1990s and we saw considerable growth over many years at a time when the labour market was particularly buoyant. Thus we have observed only one period of downturn—between 2008 and 2009—relevant to traineeships.

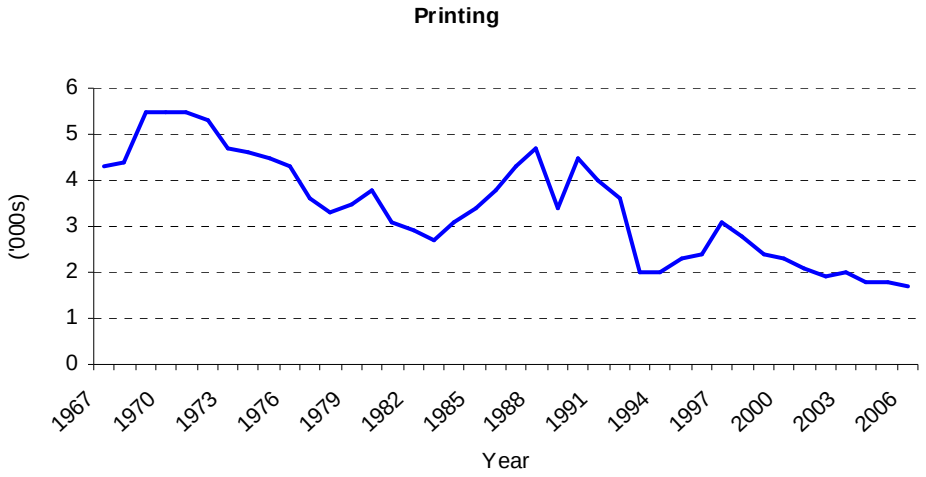
Before we look at the data in some detail we make some theoretical observations, concentrating on what might happen during a downturn:

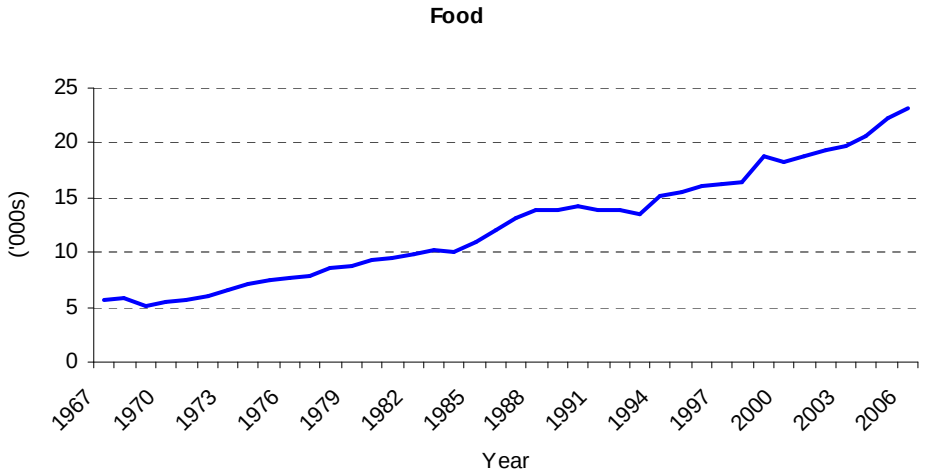
- The number of apprentices and trainees at a point in time depends on the commencements and the numbers completing or dropping out (cancellations and withdrawal).
- Typically, we can expect cancellations to go up as apprentices or trainees are made redundant but withdrawals to go down because alternative opportunities for those in apprenticeship or traineeships are reduced.
- The speed of completion may be accelerated if employers do not have sufficient work for an almost trained apprentice or trainee. In industries where sub-contracting is common (for example, construction) an employer may wish to spread the risk of insufficient work by training an apprentice and trainee to completion and then re-engaging the now qualified tradesperson as a sub-contractor. Where there is sufficient work, an employer may also slow down the rate of completers to make the maximum use of apprentice wages.
- Commencements are likely to be particularly affected by a downturn. In the case of apprenticeships there is a long period (typically three to four years) between taking on an apprentice and producing a skilled worker. If an employer is financially constrained (and thus looking to reduce costs) and is uncertain about prospects in three or four years, then one would expect a significant reduction in commencements. The low productivity of new apprentices and their high supervisory costs make it a very easy decision for cash-strapped businesses to decide not to take on an apprentice. On the other hand, if the apprentice or trainee is basically being hired as a way of keeping wage costs down—the employer taking advantage of the government subsidy and the training wages which typically are below the standard award rates—then it may be very attractive for an employer to take on an apprentice or trainee. Thus in situations where the level of skill acquisition is low, apprentices and trainees are close substitutes for other workers and this will advantage apprentices and trainees at the expense of other potential employees.

We consider apprentices first. Figure 4 plots apprentice numbers for the trades for the period 1967–2006, as modelled by Karmel and Mlotkowski (2008).

Figure 4 Apprentices in-training by trade occupation, 1967–2006







Source: Karmel and Mlotkowski (2008).

The various trades all exhibit cyclical behaviour, but there are clear differences. Metal and vehicle, electrical and building move cyclically but with no obvious long-term trend. By contrast, food trades apprenticeships are underpinned by long-term growth (driven by an expanding population), while printing apprenticeships are in a long-term decline, reflecting fundamental changes in technology.

Karmel and Mlotkoswski's model included total employment, the number of unemployed persons and construction employment. While the models are rudimentary, they do capture the cyclical nature of trade apprenticeships.

The most recent downturn did not prove an exception to previous experience. Comparing the period of the downturn (2008 quarter 3 to 2009 quarter 4) with the period immediately preceding[5] it, we saw quite dramatic declines in the numbers of commencements across a number of the trades, particularly construction trades and automotive and engineering, and electrotechnology and communications trades.

[5] The comparison period is 2007 quarter 3 to 2008 quarter 2, with the first two quarters counted twice to preserve balance in respect to seasonality.

Table 18 Impact of downturn on apprentice commencements

	Downturn period	Comparison period	Change
	'000	'000	%
31 Engineering, ICT and science technicians	5.2	4.8	8.3
32 Automotive and engineering	24.1	31.5	-23.5
33 Construction trades workers	25.1	33.9	-26.0
34 Electrotechnology and telecommunications trades workers	13.5	17	-20.6
35 Food trades workers	14.1	14.7	-4.1
36 Skilled animal and horticultural workers	6	5.9	1.7
39 Other technicians and trades workers	21.6	17	27.1
391 Hairdressers	8	8.9	-10.1
392 Printing trades workers	0.9	0.9	0.0
394 Wood trades workers	2.2	3.2	-31.3
399 Miscellaneous	10.3	3.8	171.1
3 Technicians and trades workers	**109.5**	**124.9**	**-12.3**

Notes: 3: Technicians and trades workers includes some not further defined trade occupations as well as 393 Textile, clothing and footwear trades
Source: NCVER Apprentice and Trainee Collection, June 2010 estimates.

While the number of commencements declined significantly in some (but not all) trades, there is little evidence of a comparable effect on traineeships. Table 19 makes the same comparison for traineeships.

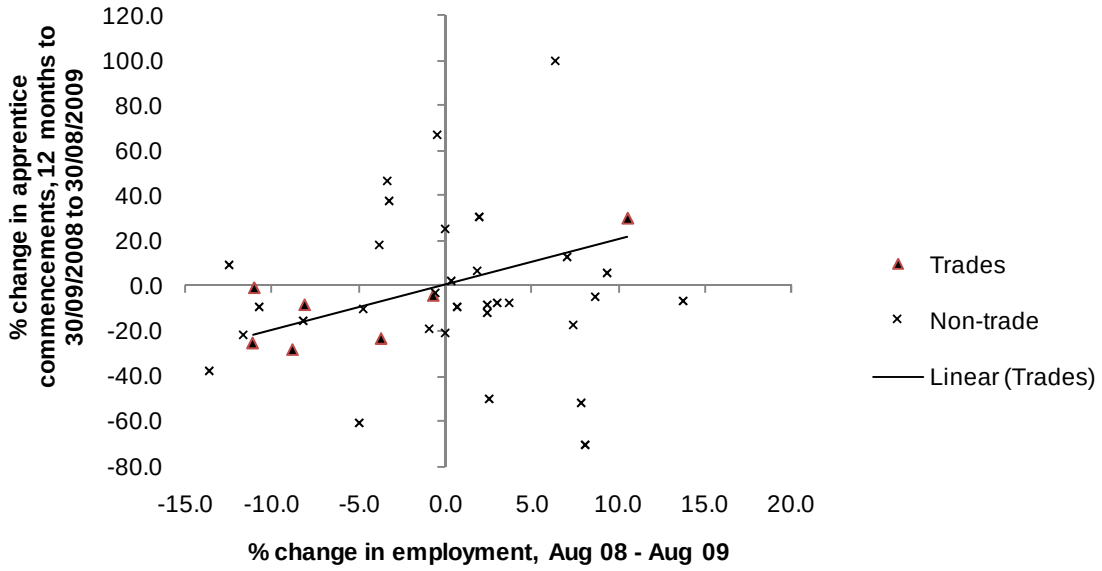
Table 19 Non-trades commencements in the downturn ('000)

	Downturn	Comparison period	Decline due to downturn (%)
Managers and professionals	13.8	16.1	14.3
Community and personal service workers	65.1	61.4	-6.0
Clerical and administrative workers	82.9	76.2	-8.8
Sales workers	62	60.5	-2.5
Machinery operators and drivers	36.7	39.1	6.1
Labourers	36.4	35.7	-2.0
Total (non-trades)	**296.9**	**289**	**-2.7**

We do not see the same decline as for the trades. In fact, overall there was an increase in the number of trainees. The primary reason for this is that the occupations in which trainees work were not affected to the same extent as the trades. Apart from managers and professional trainees (where the numbers are small in any case), the only group to be affected are machinery operators and drivers, who are much closer to those sectors of the economy that were badly affected.

In addition, there appears to be no obvious pattern between changes in occupational employment and movements in the number of commencements, as is evident from figure 5.

Figure 5 Change in apprenticeship commencements by change in employment, 2008-2009



Source: Karmel, Oliver and Vnuk (forthcoming).

In figure 5 each cross or triangle represents an occupation. For the trades there does seem to be a rough linear relationship between employment change and the change in commencements. However, among non-trades occupations there appears to be no discernible pattern. Karmel, Oliver and Vnuk (forthcoming) ran a simple regression to see where there were any occupational characteristics that would explain the scatter plot. There was a relationship between change in commencements and change in employment but it was not significant at conventional significance levels (the coefficient was 0.6 with a standard error of 0.67). Occupations with more existing workers tend to have positive growth in commencements. There were significant relationships between growth in commencements and age distribution within an occupation and duration of the training, but the results were too idiosyncratic to be convincing.

Thus our conclusion is that traineeships are not affected by an economic downturn anywhere near the extent of apprenticeships.

The impact of the downturn on completions was marginal, despite press at the time which focused on the plight of out-of-trade apprentices. Certainly, it is true that redundancy became a more important reason for not completing an apprenticeship or traineeship, as can be seen from table 20.

Table 20 Main reason for not completing an apprenticeship or traineeship, 2008 and 2010 (%)

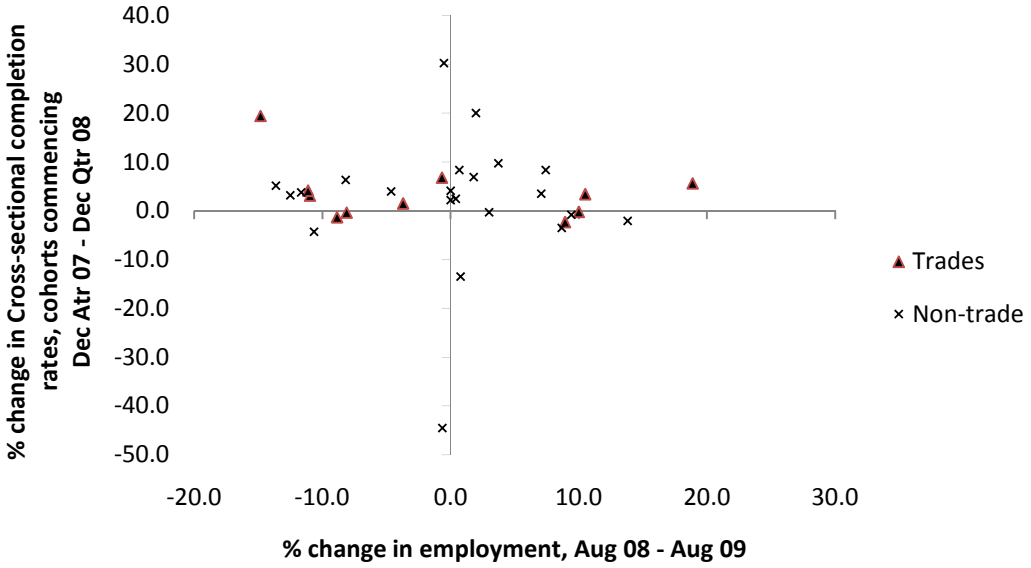
Non-completers	In a trade occupation		In a non-trade occupation	
	2008	2010	2008	2010
Lost job or made redundant	8.9	26.8	7.8	15.2
Doing something different/better	23.3	20.2	36.5	41.2
Poor working conditions/did not like boss	19.3	13.3	7	5.5
Didn't like the type of work/industry, or transferred to other apprenticeship/ traineeship	16.8	13.7	8.2	8.7
Wasn't happy with training or study	8.2	5.1	7.9	3.8
Personal reasons	10	15.7	16.2	18.8
All other reasons	13.4	5.3	16.4	6.8
Total	**100**	**100**	**100**	**100**

Notes: Non-trades are defined as all major ANZSCO (1st edition) occupations groups 1–2 and 4–8. Trades are defined as all major ANZSCO occupation group 3 (Technicians and trades workers).
Source: NCVER, Apprentice and Trainee Destinations Survey, 2010.

However, there is little evidence to show that cancellations and withdrawals grew during the downturn; our view is that growth in those losing their jobs was more than balanced by fewer leaving of their own volition. One way of looking at this is to look at completion and attrition rates.

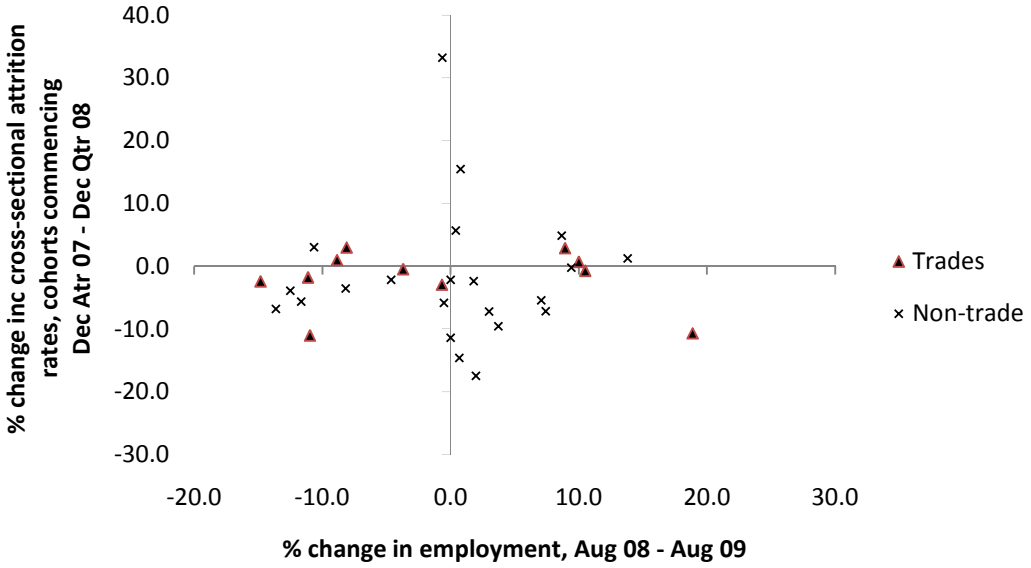
The estimation of completion rates is not straightforward because it takes up to four years for an apprentice to complete. Thus it is difficult to see the impact of the recent downturn. However, we can estimate cross-sectional rates, which observe patterns at a point in time, and then extrapolate from them. The data we use come from NCVER (2010)—experimental rates, and have been further analysed by Karmel, Oliver and Vnuk (forthcoming) (see figures 6 and 7). They find evidence that the downturn did lead to improvements in completion rates and a decline in attrition rates, suggesting that the reduction in general employment opportunities makes it more attractive to remain in an apprenticeship or traineeship and this more than outweighs increased apprentice and trainee redundancies.

Figure 6 **Change in cross-sectional completion rates (Dec. qtr 2007–08) by change in employment (Aug. 2008–09)**



Source: Karmel, Oliver and Vnuk (forthcoming).

Figure 7 **Change in cross-sectional attrition rates (Dec. qtr 2007–08) by change in employment (Aug. 2008–09)**



Source: Karmel, Oliver and Vnuk (forthcoming).

The complement of completion is attrition (figure 7). For the trades, it appears that a downturn makes little difference to the rate of attrition. Thus any increase in redundancies is offset by a decrease in apprentice-initiated departure from the apprenticeship.

The decline in commencements in some trades does pose a potential issue for the future. For the recent downturn we make some back-of-the-envelope calculations to show the impact this has on the supply of tradespersons. What we do is to estimate the impact of the downturn on the number of tradespersons graduating from apprenticeships against a counterfactual of the pattern in the year before the downturn. Our estimates are based on the commencements during the

downturn and the 2008 cross-sectional completion rates. The downturn covers the period in which commencements declined, and finishes when they had returned to historical levels (that is, 2008, quarter 3 through to 2009, quarter 4). Our comparison is the period immediately before the downturn. To preserve seasonality the comparison period is 2007, quarter 3 through to 2008, quarter 2, with the first two quarters counted twice to preserve balance. From table 21 we see that the downturn resulted in some fewer 6800 qualified tradesmen or 12.3% of the output in the comparison period. This number is relatively small compared with the stock of tradesmen of over 1.6 million.

Table 21 Impact of downturn on apprentice completions

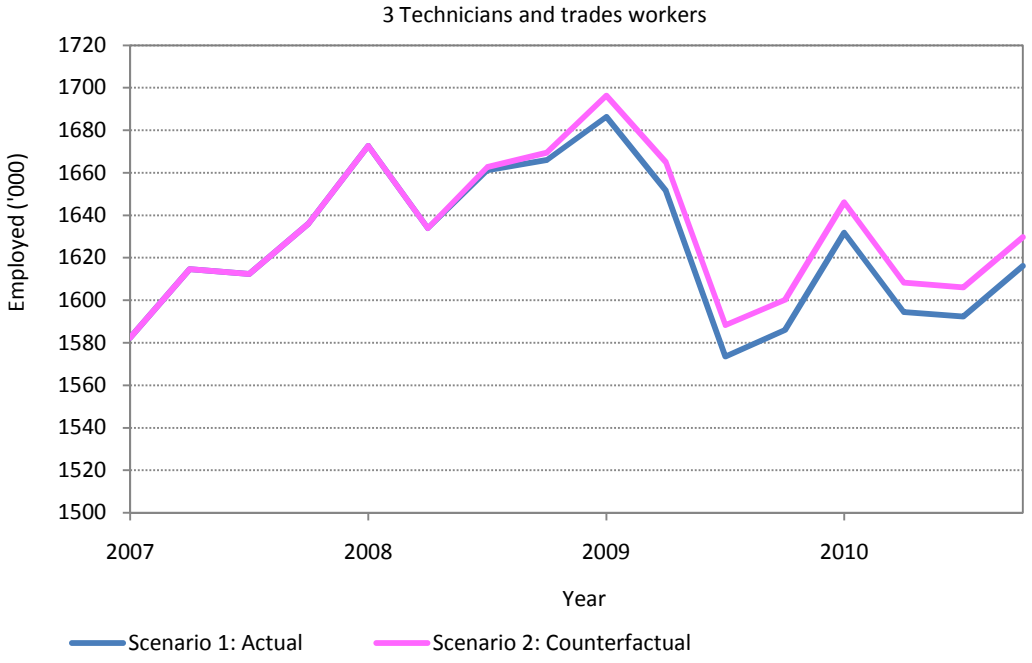
	Downturn			Comparison period			Difference in completions		Employed
	Commencements '000	Completion rate (2008) %	Completions '000	Commencements '000	Completion rate (2008) %	Completions '000	'000	%	Feb. qtr 2010 '000
31 Engineering, ICT and science technicians	5.2	64.0	3.3	4.8	64.0	3.1	0.2	8.1	228.9
32 Automotive and engineering	24.1	48.5	11.7	31.5	48.5	15.3	-3.6	-23.5	364.4
33 Construction trades workers	25.1	43.6	10.9	33.9	43.6	14.8	-3.8	-26.0	349.2
34 Electrotechnology and telecommunications trades workers	13.5	55.4	7.5	17.0	55.4	9.4	-1.9	-20.7	237.2
35 Food trades workers	14.1	26.9	3.8	14.7	26.9	4.0	-0.2	-4.5	150.9
36 Skilled animal and horticultural workers	6.0	48.9	2.9	5.9	48.9	2.9	0.0	1.7	109.7
39 Other technicians and trades workers	21.6	43.1	9.3	17.0	43.1	7.3	2.0	27.1	182.4
391 Hairdressers	8.0	37.2	3.0	8.9	37.2	3.3	-0.3	-9.7	52.1
392 Printing trades workers	0.9	62.8	0.6	0.9	62.8	0.5	0.0	6.2	27.3
394 Wood trades workers	2.2	37.9	0.8	3.2	37.9	1.2	-0.4	-30.7	32.8
399 Miscellaneous	10.3	64.3	6.6	3.8	64.3	2.5	4.2	170.1	52.1
3 Technicians and trades workers	**109.5**	**44.7**	**48.9**	**124.9**	**44.7**	**55.8**	**-6.8**	**-12.3**	**1631.8**

Notes:
3: Technicians and trades workers includes some not further defined trade occupations as well as 393 Textile, clothing and footwear trades workers, an occupation for which a reliable completion rate could not be derived.

Source: NCVER, Apprentice and Trainee Collection, June 2010 estimates. Experimental completion and attrition rates for latest commencing apprentices and trainees; ABS (2010).

The above calculations are a little odd, in that the calculations are over six quarters and therefore the lasting impact on the stock of tradespersons is not obvious. To get a better handle on this we set up a simple dynamic model, in which we predict the numbers in trade employment in one quarter as the number in the previous period plus commencements minus those who leave (see Karmel, Oliver & Vnuk forthcoming for details). Historical data are used to calculate the attrition rates and then a counterfactual scenario is created, in which we assume that the period of the downturn is replaced by the comparison period used earlier. That is, we imagine the downturn never existed. By comparing the counterfactual with the actual, we estimate the long-term impact on the stock of tradespersons. Figure 8 presents the results for all trades. The downturn has resulted in a 'shortfall' and becomes the once and for all change.[6]

Figure 8 Long-term impact of the decline in commencements, all trades



We have made these calculations for individual trades. To summarise these results we present the data for February 2010. The data for this quarter can be interpreted as the 'once and for all' change in the stock of for each trade.

[6] The 'once and for all' change occurs because we are assuming that the attrition rates are the same in both scenarios.

Table 22 Long-term impact of the decline in commencements, by trade

	Actual employment	Counterfactual employment	Difference	
	Feb. qtr 2010	Feb. qtr 2010	Feb. qtr 2010	
	'000	*'000*	*'000*	*%*
31 Engineering, ICT and science technicians	228.9	228.5	0.4	0.2
32 Automotive and engineering	364.4	371.4	-7.1	-1.9
33 Construction trades workers	349.2	357.1	-7.9	-2.2
34 Electrotechnology and telecommunications trades workers	237.2	240.8	-3.6	-1.5
35 Food trades workers	150.9	151.5	-0.6	-0.4
36 Skilled animal and horticultural workers	109.7	109.7	0.1	0.1
39 Other technicians and trades workers	182.4	178.5	4.0	2.2
391 Hairdressers	52.1	52.8	-0.7	-1.3
392 Printing trades workers	27.3	27.3	0.0	0.2
394 Wood trades workers	32.8	33.7	-0.9	-2.6
399 Miscellaneous	52.1	47.4	4.7	10.0
3 Technicians and trades workers	**1631.8**	**1646.1**	**-14.3**	**-0.9**

Notes: 3: Technicians and trades workers includes some not further defined trade occupations as well as 393 Textile, clothing and footwear trades workers.

Source: NCVER, Apprentice and Trainee Collection, June 2010 estimates; ABS (2010).

We see that overall the impact of the downturn is quite minor, equivalent to less than one per cent of the stock of tradespeople. The impact is larger in a couple of trades. Of the larger trades—automotive and engineering, construction, and electrotechnology and telecommunications trades workers—the impact range between 1.5 and 2.2 %. While these percentages are larger, they are not large enough to be too much of a problem.

It appears that the recent downturn was not prolonged long enough to do serious damage to the supply of tradespeople.

Apprenticeships and traineeships in the medium to long term

There is a popular perception that skills shortages have been a chronic feature of our labour market, partly ameliorated by the downturn, and that we face structural shortages of tradespeople. This perception is difficult to evaluate because of the slippery nature of the concept of a shortage. Conventional economics argues that in a competitive market there is no such thing as a shortage because wages and working conditions adjust so that supply and demand reach equilibrium, in the sense that at the going wage all those who want to work can and all employers have filled any vacancy. Of course, there are all sorts of frictions in the real world that mean that the supply and demand take some time to adjust and thus there is the possibility or even likelihood that shortages or surpluses do exist. That said, much of the popular discussion revolves around the desire to have a greater supply of potential workers at a given wage. Richardson (2007) provides a very nice discussion of the concept of shortages.

Even though Richardson is a little sceptical of the whole idea of occupational shortages, she acknowledges that there are situations in which we should be concerned about the balance between supply and demand (Richardson & Teese 2008). The occupations she nominates are those that take many years to train for and those that are important to the economy or society more widely. Skills Australia uses similar criteria for defining occupations which we must pay particular attention to. The trades, arguably, satisfy these criteria. Certainly, the majority of

apprenticeships take three or four years. As for importance to the economy, woe betide anyone who argues that hairdressers are not of national importance, or that insufficient printing tradesperson or horticulturalists is not a matter of national concern.

By contrast, one could argue that traineeships do not fit these criteria. These typically take one to two years to complete and therefore any imbalance can be adjusted fairly quickly. In addition, the level of skill (as we saw from earlier in the report where we way that the earnings premium on a traineeship tends to be considerably lower than that in a trades—with some exceptions) is lower and it is easier to substitute non-trained and trained individuals.

Therefore in considering how sustainable our apprenticeship and traineeship system is we focus on the trades. We draw on some earlier work (Karmel & Ong 2007 and Karmel & Mlotkowski 2010), together with the most recent forecasts of Monash University. Karmel and Ong looked at the period to 2040, choosing such a long period to evaluate whether long-term demographic trends posed a problem for the trades. The interest in demographic trends was motivated by the ageing of the population and the likely impact on occupations which are fuelled by young people—as we have already seen, most apprentices are young men. Their conclusion was that, while the ageing of the population will affect the potential supply of tradespersons, in general it does not have any serious implication for the trades, either in terms of the numbers or the age distribution of the trades workforce. If there are skill shortages, they will be driven by the relative unattractiveness of the occupation, not the demographics.

Karmel and Ong's approach is to construct a supply model in which employment in an occupation depends on the number of apprentices, completion rates, and net attrition rates (which capture both individuals leaving and entering a trade but not through an apprenticeship). A formal description of the model is at appendix 3. They then contrast projections based on historical parameters with a projection of employment demand. Their findings are driven by two major factors: first, there is plenty of scope to vary supply, based on the range of historical experience around rates at which apprenticeships are taken up, apprentice completion rates and occupational attrition rates; second, the long-term outlook for trade employment is flat—at best it will maintain its share of employment.

Karmel and Ong's supply projections were updated for the National Resources Sector Employment Taskforce (chair, the Hon Gary Gray, AO, MP) but only out to 2020. These projections are based on more up-to-date data; data are at a more detailed occupation level and were also undertaken by state (Karmel & Mlotkowski 2010). As in the earlier paper three scenarios were constructed: best case, average case and worst case. Each of the scenarios uses parameters based on historical experience with the 'best' case using parameters that give the greatest numbers and the 'worst' case using parameters that give the lowest numbers.

Table 23 presents the projections for the 'average' case for 2015 and 2020.

Table 23 Projections of employment in trade occupations for 2010, 2015, and 2020, under the 'average' scenario

Occupation	2010	2015	2020	Annual growth rate 2010–20
311 – Agricultural, medical and science technicians	49700	64460	80944	5.0
312 – Building and engineering technicians	122100	110622	97435	-2.2
313 – ICT and telecommunications technicians	52400	56872	59537	1.3
321 – Automotive electricians and mechanics	98300	107909	119606	2.0
322 – Fabrication engineering trades workers	82400	88270	94949	1.4
323 – Mechanical engineering trades workers	141400	149534	157505	1.1
324 – Panelbeaters, and vehicle body builders, trimmers and painters	35600	38575	41377	1.5
331 – Bricklayers, and carpenters and joiners	141400	164071	181705	2.5
332 – Floor finishers and painting trades workers	60400	55815	53152	-1.3
333 – Glaziers, plasterers and tilers	67000	71866	71470	0.6
334 – Plumbers	73400	82508	90279	2.1
341 – Electricians	132200	154256	178150	3.0
342 – Electronics and telecommunications trades workers	101400	97261	92407	-0.9
351 – Food trades workers	147900	141308	133679	-1.0
361 – Animal attendants and trainers, and shearers	25100	35705	47178	6.5
362 – Horticultural trades workers	82900	102787	119992	3.8
391 – Hairdressers	51100	57894	64638	2.4
392 – Printing trades workers	27000	24681	23550	-1.4
393 – Textile, clothing and footwear trades workers	17500	13971	12221	-3.5
394 – Wood trades workers	32100	33335	35282	0.9
399 – Miscellaneous technicians and trades workers	51700	45670	39525	-2.6
Total trades	1593000	1697371	1794582	1.2

Source: Karmel and Mlotkowski (2010).

Overall, the projections imply a modest 1.2% annual growth, with considerable variation by occupation. If likely demand exceeds this rate, then there is a clear potential for skills shortages to emerge. A number of economic forecasters provide forecasts of employment and we use those of Monash University to provide a comparison. Essentially, the Monash forecasts are based on a model of how the economy will evolve given certain assumptions, none of which could be characterised as a supply constraint on trades. Thus we interpret the Monash forecasts as forecasts of demand, which we then compare with our supply projections. Note the language we have used. Monash attempts to make the best estimate of future employment based on demand, while our numbers are projections of supply based on reasonable assumptions.

In table 24 we compare the supply and demand numbers for 2020. The Monash forecasts are the annualised growth rates for 2008–09 to 2016–17 (the latest forecasts available).

Table 24 A comparison of supply and demand, annual growth, 2010–20

	2010 employment	Employment forecast	'Average' supply projection	Shortfall ('average' supply)
311 – Agricultural, medical and science technicians	49700	2.0	5	-3.0
312 – Building and engineering technicians	122100	2.2	-2.2	**4.4**
313 – ICT and telecommunications technicians	52400	3.3	1.3	**2.0**
321 – Automotive electricians and mechanics	98300	1.3	2	-0.7
322 – Fabrication engineering trades workers	82400	3.7	1.4	**2.3**
323 – Mechanical engineering trades workers	141400	0.9	1.1	-0.2
324 – Panelbeaters, and vehicle body builders, trimmers and painters	35600	0.7	1.5	-0.8
331 – Bricklayers, and carpenters and joiners	141400	1.0	2.5	-1.5
332 – Floor finishers and painting trades workers	60400	0.0	-1.3	**1.3**
333 – Glaziers, plasterers and tilers	67000	0.6	0.6	0.0
334 – Plumbers	73400	0.8	2.1	-1.3
341 – Electricians	132200	1.7	3	-1.3
342 – Electronics and telecommunications trades workers	101400	0.5	-0.9	**1.4**
351 – Food trades workers	147900	1.1	-1	**2.1**
361 – Animal attendants and trainers, and shearers	25100	2.1	6.5	-4.4
362 – Horticultural trades workers	82900	2.4	3.8	-1.4
391 – Hairdressers	51100	1.4	2.4	-1.0
392 – Printing trades workers	27000	-1.3	-1.4	**0.1**
393 – Textile, clothing and footwear trades workers	17500	0.6	-3.5	**4.1**
394 – Wood trades workers	32100	1.4	0.9	**0.5**
399 – Miscellaneous technicians and trades workers	51700	1.9	-2.6	**4.5**
Total trades	**1593000**	**1.5**	**1.2**	**0.3**

Source: Employment forecasts are Monash Labour Market forecasts, 2008–09 to 2016–17. Supply projections from Karmel and Mlotkowski (2010).

We have bolded the instances in which the forecast of employment exceeds the supply projection. There are ten occupations where this happens and this signals the possibility of shortages emerging. However, before getting too excited about possible skills shortages we note that Karmel and Mlotkowski's three scenarios are quite divergent, and the 'best' scenario provides a considerable upside, as can be seen from table 25.

Table 25 Projections of trade employment under the alternative scenarios, 2020

	Worst case	Average case	Best case	Difference between best and worst case
	No. employed	No. employed	No. employed	%
311 – Agricultural, medical and science technicians	39962	80944	132893	232.5
312 – Building and engineering technicians	75574	97435	124107	64.2
313 – ICT and telecommunications technicians	32468	59537	93772	188.8
321 – Automotive electricians and mechanics	82345	119606	151327	83.8
322 – Fabrication engineering trades workers	71151	94949	129074	81.4
323 – Mechanical engineering trades workers	124106	157505	195274	57.3
324 – Panelbeaters, and vehicle body builders, trimmers and painters	28164	41377	52493	86.4
331 – Bricklayers, and carpenters and joiners	133707	181705	249648	86.7
332 – Floor finishers and painting trades workers	41744	53152	66880	60.2
333 – Glaziers, plasterers and tilers	56414	71470	89555	58.7
334 – Plumbers	67625	90279	124009	83.4
341 – Electricians	126285	178150	252521	100.0
342 – Electronics and telecommunications trades workers	64085	92407	129430	102.0
351 – Food trades workers	84077	133679	175721	109.0
361 – Animal attendants and trainers, and shearers	23684	47178	75455	218.6
362 – Horticultural trades workers	65630	119992	182208	177.6
391 – Hairdressers	45819	64638	88523	93.2
392 – Printing trades workers	17447	23550	27978	60.4
393 – Textile, clothing and footwear trades workers	8324	12221	16139	93.9
394 – Wood trades workers	26930	35282	40616	50.8
399 – Miscellaneous technicians and trades workers	27210	39525	50053	84.0
Total trades	**1242751**	**1794582**	**2447676**	**97.0**

Source: Karmel and Mlotkowski (2010).

In table 26, we derive potential shortages again, but this time using the 'best' supply projections.

Table 26 A comparison of supply and demand, annual growth, 2010–20

	2010 Employment	Employment forecast	'Best' supply projection	Shortfall ('best' supply)
311 – Agricultural, medical and science technicians	49700	2.0	10.3	-8.3
312 – Building and engineering technicians	122100	2.2	0.2	**2.0**
313 – ICT and telecommunications technicians	52400	3.3	6	-2.7
321 – Automotive electricians and mechanics	98300	1.3	4.4	-3.1
322 – Fabrication engineering trades workers	82400	3.7	4.6	-0.9
323 – Mechanical engineering trades workers	141400	0.9	3.3	-2.4
324 – Panelbeaters, and vehicle body builders, trimmers and painters	35600	0.7	4	-3.3
331 – Bricklayers, and carpenters and joiners	141400	1.0	5.8	-4.8
332 – Floor finishers and painting trades workers	60400	0.0	1	-1.0
333 – Glaziers, plasterers and tilers	67000	0.6	2.9	-2.3
334 – Plumbers	73400	0.8	5.4	-4.6
341 – Electricians	132200	1.7	6.7	-5.0
342 – Electronics and telecommunications trades workers	101400	0.5	2.5	-2.0
351 – Food trades workers	147900	1.1	1.7	-0.6
361 – Animal attendants and trainers, and shearers	25100	2.1	11.6	-9.5
362 – Horticultural trades workers	82900	2.4	8.2	-5.8
391 – Hairdressers	51100	1.4	5.6	-4.2
392 – Printing trades workers	27000	-1.3	0.4	-1.7
393 – Textile, clothing and footwear trades workers	17500	0.6	-0.8	**1.4**
394 – Wood trades workers	32100	1.4	2.4	-1.0
399 – Miscellaneous technicians and trades workers	51700	1.9	-0.3	**2.2**
Total trades	1593000	1.5	4.4	-2.9

Source: Employment forecasts are Monash Labour Market forecasts, 2008–09 to 2016–17. Supply projections from Karmel and Mlotkowski (2010).

As can be seen, the 'best' scenario gets rid of all the potential shortages except for two occupations—textile, clothing and footwear trades workers and the catch-bag of miscellaneous technicians and trade workers. The former is not one of the occupations that comes to mind when discussing shortages but if Monash is correct, then steps will have to be taken to avert the long-term decline in this trade.

A further consideration is that the uncertainty around the estimates of demand is also large relative to any gap between the demand forecasts and supply projections. The macro-economy is significantly affected by factors such as the terms of trade and external shocks (such as the global financial crisis), and these are difficult, if not impossible, to accommodate in the Monash model.

Our conclusion is that there is little reason to worry about skills shortages, given the flexibility of the economy and the uncertainty associated with both supply and demand. The role of wages in equilibrating supply and demand should also not be ignored. Increased wages in particular occupations will both increase the number of persons entering the occupation and decrease the numbers exiting. There is plenty of scope for the supply of tradespeople to expand, noting that this will only occur if trade jobs are attractive relative to alternative occupations. If trade jobs (and apprenticeships) are not attractive, then our 'worst' scenario could eventuate and this would definitely place constraints on the economy.

One point to bear in mind here is that history suggests that there is considerable flexibility in occupational labour markets in terms of the proportion of a cohort entering apprenticeships, completion rates and attrition more generally. An issue, therefore, is what has been the binding constraint on trade employment. If it is employment demand, and especially the demand for apprentices from employers, then it is one thing. If the constraint is on the supply side—individuals unwilling to undertake apprenticeships—then it is another. In particular, if the lack of new supply is caused by insufficient offering of apprenticeships, then an obvious solution is to expand the number and range of non-apprenticeship pathways into trade occupations. This is an area where evidence is scant. To address this, at least to some degree, Erica Smith and colleagues (Smith & Bush, forthcoming) were commissioned to undertake a small survey of employers to get some sort of intelligence on the balance of supply of and demand for apprenticeships and traineeships. Not surprisingly, they found a variety of views, but overall it would seem that the major constraint on the supply of skilled workers is the lack of apprenticeships and traineeships, not the lack of people willing to undertake them. This is not to say that there are no cases of employers unable to find suitable applicants, and clearly employers would always like to have more choice of suitable candidates.

In this context, apprentice and trainee wages will play a part. We already know that many employers pay above-award wages to their apprentices and trainees. However, no doubt if the minimum wages for apprentices and trainees were to increase, then more would be attracted to apprenticeships and traineeships. But any such increase would also reduce the number of employers willing to offer apprenticeships and traineeships. That is, higher wages for apprentices and trainees could reduce the demand by employers and so reduce long-term skills formation. Therefore, one would be very nervous about increasing the minimum wages of apprenticeships and traineeships if there were any concerns about the output of the apprenticeship and traineeship system. If the constraint on the number had been the lack of applicants relative to demand by employers, then it would be a different story.

While the above discussion has centred on skill shortages, there is an allied concept—that of skill gaps. These 'occur when skill levels in the workforce are below those desired by employers or when job requirements do not match precisely the content of knowledge and abilities of individuals' (CEDFOP 2010). Skill gaps are likely to occur when skill shortages lead to a lower quality hire. The 2001 UK Employer and Skills Survey found that skill gaps were related to management practices such as lack of labour training. Apprenticeships and traineeships may have a useful role in ensuring that skill gaps do not occur by promoting an employment relationship in which training is a critical element.

Before concluding our discussion of sustainability we wish to comment specifically on the resources sector, because it is this sector that is likely to drive economic growth in Australia over the next ten years. Therefore if skills shortages in the trades are likely to emerge, then arguably they will be seen in this sector. Karmel and Mlotkowski (2010) make a couple of points in this regard. First, the resources sector is a relatively small employer of tradespeople. As can be seen from table 27, the resource sector overall has a share of trade employment of 5.6%.

Table 27 Trade employment in the resource sector (per cent of respective trade), February 2010

3 – Technicians and trades workers	5.6
311 – Agricultural, medical and science technicians	2.0
312 – Building and engineering technicians	12.8
313 – ICT and telecommunications technicians	0.8
321 – Automotive electricians and mechanics	1.1
322 – Fabrication engineering trades workers	8.5
323 – Mechanical engineering trades workers	15.3
324 – Panelbeaters, and vehicle body builders, trimmers and painters	0.0

331 – Bricklayers, and carpenters and joiners	2.3
332 – Floor finishers and painting trades workers	0.7
333 – Glaziers, plasterers and tilers	0.0
334 – Plumbers	2.2
341 – Electricians	5.5
342 – Electronics and telecommunications trades workers	3.8
351 – Food trades workers	1.0
361 – Animal attendants and trainers, and shearers	0.0
362 – Horticultural trades workers	26.9
391 – Hairdressers	0.0
392 – Printing trades workers	0.0
393 – Textile, clothing and footwear trades workers	0.0
394 – Wood trades workers	0.0
399 – Miscellaneous technicians and trades workers	3.9

Source: Karmel and Mlotkowski (2010).

Only in three occupations does the resources sector have more than 10% of trade employment: building and engineering technicians (12.8%), mechanical engineering trades workers (15.3%) and horticultural trades workers (26.9%). The last of these is a surprising finding but most likely reflects the large amount of remediation and landscaping work done in mining and civil construction. It's also worth keeping in mind that the horticultural trades would be among the least skilled (they tend to be low-paid) and there would be considerable substitution between unskilled labour and horticulturalists.

The second point made by Karmel and Mlotkowski is that the resources sector is not a large employer of apprentices. Table 28 shows the relative shares of apprentices by industry, while table 29 shows the shares of apprentices and employment for those occupations in which the resource sector has more than 4% of employment.

Table 28 Relative share of apprentices employed by resource sector ('fair' share = 100)

060 – Coal mining	17
070 – Oil and gas extraction	10
080 – Metal ore mining	34
101 – Exploration	40
109 – Other mining support services	137
310 – Heavy and civil engineering construction	77
321 – Land development and site preparation services	29
329 – Other construction services	100
Total resource industries	64
Total other industries	102
Total	100

Source: Karmel and Mlotkowski (2101, derived from appendix tables B1 and B2).

Table 29 Relative share of apprentices employed by the resources sector, by selected occupations ('fair' share = 100)

	Share of apprentices	Share of employment	Relative share
3 – Technicians and trades workers	4	6	63
312 – Building and engineering technicians	20	13	160
322 – Fabrication engineering trades workers	4	8	45
323 – Mechanical engineering trades workers	6	15	39
341 – Electricians	2	6	27
342 – Electronics and telecommunications trades workers	1	4	24
362 – Horticultural trades workers	30	27	113
399 – Miscellaneous technicians and trades workers	1	4	30

Note: The occupations are those for which the resources sector employs 4% or more of the employment in that occupation.

Thus there is considerable variation in the training load being borne by various industries in the resources sector and variation by occupation. However, the overall conclusion is that the resources sector is in general a small player in the provision of apprenticeships and, moreover, it employs fewer apprentices than would be expected, given its share of trade employment. Obvious reasons behind this include the high employee turnover associated with working in remote areas and the fact that the industry has the capacity to pay wages needed to attract qualified tradespersons.

Educational trends

The above discussion on sustainability has had an economic and labour market focus. The supply models assumed that historical patterns of entry into apprenticeships would continue to apply. However, this could be questioned on the basis that the clear policy push is towards higher-level qualifications, particularly degrees. Thus governments have set ambitious targets for 40% of all 25 to 34 year olds to have a degree by 2025, and funding for university is moving to being demand-driven. That is, if an individual is accepted into an undergraduate place, then that place will be funded (with certain constraints about the extent of entitlements).

This push is part of a longer-term trend towards having a greater proportion of the population with a degree. Table 30 shows how fast qualifications have been growing.

Table 30 Employed persons by highest qualification, 1996 and 2006 (%)

Highest qualification	1996	2006
Higher degree	2.1	3.7
Bachelor degree	13.4	18.3
Diploma and advanced diploma	8.1	9.0
Certificate III and IV	14.2	18.2
Other certificates	10.9	8.8
No non-school qualification	51.3	42.1
Total	100.0	100.0

Notes: Bachelor degree includes bachelor degree and graduate diploma/ graduate certificate.
Other vocational includes, certificates I/II, certificates not further defined, and level inadequately described or not stated.

Source: Derived from the Census of Population and Housing, 1996 and 2006.

The concern is that this push towards degrees might displace, in particular, potential apprentices. The extent to which this will happen depends on the substitutability of different educational choices. In particular, as the proportion of the population going to university increases, will the proportion undertaking an apprenticeship decline? To get a handle on this, Karmel and Lim

(unpublished mimeo) have modelled educational choice using data from the Longitudinal Survey of Australian Youth. Having established the characteristics associated with going to university, undertaking an apprenticeship and so on, they conduct a mind experiment. They assume that the numbers going to university will increase (10%). They then rank the sample by the probability of going to university (based on the various background characteristics) and sort the sample by the probability. Under the expansionary counterfactual they assume that those who will (but do not currently) go to university will be those with the highest probabilities of going. A simple tabulation of what these people are currently doing should provide a good indication of the likely impact on other educational sectors, including apprenticeships and traineeships. The results of the experiment are presented in tables 31a and 31b.

Table 31a Effect of hypothetical expansion in higher education places, males

Qualification	Original numbers	New participation rate	% difference
Bachelor degree or higher	1160	1261	8.0
Diploma/advanced diploma/associate degree	118	115	-2.6
Apprenticeship	609	598	-1.8
Other VET incl. traineeships	248	242	-2.5
No post-school study	1161	1080	-7.5
Total	**3296**	**3296**	**0.0**

Table 31b Effect of hypothetical expansion in higher education places, females

Qualification	Original numbers	New participation rate	% difference
Bachelor degree or higher	1549	1719	9.9
Diploma/advanced diploma/associate degree	153	142	-7.7
Other VET incl. traineeships	393	373	-5.4
No post-school study	1267	1128	-12.3
Total	**3362**	**3362**	**0.0**

Source: Karmel and Lim (unpublished mimeo).

A general expansion of the availability of higher education would result in those not in any study taking up places in higher education. For males, there is little leakage from those undertaking an apprenticeship, a diploma or other VET. For females, the biggest group come from 'no post-school study', but the diploma and VET groups suffer a drop of around 8% in their numbers. Our conclusion is that trades apprentices are not likely to be significantly affected in the medium term by the expansion in higher education.

Final comments

The institution of apprenticeships has a long and venerable history. At its core is a contract between an employer and an apprentice in which both invest in order for the apprentice to acquire skills to become a fully fledged tradesperson and for the employer to assure the supply of skilled workers. This arrangement can be justified by standard economic theory and makes a great deal of sense. The notion of acquiring skills in a work context has a great deal of appeal.

However, any such romanticised description of the institution needs to be put to the test. The world is far more complicated than a simple closed, two-period model and there are many reasons why the apprentice–master arrangement might not be optimal. First, there are the usual market failure arguments such as lack of perfect information and inadequate capital markets. Then there are impacts of other institutions on the contract between the employer and the apprentice. Most important here are the lack of enforceability of the contract—there is nothing to stop the apprentices walking way from the contract, for example. Also the Australian system of awards means that the wages set may not fulfil the requirements for the theoretical model (and employers will not take on sufficient apprentices if the wages of unproductive apprentices are too high).

Thus it is not surprising that governments have intervened and subsidised apprentice training to a very significant level—both through underwriting the cost of off-the-job training and through incentives to employers. In addition, the apprenticeship model has been extended to a wide range of occupations, and the skills acquisition justification for the institution has become muddied by the idea that a traineeship (that is, an apprenticeship in a non-traditional occupation) often has a labour market program role in assisting those struggling in the labour market to get a job. The introduction of traineeships has certainly made matters very complicated, with some traineeships being more about wages subsidies (either directly or through access to training wages) than about investment in skills.

The magnitude of the public investment in apprenticeships and traineeships is very large. In thinking about the focus of investment we make the following observations:

- The apprenticeship model is only one way of training skilled individuals for the trades and other occupations. Other models used in other occupations and overseas include training in institutions before entry into the labour market as a novice worker, or training in an institution and then being placed in employment to complete that training. Training on the job is another alternative—this may be particularly appropriate for low-skill occupations or where people are already working in an occupation.
- Completion rates are relatively low (particularly in some occupations) and therefore many individuals are talking with their feet; those who do not complete clearly do not attach great value to completion. The obvious corollary is that a sizable proportion of individual, employer and government investment is being wasted, although not all incomplete training should be regarded as wasted.[7]

[7] Karmel and Mlotkowski (2010) show that wages for those who drop out from a trade apprenticeship increase with the duration of training,

- ✧ The wages of an apprentice or trainee are relatively low (especially in the early years) but this is intended to reflect the investment of the individual in their training. And, of course, those being trained in institutions get no wage at all.
- ✧ The government incentives are relatively unimportant for apprenticeships of three to four years duration but are significant for the shorter-duration traineeships. The cost of an apprenticeship or traineeship to an employer is significant for the trades but less so in other occupations.
- ✧ The level of skills acquisition (as reflected in post-training earnings) is very variable. Some of the trades, especially the technicians and the electrotechnology trades, command quite handsome premia—approaching those of professional occupations. Some of the traineeship occupations also have a fair degree of skills acquisition, as shown by post-qualification earnings. On the other hand, there are some occupations in which the model is not leading to good outcomes. In the trades, the clearest examples are hairdressing and the food trades. Both of these have very poor completion rates and very low earnings after completion. The hourly rate for hairdressers is among the lowest of all occupations and the food trades are also poorly paid. Many of the trainee occupations are among the lower-skilled occupations. Among the higher-skilled 'trainee occupations' it appears that generic education is more valuable than traineeship training.
- ✧ Only in the trades and several other occupations is there a high match between training and occupational destinations. It is really only in these occupations that the apprenticeship model makes sense—the whole point of an apprenticeship is the provision of occupational training.
- ✧ From a community perspective there is a strong argument that the apprenticeship and traineeship system does play a worthwhile role. Here the argument is about getting people into jobs, particularly those who might struggle in the labour market otherwise. The apprenticeship and traineeship system is also particularly important in rural and remote regions.
- ✧ One can make an argument that skills acquisition in general is important for economic growth. But this argument does not favour apprenticeships and traineeships over other forms of skilling (notably institution-based training)
- ✧ The apprenticeship model is impacted by the economic cycle, particularly in those occupations allied to construction and manufacturing. During a downturn commencements in particular drop and this has potential long-term consequences for the labour supply in those occupations. As it turns out, the recent downturn was not sufficiently pronounced to pose a particular problem, but it remains the case that the apprenticeship model does increase the labour supply's vulnerability. By contrast, the traineeship occupations do not appear to be linked so strongly to the economic cycle.
- ✧ There has also been interest in whether the apprenticeship and traineeship system is sustainable in the longer term. That is, is the system likely to lead to constraints in the growth of the economy? We restricted our analysis to the trades for the simple reason that the link between the apprenticeship and traineeship system and occupational supply is much weaker among the trainee occupations. However, within the trades we found no evidence for fears in the medium term. Historical experience suggests that labour supply will meet demand in the trades, if the trades remain attractive relative to other occupations.

In thinking about the apprenticeship and traineeship system we need to look at the model's individual elements. First, the designation of a job as an apprenticeship or traineeship enables the employer to access the industrial conditions specified for apprentices and trainees (that is, lower wages). Second, the model incorporates skills acquisition. Third, the off-the-job training element is government-subsidised (almost fully). Finally, apprenticeships and traineeships attract government benefits (to the individual and the employer).

One can therefore think of designing an apprenticeship or traineeship based on a series of questions relating to the characteristics of occupations and individuals:

- Should that occupation be entitled to lower wages than paid to an unskilled worker? Lower wages only make sense in occupations where apprenticeship and traineeships can be viewed as investment, with a wage premium resulting on completion.
- Is there serious skills acquisition associated with the apprenticeship or traineeship? We could envisage traineeships not leading to qualifications in cases where the aim is to assist transition to employment.
- Is the government trying to subsidise employment in that occupation?
- Is the government trying to assist the employment prospects of an individual?

Our point is that it would be possible to have apprenticeships and traineeships without government subsidy and it is also possible to have traineeships without serious training (an apprenticeship without training would be a contradiction). It is also possible to have serious training in an employment relationship without a traineeship (that is, an employment/training contract but without access to training wages). Finally, there is no underlying reason why occupational training needs to be done within the apprenticeship and traineeship framework.

Pulling all these observations together we suggest four ideas to think about:

- It would reduce the risk of having an inadequate labour supply by supplementing the apprenticeship model with an institution-based one, perhaps with some sort of provisional qualification that is completed with work experience.
- Give some thought to abandoning the model in occupations where it is clearly not working. In the trades the obvious possibilities are hairdressing and cooks. High dropout rates and high proportions of people working in those trades not going through an apprenticeship suggests that an institution-based model would work fine. Why would an individual want to be on apprentice wages for three of four years when he or she could obtain a non-training wage after six to 12 months of institutional training? An example in non-trade occupations is sales. Traineeships here seem to be about containing wages (allowing employers to pay below standard rates) and it is difficult to argue that sales trainees learn anything that could not be learned on the job.
- We are unconvinced about the merits of having traineeships for existing workers and part-time workers. These seem to be about reducing wages or getting a contribution from government to training which in normal circumstances would be undertaken by the employer. Of course, employees acquire skills through on-the-job training but this can be done (and mostly is) outside the apprenticeship and traineeship system.
- Be clear about which parts of the model relate to skills acquisition and which are concerned with smoothing entry into the labour market. This should then flow through to government subsidies. This might well entail a switch in subsidies from occupations to targeting individuals.

In making these observations, we need to be clear that we do not doubt the value of training that leads to serious skills acquisition. Notions of social justice argue strongly for ensuring that all new entrants to the labour market have access to appropriate, government-subsidised training (in the same way that all have access to free schooling). However, such an argument does not preclude some rebalancing of institution-based and apprenticeship/traineeship-based training. The worst of all possible worlds would be an entitlement model in which individuals use up their training entitlement with an apprenticeship or traineeship of little value to them, in order for employers to manage their wage bills.

Finally, we acknowledge that some of the suggestions will be anathema to many stakeholders. They are offered in the spirit of trying to build on the strengths of the system rather than defend its weaknesses.

References

ABS (Australian Bureau of Statistics) 2008, *Employee earnings and hours, Australia*, cat.no.6306.0, Canberra.

——2010, *Labour force, quarterly, August 2010*, cat.no.6291.0.55.003, Canberra.

Acemoglu, D & Pischke, J 2000, 'Beyond Becker: training in imperfect labor markets', *The Economic Journal*, vol.109, no.453, pp.112–42.

Ball, K & John, D 2005, *Apprentice and trainee completion rates,* NCVER, Adelaide.

Becker, G 1964, *Human capital: a theoretical and empirical analysis, with special reference to education,* University of Chicago Press, Chicago.

Boswell, WR, Roehling, MV, LePine, MA & Moynihan, LM 2003, 'Individual job-choice decisions and the impact of job attributes and recruitment practices: a longitudinal field study', *Human Resource Management*, vol.42, no.1, pp.22–37.

CEDEFOP 2010, *The skill matching challenge: analysing skill mismatch & policy implications,* EU, Luxembourg.

Cohen, W & Levinthal, D 1990, 'Absorptive capacity: a new perspective on learning and innovation', *Administrative Science Quarterly,* vol.35, no.1, pp.128–52.

Cully, M 2008, *Youth wages, training wages and productivity: the economic anatomy of traineeships*, Australian Fair Pay commission, Melbourne

Gow, K, Warren, C, Anthony, D & Hinschen, C 2008, 'Retention and intentions to quit among Australian male apprentices', *Education + Training,* vol.50 no.3, pp.216–30.

Hall, G, Joslin, H & Ward, J 2010, 'Developing higher apprenticeships in England', *Lifelong Learning Networks National Forum.*

Haskel, J, Hawkes, D & Pereira, S 2005, 'Skills, human capital and the plant productivity gap: UK evidence from matched plant, worker and workforce data', *CEPR Discussion Papers,* 5334.

Henderson, R & Cockburn, I 1994, 'Measuring competence? Exploring firm effects in pharmaceutical research', *Strategic Management Journal.*, vol.15, no.8, pp.63–84.

Iranzo, S, Schivardi, F & Tosetti, E 2008, 'Skill dispersion and firm productivity: an analysis with employer-employee matched data', *Journal of Labor Economics*, vol.26, no.2, pp.247–85.

Karmel, T 2008, 'Have traineeships increased productivity?', unpublished mimeo, NCVER, Adelaide.

Karmel, T & Lim, P (unpublished mimeo), 'Socio-economic disadvantage and participation in tertiary education: some preliminary thoughts', NCVER, Adelaide.

Karmel, T & Mlotkowski, P 2008, *Modelling the trades: an empirical analysis of trade apprenticeships in Australia, 1967–2006*, NCVER, Adelaide.

——2010, 'Tradespeople for the resources sector: projections 2010–2010', paper prepared for the National Resources Sector Employment Taskforce, NCVER, Adelaide.

Karmel, T & Ong, K 2007, *Will we run out of young men? Implications of the ageing of the population for the trades in Australia*, NCVER, Adelaide.

Karmel, T, Blomberg, D & Vnuk, M 2010, *The effectiveness of the traineeship model*, NCVER

Karmel, T, Mlotkowski, P & Awodeyi, T 2008, *Is VET vocational? The relevance of training to the occupations of vocational education and training graduates*, NCVER, Adelaide.

Karmel, T, Oliver, D & Vnuk, M (forthcoming), *Apprentices and trainees in the downturn*, NCVER

Lee, W & Coelli, M 2010, *Analysis of private returns to vocational education and training*, NCVER, Adelaide.

Leuven, E 2005, 'The economics of private sector training: a survey of the literature', *Journal of Economic Reviews*, vol.19, no.1, pp.91–111.

McNaughton, A (forthcoming), *The cost of training trainees*, NCVER, Adelaide.

Morgan, K 2007, 'The learning region: institutions, innovation and regional renewal', *Regional Studies*, vol.31, no.5, pp.491–503.

NCVER (National Centre for Vocational Education Research) 2009*, Australian vocational education and training statistics: Apprentices and trainee destinations 2008*, NCVER, Adelaide.

——2010*, Experimental completion and attrition rates for latest commencing apprentices and trainees*, NCVER, Adelaide.

Nechvoglod, L, Karmel, T & Saunders, J 2009, *The cost of training apprentices*, NCVER, Adelaide.

Rice, J, Liao, TS & Martin, N (forthcoming), 'The role of the market in transforming training and knowledge to superior performance', *The International Journal of Human Resource Management*,.

Richardson, S 2007, *What is a skill shortage?* NCVER, Adelaide.

Richardson, S & Teese, R 2008, *A well skilled future*, NCVER, Adelaide.

Ruth, K & Deitmer, L 2010, *International encyclopedia of education*/editors-in-chief Penelope Peterson, Eva Baker, Barry McGaw, Elsevier, Oxford, pp.423–8.

Ryan, C 2002, *Individual returns to vocational education and training qualifications: their implications for lifelong learning.* NCVER, Adelaide.

Smith, E & Bush, T (forthcoming), *Apprenticeship and traineeship demand and supply: employers' views*, NCVER, Adelaide.
Toner, P 2005, *Getting it right: what employers and apprentices have to say about apprenticeships*, Dusseldorp Skills Forum, Glebe, NSW.
Wolter, S, Mühlemann, S & Schweri, J 2006, 'Why some firms train apprentices, and many others do not', *German Economic Review*, vol.7, pp.249–64.
Zwick, T 2007, 'Apprenticeships in Germany – investment or productivity driven?', *Zeitschrift für Arbeitsmarktforschung*, vol.40, no.2/3, pp.193–204.

Appendix 1: Premium on completion of an apprenticeship or traineeship for apprentices and trainees, classified by whether an existing worker or not, whether full-time or part-time, and whether school-based

Table A1 Mean wage premium on completion of an apprenticeship or traineeship, trades and non-trades (male/female), 2008 and 2010 combined, excluding part-timers and existing workers

	Trades		**Non-trades (male)**		**Non-trades (female)**	
	Mean ($)	Sample size	Mean ($)	Sample size	Mean ($)	Sample size
Trades:						
31 Engineering, ICT & science technicians	7283	75	-	-	-	-
32 Automotive and engineering	15788	680	-	-	-	-
33 Construction trades workers	19911	854	-	-	-	-
34 Electrotechnology and telecommunications trades workers	23323	370	-	-	-	-
35 Food trades workers	8165	368	-	-	-	-
391 Hairdressers	5386	214	-	-	-	-
All other trade occupations	9742	288	-	-	-	-
Total	15401	2849	-	-	-	-
Non-trades:						
1+2 Managers and professionals	-	-	6538	46	4022	54
4 Community and personal service workers	-	-	4316	125	5858	256
5 Clerical and administrative workers	-	-	5559	247	5338	526
6 Sales workers	-	-	-1576	121	-2447	211
7 Machinery operators and drivers	-	-	2305	249	6893	30
8 Labourers	-	-	3678	264	-7014	67
Total	-	-	3391	1052	3274	1144

Table A2 Mean wage premium on completion of an apprenticeship or traineeship, trades and non-trades (male/female), 2008 and 2010 combined, existing workers

	Trades		Non-trades (male)		Non-trades (female)	
	Mean ($)	Sample size	Mean ($)	Sample size	Mean ($)	Sample size
Trades:						
31 Engineering, ICT & science technicians	-784	38	-	-	-	-
32 Automotive and engineering	6189	100	-	-	-	-
33 Construction trades workers	11903	51	-	-	-	-
34 Electrotechnology and telecommunications trades workers	12559	31	-	-	-	-
35 Food trades workers	-2353	30	-	-	-	-
391 Hairdressers	1682	7	-	-	-	-
All other trade occupations	-291	77	-	-	-	-
Total	4504	334	-	-	-	-
Non-trades:						
1+2 Managers and professionals	-	-	3763	118	2832	82
4 Community and personal service workers	-	-	5016	85	5460	204
5 Clerical and administrative workers	-	-	3380	249	4117	345
6 Sales workers	-	-	-3631	116	-488	186
7 Machinery operators and drivers	-	-	-1392	323	8935	52
8 Labourers	-	-	509	81	-4845	63
Total	-	-	908	972	3042	932

Table A3 Mean wage premium on completion of an apprenticeship or traineeship, trades and non-trades (male/female), 2008 and 2010 combined, part-time workers

	Trades		Non-trades (male)		Non-trades (female)	
	Mean ($)	Sample size	Mean ($)	Sample size	Mean ($)	Sample size
Trades:						
31 Engineering, ICT & science technicians	-6034	35	-	-	-	-
32 Automotive and engineering	-2096	17	-	-	-	-
33 Construction trades workers	4804	30	-	-	-	-
34 Electrotechnology and telecommunications trades workers	2607	7	-	-	-	-
35 Food trades workers	-5501	32	-	-	-	-
391 Hairdressers	-6142	17	-	-	-	-
All other trade occupations	-7198	60	-	-	-	-
Total	-4024	198	-	-	-	-
Non-trades:						
1+2 Managers and professionals	-	-	-267	18	2273	100
4 Community and personal service workers	-	-	3893	220	3778	636
5 Clerical and administrative workers	-	-	2994	62	2870	254
6 Sales workers	-	-	378	244	-480	478
7 Machinery operators and drivers	-	-	2695	69	5506	19
8 Labourers	-	-	1070	173	-5313	109
Total	-	-	1909	786	1664	1596

Table A4 Mean wage premium on completion of an apprenticeship or traineeship, trades and non-trades (male/female), 2008 and 2010 combined, school-based

	Trades		Non-trades (male)		Non-trades (female)	
	Mean ($)	Sample size	Mean ($)	Sample size	Mean ($)	Sample size
Trades:						
31 Engineering, ICT & science technicians	-4356	26	-	-	-	-
32 Automotive and engineering	-2050	15	-	-	-	-
33 Construction trades workers	4763	23	-	-	-	-
34 Electrotechnology and telecommunications trades workers	2607	7	-	-	-	-
35 Food trades workers	-427	10	-	-	-	-
391 Hairdressers	-6762	6	-	-	-	-
All other trade occupations	-4054	17	-	-	-	-
Total	-1250	104	-	-	-	-
Non-trades:						
1+2 Managers and professionals	-	-	-2598	9	1549	8
4 Community and personal service workers	-	-	-1095	39	2539	94
5 Clerical and administrative workers	-	-	600	20	2596	52
6 Sales workers	-	-	-2862	90	-506	141
7 Machinery operators and drivers	-	-	-1718	11	3946	1
8 Labourers	-	-	415	105	-3279	14
Total	-	-	-1047	274	880	310

Appendix 2: Outcomes for apprentices and trainees classified by whether Indigenous, report a disability, and by region

Source of tables in appendix 2: NCVER *Student outcomes 2009* http://www.ncver.edu.au/publications/2180.html
For notes on tables see page 16 of the publication.

Table A5 Key findings for graduates by Indigenous and apprenticeship/traineeship status, 2009

	Training was part of an apprenticeship or traineeship		Training was not part of an apprenticeship or traineeship	
	Indigenous	Not Indigenous	Indigenous	Not Indigenous
Respondents	*444*	*11 697*	*1 005*	*37 376*
Estimated population	*4 280*	*119 170*	*9 030*	*322 040*
	%	*%*	*%*	*%*
Employment and further study outcomes				
After training (as at 29 May 2009)				
Employed	75.4	87.8	64.1	75.0
Not employed[1]	24.6	12.2	35.9	25.0
Unemployed	13.9	7.2	19.9	12.4
Not in the labour force	7.8	4.6	15.5	12.3
Employed before training	68.9	80.1	62.5	74.0
Difference in proportion employed from before training to after	6.5	7.7	1.6	1.0
Employed in first full-time job after training[2]	21.9	27.0	12.1	13.3
Employed or in further study after training[2]	81.5	92.2	79.5	86.1
Enrolled in further study after training[2]	30.0	27.3	36.0	33.9
Studying at university[2]	2.6*	4.4	6.6	7.7
Studying at TAFE institute[2]	12.4	14.6	18.1	19.0
Studying at private provider or other registered provider[2]	14.1	8.0	11.2	7.0
Training				
Reasons for undertaking the training:				
Employment-related outcome	87.6	91.0	69.1	76.9
Further study outcome	**	1.3	3.9	5.3
Personal development outcome	11.8	7.6	26.9	17.9
Training was part of an apprenticeship or traineeship[2]	100.0	100.0	0.0	0.0
Satisfaction outcomes				
Satisfied with the overall quality of training	91.6	88.5	91.6	89.2
Fully or partly achieved their main reason for doing the training	91.0	94.3	86.7	83.6
Benefits of training				
Of those employed after training				
Reported that the training was relevant to their current job	85.2	89.4	76.1	72.2
Received at least one job-related benefit	88.7	86.4	73.0	65.6
Improved employment status after training				
Of those not employed before training				
Employed after training	49.9	70.6	29.6	36.1
Of those employed before training				
Employed after training at a higher skill level[2]	30.7	33.4	16.1	15.7

Table A6 Key findings for module completers by Indigenous and apprenticeship/traineeship status, 2009

	Training was part of an apprenticeship or traineeship		Training was not part of an apprenticeship or traineeship	
	Indigenous	Not Indigenous	Indigenous	Not Indigenous
Respondents	*89*	*1 789*	*492*	*18 419*
Estimated population	*1 100*	*26 100*	*7 090*	*228 770*
	%	*%*	*%*	*%*
Employment and further study outcomes				
After training (as at 29 May 2009)				
Employed	63.1	69.7	55.5	76.9
Not employed[1]	36.9	30.3	44.5	23.1
Unemployed	18.2*	19.8	25.3	9.3
Not in the labour force	15.5*	10.2	18.1	13.3
Employed before training	54.8	74.7	58.5	78.4
Difference in proportion employed from before training to after	8.3	-5.0	-3.0	-1.5
Employed in first full-time job after training[2]	15.7*	16.5	9.1	14.3
Employed or in further study after training[2,3]	65.0	71.0	57.4	78.4
Enrolled in further study after training[2,3]	**	3.6	3.6*	4.8
Studying at university[2]	**	3.6	3.6*	4.8
Studying at TAFE institute[2]	na	na	na	na
Studying at private provider or other registered provider[2]	na	na	na	na
Training				
Reasons for undertaking the training:				
Employment-related outcome	86.0	87.0	68.2	73.2
Further study outcome	**	2.2	3.1*	2.4
Personal development outcome	12.6*	10.8	28.7	24.5
Training was part of an apprenticeship or traineeship[2]	100.0	100.0	0.0	0.0
Satisfaction outcomes				
Satisfied with the overall quality of training	83.1	77.8	83.3	85.2
Fully or partly achieved their main reason for doing the training	75.9	79.5	68.5	82.2
Benefits of training				
Of those employed after training				
Reported that the training was relevant to their current job	67.4	68.1	65.1	64.2
Received at least one job-related benefit	72.3	67.8	58.1	52.8
Of those not employed before training				
Employed after training	37.0*	40.8	20.9	28.1
Of those employed before training				
Employed after training at a higher skill level[2]	22.9*	21.4	11.4	8.3

Table A7 Key findings for graduates by disability (including impairment or long-term condition) and apprenticeship/ traineeship status, 2009

	Training was part of an apprenticeship or traineeship		Training was not part of an apprenticeship or traineeship	
	With a disability	Without a disability	With a disability	Without a disability
Respondents	*749*	*11 418*	*3 606*	*34 864*
Estimated population	*7 480*	*116 180*	*31 360*	*300 320*
	%	*%*	*%*	*%*
Employment and further study outcomes				
After training (as at 29 May 2009)				
Employed	76.8	88.1	51.3	77.1
Not employed[1]	23.2	11.9	48.7	22.9
Unemployed	12.0	7.2	20.3	11.8
Not in the labour force	10.2	4.4	27.6	10.8
Employed before training	71.1	80.2	50.5	76.1
Difference in proportion employed from before training to after	5.7	7.9	0.8	1.0
Employed in first full-time job after training[2]	23.9	27.0	6.8	13.9
Employed or in further study after training[2]	85.9	92.2	72.1	87.4
Enrolled in further study after training[2]	26.9	27.4	37.4	33.6
Studying at university[2]	2.4*	4.5	4.8	8.0
Studying at TAFE institute[2]	13.4	14.5	23.4	18.4
Studying at private provider or other registered provider[2]	10.0	8.1	8.9	7.0
Training				
Reasons for undertaking the training:				
Employment-related outcome	88.8	91.0	66.0	77.7
Further study outcome	0.8*	1.3	5.2	5.2
Personal development outcome	10.5	7.6	28.7	17.1
Training was part of an apprenticeship or traineeship[2]	100.0	100.0	0.0	0.0
Satisfaction outcomes				
Satisfied with the overall quality of training	83.9	88.9	88.0	89.4
Fully or partly achieved their main reason for doing the training	89.7	94.5	77.8	84.3
Benefits of training				
Of those employed after training				
Reported that the training was relevant to their current job	81.6	89.6	69.7	72.5
Received at least one job-related benefit	83.3	86.7	67.8	65.7
Improved employment status after training				
Of those not employed before training				
Employed after training	46.3	71.6	22.9	38.6
Of those employed before training				
Employed after training at a higher skill level[2]	28.0	33.6	15.1	15.8

Table A8 Key findings for module completers by disability (including impairment or long-term condition) and apprenticeship/ traineeship status, 2009

	Training was part of an apprenticeship or traineeship		Training was not part of an apprenticeship or traineeship	
	With a disability	Without a disability	With a disability	Without a disability
Respondents	*219*	*1 661*	*2 114*	*16 850*
Estimated population	*3 150*	*24 050*	*27 200*	*209 360*
	%	*%*	*%*	*%*
Employment and further study outcomes				
After training (as at 29 May 2009)				
Employed	52.1	71.5	46.7	79.9
Not employed[1]	47.9	28.5	53.3	20.1
Unemployed	23.9	19.3	18.3	8.6
Not in the labour force	23.8	8.8	33.1	11.0
Employed before training	63.4	75.3	49.6	81.3
Difference in proportion employed from before training to after	-11.3	-3.8	-2.9	-1.4
Employed in first full-time job after training[2]	6.9*	17.6	6.8	15.1
Employed or in further study after training[2,3]	53.4	72.9	48.4	81.4
Enrolled in further study after training[2,3]	**	3.8	2.8	5.1
Studying at university[2]	**	3.8	2.8	5.1
Studying at TAFE institute[2]	na	na	na	na
Studying at private provider or other registered provider[2]	na	na	na	na
Training				
Reasons for undertaking the training:				
Employment-related outcome	82.7	87.5	60.2	74.5
Further study outcome	**	2.3	3.3	2.3
Personal development outcome	16.6	10.2	36.5	23.2
Training was part of an apprenticeship or traineeship[2]	100.0	100.0	0.0	0.0
Satisfaction outcomes				
Satisfied with the overall quality of training	76.6	78.2	78.2	86.1
Fully or partly achieved their main reason for doing the training	76.9	79.8	70.0	83.3
Benefits of training				
Of those employed after training				
Reported that the training was relevant to their current job	64.0	68.4	59.0	64.6
Received at least one job-related benefit	64.1	68.3	49.5	53.1
Improved employment status after training				
Of those not employed before training				
Employed after training	20.3*	44.1	16.1	31.8
Of those employed before training				
Employed after training at a higher skill level[2]	19.0	21.6	7.6	8.4

Table A9 Key findings for graduates by remoteness (ARIA+) region and apprenticeship/ traineeship status, 2009

	Training was part of an apprenticeship or traineeship			Training was not part of an apprenticeship or traineeship		
	Major cities	Inner regional	Outer regional, remote and very remote	Major cities	Inner regional	Outer regional, remote and very remote
Respondents	*6 392*	*3 068*	*2 800*	*20 325*	*9 116*	*8 911*
Estimated population	*69 230*	*31 020*	*24 960*	*187 190*	*78 770*	*67 760*
	%	*%*	*%*	*%*	*%*	*%*
Employment and further study outcomes						
After training (as at 29 May 2009)						
Employed	86.0	89.4	88.2	72.5	76.7	78.4
Not employed[1]	14.0	10.6	11.8	27.5	23.3	21.6
Unemployed	8.5	6.2	6.7	14.5	11.1	9.2
Not in the labour force	5.1	4.2	4.4	12.7	11.9	11.9
Employed before training	78.5	82.0	80.2	71.6	74.5	78
Difference in proportion employed from before training to after	7.5	7.4	8.0	0.9	2.2	0.4
Employed in first full-time job after training[2]	25.3	28.7	28.6	12.3	13.9	15.2
Employed or in further study after training[2]	90.8	93.4	92.4	85.1	87.4	86.8
Enrolled in further study after training[2]	27.8	27.0	25.6	35.9	33.2	29.4
Studying at university[2]	4.7	4.3	3.4	9.2	6.7	4.6
Studying at TAFE institute[2]	14.6	15.1	13.2	20.1	18.8	16
Studying at private provider or other registered provider[2]	8.2	7.6	8.6	6.5	7.4	8.5
Training						
Reasons for undertaking the training:						
Employment-related outcome	90.4	91.6	90.7	76.5	77	76.6
Further study outcome	1.5	1.0	1.3	6.7	4.2	2.6
Personal development outcome	8.0	7.5	8.0	16.8	18.8	20.8
Training was part of an apprenticeship or traineeship[2]	100.0	100.0	100.0	0.0	0	0
Satisfaction outcomes						
Satisfied with the overall quality of training	88.9	88.3	88.2	88.5	89.5	90.4
Fully or partly achieved their main reason for doing the training	93.1	95.5	95.4	81.6	85	87.1
Benefits of training						
Of those employed after training						
Reported that the training was relevant to their current job	88.5	90.2	89.1	71.6	73.3	72.9
Received at least one job-related benefit	85.9	87.5	86.4	66.3	65.5	64.6
Improved employment status after training						
Of those not employed before training						
Employed after training	65.2	75.8	74.8	34.3	37.9	37.8
Of those employed before training						
Employed after training at a higher skill level[2]	33.1	34.4	32.3	17.7	14.4	12.4

Table A10 Key findings for module completers by remoteness (ARIA+) region and apprenticeship/ traineeship status, 2009

	Training was part of an apprenticeship or traineeship			Training was not part of an apprenticeship or traineeship		
	Major cities	Inner regional	Outer regional, remote and very remote	Major cities	Inner regional	Outer regional, remote and very remote
Respondents	*1 092*	*451*	*259*	*9 512*	*4 801*	*4 793*
Estimated population	*16 080*	*6 860*	*3 530*	*123 220*	*63 060*	*53 300*
	%	%	%	%	%	%
Employment and further study outcomes						
After training (as at 29 May 2009)						
Employed	66.1	72.5	78.5	74.9	77.9	76.6
Not employed[1]	33.9	27.5	21.5	25.1	22.1	23.4
Unemployed	21.7	19.0	16.2	10.6	8.6	9.0
Not in the labour force	12.0	8.0	4.6*	13.8	12.8	13.6
Employed before training	71.2	78.6	76.6	76.6	78.5	78.4
Difference in proportion employed from before training to after	-5.1	-6.1	1.9	-1.7	-0.6	-1.8
Employed in first full-time job after training[2]	16.4	17.6	14.0	14.2	14.1	14.3
Employed or in further study after training[2,3]	67.8	74.0	76.4	76.5	79.6	77.8
Enrolled in further study after training[2,3]	4.5	3.0*	1.8*	5.5	4.7	3.1
Studying at university[2]	4.5	3.0*	1.8*	5.5	4.7	3.1
Studying at TAFE institute[2]	na	na	na	na	na	na
Studying at private provider or other registered provider[2]	na	na	na	na	na	na
Training						
Reasons for undertaking the training:						
Employment-related outcome	85.3	90.0	88.5	72.7	72.2	73.9
Further study outcome	2.7	1.4*	**	2.9	2.3	1.3
Personal development outcome	12.0	8.7	9.9	24.4	25.5	24.8
Training was part of an apprenticeship or traineeship[2]	100.0	100.0	100.0	0.0	0.0	0.0
Satisfaction outcomes						
Satisfied with the overall quality of training	77.9	74.3	81.9	83.5	86.8	86.7
Fully or partly achieved their main reason for doing the training	77.7	79.5	83.6	79.4	83.5	84.3
Benefits of training						
Of those employed after training						
Reported that the training was relevant to their current job	67.0	68.9	70.8	62.7	63.7	67.7
Received at least one job-related benefit	68.0	66.4	69.8	52.6	52.9	53.5
Improved employment status after training						
Of those not employed before training						
Employed after training	36.7	43.2	52.8	28.0	29.1	25.1
Of those employed before training						
Employed after training at a higher skill level[2]	21.5	23.6	19.2	8.9	8.1	7.6

Appendix 3: The supply model

1 The supply model

In economic parlance, supply refers to the number of people offering their labour at given wages (and working conditions). However, this is not really possible to observe because people change occupations and so there are many people who could work in the trades but who do not. Our 'supply' model, although not purporting to model the unknown potential supply, does contain the elements we associate with supply: the numbers of people entering and leaving the occupation. This contrasts with a demand approach, which would focus on the level of economic activity and the implied level of employment to underpin this.

The basis of the model is that the number of people in a trade at a point in time is determined by the number at the previous point in time, plus commencing apprentices, less withdrawals from apprenticeships and those who leave the trade. While we have data on commencements and withdrawals of apprentices, we do not have data on those people in the trade who leave. So in practice, we model net attrition rather than actual attrition. More formally,

$$X_t = X_{t-1} + C_t - W_t - D_t \qquad (1)$$

Where X_t is the number of people in the trades at the end of year t, C_t is the number of apprentice commencements during the year, W_t is the number of apprentices who have their contract cancelled during the year, and D_t is the net departures during the year. We reparameterise the model, by expressing C, W, and D as rates.

Define w as the withdrawal rate, that is, $w = W/C$

d as the net departure rate, i.e. $d = D/X$

c as the commencing rate (proportion of the population), that is, $c = C/N$ where N is the population size.

Then we have

$$X_t = X_{t-1}(1-d_t) + c_t(1-w_t)N_{t-1} \qquad (2)$$

We use historical data to estimate the parameters of the model d, c and w and then project forward using demographic projections of N.

Now the model as in (1) and (2) is highly stylised and has no demographic dimension to it, apart from the total population. In order to make the model more interesting, we introduce a demographic dimension through the index i, as follows:

$$X_t = \sum_i X_{i,t}$$

and

$$X_{i,t} = X_{i-1,t-1}(1-d_{i,t}) + c_{i,t}(1-w_{i,t})N_{i-1,t-1} \qquad (3)$$

So now the commencement, withdrawal and net attrition rates all depend on the demographic age group.

Data

We define the trades by the ASCO 4: Trades and related workers occupational group. Our initial intention was to define demographic groups by gender and individual age groups. However, the employment data in trades are constrained to five-year age groups (that is, aged 15–19, 20–24 years etc.). Therefore, we employ equation (3) with a time unit of five years. For instance, those aged 30–34 years will be aged 35–39 five years later.

As such, we focus on five-year time periods starting from 1996 to 2006 (that is, t = 1996, 2001 and 2006). The ABS Labour Force Survey provides us with the number of employed tradesmen by age group as at August in each time period ($X_{i,t}$). The number of contract commencements, cancellations and withdrawals[8] in trades for the year ending in March are obtained from the NCVER New Apprenticeship Collection 48. These numbers are then multiplied by five to approximate the total five-year commencements and cancellations ($C_{i,t}$ and $W_{i,t}$ respectively). Finally, ABS Estimated Resident Population (1991, 1996 and 2001) and ABS Population Projections (2006–40) give us the total population in each relevant time period ($N_{i,t}$).

Calculations of rates

Commencement and cancellation rates are calculated directly from the data. Commencement rates are derived as percentages of age cohorts, while cancellation rates are expressed as a percentage of commencements. We then adjust the cancellation rates following these assumptions:

- ✧ The cancellation rate is calculated, based on ten-year age group for those aged 15–19 and 20–24 years, that is, the cancellation rate equals total cancellations for the age group 15–24 years, divided by total commencements for the age group 15–24 years.
- ✧ Cancellation rates are assumed to level off after age 45.

These rates then give the ingredients to obtain the net attrition or departure rate by solving equation (3). These attrition rates are smoothed using the following guidelines.

- ✧ We assume no attrition for those aged 15–19 years since all tradespersons in this group are new entrants at time t. Those aged 65 years and above will move towards retirement (100% attrition).
- ✧ For males, those aged 25–54 years share the same aggregate attrition rates for age groups, 25–29, 30–34, 50–54 years.
- ✧ For females, those aged 50–59 years share the same aggregate attrition rate for age groups, 50–54 and 55–59 years.

[8] According to Ball and John (2005), approximately 55% of expired contracts are actual cancellations and thus total cancellations have been adjusted to include this proportion of expired contracts.