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Background

Economies in the twenty-first century are under relentless pressure to increase the skill levels of their workforce. A highly skilled workforce is widely seen as being essential for prosperity in a globalised world characterised by rapid technological change. The implication is that high and growing incomes can only be sustained by high and growing levels of worker productivity, which in turn demand ever-increasing levels of worker skills.

The development of high levels of skills in the workforce is expensive, requiring a major investment of learner time, large public expenditure on the formal education system, and high levels of formal and informal on-the-job skills development facilitated by employers. There is understandable tension about just how much should be spent on skills development, and what share of this total should be borne by each of the main players (individuals and their families, governments and firms).

In contemplating the answers to these questions, it is important first of all to have an accurate view of the current size of the investment in skills, and who pays. The answer to this apparently straightforward question is surprisingly elusive. This report provides new and enhanced estimates of the employers' full contribution to skills development. It is a companion piece to the paper by Mark Cully 'Employers' contribution to training: How does Australia compare with overseas?' prepared by the National Institute of Labour Studies for the National Centre for Vocational Education Research (NCVER) in 2002. This companion paper focuses mainly on structured training, and how the Australian approach compares with that found in other countries.

The most widely used estimate of the total cost of vocational education, and of the employers' share in this cost, comes from the Australian National Training Authority (ANTA). ANTA estimates the former as $8.545 billion in 1996 and the latter as $3.886 billion (or 45% of the total). For a number of reasons, these are likely to be underestimates. One reason is that the value of employee time spent in structured training is not counted. If it were, it would add $2.3 billion to both figures, and raise the employer share of total costs to 57%.

Current incidence of employment-based training

This report uses data from the Australian Bureau of Statistics (ABS) Survey of Education and Training (1997) (a survey of employees) to identify the major types of training workers receive and to determine how this varies according to selected worker and employer characteristics. The data indicated that:

- On-the-job training, whereby workers learn informally from co-workers while doing their job, is the most commonly experienced form of skills development provided by employers. This is true for men and women, for native and non-native speakers of English, for those with a little and those with a lot of formal education. On-the-job learning occurs at all ages, although it does decline somewhat with age. A satisfactory understanding of skills development in the workforce needs to pay careful attention to the contribution of skills learned informally on the job.
- Employer-based training reinforces skill differences which arise from differences in formal education. Those with the least education (less than Year 12) systematically report receiving less

of the main forms of employment-based training. The more formal the training, the more it is focused on those with more education.

- ✧ The public sector is an important source of employer-based training. The hours of training received by public sector workers are much higher than the hours received by private sector workers and the latter are much more likely to receive no training. Estimates of the *employer* contribution to training should not be confused with estimates of the *private sector* contribution to training.

New estimates of the employer contribution to skills

In order to calculate our own, more comprehensive, estimates of the extent of learning on the job, and of the employers' contribution to this, data from the same survey are utilised. Here the approach taken to estimating the value of the employer contribution to the development of workplace skills differs from that reported above. Employer *inputs* into training (hours or dollars) are not measured. Instead, an indirect measure of the increase in the productivity of workers as a result of the learning of skills on the job is provided.

That workers gain skills on the job is inferred from the fact that wages are systematically higher for people who have more work experience than for people who have less. This is true even when other factors which might influence a person's wage, such as sex, formal education, occupation, industry and so on, are held constant. Economists interpret this to mean that more experienced workers are more productive (which is why employers will pay them more), and that they have become so because of skills learned on the job. Since most of these skills will have been provided by the employer in one form or another, an estimate of the extent of on-the-job learning can be obtained by observing how fast wages grow with additional years of general work experience and of tenure with the current employer.

Four main conclusions arise from this analysis:

- ✧ At roughly $30 billion per annum, the estimate of the total investment in employment-based training in Australia is much larger than previously believed, and than is shown by surveys of training effort.
- ✧ The government share in this larger training effort is much smaller, and the share of employers and workers is much larger than previous estimates have concluded.
- ✧ In 1996 the total value of the employer contribution is estimated to be in the order of 5% of the wage bill, or roughly $16 billion.
- ✧ The pursuit of privatisation, deregulation, reduced power of unions and greater competition in the labour market are likely to reduce the extent of employer-funded training in future.

Industries differ in the extent of both general training and the development of specific skills of value only to the employer. The analysis found that:

- ✧ In both finance and construction, there is a high rate of general training for workers new to the workforce, but this falls rapidly as they gain some experience. Construction (along with mining and agriculture) offers very little firm-specific training.
- ✧ Agriculture offers particularly low levels of both general and firm-specific training.
- ✧ Recreation and communications offer low levels of general training to new workers, but quite high levels of firm-specific training.
- ✧ The level of training offered within public administration is no more than average in general and specific skills (or it has a wage structure that is more divorced from productivity).
- ✧ Changes in the emphasis of employment away from goods production towards service production are not likely to reduce, and may increase the overall levels of employment-based training.

Conclusion

The strength of the approach used in this report to determine the extent of employers' contribution to training is that it enables a dimension of their skill development activities (that are undoubtedly large and important enough to be included), which in the past have been routinely ignored. The limitation of the approach is that it involves views about how the labour market works which are not beyond dispute. It has also been necessary to make judgements about how the costs of obtaining skills on the job are shared between workers and employers. For these reasons, it is appropriate to view the estimates provided as approximations, rather than as precise quantifications. Where judgement has been required, this report has erred on the conservative side in valuing the employer contribution. Unless the approach adopted here is entirely rejected, it is clear that a great deal of skill enhancement does occur informally on the job. It is implausible to suppose that this learning is not without a cost to employers; indeed, the subsidies given to firms to take on apprentices and trainees imply a belief that developing work skills on the job is costly to the employer. Clearly employers (and workers) contribute much more to the costs of developing work skills than is revealed by conventional estimates. Our estimate of an employer contribution of $16 billion per annum is approximate. However, it is likely to be closer to the mark than is the conventional figure of $4 billion. We believe that this research shows a promising approach to estimating the employer contribution to skills development in the workforce and would benefit from further refinement.

Introduction

Economies in the twenty-first century are under relentless pressure to increase the skill levels of their workforce. A highly skilled workforce is widely seen as being a requirement for prospering in a globalised world with rapid technological change. High and growing incomes can only be sustained by high and growing levels of worker productivity. High skill levels are part of the requirements for high productivity. Because it contributes to more rapid obsolescence of the existing stock of skills of the workforce, rapid technological change also puts pressure on the skill formation system. There must be a matching increase in newly relevant skills just to maintain the stock.

The development of high levels of skills in the workforce is expensive, requiring a major investment of learner time, large public expenditure on the formal education system, and high levels of formal and informal, on-the-job skills development facilitated by employers. There is understandable tension about just how much should be spent on skills development, and what share of this total should be borne by each of the main players (individuals and their families, governments and firms).

In contemplating the answers to these questions, it is important, first of all, to have an accurate view of the current size of the investment in skills, and who pays. The answer to this apparently straightforward question is surprisingly elusive. One reason is that skills are acquired in a variety of formal and informal ways. Post-school, the main pathways to obtaining skills are through the higher education system, the vocational education system (public and private) and through learning on the job. We have good information on the budgetary cost to government of the public education system and the subsidies provided to private formal education. We have not so good information on the direct costs of the private training system. We have not very reliable information, derived from surveys of firms, on what employers spend on direct training costs. And we have estimates based on surveys of workers of the incidence of skills development on the job. But these sources leave out two very large components of the costs of skills. One is the cost of learners' time. The other is the cost to employers of provision of informal training on the job. Economists have identified this informal way of learning as a major contributor to the productive capacity of workers. It is unlikely that its cost to the firm can be captured in surveys of employer expenditure on training, since much of it happens in unstructured settings. But, if unmeasured, it leaves a gaping hole in our estimates of the quantity of training, and of whom pays. In this report, a first serious attempt to quantify the full extent of the learning that happens on the job is provided. Subsequently what share of this is paid for by employers is estimated, the remainder being paid for by the workers themselves. An approach which draws on economic theory to infer levels of learning is used—in contrast to estimates which rely on employer answers to survey questions.

This report is a companion piece to the paper 'Employers' contribution to training: How does Australia compare with overseas?', produced by the National Institute of Labour Studies for the National Centre for Vocational Education Research (NCVER) in 2002, with Mark Cully as the author. The latter focuses mainly on structured training, and how the Australian approach compares with those found in other countries. This current report concentrates on providing new and superior estimates of the employers' full contribution to skills development, through structured and unstructured means.

This report begins with a brief review of current estimates of the quantity of training costs and who pays (excluding higher education). These are much more extensively discussed in the earlier paper (Cully 2002). This is followed by a description of the levels of training received by workers,

categorised according to a variety of socio-demographic and employment characteristics. New estimates of the extent of skill development on the job are offered next. This is followed by an overview of the attributes associated with higher wages.

Current estimates of employer contributions

The main purpose of this study is to quantify the current contribution made by employers to the costs of vocational learning; vocational learning being interpreted in a broad sense. Vocational education and training (VET) encompasses employment-related training provided through the technical and further education (TAFE) sector and private training providers. But vocational education is broader than this. It includes the development of job-related skills and attributes which increase a person's productivity in the workplace. Economists refer to this as human capital. These skills can be learned through the formal education system (schools and higher education); through the vocational education system (TAFE and private providers); and through formal and informal learning on the job. In the assessment of the contributions of government, individuals and employers to the costs of developing work-related skills, nearly all of the attention has been paid to the costs of providing formal (structured, accredited instruction) training. The focus in this paper is on the skills development that occurs less formally as a result of learning on the job. Economists attribute a large part of the stock of work-related skills to learning which has occurred informally on the job (see, for example, Brunello & Medio 2001). Table 1 shows where on-the-job training—the subject of this report—fits in to the quantification of the employers' contribution to the costs of training.

Table 1: Form and source of funding for skills development

	Contribution to development of work skills		
	School and higher education	TAFE and private vocational education	On-the-job training
Individual	Fees plus student time	Fees plus student time	Accept lower wages
Government	Costs of education institutions plus scholarships	Costs of education institutions plus scholarships	As an employer
Employers	Limited support for staff doing degrees—fees and time off	Support for staff doing formal courses—fees and paid time off	Pay wages higher than productivity; time of experienced workers; mistakes and wasted resources; in-house training courses

Most evaluations of the contributions made by individuals, government and employers to the costs of skills development focus on the first two columns in table 1. However, it is common to exclude the costs of student time in such estimates, and in some cases, to include the costs of in-house training courses.

In this study, the employer contribution is evaluated by concentrating on the third column—on-the-job training. Learning provided to new entrants to the workforce and learning provided to established workers are not separated. It seems obvious from looking at the bottom row of the table that the employer contribution expressed in the third column is substantially greater than that defined by the other two columns. Estimates reported below provide strong support for this view. Further, the employer contribution which occurs via training on the job is much greater than just the direct provision of formal in-house instruction. It includes two major additional costs to employers. One is the cost of the time spent by experienced employees in passing on their knowledge to less skilled new workers. Most of this is done informally, but nonetheless diverts the experienced employees from their productive tasks. In addition, new and less skilled workers make

mistakes while they are learning. These are costly—in wasted materials, in damage to customer and supplier relations, in time taken to unravel the error. These costs of learning are borne by the employer, at least in part. The second cost borne by the employer occurs when they pay new workers more than they are initially contributing, in the expectation that, with learning on the job, their productivity will come to exceed their wage.

There are serious empirical problems in quantifying the extent of employer contributions to vocational education. These arise in part because of the joint nature of training and production whereby skills are learned on the job. Employers find it difficult to answer accurately survey questions about the extent and cost of the training they provide. Estimates based on the observed link between length of employment and pay levels require strong assumptions about how the labour market works. This research is unable to avoid some of these problems, but, where possible, their effect will be mitigated and where it cannot, due acknowledgement will be made.

A number of estimates of the value of the employer contribution to vocational education and training have already been made. Most derive from the Australian Bureau of Statistics (ABS) 1997 Survey of Education and Training or the ABS 1996 Survey of Employer Training Expenditure. They concentrate on the cost to employers of provision of structured training and time off to undertake external courses.

In 2000, total public funding of VET in Australia amounted to $4.16 billion across all governments, of which recurrent funding was $3.30 billion (ANTA 2000). The money is mostly provided to state governments through the Australian Government. Information on private vocational education expenditure, whether by employers or individuals, is less current and also much more difficult to identify accurately.

In its 1998 annual report, the Australian National Training Authority (ANTA) estimated the amount of expenditure on vocational education and training by each of government, employers and individuals. The results of this are shown in table 2. This estimate, which has not been updated, is now routinely cited in any discussion of how funding is apportioned (for example, Senate Standing Committee on Employment, Workplace Relations, Small Business and Education 2000; Selby-Smith et al. 2001). This report questions its accuracy.

Table 2: Expenditure on VET, by type of contributor, Australia 1998

	$ (billions)	%
Government	3.740	43.8
Employers	3.886	45.4
Households	0.919	10.8
Total	**8.545**	**100.0**

Source: ANTA (1999)

The major difficulty is that there is no publicly available source document from which the derivation of the figures can be traced and the assumptions underpinning them tested.[1] The main source is the 1996 Employer Training Expenditure Survey, September quarter. Figures from this have been multiplied by a factor of four (on the assumption of no seasonal effects) to arrive at some of the component parts. This survey captures employer contributions to formal training of their employees, provided both in-house and externally. From what we can glean in the information provided in the ANTA annual report there appear to be several factors not taken into account which both understate and overstate the employer contribution. Of these factors, set out below, the biggest one is the exclusion of the costs of providing informal on-the-job training.

[1] ANTA have been unable to locate the original data from which the estimate in the annual report is derived.

Factors which appear to *understate* the contribution of employers are:

- ✧ The wages and salaries paid to employees while in training are not included.
- ✧ Support for employees taking part in training activities not provided by the employer, such as paid training leave and payment of course fees, are also not included.
- ✧ No valuation is placed on on-the-job training or any net cost incurred in employing apprentices and trainees.
- ✧ Increases in the cost of training provision between 1996 and 1998 are not taken into account.

Factors which appear to *overstate* the contribution of private employers are*:*

- ✧ It fails to distinguish between that which is spent by private employers and that which is spent by the public sector as employer—the latter spend considerably more as a percentage of payroll, 3.16% in 1996 compared with 2.30% for the private sector.
- ✧ It may involve a measure of double-counting by incorporating an estimate of training provided to operate new equipment purchased without knowing whether such training was already included in amounts reported by employers.

The decision by ANTA to exclude wages paid to employees while they are receiving training makes a substantial difference to the estimated cost of the employer contribution. According to the ABS Survey of Employer Training Expenditure (from which the ANTA data are taken), these wages amount to almost half of all employer training expenditure, or $2.2 billion for 1996. It is true that the loss of revenue incurred by an employer as a result of staff undertaking training may be somewhat less than their wages, but it would be astonishing if it were zero, as implied by the ANTA approach. If the full cost of employees' wages for the time they are receiving training is counted as an employer cost of training, then their contribution to the total cost of vocational education, as per table 2, rises to 57%, or $6.1 billion in 1996.

The decision by ANTA to combine spending by both private and public sector employers means that the employer's share cannot be interpreted to mean the private sector share. This is not a trivial matter. Data from the Employer Training Expenditure survey of 1996 show that one-third of total employer training expenditure was accrued by public sector employers (author's own calculations).

The ANTA approach clearly captures only a fraction of the total employer cost of training, as set out in table 1. In particular, it misses most of the cost to be emphasised in this study, the costs of on-the-job training.

Who gets employer training?

Introduction

This section begins with a description of the extent of various forms of recorded formal and on-the-job training experienced by employees. How training varies with different personal characteristics of workers and with different characteristics of the employer is demonstrated. This section is purely descriptive, and is based on data from the ABS Survey of Education and Training (1997). This survey was answered by employees, not by employers. For this reason, it is not a reliable source on which to construct the usual estimates of the employer contribution to vocational skills development: employees are not able to answer questions about how much their training might have cost their employer. But it is valuable in its coverage of the variety of ways in which workers enhance their work skills. It includes the participation in informal on-the-job learning which is so hard to capture in surveys of employers. It also helps us to answer some of the questions of interest to this study, such as how much do firms and industries contribute to the training effort?

Employees were asked in the Survey of Education and Training how many hours, in the past year, they had spent in training courses. They could include time spent in up to four different courses completed in the previous 12 months. The hours reported in response to this question are the basic unit of analysis. They include time spent on in-house and external training courses and time spent in informal learning. Estimates of the last of these must be treated with caution, as it is inherently difficult for respondents to calculate the answer to such a question. The analysis covers all people who were employed at the time of the survey by their main employer for the year of the survey, and who were not full-time students.

Age

Numerous studies have documented that the level of training falls with the age of the worker. A very good reason for this is that the years over which a worker can benefit from new skills acquired from training are higher the earlier in his or her career the training is acquired. This does not take account of obsolescence, which may make the 'use by date' of a skill rather less than the retirement date of the worker.

Strong empirical support for the view that training falls with age (and/or the obsolescence of skills increases) comes from the decline in the wage growth from an extra year of work experience which is reported in the next section of this report. More evidence is provided in figure 1.

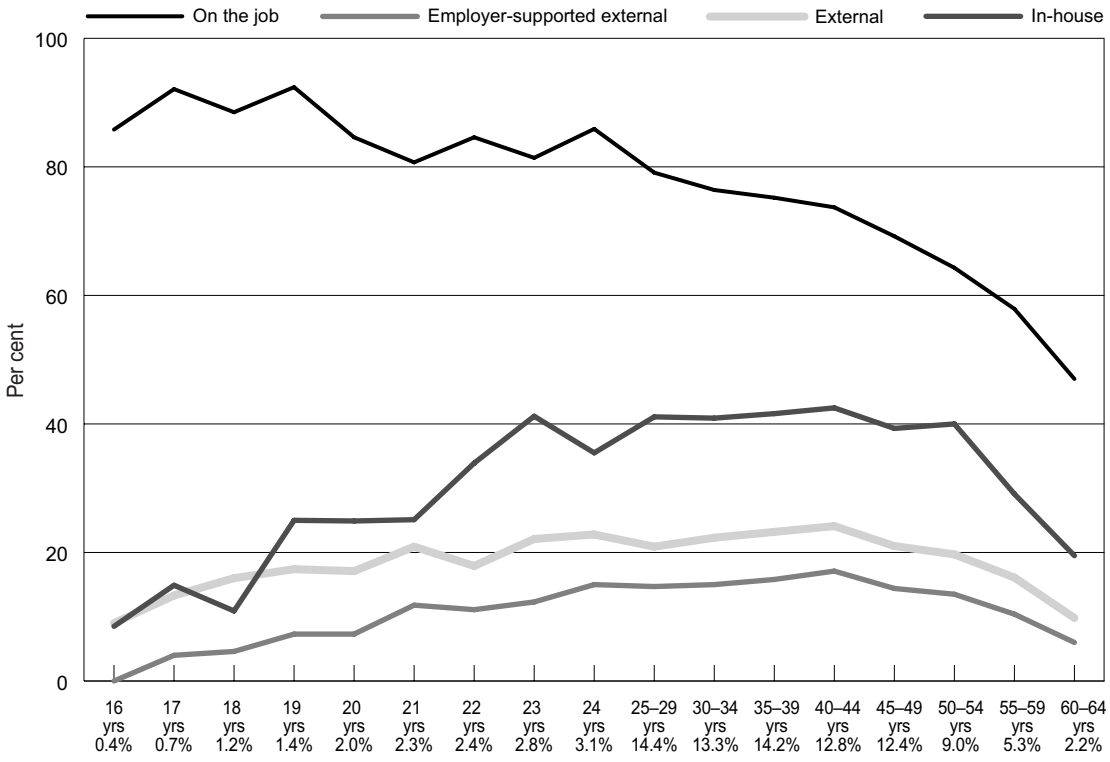
Figure 1 describes the training received by workers who are not full-time students and who are working for their main period employer. It shows how the different types of training vary by the age of the worker. The most interesting insight to be gained from figure 1 is how *insensitive* to age is the exposure to training. The picture presented shows that workers typically receive some training related to their employment over the whole of the age range, with a decline in more formal types of training occurring only once workers exceed age 50.

On-the-job training, comprising instruction and advice from experienced workers, is the form most sensitive to age. Generally, workers under the age of 25 are those most likely to receive this sort of training—as over 80% of young workers do. The incidence of this form of training then falls

steadily as workers age, to about 45% of workers aged over 60. Still, it is interesting to note that almost half of the oldest age group of workers reports still learning skills from their co-workers.

The other forms of training are highest for workers aged from their mid-twenties to their early fifties. In-house training is the most common (after on-the-job training), being reported by about 40% of workers. Over 20% of workers did some form of external training.

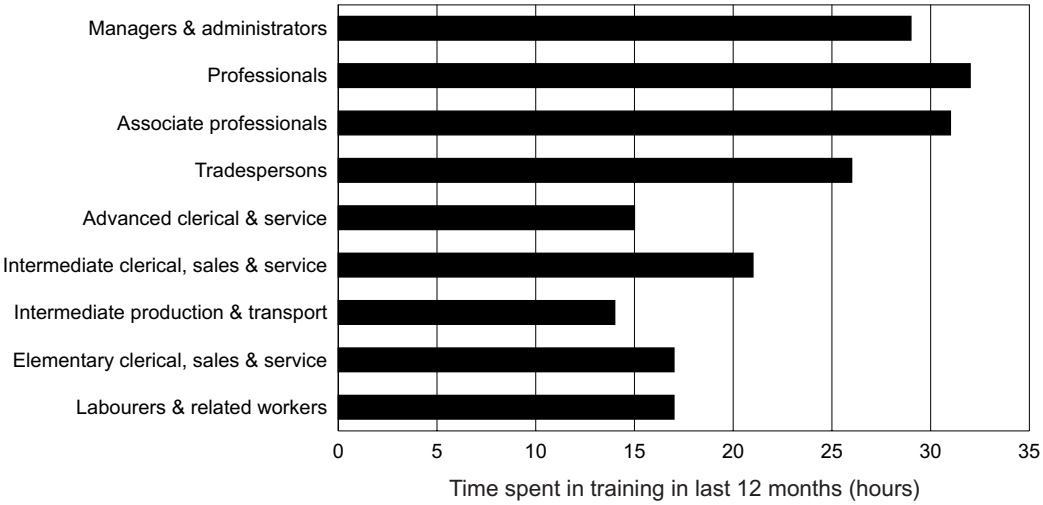
Figure 1: Training by age



Occupation

Figure 2 shows that, generally, people in higher paid/status occupations receive more hours of training than do those in lower occupations. Professionals and associate professionals receive the highest number of hours of training (on average, 32 and 31 hours per year, respectively). They are closely followed by managers and administrators. The occupations with the least training are intermediate production and transport workers, and advanced clerical and service workers. Interestingly, the lowest level occupations of elementary clerical and service workers, and labourers receive more hours of training than does the former pair. High-training occupations provided more than twice the number of hours of training than the low-training occupations, but even they, on average, provided less than a week of training per annum. The average in this case includes people who received no training.

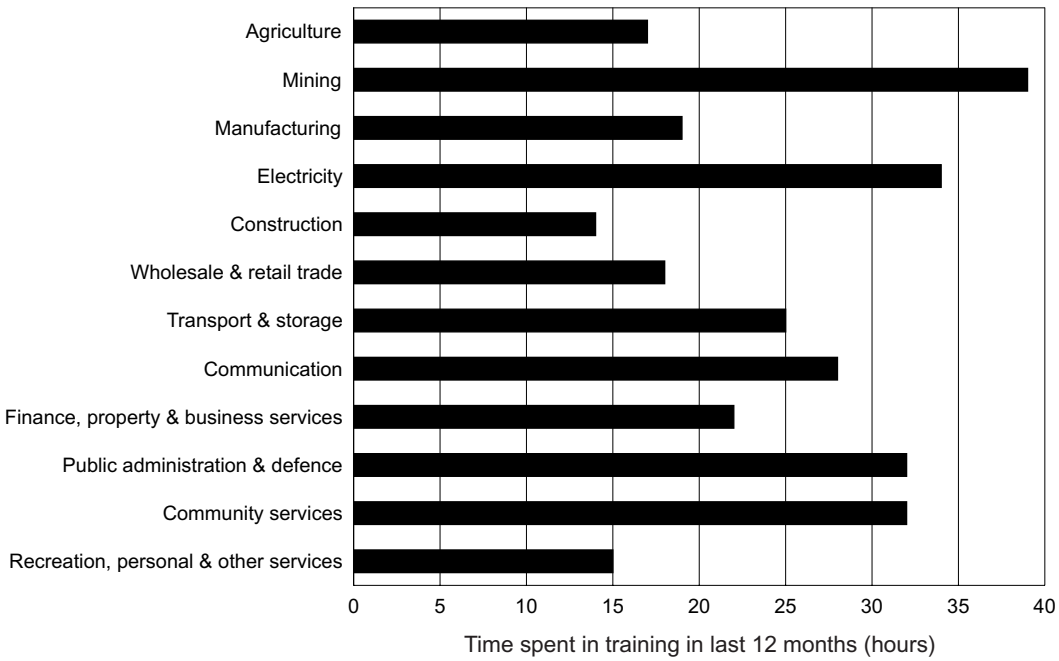
Figure 2: Average hours of training by occupation



Industry

The variation in average hours of training is larger among industries than among occupations. Figure 3 illustrates this. Mining is a high-training industry, measured in this way, followed by electricity, then public administration and community services. It should be noted that there is more variation *within* these broad industry groups than there is *between* them. For example, the wholesale industry provides substantially more training than does the retail industry, although the two are grouped together in the industry classification. The lowest levels of training (only 14 hours per year on average) are provided by the construction industry, and the recreation and personal services industry.

Figure 3: Average hours of training by industry

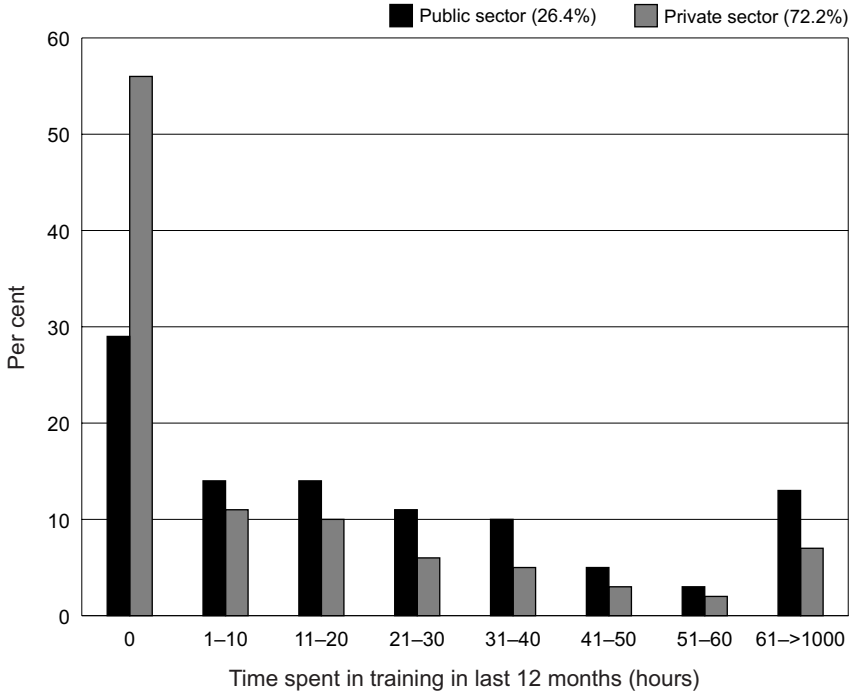


Sector

The striking story from figure 4 is the large difference in the proportion of workers in the public sector who receive no training (only 29%) compared with the private sector (56%). The point has been made before, but is worth making again: *the training role of the public sector is very large.* However, the strong moves to shift production from the public to the private sectors (privatisation) is likely to cause a noticeable decrease in the extent of employment-related training, as an unintended by-product.

At the other end of the training effort, the public sector is twice as likely as the private sector to offer more than 60 hours of training in the year.

Figure 4: Training hours by sector, by percentage

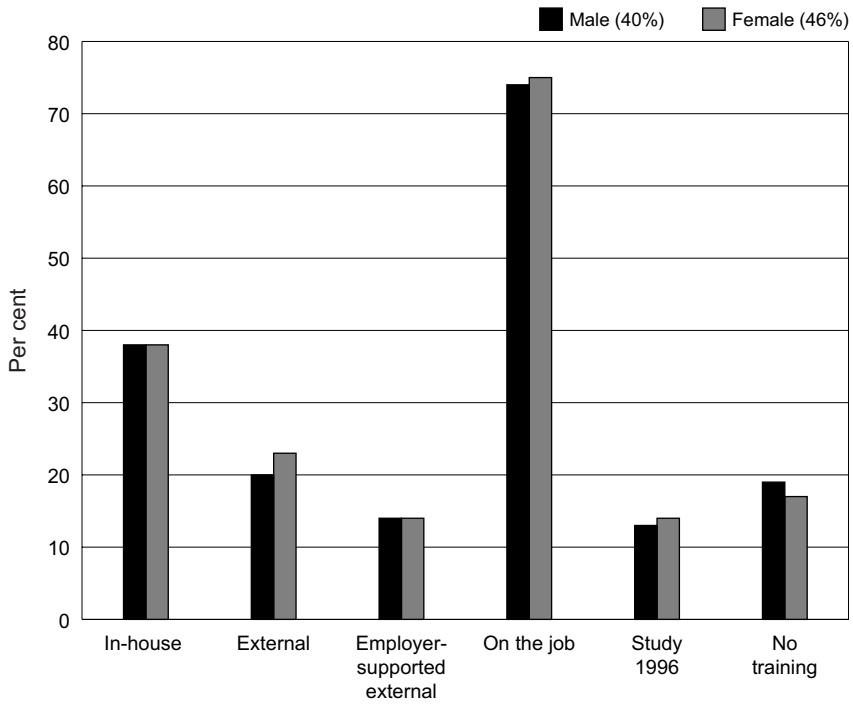


Sex

The figures presented for gender differences in participation in training report a headcount measure of training rather than an intensity measure. That is, they do not distinguish a person who receives a ten-week full-time course from a person who receives a half-day course. Nonetheless, on the headcount measure, there is almost no difference between men and women in terms of the likelihood that they have received each of the different types of training. This is a notable outcome, as it is frequently assumed that men receive more training than women. One reason for this expectation is that men are less likely to be in low paid and part-time jobs. Figure 5 shows that, in terms of the likelihood of receiving some of each of the nominated forms of training, there is no difference between the sexes.

For economy of space, the data which examine training differences among married and non-married and those with and without disabilities are not given. In both cases, as with sex, there were no substantial differences.

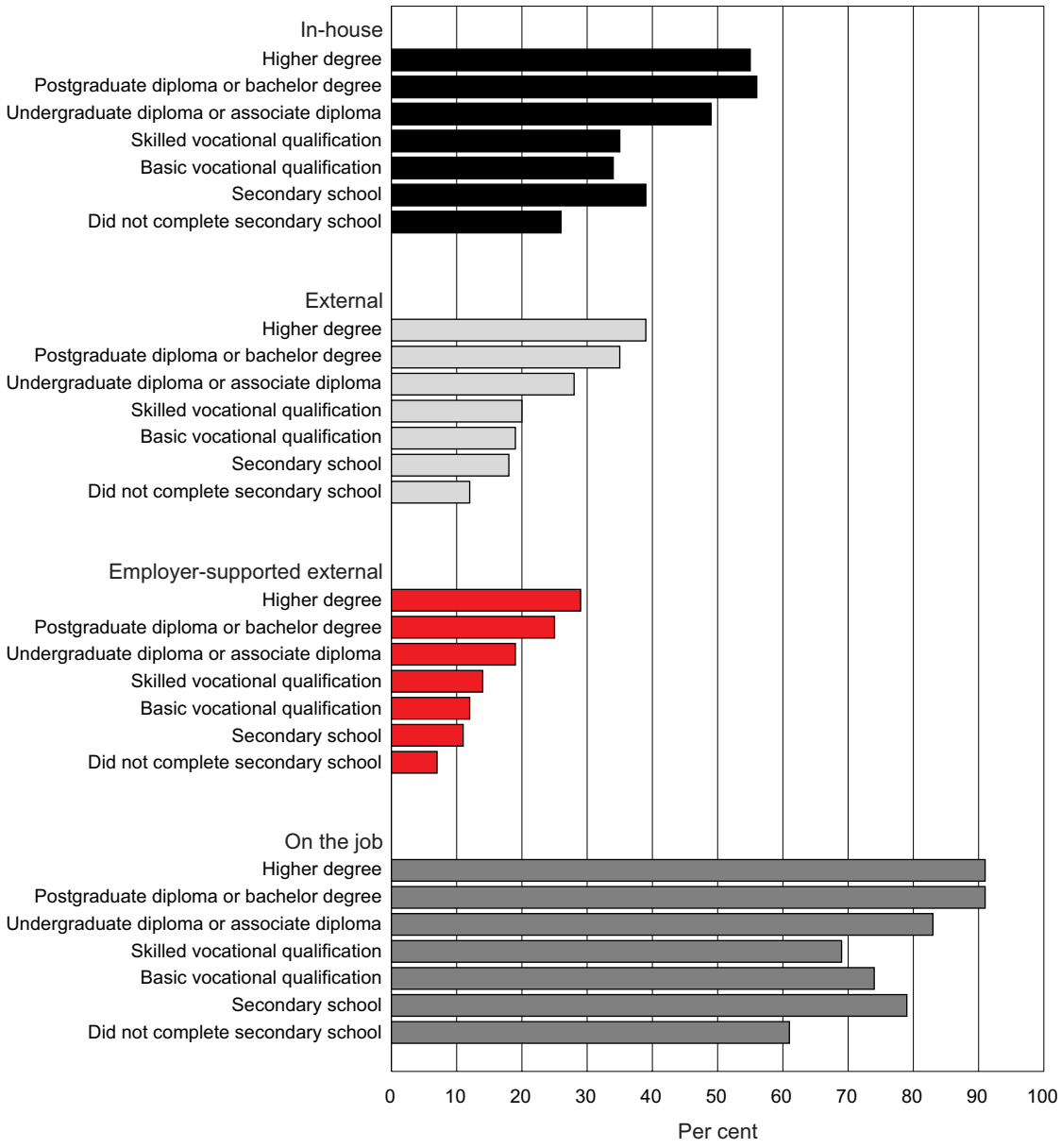
Figure 5: Training by sex



Education

Figure 6 confirms the expectation that people with more education receive more training at work. For each of the types of training, the people who are most likely to participate are graduates, and those least likely to participate are those who left school without completing Year 12. The link between education and training is tightest for external training, and weakest for on-the-job training. The very important conclusion to draw from figure 6 is that work-based training reinforces rather than compresses the hierarchy of skills obtained through the formal education system.

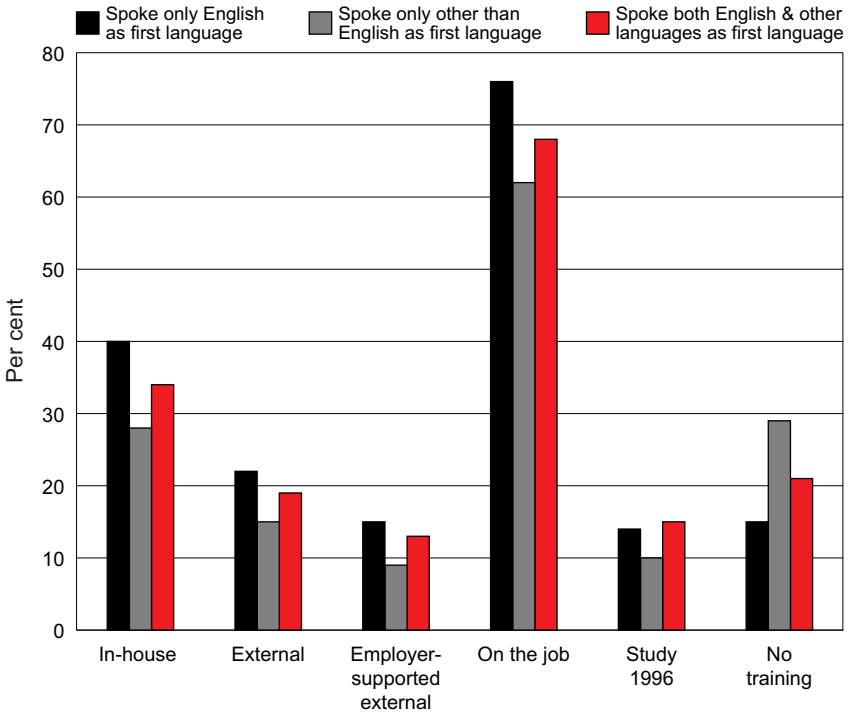
Figure 6: Training by educational attainment



English proficiency

Sixteen per cent of the workforce in the sample spoke a language other than English as their first language. This is an indirect measure of the level of fluency in English and we can assume that most of those whose first language is not English were born overseas. Figure 7 shows that non-native English speaking migrants receive less training, in all its forms, than do native speakers of English. Overall, 29% of non-native speakers received no training, compared with 15% of native speakers. In proportionate terms, the greatest disadvantage of non-native English speakers is in employer-supported external training, and the least disadvantage is in on-the-job training. As with education, it seems that work-based training reinforces initial labour force differences in productivity, rather than reducing them. But in the case of language capacity, the differences are not large.

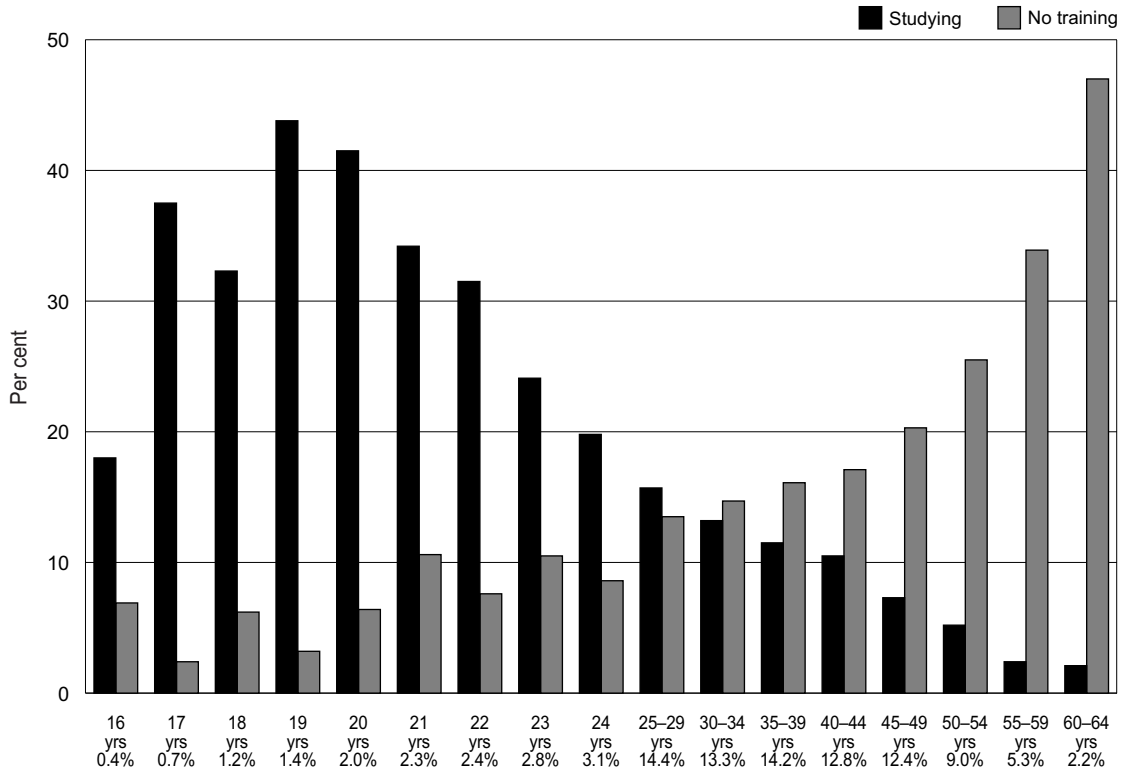
Figure 7: Training by language first spoken



Studying or training

The data enable us to identify who is undertaking study directed towards obtaining a formal educational qualification. In figure 8, how this varies with age is shown. At the same time, how overall participation in work-based training varies with age is shown. The figure demonstrates a clear pattern. Workers enrol in formal education courses in their late teens and twenties. Enrolment rates then fall steadily with age, to reach 5% or less for those aged 50 plus. Participation in work-based training follows a similar pattern, although with slightly less regularity. Thus workers in their teens and twenties invest heavily in skills, both through formal education and on the job. From about the age of 25 on, these rates of investment start to fall continuously, so that by age 60, only 2% of workers are studying and almost half are not participating in any work-related training.

Figure 8: Those studying compared with those not, by age in training



Conclusions

On-the-job training, whereby workers learn informally from co-workers while doing their job, is the most commonly experienced form of skills development provided by employers. It is the most common form of skill enhancement for men and women, for native and non-native speakers of English, for those with a little and those with a great deal of formal education. On-the-job learning happens at all ages, although it does decline somewhat with age. A satisfactory understanding of skills development in the workforce needs to pay careful attention to the contribution of skills learned informally on the job.

The information presented in this section also throws light on the question of whether employer-based training reinforces skill differences which arise from differences in formal education, or compresses them. On this evidence, it reinforces them. Those with the least education (less than Year 12) systematically report receiving less of the main forms of employment-based training. The more formal the training, the more it is focused on those with more education, and the less do those with the least education benefit. For example, for employer-supported external training, workers who did not complete secondary school have only one-quarter the likelihood of participating compared with workers with degrees. The former group is two-thirds more likely to participate in on-the-job training and in-house training than the latter group.

The third conclusion drawn from the data is that the public sector is an important source of employer-based training. The hours of training received by public sector workers is much higher than the hours received by private sector workers; and the latter are much more likely to receive no training. This supports the view expressed in the previous section, that estimates of the *employer* contribution to training should not be confused with estimates of the *private sector* contribution to training, or the costs of training.

New estimates of employer-provided training

Theory

The approach adopted to estimating the value of the employer contribution to the development of workplace skills differs from those reported in the previous section. Employer *inputs* into training (hours or dollars) are not measured; rather, a (indirect) measure of the increase in the productivity of workers as a result of learning of skills on the job is provided. As noted in the companion paper, it is very difficult to obtain reliable information from surveys on what firms spend on the provision of skills development. Much of the learning firms provide is informal, as shown in the previous section, and is therefore difficult for the firm to quantify with any precision. Even where more formal instruction is given, it would be most surprising if the typical firm kept a careful log of the costs of providing the training, and the hours and pay of those undertaking it.[2] Thus it is likely that answers to these questions that firms provide may be quite imprecise—especially for smaller firms with less formal human resource development structures. Such firms employ almost half the total workforce. Surveys of employees, while able to provide reasonable information on the incidence of training, cannot quantify the cost to employers.

There is good evidence that skills learned on the job are a large part of most people's stock of human capital (for example, see OECD 1991; Lynch 1994; Brunello & Medio 2001). But because the existing sources of information on the extent of employer development of skills are inherently imprecise, this report approaches the task of estimating the size of the employer contribution from a different direction. This report infers that workers gain skills on the job from the fact that wages are systematically higher for people who have more work experience than for people who have less. This is true even when we hold constant other factors that might influence a person's wage, such as sex, formal education, occupation, industry and so on. Economists interpret this to mean that more experienced workers are more productive (which is why employers will pay them more), and that they have become so because of skills learned on the job. Some of the skills learned will only be of value to the current employer, for example, unique work processes, firm culture or customer details and whether the job is a good match for worker and firm. It is these firm-specific skills which are rewarded by wages which rise with length of tenure on the current job. Since most of these skills will have been provided by the employer in one form or another, we can obtain an estimate of the extent of on-the-job learning from observing how fast wages grow with additional years of experience and tenure. To do this, it must be assumed (as the theory implies) that the growth in wages is caused by an increase in workers' productivity.

The human capital explanation of the observed positive link between general *experience* and *wages* is that people learn general work skills as they work, and that these skills increase their value to a range of employers. As their productivity rises with these increased skills, employers are willing to pay them more (indeed, must pay them more in order to prevent them from moving to a different employer who will). The human capital interpretation of the positive link between *tenure* and *wages* is that people also learn skills which are of use only while they are with their current employer.

[2] Billett & Cooper (1997), for example, concludes that firms have little idea of the returns to or even, in some cases, their direct expenditure on training.

Since the employer would lose the benefit of these skills should the worker leave, they pay more to induce the more skilled worker to stay.[3]

If the labour market were perfectly competitive, firms would not pay the costs of workers getting general skills on the job. Rather, the workers would pay themselves—in the form of accepting a lower wage. As the workers became more skilled, hence productive, the employer would have to pay them a higher wage to prevent their leaving to go to another employer who would pay a wage which matched their now higher productivity. Thus the wage and productivity profile would match at any point in time. In this world, there would be no cost to the employer, and hence no employer contribution to training accruing from the provision of general skills on the job. The costs to the employer would be offset by paying workers a 'training wage'—a wage which was lower than that they could obtain at a non-training firm. The worker recovers these costs later in the form of a higher wage, paid by the current or some other employer. It is important to recognise that these wage costs to the worker do not show up in any survey as part of the costs or amounts of training. However, they will show up as part of the estimates of the quantity of training presented below.

The payment arrangements for the skills acquired through additional years of tenure with the current employer are different. In the case of tenure, the productivity gains from the training only apply to the firm in which the training occurs. The costs and the future benefits of that training will, in all probability, be shared between the firm and the worker. Thus, while the training is occurring, the worker is paid somewhat more than the value of her or his marginal product (which is part of the cost of the training to the employer). Later, she or he is paid somewhat less than the value of the marginal product to that specific employer to recoup the cost of training for the employer.

The theory that we have outlined is somewhat controversial. For example, it has been observed that firms often do pay for general training (for example Acemoglou & Pischke 1999). Parent (1999, p.313) concludes from his study of young workers that: 'there is no really convincing evidence that workers implicitly pay for the degree of portability of their newly acquired skills by having lower starting wages or, more generally, lower wages while being trained'. One explanation for why firms do not behave as expected in this matter is that they are not operating in perfectly competitive labour markets. A consequence is that, for both general and specific training, the wage profile is likely to be more compressed (flatter) than the productivity profile. That is, an individual's productivity increases with experience faster than does his or her wage. Thus estimates of the slope of the wage profile are likely to underestimate the true increase in productivity from firm and worker investment in skills learned on the job, and the true level of that investment. But they do give an approximation of the level of such training. They do not, however, enable us to determine how the cost of training is divided between the workers (through accepting a lower wage) and the firm (through paying a wage that exceeds the productivity of the worker).

It may be inferred from this discussion of the expected link between the wage profile and the productivity profile that the increase in wages associated with an increase in experience and tenure reflects (but does not exactly match) the rise in productivity caused by the learning on the job. Suppose a person who has worked with a given firm for five years receives a wage that is 2% higher than an otherwise similar person who has worked for the firm for four years. We infer that, in the fourth year of employment, the person learned additional skills which increased her or his productivity to the firm by at least 2%. This productivity gain will persist for as long as the worker continues to work with the firm. Firms will discount future productivity benefits because immediate results are valued more highly, and because of the risk that the worker may quit or be fired. It is thus likely that the firm will apply a high discount rate, or short pay-back period, to investments in worker skills. If the firm is a rational profit-maximiser, it will invest in skill development to the point where the cost equals the net present value of the increase in productivity. Assuming a pay-back period of

[3] The term *experience* is used to mean the number of years that a person has spent (full-time equivalent) in paid employment, with any employer or even as self-employed. The term *tenure* is used to mean the number of full-time equivalent years spent working for the current employer. It is often necessary to estimate a person's level of experience, since the usual surveys do not ask how many years a person has been in full-time employment.

three years, for example, then the firm would be willing to spend an amount approximately equal to 6% of the worker's wage in providing training for that person in their fourth year of employment. It would gain from this investment an increase in the worker's productivity of 2% per year for three years. For the reasons given above, among others, this will not be a precise estimate of the firm's investment in training. (Other reasons include inaccuracies in the data and some additional theoretical complications which arise once the assumption of a competitive labour market is abandoned.) Nonetheless, if skills learned on the job are as important as the literature suggests they are, then we would expect to see a robust relation between experience, tenure and wages which can be used to infer the extent of investment in on-the-job training. This is the framework used in the estimates presented below. Here the increase in skills can come from doing formal—external or internal—courses, or from informal learning on the job. However, skills which accrue from undertaking a formally accredited course which leads to a qualification are not included, because the effects of formal education are estimated separately. That is, we are seeking to quantify the costs of the same sources of skill development given in the previous section of this report.

A note of caution is in order. While the positive empirical link between wages and experience/tenure is clear, it is difficult to know the real causal link between training and wage outcomes. Empirical work in this area is beset with problems of selection bias.[4] And 'the complexity of the causal process is such that simple statistical analyses can give misleading results—the associated problems of simultaneity and heterogeneity for the estimation of statistical models of the causal process are severe' (Elias 1998, p.3). For example, it may be that the people who get the training are those who, any way, have higher ability (hence a greater capacity to learn). What is seen as a return to training is in part then a return to ability. This same identification problem besets efforts to estimate the returns to formal education.

We acknowledge that the picture that we present is broad brush. It does not deal with the fact that the workers who receive training are likely to be those who can benefit most. Nor does it formally take account of the fact that some of the growth in skills is likely to be paid for by the worker rather than by the employer. Blandy et al. (2000, p.10) conclude from their study of training by Australian firms that: 'Australian workers pay more for their training (through accepting lower starting wages) than happens in the USA (making Australian on-the-job training look more general—that is, useful in a broad range of work places) than it is in the USA'. There is scope for a further, more nuanced, study of returns to training to follow our broad approach.

Other studies

Longitudinal studies are an important tool for unravelling cause and effect. There are, as yet, not many such studies which have been applied to sorting out the causal contribution of on-the-job training to wage mobility.

Elias (1998) conducted one such study, although it has limitations. To unravel these relations, he draws on data recording month-by-month training, earnings, and labour force status of British young people (aged 19 and 20) who had finished full-time education and not gone to university. He concludes:

- ✧ Formal training for these young people has negative effects on earnings (possibly because youth pay for part of their general skills).
- ✧ Informal training was widespread, but not systematically associated with earnings.

[4] For a discussion, and one solution, to this problem, see Leuven and Oosterbeek (2002). They conclude that selection bias does cause the estimates of the return to training to be substantially overestimated. Offsetting this, however, is the fact that the observed wage profile, on which the estimates to training are based, will be flatter (implying a lower estimate of the value of training) than is the true productivity profile. This will bias the estimated return to training downwards.

Lynch (1991) followed five waves of school leavers in the United States who left school during the years 1979–83 and obtained a job in the first year after permanently leaving school. These young people were followed for four years. College graduates were much more likely to receive on-the-job training than were school leavers. School leavers and women were more likely to get some off-the-job training. As Lynch notes:

> Company training in the United States is firm-specific, even for young workers in their first job. Young workers entering the labor market can receive both good and bad draws from the labor market. There are some workers who get a bad draw who appear to move to better employment by investing in off-the-job training. Those in good jobs are more likely to obtain on-the-job training that results in higher wages and a lower probability of leaving the firm. These effects are particularly strong for women. (Lynch 1991, p.155)

Dunlop (2000) examines the rates of transition from a low-wage job to a higher-paying job across a range of personal and work attributes. She reports (for Australia) that those with the lowest prospects of improving their wages are women with dependent children, older workers, rural workers, part-time and casual workers, and non-union members who work in a small private sector firm. A logit estimate of the determinants of moving above the low wage threshold for Australian workers concluded that young male urban low-wage workers were the most likely to be upwardly mobile. However, workers employed by small firms were significantly less likely to move to a higher wage in the next period. This is most sensibly interpreted to mean that such firms do not provide systematic on-the-job training nor have promotion ladders which provide wage growth within the firm. This finding is consistent with that for the United Kingdom (Stewart & Swaffield 1997; Sloane & Theodossious 1994). It should also be noted that, for low-wage workers, having undertaken training in the previous year was not significantly associated with the probability of moving to a higher wage (Dunlop 2000, p.38).

It is interesting to ask whether some industries provide more training and opportunities for advancement than do others. This is especially important when the structure of the economy is changing, so that some industries are growing and others are shrinking. This structural change can of itself affect the overall level of training provided by firms. Hines, Heynes and Kreuger (2001) calculate a return to tenure in the United States estimated for different industries. They find a rate of return to tenure of virtually zero for entertainment, recreation, mining and personal services industries, while the return was as high as 2.8% per year for finance, insurance and real estate. Similarly, the returns to tenure varied from zero for farmers to 2.2% per year for professional and technical workers. This strongly implies that skills development on the job is very limited in the United States entertainment, recreation, mining and personal services industries, while it is substantial in finance, insurance and real estate.

Empirical estimates

In the following section, data from the 1997 Survey of Education and Training are used to estimate the increase in wages associated with an additional year of general employment, on the one hand, and of employment with the current employer, on the other hand.

The data used are extracted from the unit record file and comprise 22 700 respondents in Australian households. They include information about their employment, and the extent and form of any education and training they had participated in over the previous year. Because the data are in unit record form, it is possible to conduct multiple regression analysis.

Both earnings and hours worked are reported in bands (above a threshold). The information needed in order to estimate the return to an additional year of general experience and of tenure with the current employer is the hourly wage. Because both earnings and hours are recorded with errors in their measurement, the calculation of the hourly wage by dividing weekly earnings by reported hours, results in two sources of measurement error and is thus imprecise. For this reason, the

analysis has been confined to people who worked full-time, and for whom their current employer was the one for whom they mainly worked during the year. It is then possible to use the weekly wage, rather than the hourly wage. This leaves us with a total sample of 9386.

Abundant empirical work undertaken by others indicates that wages vary systematically with a variety of worker and employer attributes. In the research it is important to isolate the rise in wages caused by an extra year of general work experience, or an extra year of tenure with the current employer. Estimates of the rate of return to experience and to tenure will be biased if we do not control for these other influences, if they are correlated with the two variables of interest. Thus we control for the following:

- ✧ sex
- ✧ education
- ✧ firm size
- ✧ occupation
- ✧ public or private sector
- ✧ industry
- ✧ union membership
- ✧ marital status
- ✧ permanent or casual employment status.

Details of how these attributes are measured are provided in the appendix.

The aim is to estimate the wage gains from of an additional year of general work experience and an additional year of tenure with the current employer. An additional year of tenure implies an additional year of experience, so the total gain from an extra year of tenure is the sum of the returns to experience and to tenure. The research notes that wages may rise for a variety of reasons, including general rises in inflation and in average productivity, and from incremental progression up an internal wage ladder. The statistical techniques adopted for this analysis allow us to isolate the rises which are 'caused' by an additional year of experience and tenure from rises originating from other sources. The approach is to ask what factors are associated with a person having a higher as compared with a lower wage. Circumstances which change over time, such as inflation and average levels of productivity, are not relevant to the explanation or to the empirical findings, because the data are taken from a cross-section of workers at a point in time. Multiple regression analysis is applied to a large, randomly selected sample of the workforce to identify the factors which contribute to explaining differences in wages between workers. The particular aim is to see whether people who have more work experience and more years working for their current employer, have higher wages as a result. The effect of experience and tenure are separated by holding constant the characteristics listed above. For example, we ask, does a man with Year 12 as his highest formal education, who works for a firm which employs 50 to 99 people in the private sector, as an intermediate service worker, in business services, who is married and does not belong to a union and has a continuing job, earn more if he has more years of work experience than does another man who has the same characteristics, but has less work experience. If workers with more work experience do earn more, in a systematic and statistically significant way, then it is inferred that this is because they are more productive. Moreover, it is inferred that they have become more productive because of their growing capacity to do their job well, arising from what they have learned while working.

It is well established in both theory and empirical work that the benefit of an additional year of experience declines as workers become more experienced. This is captured in regression analysis by including a quadratic term: specifically, experience is entered into the regression equation as both years of experience and years of experience squared. The second term indicates the rate at which the return to experience declines with additional years of experience.

The wage gains from an additional year of experience and tenure can be estimated in two ways. In the first, the return is measured as the extra dollars which an otherwise similar person receives if he or she has one more year of experience/tenure. The amount of extra dollars is not directly related to the value of the wage prior to the extra year of experience. In the second, the benefit from an extra year of employment is expressed as a percentage increase in the wage. The first way of representing the return to experience and tenure is used. This gives a dollar value of the gain in weekly wages (inferred to equal the gain in productivity) accruing to the Australian workforce from an extra year of work experience.

Table 3 shows the results of our estimates of the wage gain arising from an additional year of experience and an additional year of tenure, holding constant the worker attributes described above. The results are presented only for full-time workers, employed with their main period employer. They are given for the whole workforce and for the workforce of each major industry. We have estimated returns to on-the-job training separately for each industry in the expectation that some industries provide more training than do others. This expectation is confirmed by the results.

Table 3: Increase in weekly wage 'caused' by an additional year of experience and tenure among full-time workers, by industry, $ per week, 1996

Industry	Number	Adj. R^2	Experience $	Exp^2 $	Tenure $
Total	**9386**	**0.51**	**14**	**-0.264**	**3.5**
Community services	2036	0.49	12	-0.230	3.7
Manufacturing	1766	0.45	14	-0.264	4.0
Wholesale/retail	1474	0.51	13	-0.227	2.8
Finance	1110	0.56	20	-0.383	4.3
Public admin.	827	0.59	13	-0.230	3.5
Transport	556	0.34	13	-0.240	6.9
Recreation	468	0.50	10	-0.210	8.0
Construction	453	0.45	20	-0.365	1.7
Communications	224	0.54	10	-0.220	5.1
Mining	176	0.15	*11	*-0.228	1.1
Agriculture	175	0.25	11	-0.228	*0.2
Electricity etc.	121	0.34	**16	**-0.307	**5.2

Notes:
1 * The coefficient for experience or for tenure in the regression was *not* significantly different from zero at the 10% confidence level.
2 ** The coefficient for experience or for tenure in the regression was significantly different from zero at the 5–10% confidence level.
3 All other coefficients are significantly different from zero at the 5% confidence level.
4 Adj. R^2 = the measure of the extent to which people's weekly wage is 'explained' by the independent variables (e.g. differences in their education, sex and age) used in the estimating equation.
5 Exp^2 $ = the numbers of years a person is estimated to have been in the workforce, squared, with the increase in wages caused by an extra year of experience expressed as $ per week.

Source: ABS Survey of Education and Training (1997)

The dependent variable is weekly earnings, in dollars. The regression results (the adjusted R^2) show that, for the full sample, about half of the variation in weekly earnings among full-time workers can be explained by differences in the independent variables as set out above, together with differences in experience and in tenure. In estimating the wage gain from another year of experience, a variable measuring the value of experience squared was included. This is to recognise that the gain from an additional year of experience falls as the level of experience rises. The average employee in the survey has about 19 years of work experience. For such a person, the increase in wages associated with an additional year of experience is only $5 per week[5], compared with $14 for a person new to the workforce. After 27 years of experience, the estimations show that additional years of employment cease to add to productivity. (The equation implies that productivity falls after reaching this

[5] This is calculated as follows: 19 x (14 - 0.264 x 19) - 18 x (14 - 0.264 x 18).

maximum. However, this is most likely due to the equation used for estimating which was deliberately kept simple, imposing a limited functional form on the data, and the fact that it is cross-section. For our further calculations, a zero gain from an additional year of experience after 27 years is assumed.)

From table 3 it can be inferred that, for the average worker, an additional year of work experience with their current employer will add $8.50 to their weekly wage ($5 for the general experience and $3.50 for the extra tenure). Given the interpretation being placed on experience and tenure, this implies that that their general productivity rises by an amount worth $5 and their unique value to their employer rises by $3.50. This further implies that learning worth this amount has occurred in the previous year.

Some industries contribute more to the development of general skills among their workers than do others. Table 3 suggests that the highest rates of general skill enhancement occur in finance, construction and electricity, gas and water. To illustrate, for the whole sample, a person who has the average level of experience, 19 years, earns $171 per week more than an otherwise similar person with no experience.[6] In the case of the finance industry, a person with 19 years of experience earns $242 more than the novice. The comparable figure for construction is $249. Industry differences are discussed in more detail below.

The coefficients reported in table 3 imply that the wage gain from an additional year of experience depends on the current level of experience. In order to estimate the gain for the whole workforce of an additional year of experience, we must take account of the distribution of levels of experience across the workforce. Specifically, the gain from an additional year of experience for workers at each level of experience (up to 27 years) must be calculated with zero for higher levels. This annual gain must be multiplied by the number of people (full-time with main period employer) who have that level of experience. For example, the wage gain for workers with ten years' experience is calculated as:

11 x (14 - 0.264 x 11) - 10 x (14 - 0.264 x 10) x 210 412 - $1 767 461 per week, or $91 907 961 per annum

where 210 412 is the number of workers in the population who have ten years of experience, and 14 and -0.264 are the coefficients on experience and experience squared, respectively (expressed as dollar values). The sum of all the wage gains from experience in a year, across full-time workers employed with their main period employer, is $1 111 872 900. In calculating this figure, we take account of the actual distribution of experience across the entire workforce. In order not to suggest that this figure is precise, it is called $1.1 billion.

This figure does not reflect the entirety of the gains from an additional year of employment, because it covers only a sub-set of the workforce. The gains to people who were employed part-time by their main period employer, and those who were employed but not by their main period employer, must be added in, as must the gains from an additional year of tenure.

Because we could not get a satisfactory measure of the hourly earnings of part-time workers, this research has not been able to replicate the estimate for them. It is also difficult to get a reasonable approximation of levels of experience for people who do not work full-time. (For full-time workers, it is assumed that they are in employment for every year since they left full-time education.) Theory would lead us to expect that the level of on-the-job training for part-time workers is less than for full-time workers, in part because many are employed on a casual basis. In order to obtain an estimate of the total investment in on-the-job training, it is assumed that the rate of training for part-time workers is half that (measured as a proportion of their weekly wage) of full-time workers (a rather arbitrary number). There were 1.65 million part-time workers who had average weekly earnings of $257 in 1996. This gives a total estimate of the annual gain from an additional year of experience for part-time workers, which in round terms is $170m.

[6] A person with the average (19) years of experience earns 19 x (14 - 0.264 x 19) dollars per week more than a person with no experience.

In addition, there were a further 1.47 million workers who at the time of the survey were not working for their main period employer. Their earnings averaged $412 per week. To them is imputed a gain from an additional year of experience which is two-thirds of the equivalent for the base group. This amounts to a rounded number of $200m.

Thus in 1996 for the Australian workforce, the total increase in annual wages arising from an additional year of experience was approximately $1.47 billion dollars.

The returns to tenure have to be added to the returns to general experience to obtain a complete picture of the gain in wages (and by inference, in productivity) from an additional year of employment.

The coefficient on tenure is $3.50 per week. This amounts to $182 for a full year. The same ratios are applied to estimate return to tenure for the people who were not employed full-time with their main period employer as were used to estimate their return to general experience. The total return to tenure estimated in this manner is approximately $940m.

The total gain in wages/productivity for the Australian workforce from an extra year of employment is thus the gain from general experience ($1.47 billion) plus the gain from tenure ($0.94 billion), for a total of $2.41 billion.

The gain in general productivity will persist for each worker for the remainder of her or his working life (less any obsolescence). The gain in firm-specific productivity will persist for as long as the worker remains with her or his current employer. How much, then, would employers (or workers or government) be willing to pay to obtain an ongoing increase in the productivity of the workforce of $2.41 billion per annum? The answer to this depends crucially on the discount rate applied to the expected future flow of productivity.

The social discount rate to apply to the value of general skills should match the general social discount rate. There are no special risks for the economy as a whole for this investment, provided that the workers remain employed. The average expected time to retirement is about 20 years (since average experience is 19 years and people work approximately 40 years). There is no need to make an allowance for inflation, since the data come from a cross-section. Two discount rates (in order to illustrate the sensitivity of the figures to choice of discount rate) are used. One is 6% and the other is 10%. A formula is used which provides an adequate approximation of the net present value, namely NPV = (annual wage increase)/discount rate. This gives us the following values for the net present value, to the whole economy, of the general experience (on the assumption that there is no obsolescence):

Discount rate (%)	Value ($)
6	24.5 billion
10	14.7 billion

The returns to tenure need to be discounted more heavily, since they are lost when a worker changes employer. Again, high and low discount rates are applied to obtain the following net present value of the gain from an extra year of tenure:

Discount rate (%)	Value ($)
20	4.7 billion
30	3.1 billion

At a relatively low discount rate, the total net present value of the gain in wages/productivity from an extra year of work experience is therefore approximately $29.2 billion. At a relatively high discount rate, the net present value is approximately $17.8 billion. Respectively, these represent approximately 9 and 6% of the total wage and salary bill (of about $300 billion).

While we can argue over the precise numbers, it is clear that the value to the economy of the skills developed from working on the job is very high. It is important to keep in mind that the estimate we have come to is an understatement of the true gain in productivity. This is because the analysis has been relying on the wage profile to indicate how productivity rises with experience. There are strong theoretical reasons for thinking that the wage profile is flatter than the productivity profile underlying it. That is, the growth rate of productivity arising from learning on the job is higher than the growth rate of the wage. Acemoglou and Pischke (1999, p.567), for example, conclude that: 'Wage returns to training reflect the total increase in productivity only if labor markets are competitive. Our work predicts that, whenever employers pay for training, true returns will exceed wage returns, which are often estimated to be quite large already'.

The employers' contribution

The identified growth in wages is clearly of benefit to the workforce. However, it is not itself a benefit to the employer. Employers benefit only where the growth in productivity exceeds the growth in wages. It is accepted in the literature that this will occur for firm-specific skills (that is, the returns to tenure). It is also standard to argue that, in a competitive labour market, wage growth will match productivity growth so there is no benefit to firms from general training. Thus, a starting point is that firms will not pay for the provision of general skills but will pay some, probably quite a large, share of the costs of provision of firm-specific skills.[7]

In estimating the employer contribution to the costs of the productivity growth the research has identified, the last point made above is considered. That is, it is widely agreed among economists that employers will pay for a large share, although not all, of the development of firm-specific skills. We estimated that the net present value of the investment in firm-specific skills (that is, the returns from an additional year of tenure) was between $3 to 4.7 billion. Profit-maximising firms would be willing to pay up to this amount in order to increase the productivity of their workers. We have been unable to find empirical estimates of the share of the costs of firm-specific training that firms are willing to bear. Theory suggests that it will be high but less than 100%. This research adopts a figure of 80% of the mid-point of the range estimated. This gives an employer contribution to the development of firm-specific skills of $3 billion for Australian employers in 1996.

While theory indicates that workers, rather than employers, will pay for the costs of general skills, a number of studies have concluded that this is not the whole story in practice. Firms do pay for general skills, for example, when they take on apprentices at a net cost to the firm. A particularly striking example of firms paying for general training is given by Autor (1998), who shows that some labour hire firms in the United States pay for workers on their books to learn typing and office computer skills. Why do firms in practice pay at least some of the costs of the development of general skills? One reason is that it is hard to separate the learning of specific skills from the learning of general skills, and that doing the job often entails learning that cannot be separated from doing. A second reason, argued by Acemoglou and Pischke (1999), is that many labour markets are not competitive. This means that workers will incur some cost in moving from their current employer to a new one. Where this is the case, and where the wage structure is more compressed than the differences in productivity would suggest, then firms are able to pay workers something less than their marginal product to the firm. This makes general skills look like specific skills, in terms of an investment for the firm. Indeed, Acemoglou and Pischke argue that: 'More frictional and regulated labor markets may encourage more firm-sponsored training' (1999, p.567). That is, where labour markets are very competitive (and workers are thereby paid their marginal product), firms will not spend money on general training. However, where labour markets are less competitive, this relation between marginal product and wage is modified, and firms can expect to be able to obtain a return on their investment, even in general skills. Causes of reduced competitiveness in the labour market include the presence of effective unions, minimum wages laws which 'bite', market power in

[7] These points are made in most labour economics text books. An example is Hammermesh and Rees (1993), chapter 3.

product markets, a relatively compressed wage structure (such as has arisen through the Australian award wage system), and incentive structures to induce unobservable effort.

It is apparent that many of these conditions apply in Australia. Indeed, it is probably an unforseen consequence of the reasonably high level of regulation of the Australian labour market that it has induced firms to pay for general skills training for their workers. Conversely, contemporary efforts to reduce 'impediments to competition' in the labour market are likely, on this argument, to reduce the overall level of training, especially that part of it paid for by employers.

In the light of this discussion, it is arguably justifiable to attribute some of the costs of the provision of general skills to employers. The research identified that the total net present value of these skills acquired in a year came to between $15 billion and $25 billion, depending on the discount rate used. If the middle of this range is adopted, and it is supposed that employers pay for a bit less than half of the value of the skills developed, then the employer contribution would be of the order of $9 billion. Add to this the $3 billion for development of firm-specific skills, then the total employer contribution to skills development amounts to about $12 billion. To find the total employer contribution, we need to add the direct costs paid out by firms. These amounted to $3.9 billion (see table 2).[8] This gives a total of $15.9 billion, or about 5% of the wage bill.

This sum is much larger than the amount estimated by other means. But so too is the estimate of the total amount of training occurring in Australia. Note that all of the extra value of training identified in the analysis arises from investments by firms and workers: no extra government contribution is involved.

A major source of the extra investment captured in this approach is in the form of workers being prepared to work at lower wages in order to obtain on-the-job training. They may accept a job at a lower wage than from another firm, in order to take a job which provides more training, or they may accept pay from their employer lower than the worth of their productive contribution, in return for training. Neither of these forms of investment by the worker is picked up in surveys of training costs. Particularly for younger workers where most of the training occurs, these foregone wage costs are plausibly very large. To ignore these costs is analogous to ignoring the foregone earnings of university students, and measuring only the cost of fees and books, when estimating the costs of university education.

On the firm side, the cost to the firm of providing training is also mainly in the form of a difference between the productivity of the worker and the wage paid. In this case, the firm pays a wage that, for a period, is higher than the productivity of the worker. This cost is in addition to the direct costs of providing training, such as the costs of instructional staff and of materials used and mistakes made. Again, this payment of wages in excess of productivity is not picked up in surveys of employer training costs. It is sometimes picked up in more detailed studies of, for example, the net cost to firms of apprentices. These studies conclude that firms do indeed pay for general training, and a major way in which they do it is by paying a wage which exceeds the productivity of the apprentice.

Four conclusions can be made from this section:

- ✧ The total investment in employment-based training in Australia is much larger than previously believed and than is shown by surveys of training effort.
- ✧ The government share in this larger training effort is much smaller, and the share of employers and workers is much larger than previous estimates have concluded.
- ✧ The total value of the employer contribution is in the order of 5% of the wage bill.
- ✧ The pursuit of privatisation, deregulation, reduced power of unions and greater competition in the labour market may well reduce the extent of employer-funded training in future.

[8] Here it is appropriate to exclude the costs of employee wages for time receiving training, since these will already be counted in the return-to-training estimates.

Industry differences

The same approach can be utilised to enquire which industries do the most training. In doing so, their contribution to general training can be separately identified from their contribution to training which is specific to the tasks of individual firms. Table 4 contains the necessary information. From it we can see that:

- ✧ In both finance and construction, there is a high rate of general training for workers new to the workforce, but this falls rapidly as they gain some experience. Construction (along with mining and agriculture) offers very little firm-specific training.
- ✧ Agriculture offers particularly low levels of both general and firm-specific training.
- ✧ Recreation and communications offer low levels of general training to new workers, but quite high levels of firm-specific training.
- ✧ Public administration is no more than average in the levels of general and specific skills it provides (or it has a wage structure that is more divorced from productivity).
- ✧ Changes in the emphasis of employment away from goods production towards service production is not likely to reduce, and may increase, the overall levels of employment-based training.

The industries in table 4 can be ranked in terms of their contribution to the development of general skills. To do this, no account is taken of differences in the distribution of levels of experience between the different industries. The information used is the coefficients on experience and its squared term. The former measures the gain to an additional year of experience, and the latter measures the rate at which this declines with additional experience. If both factors are taken into account, the following ranking can be found (see table 4, column 2).

Table 4: Ranking of industries by their contribution to provision of general skills, 1996

Ranking	Industry	Hours of training		Expenditure per employee	
High	Construction	14.4	(12)	$100	(11)
	Finance and property	21.7	(7)	$236	(6)
	Electricity etc.	33.7	(2)	$481	(2)
Middle	Retail and wholesale	18.5	(8)	$110	(9)
	Manufacturing	18.5	(8)	$194	(7)
	Public administration	31.7	(3)	$264	(4)
	Transport and storage	25.2	(6)	$251	(5)
Low	Community services	31.7	(3)	$150	(8)
	Mining	39.5	(1)	$896	(1)
	Agriculture	17.0	(10)	n.a.	
Very low	Recreation	14.8	(11)	$103	(10)
	Communications	28.1	(5)	$318	(3)
	Average for all industries	**26.6**		**$186**	

Source: ABS (1996, 1997). The first column is derived from regression estimates done by the author. The figures in brackets are the ranking on the relevant domain.

Note that recreation and communications, while providing low levels of general skills, provide relatively high levels of firm-specific skills. Agriculture and mining provide low levels of both types of skills.

As table 4 shows, the ranking of industry training effort by the gains in wages from experience is different from the ranking given by measured hours spent in training by employees (taken from the Survey of Education and Training), or amount spent on training by employers (taken from the Survey of Employer Training Expenditure). Recreation and agriculture rank low and electricity ranks high on all measures. But the correlation ends there. Mining ranks highest on hours spent in

training and dollars spent per employee, but low on wage progression. Note that mining was also found to give low returns to experience in the United States (Lynch 1994). It may be that, in mining, much training is devoted to safety issues, the benefits of which would not be reflected in wage growth over time. Public administration, community services and communications all rank rather higher on levels of training than they do on wage growth. Community services appears to spend a lot of hours but not much money, so their wage growth and dollars spent rank similarly. Conversely, construction and finance seem to provide relatively little training, but considerable wage growth. A close correlation between the two approaches (survey responses and estimates of wage growth) to measuring amounts of training is not necessarily expected. Indeed, even if the correlation were close, for many purposes, nothing extra from taking the different approaches is gained. Wages growth, in the model put forward here, comes from the sort of formal training captured in the survey measures. But it also comes from informal learning not reflected in the surveys. It is perfectly possible, and interesting, to find that industries, such as finance, which do not spend a great deal on formal skills development, nonetheless appear to provide their employees with many informal learning opportunities.

Determinants of wage growth

The regression used to estimate the extent of learning on the job is reported in the appendix. The regression for each industry is not reported separately, because to do so would be cumbersome. This regression provides some interesting insights into other determinants of wage growth, in addition to experience and tenure. Only variables that are significant at the 5% level are reported.

Even standardising for years of education and experience, and for sex and industry, people's occupation has a significant effect on their earnings. Managers and professionals earn the most, and labourers earn the least out of all occupational groups, while tradespersons have the smallest pay advantage over labourers. Size of business is a strong determinant of earnings, with larger firms paying more, other things equal. Women earn less than men, and married people earn more than single people. Mining is the highest paying industry, for a given level of education, experience etc., while agriculture pays the least. Being a member of a trade union, or employed in the private sector, or employed on a permanent rather than casual basis are not significantly associated with higher pay. These findings largely accord with those from other studies. They are reported here because they are an interesting by-product of the work which was necessary to answer the core question of this project.

Conclusion

This paper argues that current estimates of the total level of vocational skills development and the employer contribution to this development seriously underestimate the true levels in Australia. Where conventional measures put the total cost of training at around $8.5 billion per annum, this research estimates it to be about $30 billion. Even this large number is probably an underestimate of the total, because it does not put a value on student time spent in classroom instruction.

The reason for the much higher estimate is that a value on all the informal development of knowledge which occurs in the workforce is inferred, as well as on the more structured development of skills by employers. Informal acquisition of skills by learning by doing and by learning from co-workers is recognised by economists to be an important contribution to people's productive capacity. The wage outcomes of a random sample of 9000 people employed full-time in Australia in 1996 have been used to estimate how much their wages rise as a result of more years of general work experience, and more years of employment with their current employer. Guided by economic theory, this information has been used to infer how much employers and workers would be prepared to pay for the rise in productivity which underlies the higher pay that more experienced workers receive. From this the estimates of what employers do in fact pay are drawn.

The strength of the approach used in this paper is that it enables a qualification of a dimension of skills development which is undoubtedly large and important, yet is routinely ignored. The limitation of the approach is that it involves views about how the labour market works which are not beyond dispute. It has also been necessary to make judgements about how the costs of obtaining skills on the job are shared between workers and employers. For these reasons, it is appropriate to view our estimates as approximations, rather than as precise quantification. Where judgement has been required, the research has erred on the side of being conservative in valuing the employer contribution. Unless the approach is entirely rejected, it is clear that a great deal of skill enhancement does occur informally on the job. It is implausible to suppose that this learning is costless to employers; indeed, the subsidies given to firms to take on apprentices and trainees reflect the belief that developing work skills on the job is costly to the employer. We are confident that employers (and workers) contribute much more to the costs of developing work skills than is revealed by conventional estimates. The estimate given here of an employer contribution of $16 billion per annum is only approximate. But we are confident that it is closer to the mark than is the conventional figure of $4 billion. We believe that we have identified a promising approach to estimating the employer contribution to skills development in the workforce, one which would benefit from further refinement.

Does any of this have policy implications? The main implication drawn is that what is happening informally in the workplace is very important for determining the future quantity, quality and character of the skills of the workplace. There is a large public interest in what happens in the domain of on-the-job learning. The opportunities which workers have for the development of skills is affected greatly by the sorts of jobs and learning provided by employers. We have seen that some industries provide much greater scope for learning than do others. Changes in industry structure will therefore affect the total level of skills development. Firms which choose high-skill, high-wage approaches to profitability will generate more opportunities for skills development than do firms which choose the low-skill, low-wage path. Furthermore, economic analysis is clear that the more

competitive the labour market, the less the incentive for firms to provide high levels of (especially general) training for their workers. It is outside the scope of this paper to think through in detail what high levels of on-the-job learning mean for public policy. But if our estimates are persuasive, such thinking is a high priority.

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Appendix

Table A1: Ordinary Least Squares (OLS) regression of weekly earnings ($) of full-time workers, 1996

	Coefficient	Tenure	Sig.
(constant)	146	10.0	0
years of education	22	20.8	0
imputed experience	14	21.2	0
manager	346	36.6	0
experience squared	-0.264	-18.3	0
professional	234	28.9	0
sex (1 is female)	-93	-20.0	0
mining	322	21.7	0
associate professional	155	19.2	0
size of business <10	-112	-17.6	0
finance	66	9.6	0
tenure	0.294	9.8	0
transport	82	9.2	0
community services	-37	-6.2	0
size of business 10–19	-70	-8.7	0
agricultural	-78	-5.1	0
marital status (1 is married)	29	6.5	0
advanced clerical	101	8.5	0
construction	59	6.1	0
communications	78	6.1	0
size of business 20–99	-29	-5.1	0
intermediate clerical	57	7.8	0
tradesperson	44	5.6	0
intermediate production	33	4.0	0
electricity, gas and water	56	3.3	0.001
manufacturing	19	3.1	0.002
adj. R^2	0.51		

The omitted variables are labourers and firm size in excess of 99.

- ✧ Education is measured as a continuous variable, where the number of years of full-time education is deduced from the highest qualification reported.
- ✧ Tenure is reported in months. The coefficient thus measures the return to an extra month of tenure. This has been multiplied by 12 to obtain the return to an extra year of tenure.
- ✧ Experience is not observed directly in the data. It has been imputed as their age, minus their years of schooling, minus five (which is the assumed school starting age). This is a standard procedure in earnings equations.

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