

NATIONAL VOCATIONAL EDUCATION  
AND TRAINING RESEARCH PROGRAM

## RESEARCH REPORT

# The returns to literacy skills in Australia

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*Mathais Sinning*

AUSTRALIAN NATIONAL UNIVERSITY



**Australian Government**

**Department of Industry, Innovation,  
Climate Change, Science, Research  
and Tertiary Education**





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This document should be attributed as Chesters, J, Ryan, C & Sinning, M 2013, *The returns to literacy skills in Australia*, NCVER, Adelaide.

This work has been produced by NCVER on behalf of the Australian Government and state and territory governments, with funding provided through the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education.

COVER IMAGE: GETTY IMAGES/THINKSTOCK

ISBN 978 1 922056 54 2

TD/TNC 112.09

Published by NCVER, ABN 87 007 967 311

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# About the research

## *The returns to literacy skills in Australia*

Jenny Chesters, Chris Ryan and Mathias Sinning, Australian National University

Most investigations into the returns to training include educational attainment and labour market experience as determinants of earnings. The authors of this study propose that individual skills may also explain why some workers earn more than others.

This research investigates the relationship between literacy skills and the incomes of workers in the Australian labour market through the use of the Survey of Aspects of Literacy (SAL) and the Adult Literacy and Life Skills (ALLS) Survey. It also estimates whether the return from literacy skills changed between 1996 and 2006, and how returns vary with level of education.

## Key messages

- Both educational qualifications and literacy skill levels are positively associated with income among full-time male and female employees. In addition, within broad education levels (university-level qualifications, vocational education and training qualifications, and no post-school qualifications), income increases with literacy skill level.
- Highly educated workers experience higher returns to literacy skills than workers with low levels of education. However, the returns to literacy skills held by workers with low and medium levels of education have increased over time in some cohorts, although not for workers with high levels of education.
- There was no change in the magnitude of the return from literacy skills between 1996 and 2006 at the aggregate level.

Given that both qualification level and literacy skills are important in determining wages, an implication is that the quality of the qualification is important. Those qualifications that offer improvement in literacy skills, in addition to technical skills and knowledge, will provide the best returns for workers.

Tom Karmel  
Managing Director, NCVET



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# Executive summary

Skills are typically unobserved; hence we know very little about the extent to which individual skills affect the remuneration of workers. This is unfortunate because it seems likely that the skills of workers explain a considerable part of their earnings that may not be attributed to formal education. Moreover, an understanding of earnings differentials within various educational categories requires knowledge about individual skills.

Over recent decades, income inequality has increased in many industrialised countries. Existing studies have typically attributed this to skill-biased technological change, which raised the demand for highly educated workers relative to less-educated workers and resulted in a higher earnings gap between these two groups. While the economic literature finds that the earnings premium paid to college graduates in the United States has increased considerably since the 1980s, the earnings gap between highly educated and less-educated workers in Australia has remained largely stable over this time. Against this background, our analysis contributes to the literature by focusing on the returns to workers from skill accumulation. Our data further allow us to investigate changes in the way skills are rewarded in the labour market across the educational spectrum.

In this study, we examine the rewards for individual literacy skills in the labour market, paying particular attention to the relationship between literacy skills and the incomes of full-time employed workers aged 25–64 years in the Australian labour market. We take advantage of the opportunity to use data that contain the literacy skill measures of workers, because this allows us to study income differences in the return from the literacy skills of workers with varying levels of education. We further consider changes in the returns to skills among workers to assess whether the rewards for literacy skills in the labour market changed between 1996 and 2006. Literacy skills may also contribute to the likelihood that individuals are employed full-time but, like most studies of human capital earnings functions, we focus on their effect among full-time workers.

We use two surveys conducted by the Australian Bureau of Statistics (ABS) ten years apart: the 1996 Survey of Aspects of Literacy (SAL) and the 2006 Adult Literacy and Life Skills (ALLS) Survey. A household-based survey of Australians, the Survey of Aspects of Literacy collected information about the current income of workers and the literacy skills of individuals. The Adult Literacy and Life Skills Survey can be treated as a later iteration of the Survey of Aspects of Literacy, with a similar survey size, design features and overlapping questions. Although the two surveys are based on different samples of the population and therefore do not permit a longitudinal analysis, they enable us to examine changes in the returns to skills and other relevant determinants of individual earnings, including formal education.

Our analysis adopts a modified version of the standard human capital earnings function, in that we are able to add measures of the literacy skills of individuals to educational attainment and (potential) labour market experience as key determinants of earnings. We are able to estimate whether the income payoffs to these phenomena were different in 2006 compared with 1996. Further, we study changes in the skill–income profiles of male and female workers over time to find out whether changes in the returns to skills were different across the distribution of education.<sup>1</sup>

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<sup>1</sup> We use the income of full-time employees as a measure of earnings in our analysis. Although it seems reasonable to expect that the incomes of employees do not differ much from their earnings, we use the term ‘income’ instead of ‘earnings’ throughout the paper.

We are particularly interested in answering the following questions: How do literacy skills affect the incomes of Australian workers? Have the rewards from the literacy skills of workers become increasingly important in the labour market? Were changes in the returns to skills different across the educational distribution?

The major findings and their implications are highlighted in the points below:

- Both observed literacy skill levels and educational qualifications are positively associated with income among full-time male and female employees. The inclusion of literacy skills lowers the estimated income effects of qualifications; hence, both education levels and literacy skill levels are important in determining income.
- Having a vocational or university education is associated with a higher income compared with having a lower level of education. This return from education has not changed significantly over time.
- Within broad education levels (corresponding to university-level qualifications, vocational education and training [VET] level qualifications and those without post-school qualifications), income increased with literacy skill level. Hence, within education levels, the labour market operates in such a way that more skilled individuals receive better remuneration.
- There is no evidence of any change in the magnitude of the return from literacy skills between 1996 and 2006 at the aggregate level. This result suggests that technical change in Australia was not skill-biased in this period, in terms of favouring highly educated workers, as has been found in other industrialised countries.
- Highly educated workers experience higher returns to literacy skills than workers with low levels of education. However, the returns to the literacy skills of workers with low and medium levels of education have increased over time in some cohorts, although this was not the case for workers with high levels of education.

# Introduction

Over recent decades, income inequality has increased in many industrialised countries. Empirical studies have attributed this trend to skill-biased technological change, which raised the demand for highly educated workers relative to less-educated workers and resulted in a higher earnings gap between these two groups (the so-called ‘college’ earnings premium).

While the economic literature finds that the earnings premium paid to college graduates in the United States has increased considerably since the 1980s (Murphy & Welch 1992, 1993; Bound & Johnson 1992; Katz & Murphy 1992; Berman, Bound & Machin 1997; Card & DiNardo 2002), the earnings gap between highly educated and less-educated workers in Australia remained remarkably stable over time (Borland 1999; Coelli & Wilkins 2009).

Borland (1999) argues that the relative earnings of highly educated Australian workers did not change because both the demand for and the supply of university graduates increased simultaneously. Coelli and Wilkins (2009) examined the effect of the change in credentials or the required qualifications of workers in the teaching and nursing professions, from predominantly certificates and diplomas to university bachelor degrees and above, and concluded that this shift may have reduced the estimates of the earnings premium of bachelor degree holders.

This study contributes to the literature by focusing on the returns to the literacy skills of workers with varying levels of education and training qualifications. We utilise data that allow us to isolate employees’ returns to literacy skills from those from education. We also look at changes in the returns to literacy skills over time.

We use two surveys conducted by the Australian Bureau of Statistics (ABS) ten years apart, which allows us to study changes in the returns to the literacy skills of workers within different age groups and with different levels of education. Specifically, we employ data from the 1996 Survey of Aspects of Literacy (SAL) and the 2006 Adult Literacy and Life Skills (ALLS) Survey. The former, a household-based survey of Australians, collected information about the current income of workers and the literacy skills of individuals. The latter can be treated as a later iteration of the Survey of Aspects of Literacy, with a similar survey size, design features and overlapping questions. Although the two surveys are based on different samples of the population and therefore do not permit a longitudinal analysis, they enable us to examine changes in the returns to skills over time.

Our analysis departs from the standard human capital earnings function, which typically includes educational attainment and (potential) labour market experience as the key factors determining earnings. Since the actual skills of individuals are usually not available for inclusion in analysis by researchers, econometric theory suggests that the returns to education estimated by this function will be upward biased, because high-skilled workers are more likely to obtain both higher levels of education and earn higher wages. By including literacy skills into the earnings function estimated here, we remove this source of bias from the estimate of the returns to education; we also provide an estimate of the returns to skills. We use these estimates as the starting point for our analysis of the returns to the skills of workers with different levels of education. Specifically, we study changes in the skill–income profiles of male and female workers over time to determine whether changes in the returns to skills between 1996 and 2006 were common across workers with differing levels of education or not.

We are particularly interested in answering the following questions:

- How do literacy skills affect the incomes of Australian workers?
- Have the rewards from the literacy skills of workers become increasingly important in the labour market?
- Were changes in the returns to literacy skills different across the educational distribution?

Addressing these questions is important, given the predominant focus of the empirical literature on university graduates. We contribute to this literature by investigating changes in the relevance of literacy skills in the labour market across groups with different levels of education.

Our findings reveal that both observed skill levels and educational qualifications are positively associated with income among full-time male and female employees. The inclusion of literacy skills lowers the estimated income effects of qualifications. Moreover, having a vocational or university education is associated with a higher income compared with having a lower level of education, and the premium attached to education does not change significantly over time. Within broad education levels (corresponding to university-level qualifications, vocational education and training [VET] level qualifications and those without post-school qualifications), income increased with skill level.

We find no evidence of any change in the magnitude of the literacy skills effect between 1996 and 2006 at the aggregate level. This result suggests that technical change in Australia was not skill-biased in this period, in terms of favouring highly educated workers, as has been found in other industrialised countries. Moreover, within education levels, those with higher levels of literacy skills tended to enjoy higher incomes than those with lower-level skills. Hence, within education levels, the labour market operates in such a way that more skilled individuals receive better remuneration. Highly educated workers further experience higher returns to skills than workers with low levels of education. However, the returns to the skills of workers with low and medium levels of education have increased over time in some cohorts, although this was not the case for workers with high levels of education. While the returns for younger workers tended to increase, older workers with medium levels of education seemed to experience a decline in their returns to skills over time.

The following chapter includes a detailed description of the data used in our analysis. Later chapters provide empirical evidence on the returns to education and skill accumulation. The final chapter discusses the implications of the results.

# Description of the data

This chapter contains a description of the data and the relationships between income and educational attainment, age and literacy skills. The analysis concentrates on the sample of full-time employees aged 25–64 years.

## Data sources

The empirical analysis uses information from two comparable surveys of one person from Australian households conducted in 1996 and 2006 by the ABS, the Survey of Aspects of Literacy and the Adult Literacy and Life Skills Survey, respectively.

### Survey of Aspects of Literacy (1996)

The Survey of Aspects of Literacy was a national survey designed to measure certain aspects of the literacy and numeracy skills of Australians. Personal interviews were carried out over a nine-week period between May 1996 and July 1996. The sample consists of 9302 respondents aged 15–74 years living in private dwellings, but excluded those living in remote and sparsely settled areas. The data include information about those literacy and numeracy skills of individuals that are deemed necessary for the use of printed materials typically found at work, at home and in the community (ABS 1997a, 1997b). The survey was part of an international project led by Statistics Canada called the International Adult Literacy Survey (IALS).<sup>2</sup>

There were two major components to the survey:

- A background questionnaire captured individual and household information such as general demographic information, parental information, labour force activities, literacy and numeracy practices in daily life and at work, participation in education and learning, and personal and household income.
- An objective test-based assessment of literacy and numeracy skills asked respondents to undertake a set of tasks:
  - Each respondent was asked to complete six relatively simple literacy-related tasks.
  - Those who completed two or more of these correctly were then given 46 additional tasks drawn from a pool of 108. They used commonplace examples of printed materials and required varying degrees of comprehension and arithmetic skills.

The Survey of Aspects of Literacy data include three objective skill measures:

- document literacy: the effective use of information contained in materials such as tables, schedules, charts, graphs and maps (used throughout this report, since the three measures are so highly correlated)
- prose literacy: the skills required to understand and use information from various kinds of prose texts, including texts from newspapers, magazines and brochures

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<sup>2</sup> For Australia, the questionnaire and task booklets were administered in English and people with poor English language were excluded from the survey. This might have excluded a lot of migrants, and probably Indigenous Australians. Since remote and very remote areas were excluded from the sampling frame, a significant proportion of the Indigenous population was excluded from the survey as well.

- quantitative literacy: the ability to perform arithmetic operations using numbers contained in printed texts or documents. This is a very narrow measure of the numeracy skills of individuals.

## Adult Literacy and Life Skills Survey (2006)

The Adult Literacy and Life Skills Survey was conducted in Australia as part of an international study coordinated by Statistics Canada and the Organisation for Economic Co-operation and Development (OECD). Personal interviews were carried out from July 2006 to January 2007 in private dwellings throughout non-remote areas of Australia. The sample consists of 8988 respondents aged 15–74 years.

The Adult Literacy and Life Skills Survey is divided into two sections:

- A background questionnaire was administered and included individual and household information such as general demographic information, linguistic information, parental information, labour force activities, literacy and numeracy practices in daily life and at work, frequency of reading and writing activities, participation in education and learning, social capital and wellbeing, information and communication technology, personal and household income.
- After the background questionnaire, each respondent was asked to complete a set of six basic questions. Only respondents who correctly answered a minimum of three questions of this basic component moved onto a main component, consisting of three blocks designed to measure (ABS 2006):
  - document literacy: the efficient use of information contained in various formats, including job applications, payroll forms, transportation schedules, maps, tables and charts
  - prose literacy: the knowledge and skills required to understand and use information from various kinds of narrative texts, including texts from newspapers, magazines and brochures
  - along with numeracy, problem-solving skills and health literacy, none of which are used in this paper.

We use information on the personal income of full-time employed workers as earnings measure in our analysis. Unfortunately, the data only include information on the income decile in which an individual in the sample appeared. For that reason, we use personal weekly income deciles for our descriptive analysis and exploit the decile boundaries provided by the ABS in the conduct of the regression analysis undertaken here (that is, we undertake grouped or interval regression).

While the measures of individual literacy in the 2006 data contain an underlying continuous score on a range of 0–500 and a summary indicator in the form of a five-point scale (with known thresholds from the underlying scale), the literacy skill levels of the 1996 survey were only published on the same summary five-point scale used in 2006. To overcome this problem, we generate a continuous scale for 1996, given the observed five-point scale scores of individuals and a small set of other characteristics. A propensity score matching approach is employed to generate the continuous literacy measures for 1996.

## Descriptive statistics

Table 1 reports the relationship between income and education for full-time employed men and women aged 25–64 years in 1996 and 2006. The income deciles refer to the personal weekly income of employed persons and range from 1 (lowest) to 10 (highest). We use three categories to partition respondents in terms of their highest level of completed education: low, medium and high.

Respondents with a Year 12 or lower level of education have been assigned to the low category. Respondents with a post-school qualification such as a certificate or diploma, but not a university degree, are assigned to the medium category. The high category includes all respondents with a university degree or higher qualification.

**Table 1 Educational attainment by income level and gender, 1996 and 2006 (%)**

	Percentages by gender and level of education							
	Males				Females			
	Low	Medium	High	Total	Low	Medium	High	Total
<b>1996</b>								
Income decile: 1 (%)	0.3	0.0	1.0	0.3	0.8	0.7	0.7	0.7
Income decile: 2 (%)	0.5	1.0	0.6	0.7	1.5	1.1	1.9	1.5
Income decile: 3 (%)	1.0	1.5	1.0	1.2	1.8	2.1	0.7	1.6
Income decile: 4 (%)	2.3	1.6	2.3	2.0	6.2	10.0	1.9	6.1
Income decile: 5 (%)	5.6	2.6	2.6	3.8	11.3	7.1	4.1	8.0
Income decile: 6 (%)	15.8	8.5	1.9	10.0	23.8	15.4	5.6	16.1
Income decile: 7 (%)	18.2	14.3	5.5	14.1	26.9	23.6	9.3	20.9
Income decile: 8 (%)	21.7	25.8	9.6	21.1	16.9	21.1	23.3	20.0
Income decile: 9 (%)	22.5	27.5	29.9	26.1	8.2	14.3	36.3	18.1
Income decile: 10 (%)	12.1	17.1	45.7	20.7	2.6	4.6	16.3	7.1
Number of observations	621	683	311	1615	390	280	270	940
<b>2006</b>								
Income decile: 1 (%)	0.9	1.8	2.7	1.7	2.8	4.7	0.9	2.6
Income decile: 2 (%)	0.7	0.7	1.0	0.8	0.8	1.3	1.9	1.3
Income decile: 3 (%)	0.4	0.4	0.0	0.3	0.5	0.3	0.5	0.4
Income decile: 4 (%)	2.4	1.6	0.6	1.7	4.5	1.7	0.9	2.4
Income decile: 5 (%)	6.1	2.8	2.5	4.0	10.4	7.0	2.3	6.4
Income decile: 6 (%)	14.9	8.4	4.0	9.7	27.5	21.3	6.1	17.7
Income decile: 7 (%)	17.0	15.7	5.0	13.4	21.2	22.7	13.6	18.7
Income decile: 8 (%)	21.1	23.6	11.9	19.6	16.7	19.3	21.3	19.1
Income decile: 9 (%)	19.6	24.8	25.8	23.1	11.4	15.7	30.6	19.8
Income decile: 10 (%)	16.9	20.0	46.5	25.7	4.3	6.0	22.0	11.5
Number of observations	700	669	480	1849	396	300	428	1124

Note: Unweighted numbers.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996; ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

A number of well-known features of the income distribution are evident in table 1. Full-time employees have high incomes (they are concentrated in the upper deciles of personal income); income rises with education (those with high levels of education are even more concentrated in the top deciles); and men tend to earn more than women, even after controlling for education levels (men are more concentrated in the top deciles than women with the same education level).

The patterns in the data are quite similar for 1996 and 2006, although if anything full-time employees were even more concentrated in the top two income deciles in 2006 than 1996. This was particularly evident for women, where the proportion in the top two deciles grew by six percentage points, partly because of compositional changes associated with more educated women, and partly because their concentration there increased for all education levels.

Table 2 reports the relationship between age and income for full-time employed men and women in 1996 and 2006. The numbers in table 2 indicate that the relationship between age and income varies considerably by gender. In 1996, the majority (68%) of full-time employed men aged 25–64 years were located in the top three income deciles, whereas the majority (51%) of full-time employed women aged 25–64 years were located in the middle four income deciles.

Seventy-three per cent of men aged 35–49 years were located in the top three deciles compared with 61% of men aged 25–34 years and 68% of men aged 50–64 years. The percentage of women in the top three deciles does not change much with age.

In 2006, the majority (68%) of full-time employed men aged 25–64 years were located in the top three income deciles, whereas 50% of full-time employed women aged 25–64 years were located in the top three income deciles. Once more, the percentage of women in each age group located in the top three deciles were broadly similar: 48% of women aged 25–34 years; 54% of women aged 35–49 years; and 48% of women aged 50–64 years earning above-average incomes.

**Table 2 Age groups by income level and gender, 1996 and 2006**

	Percentages by gender and age group							
	Males				Females			
	25–34	35–49	50–64	Total	25–34	35–49	50–64	Total
<b>1996</b>								
Income decile: 1 (%)	0.2	0.5	0.0	0.3	0.8	0.9	0.0	0.7
Income decile: 2 (%)	0.9	0.7	0.6	0.7	2.2	1.1	0.8	1.5
Income decile: 3 (%)	1.1	1.1	1.6	1.2	2.4	0.9	1.6	1.6
Income decile: 4 (%)	2.7	1.9	1.0	2.0	4.3	7.9	4.7	6.1
Income decile: 5 (%)	4.3	3.5	3.5	3.8	9.5	6.3	9.4	8.0
Income decile: 6 (%)	12.0	8.2	10.9	10.0	14.9	17.4	15.0	16.1
Income decile: 7 (%)	18.2	10.9	14.5	14.1	24.6	18.3	18.9	20.9
Income decile: 8 (%)	25.4	20.2	15.8	21.1	23.2	18.5	15.7	20.0
Income decile: 9 (%)	23.8	27.6	26.7	26.1	13.5	19.2	27.6	18.1
Income decile: 10 (%)	11.6	25.5	25.4	20.7	4.6	9.5	6.3	7.1
Number of observations	560	744	311	1615	370	443	127	940
<b>2006</b>								
Income decile: 1 (%)	2.3	1.8	0.8	1.7	3.0	3.1	1.3	2.6
Income decile: 2 (%)	1.4	0.5	0.8	0.8	1.9	1.6	0.3	1.3
Income decile: 3 (%)	0.4	0.2	0.4	0.3	1.1	0.0	0.3	0.4
Income decile: 4 (%)	0.8	1.9	2.2	1.7	2.7	1.3	3.6	2.4
Income decile: 5 (%)	4.7	3.9	3.4	4.0	6.8	4.5	8.8	6.4
Income decile: 6 (%)	11.7	8.3	9.9	9.7	17.0	17.3	19.2	17.7
Income decile: 7 (%)	18.6	11.1	12.0	13.4	19.7	17.7	18.8	18.7
Income decile: 8 (%)	18.2	21.1	18.7	19.6	25.4	13.0	20.5	19.1
Income decile: 9 (%)	23.4	22.6	23.5	23.1	15.7	26.2	15.6	19.8
Income decile: 10 (%)	18.6	28.6	28.2	25.7	6.8	15.2	11.7	11.5
Number of observations	512	844	493	1849	370	446	308	1124

Note: Unweighted numbers, full-time employees.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996; ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.



Table 3 reports the mean level of literacy skills by income level for men and women in 1996 and 2006. In general, income appears positively associated with literacy skills: higher-income groups tend to have higher average literacy skills. While there is no uniformly increasing pattern of association between income and literacy skills for men in the lowest six deciles in 1996, for men located in the top four deciles, average literacy skills increase as income increases. Men in the seventh decile averaged 276 on the literacy skills test, whereas men in the tenth decile averaged literacy scores of 319. For women in 1996, the positive association between literacy skills and income decile is more consistent. Women in the fifth income decile averaged 271 on the literacy skills test. The mean on the literacy skills tests increased for each decile with women, and in the tenth decile was 327.

In 2006 the association between income and literacy skills is more consistent than in 1996 for both genders. Men in each decile, from the fifth decile upwards, averaged higher levels of literacy skills than men in the preceding decile. Men in the fifth decile averaged 240, whereas men in the tenth decile averaged 314. For women a similar pattern is observed from the fourth decile upwards: women in the fourth decile averaged 235 on the test and women in the tenth decile 312.<sup>3</sup>

**Table 3 Document literacy skills by income level, year and gender**

	Mean value by year and gender			
	1996		2006	
	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>
Income decile: 1	309.6 (28.6)	292.2 (37.9)	308.2 (10.8)	289.1 (8.9)
Income decile: 2	282.8 (23.1)	273.3 (29.8)	288.1 (16.2)	306.5 (12.7)
Income decile: 3	261.4 (19.5)	300.3 (14.0)	221.0 (79.4)	255.5 (21.9)
Income decile: 4	268.3 (15.1)	276.5 (9.7)	249.1 (12.7)	235.2 (16.2)
Income decile: 5	272.1 (7.6)	271.2 (9.2)	239.9 (9.7)	263.7 (7.0)
Income decile: 6	268.2 (5.0)	272.8 (5.2)	262.9 (5.2)	272.4 (5.3)
Income decile: 7	276.3 (4.8)	291.7 (3.7)	275.2 (3.8)	288.1 (4.1)
Income decile: 8	283.5 (3.7)	302.0 (3.8)	286.8 (3.3)	298.7 (3.8)
Income decile: 9	299.2 (2.6)	305.9 (3.7)	296.5 (3.1)	308.5 (3.4)
Income decile: 10	318.5 (2.9)	327.1 (5.2)	313.7 (2.9)	312.4 (4.9)
<b>Total</b>	<b>291.6</b> <b>(1.8)</b>	<b>292.2</b> <b>(2.5)</b>	<b>289.1</b> <b>(1.9)</b>	<b>290.9</b> <b>(1.9)</b>
Number of observations	1615	940	1849	1124

Notes: Weighted numbers based on weights provided by the ABS and self-generated replicate weights for 1996. Standard errors in parentheses.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996; ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

<sup>3</sup> The numbers in table 3 and the numbers presented in our empirical analysis were weighted using survey weights provided by the ABS. We further use replicate weights from the ALLS to perform the analysis. A set of similar replicate weights was generated for 1996, stratified by age, gender, state and place in state (rural vs urban area).

# Literacy skills and the returns to education

This chapter analyses the relationship between income and education, age and literacy skills. It focuses on

- the estimation of the returns to education
- the estimation of the returns to skills
- an examination of the bias in the estimated parameters that occurs when the literacy skills of individuals are included in the estimation of wage equations.

Our empirical analysis departs from a standard earnings regression framework, which is typically employed to examine the relationship between earnings and factors commonly available in data that contribute to the productivity of an individual (such as completed education and potential labour market experience). The analysis of the effect of investments in human capital on earnings is usually limited to the estimation of private returns to education because most datasets do not include individual skill measures.

Since the (unobserved) cognitive ability of individuals is positively correlated with earnings and education, it seems likely that estimates of the private returns to education will be upward biased. In our empirical analysis, we use literacy skills to capture aspects of individual ability and broader skills to obtain better parameter estimates. In addition, we obtain an estimate of the return from skills, which is analysed in greater detail in the next chapter.

Due to the grouped nature of the income variable (our measure of earnings of full-time employed workers), we are unable to obtain the model parameters by a linear regression model. For that reason, we estimate an interval regression model that allows us to model the distance between the income decile boundaries provided by the ABS appropriately (see Wooldridge 2002). Before reporting the regression analysis, we provide some context for our later analysis by examining the relationship between the determinants of income that are usually observed by researchers (age and educational attainment) and a key factor that is usually not observed (individual skills).

## Literacy skills and age

Table 4 contains the average literacy scores in the two surveys by age of full-time employed males and females aged 25–64 years. Overall, there was little difference in the average level of literacy skills for full-time employed men and women aged 25–64 years: in 1996 both men and women averaged about 292; in 2006 men averaged 289 and women averaged 291. While there is no linear pattern with age in the numbers in table 4, there is something of a decline in average scores after middle age for both men and women. In 1996, the highest average level of literacy skills was recorded by men aged 40–44 years (301) and after that, average literacy skills decline with age, with the lowest average level of literacy skills being recorded by men aged 60–64 years (268). For women, those aged younger than 45 years had higher literacy skills than those aged 45 years or older. Women aged 60–64 years had the lowest average level of literacy skills among females (264).

In 2006, the pattern is somewhat different for men from that in 1996. The highest average level of literacy skills was recorded for men aged 35–39 years (297), increasing marginally from 294 for those aged 25–29 years and 296 for men aged 30–34 years. After age 45 average literacy skills decline with age, with men aged 60–64 years again having the lowest average levels (259). The pattern for women bounces around somewhat more, but those aged younger than 50 years had higher literacy skills than those aged 50 years or older.

The decline in literacy skills as cohorts age beyond middle age is apparent in table 4. While the average literacy skills of the cohorts of males and females aged 35–39 years in 1996 changed only marginally in 2006, when they were aged 45–49 years, the average skill levels for all cohorts older than that did fall between 1996 and 2006. For example, the average literacy skills levels of the cohort of males aged 40–44 in 1996 were 21 points lower in 2006, when they were aged 50–54 years, while the same cohort of females saw an 9-point decline.

**Table 4 Literacy skills by age group, year and gender**

	Mean value by year and gender			
	1996		2006	
	Males	Females	Males	Females
Age 25–29	292.9 (4.4)	298.6 (3.5)	294.2 (3.9)	300.2 (4.3)
Age 30–34	294.0 (2.3)	295.6 (5.1)	296.1 (4.1)	294.3 (4.3)
Age 35–39	291.5 (4.0)	295.2 (7.0)	297.0 (4.0)	297.5 (4.3)
Age 40–44	301.1 (4.7)	290.9 (5.5)	289.6 (4.0)	286.7 (5.2)
Age 45–49	287.9 (4.0)	287.7 (6.7)	292.1 (3.7)	293.9 (5.1)
Age 50–54	292.9 (4.7)	282.9 (6.0)	280.1 (5.2)	281.5 (5.7)
Age 55–59	278.9 (3.7)	275.8 (11.5)	276.5 (6.3)	281.9 (5.3)
Age 60–64	267.7 (10.1)	263.8 (15.6)	259.2 (8.1)	268.5 (10.6)
<b>Total</b>	<b>291.6</b> <b>(1.8)</b>	<b>292.2</b> <b>(2.5)</b>	<b>289.1</b> <b>(1.9)</b>	<b>290.9</b> <b>(1.9)</b>
Number of observations	1615	940	1849	1124

Notes: Weighted numbers based on weights provided by the ABS and self-generated replicate weights for 1996. Standard errors in parentheses.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996; ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

## Literacy skills and educational attainment

Table 5 shows the relationship between literacy skills and educational attainment for full-time employed men and women in 1996 and 2006. As expected, men and women with higher levels of educational attainment have higher average levels of literacy skills. An interesting pattern occurs when gender is considered: men with less than a Year 12 level of education have lower, on average, literacy skills than women with less than Year 12 level of education; however, men with a bachelor degree or higher degree have higher, on average, levels of literacy skills than women with a bachelor degree or higher degree. Another point of interest is that employed men and women in 1996 typically

had higher, on average, literacy skills than their counterparts in the comparable qualification category in 2006. However, the average for males and females changed little because more people were in higher qualification categories in 2006. For example, men with a less than Year 12 level of education averaged 264 in 1996 and 251 in 2006 and women with a less than Year 12 level of education averaged 272 in 1996 and 257 in 2006. The exception to this pattern occurred for individuals with bachelor degrees, where there were no apparent declines in the average literacy skills of men or women between 1996 and 2006.

**Table 5 Literacy skills by educational attainment, year and gender**

	Mean value by year and gender			
	1996		2006	
	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>
Year 11 and below	263.7 (2.7)	271.8 (4.4)	250.7 (2.8)	257.2 (3.6)
Year 12	294.3 (5.5)	295.0 (4.6)	291.6 (5.1)	291.9 (4.9)
Certificates	284.3 (2.4)	287.0 (4.3)	282.3 (2.7)	284.6 (5.0)
Advanced diploma or diploma	305.3 (3.5)	294.7 (6.0)	304.5 (4.2)	291.0 (4.4)
Bachelor degree	321.7 (3.8)	309.8 (4.0)	322.5 (3.2)	309.5 (3.1)
Higher degree	338.5 (4.8)	328.7 (4.8)	328.0 (3.8)	315.4 (3.8)
<b>Total</b>	<b>291.6</b> <b>(1.8)</b>	<b>292.2</b> <b>(2.5)</b>	<b>289.1</b> <b>(1.9)</b>	<b>290.9</b> <b>(1.9)</b>
Number of observations	1615	940	1849	1124

Notes: Weighted numbers based on weights provided by the ABS and self-generated replicate weights for 1996. Standard errors in parentheses. In 1996 the 'certificates' classification consisted of both 'skilled' and 'basic' vocational qualifications.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996; ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

## Regression analysis

To investigate whether the relationships between income and its determinants are statistically significant – taking into account the described correlations between individual literacy skills, age and education – we estimate a multivariate regression model. As mentioned above, the non-linear nature of the dependent variable requires the use of an interval regression model, which accounts for the fact that income decile boundaries are observed instead of a continuous income measure.

The interval regression model has two properties that facilitate our analysis. First, the marginal effects of the explanatory variables on the (latent) dependent variable are just equal to the model parameters. This property allows us to interpret the estimated coefficients directly – in the same way as the coefficients of a linear regression model. Second, we can take the log of the dependent variable boundaries when estimating interval regressions. This property allows us to measure income differentials in percentage points, which facilitates the quantitative interpretation of the regression results considerably.

According to the World Economic Outlook index compiled by the International Monetary Fund (2009), macroeconomic conditions in Australia changed considerably between 1996 and 2006. Specifically, the gross domestic product (GDP) per capita (in current prices) grew from about \$29 000 to about \$48 000

over this period. The number of employed persons increased from 8.4 million in 1996 to 10.2 million in 2006, and the unemployment rate dropped from 8.2% in 1996 to 4.8% in 2006. In order to take these changes into account, we include a time indicator in our model and estimate a fully interacted model that also captures changes in the estimated parameters over time.

The estimates of the regression model can answer a number of important questions for our study, such as:

- What are the returns to education, particularly after taking into account individual skills?
- What are the separate returns to skills?
- How much did the returns to education and training qualifications and skills change over time?
- How much do the estimated parameters differ between men and women?
- How much do the estimated parameters change over time?

To answer these questions, we estimate the effects of relevant income determinants separately for full-time employed male and female employees aged 25–64 years:

intercept  
+ employer size indicators  
+ highest level of education indicators

Income = + age group indicators  
+ year indicator  
+ interaction between year indicator and all variables  
+ residuals

Table 6 contains the interval regression estimates of this regression equation, estimated over all full-time employees. Table 7 presents an extended version of the equation that includes the document literacy measure and the interaction between the year indicator and the document literacy measure as additional variables.

The first column of each table reports the parameter estimates of the interval regression model, that is, the effects of different determinants on income. The second column includes the t-values that correspond to the model parameters (that is, parameter estimate/standard error). In general, variables are interpreted to have a significant effect on a dependent variable of a regression equation where the absolute value of their t-value exceeds 1.96. The parameters on such variables are said to be statistically different from zero at a 5% significance level.

The estimates in table 6 reveal that income increases with employer size. We include employer size indicators in our regression model to control for structural variations in the labour market (and structural changes over time) when estimating the returns to education. Controlling for the size of the employer accounts for differences in the remuneration of productivity characteristics (such as age and education) between large and small firms.

Education has a positive effect on income: those with higher levels of education report a higher income, net of other factors. Age also has a positive effect, with male employees aged 35–54 years and female employees aged 45–54 years earning more than those aged 25–34 years (the reference category). Although those aged 55–64 also report higher income, their income does not differ

significantly from the reference category. These terms capture the experience effects commonly found in standard wage regressions. Of note here is that they matter more for males than females.

The interaction terms for 2006 and educational qualifications for males and females suggest that the returns to education have not changed over time. This result is consistent with Coelli and Wilkins (2009), who found that graduate premiums did not change over this period. We further observe no significant change in the remuneration of different age groups over time. The effects of the employer size indicators are also remarkably stable over time, with the exception of male workers in firms with more than 500 employees, whose earnings in 2006 are significantly lower than in 1996.

**Table 6 Income determinants among full-time workers by gender (without document literacy)**

	Males		Females	
	Estimate	t-value	Estimate	t-value
Intercept	6.3343	106.18	6.1605	97.91
<b>Employer size</b>				
Employer size: 20–99	0.1652	3.46	0.1390	2.47
Employer size: 100–499	0.2822	6.55	0.2227	3.55
Employer size: 500 and over	0.3667	9.60	0.2789	5.24
<b>Highest level of education</b>				
Year 12 and below (reference group)				
Certificate or advanced diploma/diploma	0.0922	3.69	0.0402	0.75
Bachelor degree or higher	0.3476	7.50	0.3714	5.00
<b>Age group</b>				
25–34 (reference group)				
35–44	0.1428	2.79	0.0580	1.35
45–54	0.2320	3.97	0.1013	2.48
55–64	0.1322	1.79	0.1313	1.53
<b>Interaction term: Year 2006 x</b>				
Intercept	0.2804	3.88	0.2356	2.77
<b>Employer size</b>				
Employer size: 20–99	0.0113	0.17	-0.1051	-1.07
Employer size: 100–499	-0.0433	-0.65	-0.1406	-1.59
Employer size: 500 and over	-0.1297	-2.46	-0.1047	-1.58
<b>Highest level of education</b>				
Year 12 and below (reference group)				
Certificate or advanced diploma/diploma	-0.0067	-0.18	0.0001	0.00
Bachelor degree or higher	-0.0329	-0.50	0.0754	0.78
<b>Age group</b>				
25–34 (reference group)				
35–44	-0.0063	-0.09	0.0594	0.77
45–54	-0.0219	-0.30	0.0785	1.06
55–64	0.0542	0.63	-0.0109	-0.11

Notes: Number of observations: 3464 men and 2064 women. Weighted interval regression based on weights provided by the ABS and self-generated replicate weights for 1996.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996; ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

The results where literacy skills were included as an additional control variable are reported in table 7. Higher document literacy skills are associated with higher incomes, net of other factors. The magnitude of the effect is equivalent to around a ten-percentage-point increase in income with each increase in skills of one standard deviation. The interaction terms between time and skills are

insignificant, indicating that the effects of document literacy skills for males and females did not change over time.

As expected, the returns to education declined after document literacy was included as an additional control variable in the model, suggesting that the returns to education are overestimated if we omit the skill measure from the model. This decline was by about a third of the magnitude of the original effect for men and about 20% for women in the case of the degree estimate and around 40% of the vocational qualification estimate.

Using regression approaches similar to those presented here, the following chapter provides a more detailed analysis of the returns to skills for employees with different levels of education.

**Table 7 Income determinants among full-time workers by gender (including document literacy)**

	Males		Females	
	Estimate	t-value	Estimate	t-value
Intercept	5.7363	54.12	5.6313	33.67
<b>Document literacy</b>	0.0022	6.38	0.0018	3.83
<b>Employer size</b>				
Employer size: 20–99	0.1602	3.53	0.1336	2.25
Employer size: 100–499	0.2725	6.30	0.2355	3.24
Employer size: 500 and over	0.3274	8.76	0.2532	4.90
<b>Highest level of education</b>				
Year 12 and below (reference group)				
Certificate or advanced diploma/diploma	0.0545	2.35	0.0225	0.42
Bachelor degree or higher	0.2314	5.43	0.3050	4.14
<b>Age group</b>				
25–34 (reference group)				
35–44	0.1478	2.66	0.0633	1.49
45–54	0.2409	3.99	0.1221	2.86
55–64	0.1753	2.43	0.1770	2.26
<b>Interaction term: Year 2006 x</b>				
Intercept	0.2356	1.74	0.2447	1.26
<b>Document literacy</b>	0.0002	0.51	0.00002	0.04
<b>Employer size</b>				
Employer size: 20–99	-0.0147	-0.23	-0.1033	-1.03
Employer size: 100–499	-0.0500	-0.78	-0.1656	-1.66
Employer size: 500 and over	-0.1341	-2.66	-0.0990	-1.51
<b>Highest level of education</b>				
Year 12 and below (reference group)				
Certificate or advanced diploma/diploma	-0.0239	-0.62	-0.0133	-0.17
Bachelor degree or higher	-0.0555	-0.81	0.0678	0.68
<b>Age group</b>				
25–34 (reference group)				
35–44	-0.0171	-0.24	0.0676	0.90
45–54	-0.0195	-0.27	0.0713	0.96
55–64	0.0569	0.67	-0.0265	-0.28

Notes: Number of observations: 3464 men and 2064 women. Weighted interval regression based on weights provided by the ABS and self-generated replicate weights for 1996.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996; ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

## Summary

This chapter investigated the relationship between income, education, age and literacy skills, paying particular attention to the estimation of the returns to education and the returns to skill accumulation. The results may be summarised as follows:

- Higher levels of income are associated with increased educational attainment and higher levels of literacy skills for both males and females. Hence, both education levels and skills are important in the determination of wages.
- The inclusion of literacy skills in the income equation lowered the returns to education to about two-thirds of the magnitude of the original effect for men and 80% for women in the case of the degree estimate and to around 60% of the original vocational qualification estimate.
- Having a vocational or university education is associated with a higher income compared with having a lower level of education, and the premium attached to education does not change significantly over time.
- There is no evidence of any change in the magnitude of the literacy skills effect between 1996 and 2006 at the aggregate level. In aggregate at least, changes in income in Australia over this period do not appear to reflect skill-biased technological change.



# The return from literacy skills

This chapter examines the return from skills. It focuses on:

- differences in the returns to skills between different levels of education
- changes in the returns to skills over time within educational categories.

Particular attention is paid to workers without a university degree. Specifically, we differentiate between workers with low (Year 12 and below), medium (those with post-school qualifications – certificate, associate diploma, diploma) and high (degree or higher) levels of education. While the low education level group includes the potentially disparate completers and non-completers of Year 12, our aim was to provide the most parsimonious categorisation, one that separately identified those with VET-level qualifications from other groups of workers.

Our focus is on whether the relationship between skills and income differs between groups with different education levels and whether, or how, the relationship has changed over time. The approach we adopt is to estimate regression equations similar to those of the last section, but for different birth cohorts. Further, we allow the skills effect to vary across the three education categories. Hence, each education level has an intercept effect, as in table 7, as well as an effect on the way skills are rewarded (an interaction effect with the skills variable). Specifically, we estimate the following regression model separately by gender, birth cohort and year:

$$\begin{aligned} & \text{intercept} \\ & + \text{employer size indicators} \\ \text{Income} = & + \text{document literacy} \\ & + \text{highest level of education indicators} \\ & + \text{interaction between document literacy and education} \\ & + \text{residuals} \end{aligned}$$

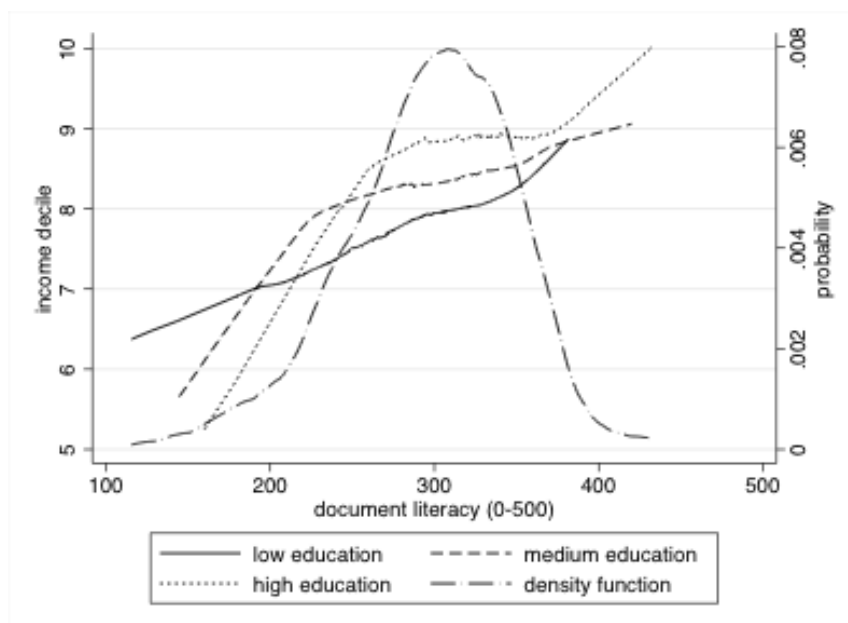
The education and skills effects are allowed to change over time and we test formally for differences in the parameters between the groups for the education and skills effects and whether these have changed over time. We also present figures of the relationship between skills and income to aid understanding. The relationships between skills and income shown in these figures are estimated differently from the regression estimates, although they convey similar information.<sup>4</sup>

Figure 1 illustrates these skill–income profiles, using the sample of full-time employed male workers aged 35–44 years in 1996 as an example. The skill–income profiles in figure 1 reveal that highly educated workers (the dotted line, those with a university degree or a higher-level qualification) exhibit higher returns to skills than less-educated workers. That is, workers with the highest education level with the same level of skills tend to have higher incomes than workers with medium or low levels of education. This difference is particularly large at the mean of the skill distribution (around a skill level of 300).

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<sup>4</sup> The skill–income profiles in the figures are estimated via the non-parametric regression procedure *lowess* in *stata* and show the relationships between the expected or typical income deciles of individuals employed full-time, given their observed skill levels.

**Figure 1 Skill–income profiles of men: birth cohort 1952–61 in 1996**



Source: ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

Since the estimated relationship at the bottom and the top of the skill distribution is particularly sensitive to outliers, figure 1 also includes a plot of this skill distribution, which shows how common particular skill levels are in the working population. The plot suggests that the literacy skills of almost all workers lie between 200 and 400 for this cohort. Consequently, the estimated skill–income profiles above and below these values are not very reliable. In all of the figures shown subsequently, we will include plots of the skill distribution for the relevant group and limit our discussion of apparent relationships to those regions where there is sufficient probability mass in the skill distribution.

## Significant differences in skill–income profiles

As foreshadowed, we begin by performing a number of regression-based tests to determine whether the skill–income profiles of two groups with specific education levels are statistically different from each other. The tests are based on interval regression estimates. Since interval regressions model the linear relationship between skills and income for different education groups in this case, we can test whether the slope for one group is different from the slope of another education group, using a Wald-test.

We present the test results in tables 8–10 for three different birth cohorts (the 1962–71, 1952–61 and 1942–51 cohorts respectively). The first set of numbers in these tables refers to the calculated values of the tests where the skill–income relationships are identical for the specified groups. The test statistics tell us whether we should reject the equivalence of the relationships or not. In this case, these test statistics have a chi-square distribution and we also present the corresponding p-values (in the second set of figures), which tell us whether the differences between the skill–income relationships for the two groups are significantly different. Specifically, we call the difference between two estimated relationships statistically significant at a 5% significance level when the p-value is smaller than 0.05.

Table 8 contains the test results for the birth cohort 1962–71. The numbers in table 8 indicate that the difference between workers with low (Year 12 and below) and medium education (certificate,

associate diploma, diploma) is insignificant for all workers in both years at the 5% significance level (all of the p-values are greater than 0.05). Other results in table 8 indicate that the differences between workers with low and high levels of education are significant for men in 1996 and for women in 2006, suggesting that highly educated workers have significantly higher returns to skill accumulation than workers with a low level of education. The test results further show significant changes in the returns to skill accumulation between 1996 and 2006 for male workers with low levels of education.

**Table 8 Test results of skills–income relationships: birth cohort 1962–71**

	Test results by gender and year			
	Men		Women	
	1996	2006	1996	2006
<b>Difference between low and medium level of education</b>				
F-value	1.32	2.70	1.38	0.19
p-value	0.2758	0.0758	0.2590	0.8294
<b>Difference between low and high level of education</b>				
F-value	4.88	0.19	0.91	5.48
p-value	0.0110	0.8262	0.4070	0.0066
<b>Difference between 1996 and 2006</b>				
Low level of education				
F-value	10.32		0.01	
p-value	0.0021		0.9061	
Medium level of education				
F-value	0.07		1.80	
p-value	0.7964		0.1844	
High level of education				
F-value	0.00		0.37	
p-value	0.9813		0.5467	

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996; ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

The test results for the birth cohort 1952–61 are reported in table 9. The test statistics reveal that differences in the relationship between skills and income between workers with low and medium levels of education are not statistically significant. Similar to the test results in table 8, the numbers in table 9 reveal significant differences between male and female workers with high and low levels of education. Changes over time within the birth cohort 1952–61 are insignificant.

The test results for the birth cohort 1942–51 presented in table 10 provide evidence for significant differences in the relationship between skills and income between workers with high and low levels of education and show that the returns to skill accumulation have changed significantly for female workers with medium levels of education.

In sum, the results presented in tables 8–10 suggest that highly educated workers exhibit higher returns to their skills than workers with low levels of education. However, it is striking that the returns to the skills of male workers with low levels of education (table 8) and female workers with medium levels of education (table 10) have increased over time, while the returns to the skills of highly educated workers did not increase at all.

**Table 9 Test results of skills–income relationships: birth cohort 1952–61**

	Test results by gender and year			
	Men		Women	
	1996	2006	1996	2006
<b>Difference between low and medium level of education</b>				
F-value	2.26	1.83	0.58	0.03
p-value	0.1138	0.1696	0.5625	0.9664
<b>Difference between low and high level of education</b>				
F-value	2.35	10.93	11.43	9.43
p-value	0.1048	0.0001	0.0001	0.0003
<b>Difference between 1996 and 2006</b>				
Low level of education				
F-value		1.46		1.38
p-value		0.2321		0.2453
Medium level of education				
F-value		1.33		0.27
p-value		0.2543		0.6036
High level of education				
F-value		1.76		0.86
p-value		0.1903		0.3583

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996; ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

**Table 10 Test results of skills–income relationships: birth cohort 1942–51**

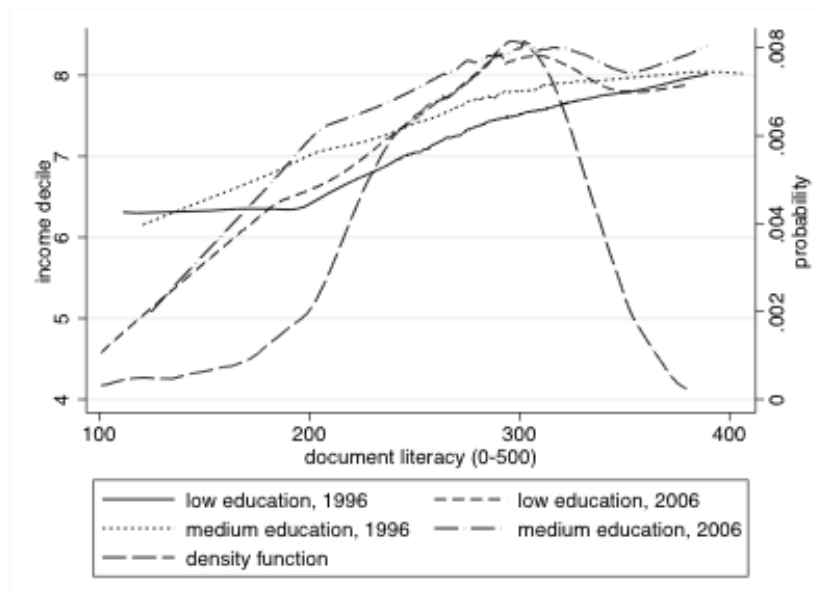
	Test results by gender and year			
	Men		Women	
	1996	2006	1996	2006
<b>Difference between low and medium level of education</b>				
chi square	0.48	0.29	4.97	2.80
p-value	0.6183	0.7529	0.0102	0.0690
<b>Difference between low and high level of education</b>				
chi square	6.93	2.85	11.43	3.34
p-value	0.0020	0.0660	0.0001	0.0423
<b>Difference between 1996 and 2006</b>				
Low level of education				
chi square		0.52		0.24
p-value		0.4724		0.6237
Medium level of education				
chi square		0.40		5.23
p-value		0.5296		0.0258
High level of education				
chi square		1.81		0.67
p-value		0.1842		0.4164

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996; ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

## Skill–income profiles

In the following, we depict the skill–income profiles of males and females with low and medium levels of education for the three birth cohorts. These profiles tell us more about how the returns to skills differ between groups and how they might have changed over time. Figures 2 and 3 depict the skill–income profiles of male and female workers, respectively, of the youngest birth cohort born between 1962 and 1971, inclusive.

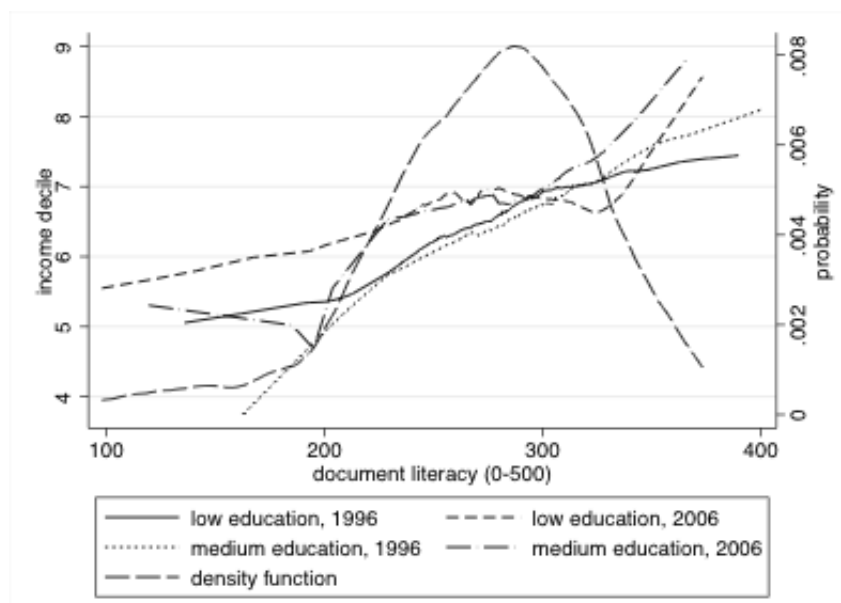
**Figure 2 Skill–income profiles of men: birth cohort 1962–71**



Source: ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

The lines for male workers in figure 2 suggest that the profiles of workers with both low and medium levels of education shifted up between surveys. However, the test statistics in table 8 suggest that the changes were significant only for men with low education levels.

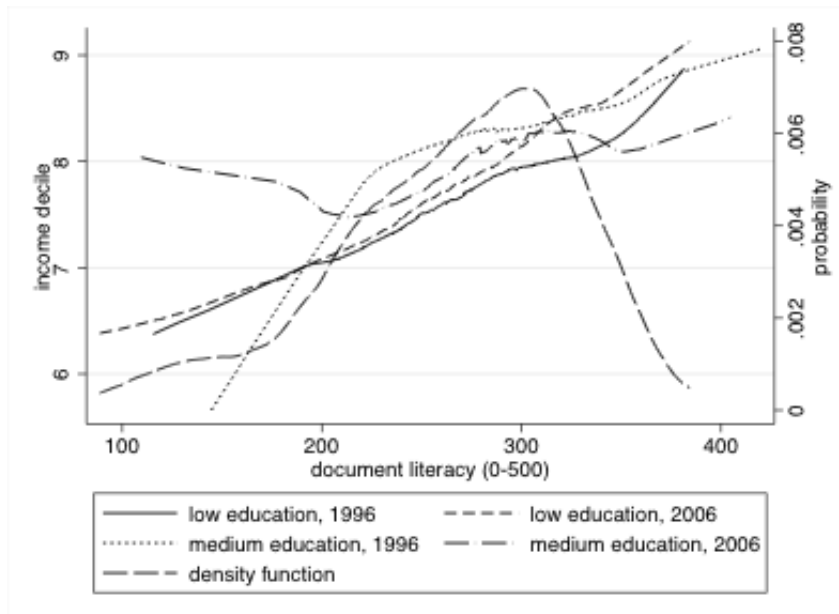
**Figure 3 Skill–income profiles of women: birth cohort 1962–71**



Source: ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

A very different pattern is observed for female workers in figure 3, which confirms the insignificant differences between female workers with low and medium levels of education and the insignificant changes over time presented in table 8.

**Figure 4 Skill–income profiles of men, birth cohort 1952–61**



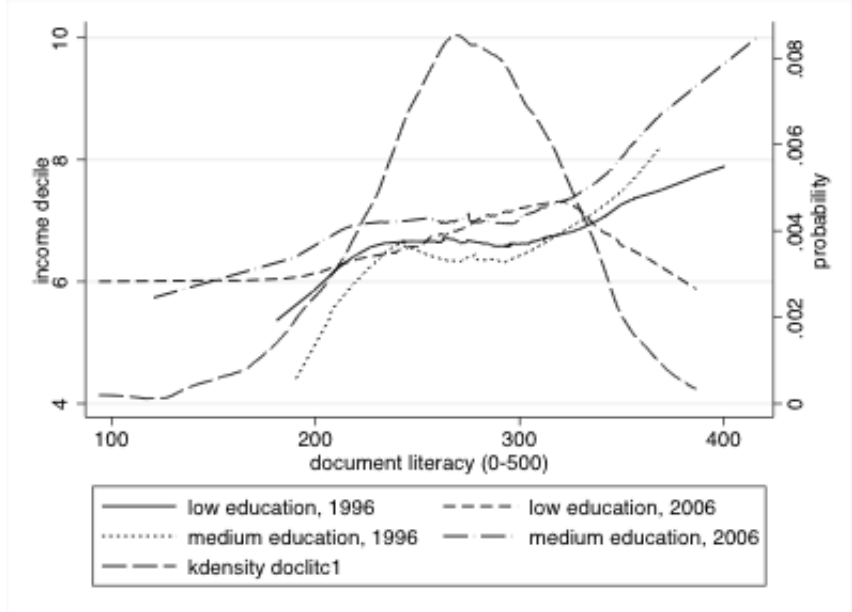
Source: ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

Figures 4 and 5 show the skill–income profiles in both surveys of male and female workers, respectively, for the cohort born between 1951 and 1962. Table 9 indicates that the differences in the skill–income profiles between medium and low-educated men are insignificant. From figure 4, male workers with low education experienced an increase in income along the entire skill distribution, while returns to skills increased at the bottom but not at the top of the skill distribution for male workers with medium education levels. In contrast to the younger 1962–71 birth cohort discussed above, the observed increase is insignificant.

The skill–income profiles of low-educated female workers increased in the middle of the distribution but declined at the top. Female workers with medium education levels experienced a relatively strong (but insignificant) increase along the entire distribution.

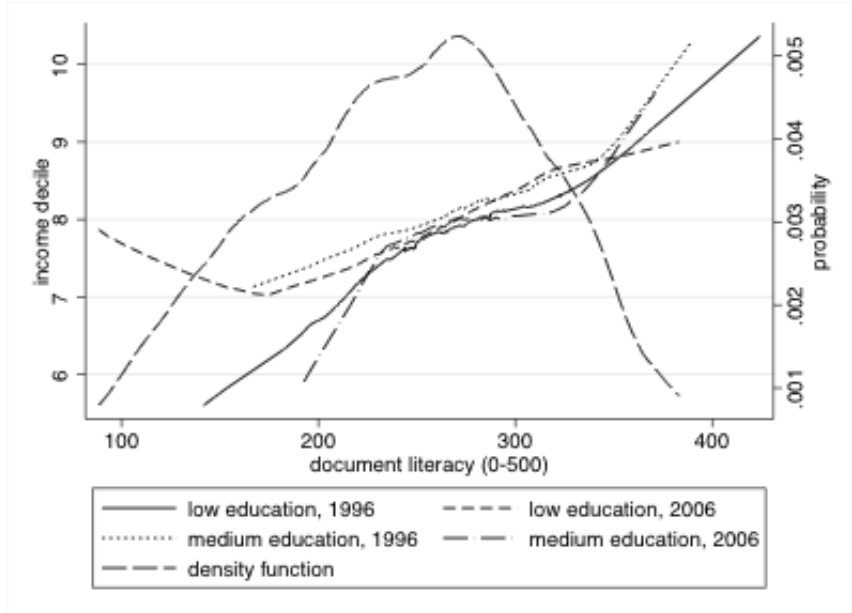
Figures 6 and 7 contain the skill–income profiles of workers of the oldest birth cohort, those born between 1942 and 1951.

**Figure 5 Skill–income profiles of women: birth cohort 1952–61**



Source: ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

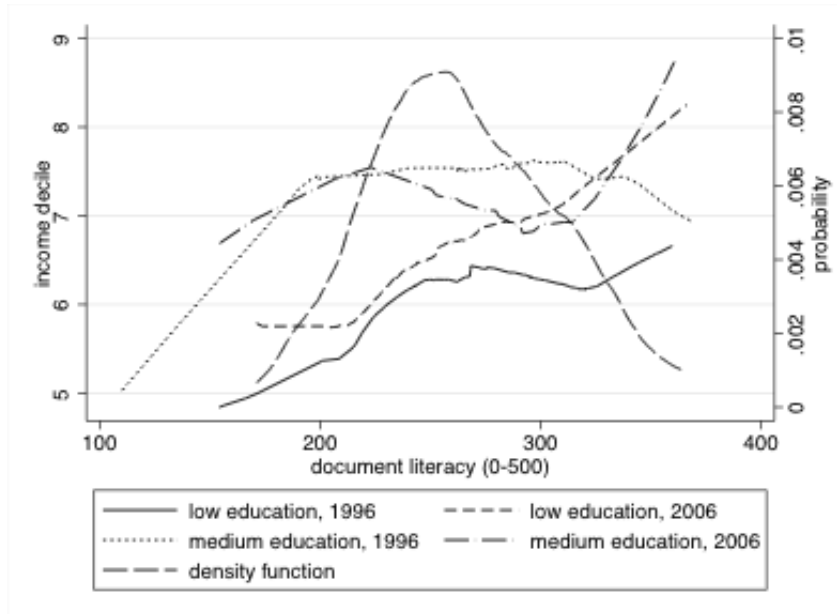
**Figure 6 Skill–income profiles of men: birth cohort 1942–51**



Source: ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

The lines in figure 6 indicate that the returns to the skills of low-educated male workers increased along a substantial part of the skill distribution, particularly at the bottom of the distribution, but remained unchanged in the middle of the distribution.

**Figure 7 Skill–income profiles of women: birth cohort 1942–51**



Source: ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

The test statistics in table 10 indicate that these changes were insignificant. For male workers with medium-level education, the 2006 profile lies below the 1996 profile over much of the skill distribution, indicating that the returns to skills declined for this group. The results in table 10 suggest that this decline was also insignificant.

The results from figure 7 reveal an increase in the returns to skills for the group with low-level education and a decline for the group with medium education levels. The numbers in table 10 indicate that the decline for the medium education group was significant, while the increase for the low-education group was insignificant.

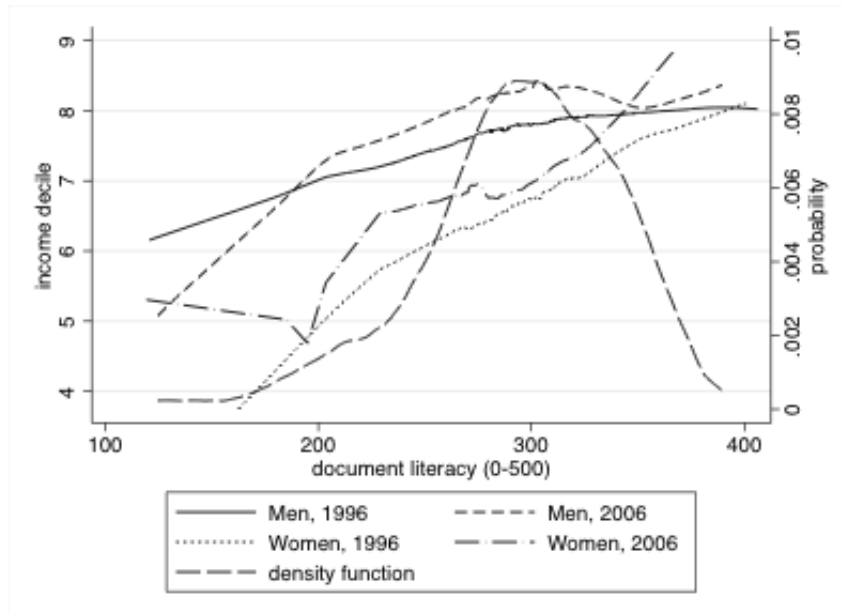
## Skill–income profiles for workers with VET qualifications

While the figures presented above compare the skill–income profiles of workers with medium and low education, they do not allow a direct comparison between male and female workers, nor do they bring out very effectively the experiences of workers with VET-level qualifications. For these reasons, the following figures reproduce the skill–income profiles of male and female workers with medium-level education in 1996 and 2006 for each birth cohort. Although we do not report formal significance tests, we know from countless other studies that in Australia men are paid more than similarly educated women. Our interest here is in seeing the extent to which the skill profiles of male workers with VET-level qualifications lie above those of females with the same types of qualifications. As is clear from figures 8–10, the male profiles are higher than those of female workers at most points of the skill distribution (where the number of observations is sufficient to allow comparisons).

Figure 8 presents the profiles of male and female workers with medium education levels from the 1962–71 birth cohort. The lines not only reveal increases in the profiles for male and female workers over time but also substantial differences between the two groups in both years. However, the test statistics in table 8 suggest that these overall changes were not significant.



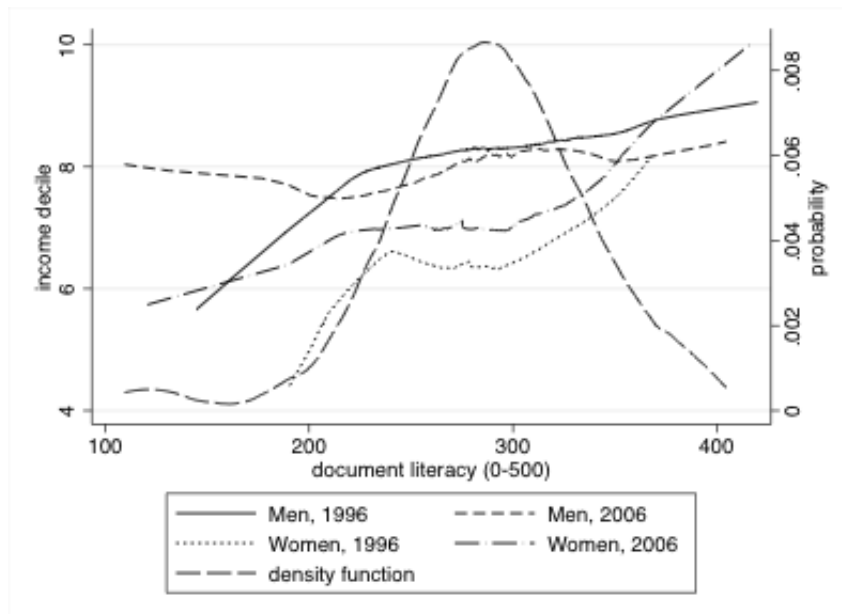
**Figure 8 Skill–income profiles: birth cohort 1962–71, medium level of education**



Source: ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

The lines in figure 9 show a quite different picture for both men and women for the 1952–61 birth cohort. Specifically, we observe strong increases for both male and female workers at the bottom of the distribution, suggesting that VET-qualified workers experienced a relatively strong increase in their returns to skills between the surveys. The overall change in the returns for skills is insignificant.

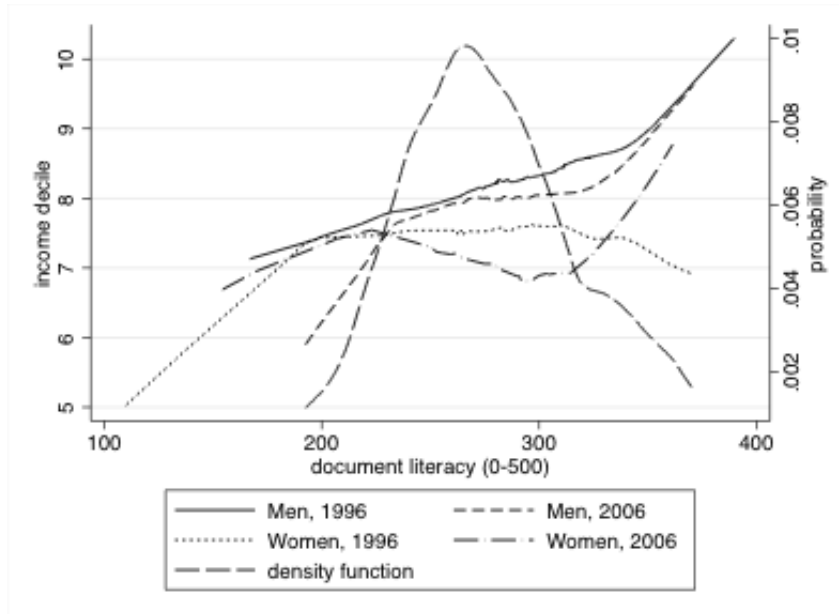
**Figure 9 Skill–income profiles: birth cohort 1952–61, medium level of education**



Source: ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

The skill profiles shown in figure 10 for male and female workers of the oldest birth cohort show no clear pattern of change across the skill distribution. However, there is some evidence that the skill–income profiles of both groups declined in general across the skill distribution, suggesting that older workers with VET qualifications experienced a decline in their return from skills between the surveys. This decline is significant for female workers.

**Figure 10 Skill–income profiles: birth cohort 1942–51, medium level of education**



Source: ABS, Adult Literacy and Life Skills Survey, Australia, Basic Confidentialised Unit Record File, 2006.

## Summary

This chapter examined the return from skills. The results may be summarised as follows:

- Within education levels, on average those with higher levels of literacy skills tended to enjoy higher incomes than those with lower-level skills. Hence, within education levels, the labour market operates in such a way that more skilled individuals receive better remuneration.
- Highly educated workers experience higher returns to literacy skills than workers with low levels of education. However, the returns to the skills of workers with low and medium levels of education have increased over time in some cohorts, although this was not the case for workers with high levels of education.
- While the returns for younger workers tended to increase, older workers with medium levels of education seemed to experience a decline in their returns to literacy skills over time.

# Conclusions and implications

This study examined the returns to the literacy skills for workers with differing levels of education. Most of the focus was on those with low (Year 12 and below) or medium or VET-level qualifications (certificate, associate diploma, diploma). We utilised data that allowed us to separate the skills that workers actually possess from their educational attainment. By comparing changes in the returns to the skills of workers in different birth cohorts and with different levels of education, we were able to assess how the importance of skills in the labour market may have changed.

The key results of the paper demonstrate that both literacy skills and education levels matter for the way people are remunerated in the labour market. Both factors are positively associated with increased income among full-time workers. Further, part of the educational qualification effect on income found in many other studies arises through the positive relationship between skills and education levels: including individual skills as an explanatory variable in the regression equation reduces the estimated impact of education on income (a result found in Green & Riddell 2003 using Canadian data from the first of the surveys analysed here).

The relationships between income and education and literacy skills among full-time workers in Australia have remained remarkably stable over time. This is consistent with other Australian evidence (Coelli & Wilkins 2009), which shows no change in returns, and with international evidence that concluded that the degree premium has increased since the 1980s. As with other Australian evidence, we find that possession of a VET-level qualification is positively associated with the remuneration of working males, but not females (Ryan 2002). There is only weak evidence of any change over time, on average, in the way VET-level qualifications have been remunerated. However, this result may reflect the diverse, offsetting experiences of differing cohorts or workers. The returns to these qualifications may have fallen among the older birth cohort, but increased for younger cohorts.

Except for the older cohort studied here, the returns to literacy skills also seem to have increased or remained stable over time for all education levels. Moreover, for all the broad education levels studied here, income increases with literacy skills. That income increases with literacy skills within education categories has a number of implications for the education and training system.

Qualifications or credentials are not all-important in determining labour market outcomes. Extreme screening theories that suggest that education may do little more than signal the ability of those who complete qualifications are underpinned by the premise that employers find it extremely difficult to observe individual productivity and skills. The evidence here is that individual skills are remunerated in the labour market. Since the labour market seems capable of distinguishing the most skilled or productive within each education group and rewarding them accordingly, education and training qualifications need to continue to provide individuals with improved skills such that they provide an income payoff and are worth undertaking. The education and training system itself needs to ensure that quality standards are maintained, since individuals will only be prepared in the long run to undertake those courses of study and training that provide real improvements in their skills.

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# Appendix

**Table A1 Description of variables**

Variable	
Person ID	Person ID
Year	Year indicator
Weight	Person weight
Income	Income deciles of weekly personal income. The following thresholds were used: 1996: [1] 0–86, [2] 87–143, [3] 144–191, [4] 192–287, [5] 288–383, [6] 384–479, [7] 480–575, [8] 576–730, [9] 731–960, [10] 961 and above; 2006: [1] 0–91, [2] 92–204, [3] 205–270, [4] 271–403, [5] 404–575, [6] 576–738, [7] 739–900, [8] 901–1151, [9] 1152–1534, [10] 1535 and above
Document literacy 1–5	Document literacy, level 1–5
Document literacy 1–5 (0–500)	Document literacy, generated continuous measure 1–5 (0–500)
Document literacy 1–5 (0–500)	Document literacy, continuous measure 1–5 (0–500)
Educational attainment	Highest level of completed schooling or post-school qualification; the following categories could be used in 1996 and 2006: [1] 1996: Has not completed highest level of secondary school available/Never attended school; 2006: Level not determined/Year 8 or below including never attended school/Year 9–11, [2] 1996: Completed highest level of secondary school available; 2006: Year 12, [3] 1996: Basic vocational qualifications; 2006: Certificate I/II/certificate not further defined, [4] 1996: Skilled vocational qualifications; 2006 Certificate III/IV, [5] 1996: Associate diploma/undergraduate diploma; 2006: Advanced diploma/diploma, [6] 1996: Bachelor degree; 2006: Bachelor degree, [7] 1996: Postgraduate diploma/higher degree; 2006: Postgraduate degree, graduate diploma/graduate certificate
Age	Five-year age ranges
Birth cohort	Identifier for individuals from common birth cohorts in each survey
Sex	Male or female
Employer size	Employer size; number of persons employed at the location of the individuals' workplace

**Table A2 Descriptive statistics, male workers, 1996**

Variable	Mean	Standard deviation	Minimum	Maximum
<b>Income</b>				
Decile 1	0.003	0.055	0	1
Decile 2	0.007	0.085	0	1
Decile 3	0.011	0.107	0	1
Decile 4	0.019	0.139	0	1
Decile 5	0.037	0.190	0	1
Decile 6	0.100	0.300	0	1
Decile 7	0.141	0.348	0	1
Decile 8	0.211	0.408	0	1
Decile 9	0.260	0.439	0	1
Decile 10	0.206	0.405	0	1
<b>Document literacy measure</b>	291.9	50.4	104.4	432.5
<b>Educational attainment</b>				
Year 11 or below	0.254	0.435	0	1
Year 12	0.130	0.336	0	1
Certificate I/II	0.026	0.161	0	1
Certificate III/IV	0.263	0.440	0	1
Advanced diploma/diploma	0.133	0.339	0	1
Bachelor degree	0.118	0.323	0	1
Postgraduate degree, graduate diploma/graduate certificate	0.073	0.261	0	1
<b>Age</b>				
Age 25–29 years	0.170	0.375	0	1
Age 30–34 years	0.176	0.381	0	1
Age 35–39 years	0.188	0.391	0	1
Age 40–44 years	0.137	0.344	0	1
Age 45–49 years	0.134	0.341	0	1
Age 50–54 years	0.091	0.288	0	1
Age 55–59 years	0.068	0.253	0	1
Age 60–64 years	0.032	0.176	0	1
<b>Employer size</b>				
20–99	0.146	0.353	0	1
100–499	0.148	0.355	0	1
500+	0.525	0.499	0	1

Notes: This table includes descriptive statistics (unweighted numbers) of the sample that was used in the empirical analysis of the report. Number of observations: 1615.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996.

**Table A3 Descriptive statistics, female workers, 1996**

Variable	Mean	Standard deviation	Minimum	Maximum
<b>Income</b>				
Decile 1	0.007	0.086	0	1
Decile 2	0.014	0.121	0	1
Decile 3	0.015	0.125	0	1
Decile 4	0.060	0.238	0	1
Decile 5	0.079	0.271	0	1
Decile 6	0.160	0.367	0	1
Decile 7	0.208	0.406	0	1
Decile 8	0.200	0.400	0	1
Decile 9	0.180	0.385	0	1
Decile 10	0.071	0.257	0	1
<b>Document literacy measure</b>	294.7	47.1	109.9	432.5
<b>Educational attainment</b>				
Year 11 or below	0.270	0.444	0	1
Year 12	0.144	0.351	0	1
Certificate I/II	0.094	0.292	0	1
Certificate III/IV	0.094	0.292	0	1
Advanced diploma/diploma	0.108	0.311	0	1
Bachelor degree	0.178	0.383	0	1
Postgraduate degree, graduate diploma/graduate certificate	0.108	0.311	0	1
<b>Age</b>				
Age 25–29 years	0.225	0.418	0	1
Age 30–34 years	0.168	0.374	0	1
Age 35–39 years	0.170	0.376	0	1
Age 40–44 years	0.163	0.370	0	1
Age 45–49 years	0.137	0.344	0	1
Age 50–54 years	0.076	0.266	0	1
Age 55–59 years	0.045	0.209	0	1
Age 60–64 years	0.012	0.112	0	1
<b>Employer size</b>				
20–99	0.144	0.351	0	1
100–499	0.141	0.348	0	1
500+	0.519	0.499	0	1

Notes: This table includes descriptive statistics (unweighted numbers) of the sample that was used in the empirical analysis of the report. Number of observations: 940.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996.

**Table A4 Descriptive statistics, male workers, 2006**

Variable	Mean	Standard deviation	Minimum	Maximum
<b>Income</b>				
Decile 1	0.016	0.128	0	1
Decile 2	0.008	0.089	0	1
Decile 3	0.003	0.056	0	1
Decile 4	0.016	0.128	0	1
Decile 5	0.040	0.196	0	1
Decile 6	0.096	0.295	0	1
Decile 7	0.134	0.340	0	1
Decile 8	0.196	0.397	0	1
Decile 9	0.230	0.421	0	1
Decile 10	0.256	0.437	0	1
<b>Document literacy measure</b>	290.5	54.8	86.4	432.5
<b>Educational attainment</b>				
Year 11 or below	0.243	0.429	0	1
Year 12	0.134	0.341	0	1
Certificate I/II	0.009	0.095	0	1
Certificate III/IV	0.250	0.433	0	1
Advanced diploma/diploma	0.102	0.303	0	1
Bachelor degree	0.165	0.371	0	1
Postgraduate degree, graduate diploma/graduate certificate	0.094	0.292	0	1
<b>Age</b>				
Age 25–29 years	0.128	0.334	0	1
Age 30–34 years	0.148	0.355	0	1
Age 35–39 years	0.155	0.362	0	1
Age 40–44 years	0.157	0.364	0	1
Age 45–49 years	0.143	0.350	0	1
Age 50–54 years	0.123	0.329	0	1
Age 55–59 years	0.101	0.301	0	1
Age 60–64 years	0.041	0.199	0	1
<b>Employer size</b>				
20–99	0.155	0.362	0	1
100–499	0.131	0.338	0	1
500+	0.397	0.489	0	1

Notes: This table includes descriptive statistics (unweighted numbers) of the sample that was used in the empirical analysis of the report. Number of observations: 1849.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996.



**Table A5 Descriptive statistics, female workers, 2006**

Variable	Mean	Standard deviation	Minimum	Maximum
<b>Income</b>				
Decile 1	0.025	0.158	0	1
Decile 2	0.013	0.114	0	1
Decile 3	0.004	0.066	0	1
Decile 4	0.024	0.153	0	1
Decile 5	0.064	0.244	0	1
Decile 6	0.177	0.381	0	1
Decile 7	0.186	0.389	0	1
Decile 8	0.191	0.393	0	1
Decile 9	0.198	0.398	0	1
Decile 10	0.114	0.318	0	1
<b>Document literacy measure</b>	292.1	46.4	93.8	427.5
<b>Educational attainment</b>				
Year 11 or below	0.212	0.409	0	1
Year 12	0.139	0.346	0	1
Certificate I/II	0.011	0.106	0	1
Certificate III/IV	0.126	0.332	0	1
Advanced diploma/diploma	0.129	0.335	0	1
Bachelor degree	0.252	0.434	0	1
Postgraduate degree, graduate diploma/graduate certificate	0.128	0.334	0	1
<b>Age</b>				
Age 25–29 years	0.166	0.372	0	1
Age 30–34 years	0.162	0.369	0	1
Age 35–39 years	0.120	0.325	0	1
Age 40–44 years	0.136	0.343	0	1
Age 45–49 years	0.140	0.347	0	1
Age 50–54 years	0.125	0.331	0	1
Age 55–59 years	0.100	0.300	0	1
Age 60–64 years	0.048	0.213	0	1
<b>Employer size</b>				
20–99	0.137	0.344	0	1
100–499	0.125	0.331	0	1
500+	0.473	0.499	0	1

Notes: This table includes descriptive statistics (unweighted numbers) of the sample that was used in the empirical analysis of the report. Number of observations: 1124.

Source: ABS, Survey of Aspects of Literacy, Australia, Basic Confidentialised Unit Record File, 1996.

# NVETR program funding

This work has been produced by NCVET under the National Vocational Education and Training Research (NVETR) Program, which is coordinated and managed by NCVET on behalf of the Australian Government and state and territory governments. Funding is provided through the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education.

The NVETR Program is based on national research priorities approved by ministers with responsibility for vocational education and training.

The author/project team was funded to undertake this research via a grant under the NVETR Program. The research grants are awarded to organisations through a competitive process, in which NCVET does not participate. To ensure the quality and relevance of the research, projects are selected using an independent and transparent process and research reports are peer-reviewed.

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