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Labour market outcomes of skills and qualifications

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LABOUR MARKET OUTCOMES OF SKILLS AND QUALIFICATIONS

KEY FINDINGS

Analysing the labour market outcomes of educational qualifications and skills enables us to understand how the education system benefits people and the economy. The Adult Literacy and Life Skills (ALL) survey provides a unique opportunity to look at the combined effects of literacy and qualifications on employment and hourly wages.

The results of the analysis show that the benefit of increased literacy without higher qualifications is limited in the New Zealand labour market. The major benefit comes from improved literacy in combination with gaining a qualification, which can result in greater opportunities to move into higher paid jobs.

The results also show that experience, as measured by age, has a similar effect as increased qualifications. It has a large effect on employment for people with no or low qualifications, but little effect on hourly wages for this group. It has a large effect on hourly wages for people with qualifications at level 4 and above.

Disparities by gender and first language persist, even once qualifications and literacy are controlled for.

Introduction

An important benefit of tertiary education is the ability of graduates to obtain employment, contribute to the economy and receive higher wages in return. There is an ongoing interest in the labour market outcomes of educational qualifications and various skills. Most analyses use educational qualifications as a proxy for both skills and knowledge, in the absence of any direct measurement of skills. The Adult Literacy and Life-Skills (ALL) survey provides an opportunity to look more directly at the combined effects of literacy skills and educational qualifications on labour market outcomes.

Over the last 10 years there has been a greater focus on developing the literacy and numeracy skills of the adult population. Literacy is a general skill that enables people to understand information in various forms and apply it to work and life situations. In today's society, higher levels of literacy are required in a larger proportion of jobs. There is recognition that many adults do not have sufficient literacy and numeracy to function fully in a knowledge society and that lack of these skills may be holding back productivity in the workplace. Recent policy focus has been on developing these skills through work-place programmes and within lower-level tertiary qualifications.

This paper uses data from the ALL survey to look at the effect of literacy skills and qualifications on two key labour market outcome indicators: employment rates and hourly wages. These two indicators represent the relative ability to maintain employment[1] and the economic value of employment. The survey captures relationships between factors at a point in time. The analysis in this paper does not take into account effects such as when qualifications were achieved or comment on the lifetime effects for individuals of higher literacy or qualifications.

[1] Employment rates have been used in preference to unemployment rates, as employment rates provide a more stable measure of long-term employability, whereas unemployment rates are more influenced by short-term fluctuations in supply and demand. Employment rates also tend to be more statistically robust in sample surveys, due to the larger numerator.

Document literacy has been used in this paper because it provides an intermediate measure between prose literacy and numeracy. The assessment tasks involved understanding short texts, charts and tables. In this way, it most closely fits common workplace literacy and numeracy tasks. The scale used in this report for document literacy is a standardised measure, where 0 represents the New Zealand population mean and 1 represents one standard deviation. A change of one standard deviation is equivalent to a change of one level on the literacy and numeracy scales derived from the ALL survey, as presented in Satherley, Lawes and Sok (2008) and other reports.

This paper builds on earlier reports in this area by looking at both employment and wages, and further considering the combined impact of skills and qualifications, as well as variables such as age, gender and first language. The paper reports results of two sets of regression models. A logistic regression model was developed to look at the probability of being employed. A log linear model was developed to look at hourly wages. Each model used document literacy, highest qualification, age, gender and first language as explanatory variables. Various interaction effects between these variables were tested. The variations on the models are listed at the end of the paper and referenced in the text. The original model is referred to as the basic model. The variations are label A to D. The output of the models is available on http://www.educationcounts.govt.nz, along with the electronic version of this paper.

Previous research

Smart (2006) demonstrates that attaining tertiary qualifications increases the chances of labour force participation, with rates being highest for those with bachelors degrees or above. While women continue to have lower labour force participation than men, rates are converging and women with higher tertiary qualifications have closer rates to men with the same qualifications, than women with no qualifications compared to men with no qualifications.

Income premiums from tertiary education have also been well documented (Nair, Smart and Smyth, 2007). Data from Statistics New Zealand's Income Survey shows that in 2006 people with a bachelors degree earned 64 percent more than those with no qualifications. This premium persisted across age groups. The premium for tertiary diplomas and certificates was lower and had reduced as employment had risen and as increased demand for lower skilled workers had driven up lower-end wages.

The ALL survey provides an opportunity to explore the link between skills, qualifications and wages. Earle (2009a) looked at the overall relationship with a particular focus on differences between industries and occupations. The analysis showed that a one standard deviation difference in literacy or numeracy skills accounted for, on average, a 20 percent difference in hourly wages. This is similar to the average increase in earnings associated with holding a tertiary non-degree qualification, compared with having a school level qualification, or the average increase associated with having a degree compared with a tertiary non-degree qualification. When literacy or numeracy skills and qualifications were considered together, then the increase in wages attributable just to literacy or numeracy differences reduced to around 10 percent for each standard deviation difference in literacy or numeracy skills.

Earle (2009b) looked specifically at the effect of first language and education on literacy, employment and income. The analysis showed significant differences in employment and income for New Zealanders with English as an additional language, even after English-based literacy and numeracy was controlled for. New Zealanders with English as an additional language are more likely to face barriers in obtaining employment and more likely to have lower hourly wages. They also get little or no additional income benefit from holding a degree or postgraduate qualification.

Earle (2010) looked further into the relationship between skills, qualifications, experience and the distribution of wages. The analysis showed that people with higher levels of literacy and higher qualifications have significantly greater opportunities to earn higher incomes, where they are earning above the median wage. It also showed that experience, as measured by age, has the strongest effect on increasing wages for people in higher wage jobs and has little effect on increasing wages for people in low wage jobs.

The interaction of skills and qualifications

This first section looks at how skills and qualifications work together to affect employment and income.

Employment

From the descriptive data, it is clear that both skills and qualifications are important to being in employment. Figure 1 looks at the distribution of qualifications across people who employed and people who are not employed. Employed includes both full-time and part-time employment. Not employed includes both unemployed and not in the labour force. The results show that 37 percent of people who are not employed have no qualifications, compared with 21 percent of those who are employed. Conversely, 52 percent of people in employment have level 4 certificates and above, compared with 37 percent of people not in employment.

Figure 1

Distribution of people employed and not employed by highest qualification

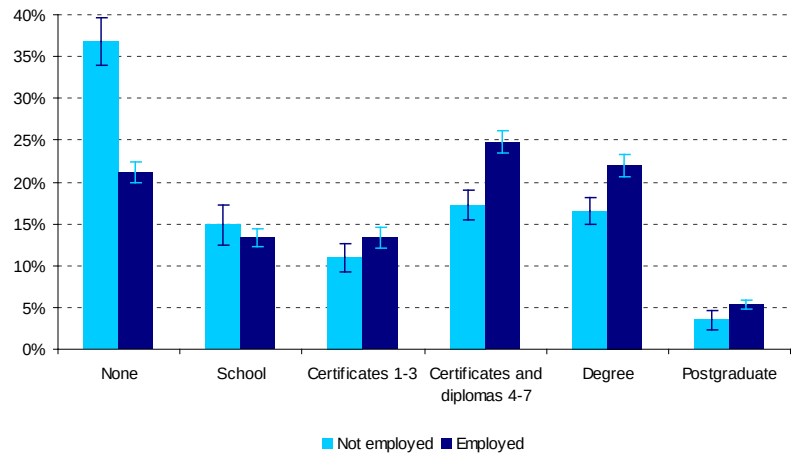
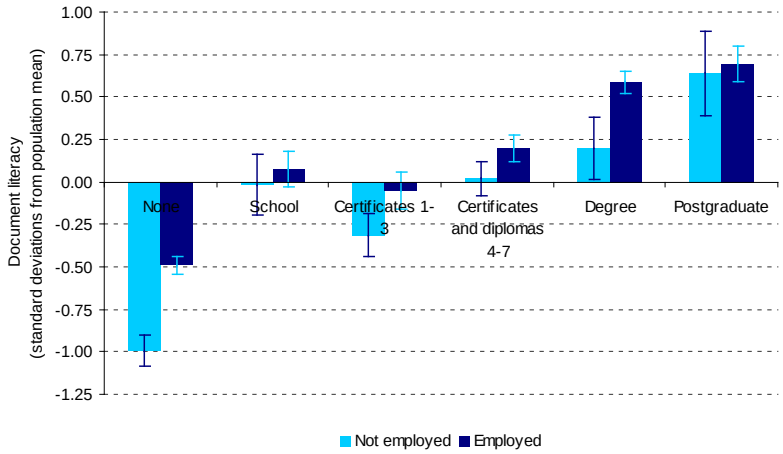


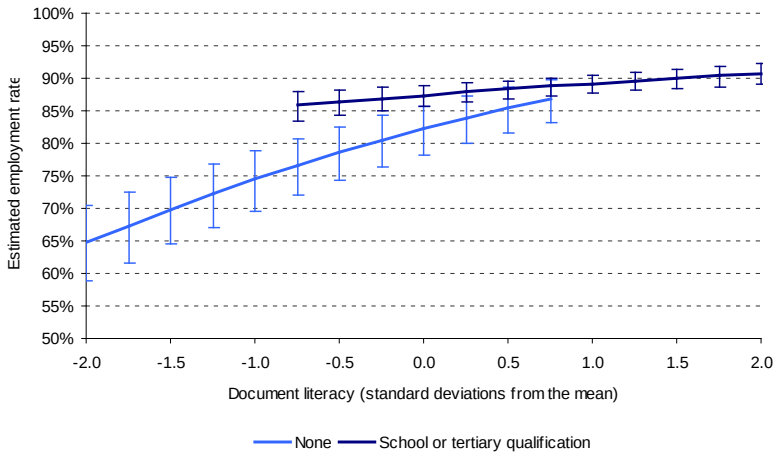
Figure 2 shows that for people with no qualifications, those in employment have significantly higher document literacy skills than those who are not in employment. For people with school qualifications or a tertiary certificate or diploma there is no statistically significant difference in average document literacy skills according to employment status. However, for those with degrees, the difference is statistically significant.

Figure 2
Average document literacy of people employed and not employed by highest qualification



The basic employment model suggests that, having controlled for document literacy and other factors, a person with no qualifications or school qualifications is somewhat less likely to be employed (81 percent) than a person with a tertiary qualification (88 percent).[2] However, the effects of literacy on employment rates are not equal by level of qualification. Interacting document literacy and qualification level in the model (model A) reveals statistically significantly different effects of literacy levels for people with and without school or tertiary qualifications, and no statistically significant differences between qualification levels.

Figure 3
Estimated employment rate by document literacy and highest qualification



Note: Reference group is males, aged 30, with English as a first language. The lines show the population distribution from the 10th to 90th percentile for each qualification group.

Figure 3 shows the results of this model. The employment rate is the proportion of the working age population in full-time or part-time employment. It shows that for people with no qualifications, gains in literacy have a large impact on employment rates. Once people have qualifications, literacy has much less impact on the chances of being employed.

The model suggests that the best way for people with low literacy and no qualifications to improve their chances of employment is to both improve their literacy and gain a qualification.

[2] The reference group is a men with English as a first language, aged 30.

Wages

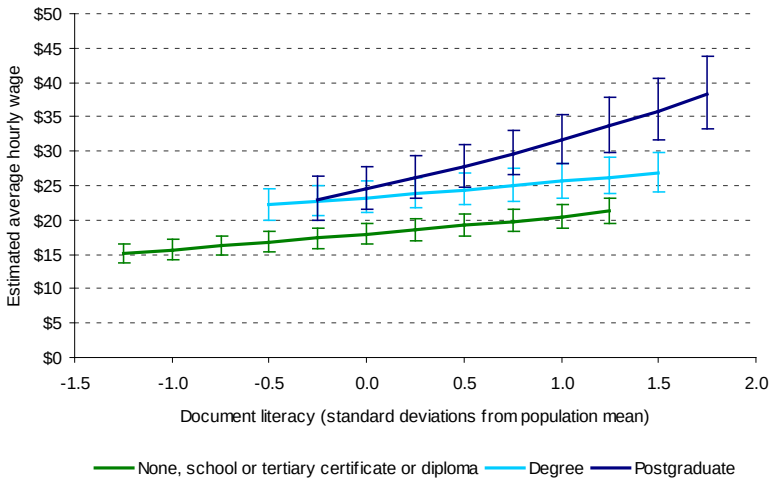
Using the basic wage model, it can be seen that on average, a one standard deviation increase in document literacy results in a 12 percent increase in hourly wages. Qualifications also result in increased income. A person with a level 4 to 7 certificate or diploma earns 21 percent more than a person with no qualifications, once literacy and other factors are controlled for. The further premium for a degree is 18 percent and the premium for a postgraduate qualification, compared with a degree, is 17 percent.

However, the returns to document literacy are not equal across qualification levels. Figure 4 shows the results from including an interaction between document literacy and qualification level in the wages model (model A). In this model, the estimates for wages from no qualifications to level 4 to 7 certificates and diplomas are not statistically significantly different from each other. As a result, these levels have been combined.

The model predicts that a one standard deviation increase in document literacy for people with qualifications up to level 4 to 7 certificates and diplomas is related to a 15 percent increase in average wages. At bachelors level, the relationship appears to be lower at 10 percent. However, the big difference is for people with postgraduate qualifications, where the benefit is 29 percent. At this level, literacy and related skills are the main way to differentiate higher and lower performance – there is no higher level of qualification to differentiate ability.

Figure 4

Estimated average hourly wages by document literacy and highest qualification



Note: Reference group is males, aged 30, with English as a first language. The lines show the distribution from the 10th to 90th percentile fore each qualification level.

The results also show a stair-casing effect of literacy and qualifications on wages. The average wage rate for someone with qualifications below degree-level at the 90th percentile of literacy for that group (end of below degree level line) is similar to the wage rate for someone a degree at the 10th percentile of literacy for that group (start of the degree line).

This analysis suggests that the benefit of increasing literacy without also increasing qualifications is limited in the New Zealand labour market. The major benefit comes from increasing literacy in order to gain a higher level of qualification. Increases just in literacy are related to improved employment for people with no qualifications and to moderate increases in wages. However, gaining higher-level qualifications opens up more employment opportunities and allows people to move into higher paid jobs.

Differences by age

Age can be regarded as a proxy for work experience. This section looks at how age, together with skills and qualifications, affects employment and wages.

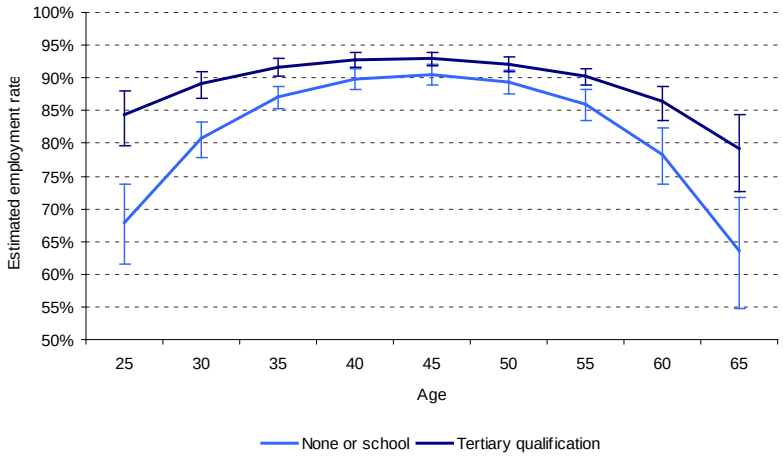
Employment

The results of interacting age with qualification in the employment model (model B) show that people without tertiary qualifications have lower employment rates in each age group than those with tertiary qualifications, even after differences in literacy are accounted for. No statistically significant difference was found between those with no qualifications and those with school qualifications, or between the different levels of tertiary qualification.

Employment rates for people with no or school qualifications do increase substantially between ages 25 to 35, showing the effect of experience. The employment rate for a 35 year old with no or school qualifications is equivalent to those of a 25 year old with a tertiary qualification. However, people with school or no qualifications are also more likely to be out of employment after age 55. By contrast, people with tertiary qualifications have much more even employment rates across age groups.

Figure 5

Estimated employment rates by age and highest qualification

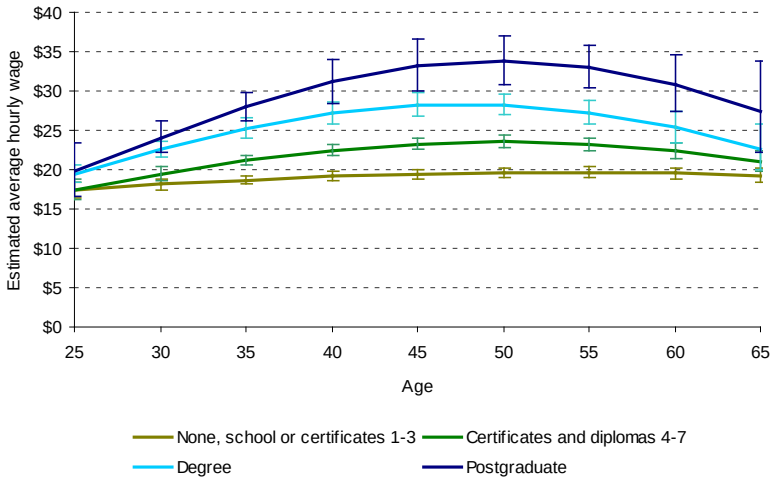


Note: Reference group is men, with average document literacy and English as a first language.

Wages

The results of interacting age with qualifications in the wage model (model B) show that the effects of experience, as measured by age, are quite different by qualification level. For people with no qualifications and school-level qualifications there is limited difference in wages by age group. The major effects of experience on wages are evident for people with level 4 certificates or higher. Experience counts more at higher qualification levels. For the higher level qualifications, average wage increase steadily between age 25 to age 50 and then decreases for people in the 55 to 65 age group.

Figure 6
Estimated average hourly wages by age and highest qualification



Note: Reference group is men, with average document literacy and English as a first language.

This analysis suggests that experience, as measured by age, has a large effect on employment for people with low or no qualifications, but little effect on their wages. It does have a large effect on wages for people with tertiary qualifications at level 4 and above. This reinforces the finding in Earle (2010) that experience, as measured by age, has the strongest effect on increasing wages for people earning above the median wage. These will largely be people with tertiary qualifications at level 4 and above.

Differences by gender

Previous research has shown that, on average, women have lower employment rates and earn lower wages than men. This is due to a range of factors, including occupational differences and time spent out of the workforce for parenting and family responsibilities (Dixon, 2000). The following models explore the extent to which gender differences in employment and wages can be explained by differences in literacy and qualification levels.

Employment

Figure 7 shows the differences in employment rates by gender and qualification level. It shows the observed values from the ALL survey, without taking into account differences in literacy, age and language differences. The results suggest that women are significantly less likely to be employed than men at all levels of qualification, with the exception of postgraduate qualifications. However, the gap generally diminishes with qualification level.

Figure 7
Employment rates by gender and highest qualification (observed values)

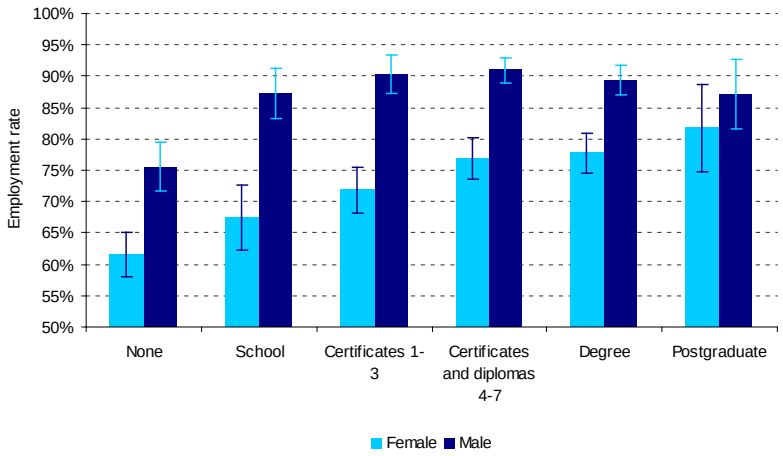
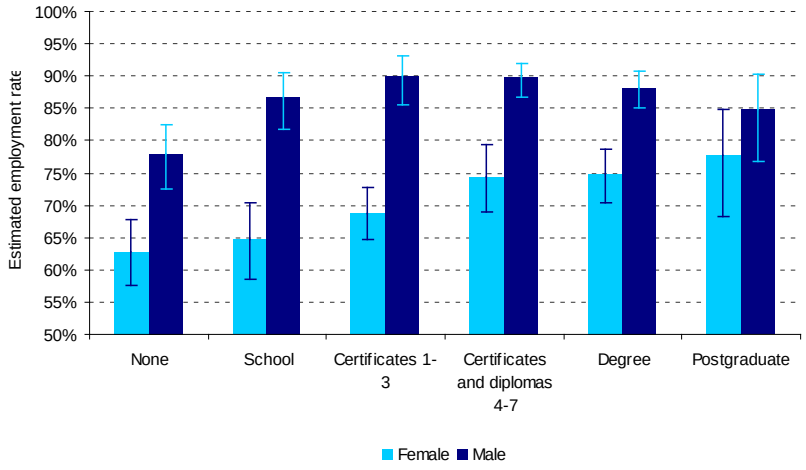


Figure 8 shows the predicted values from the employment model that includes an interaction for qualifications and gender and controls for literacy, age and language (model C). The predicted values show that these differences persist, even once document literacy and other factors are controlled for.

Figure 8
Employment rates by gender and highest qualification (predicted values)



Note: Reference group is people with average document literacy, aged 30, with English as a first language.

Wages

Figure 9 shows the observed average hourly wages for men and women by highest qualification. The results show that men have higher hourly wages than women at all levels of qualification. The effect of higher wages for school qualifications than level 1 to 3 certificates is more evident for men than for women. For level 4 certificates and above, there is a steady increase in wages for both men and women, with the gender disparity being least at degree level.

Figure 9
Average hourly wages by gender and highest qualification (observed values)

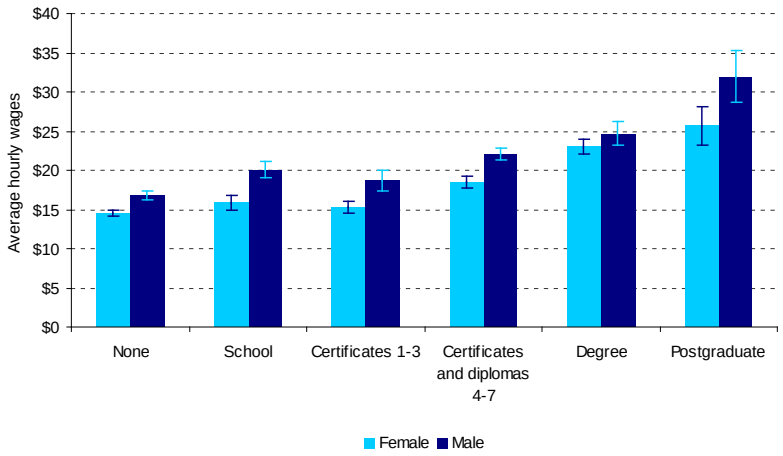
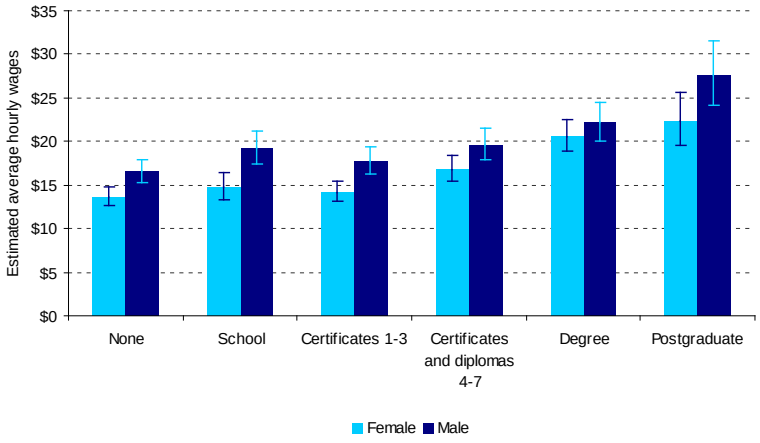


Figure 10 shows the predicted values, once document literacy and other factors are controlled for (model C). The predicted values show that the gender differences persist and are not explained by the other factors in the model.

Figure 10
Average hourly wages by gender and highest qualification (predicted values)



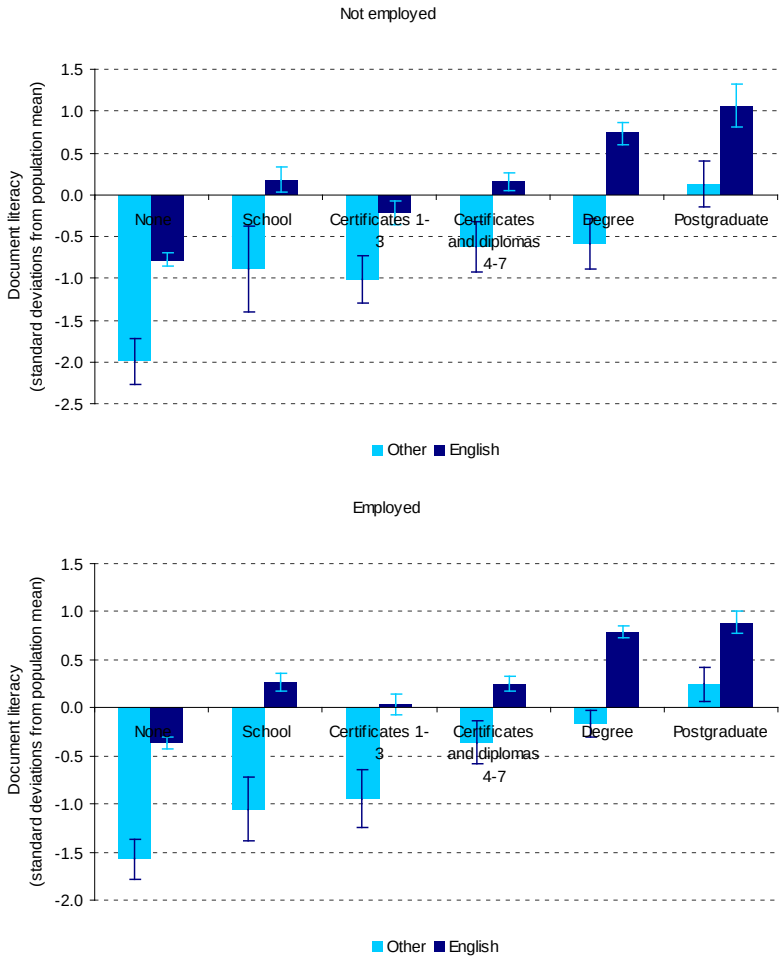
Note: Reference group is people with average document literacy, aged 30, with English as a first language.

Differences by first language

First language has been included in the models to control for its effects on document literacy, employment and wages. Earle (2009b) explored the effect of first language and education on literacy, employment and wages. That report used prose literacy and numeracy as the analysis variables. The following section replicates the analysis using document literacy as the analysis variable and the same qualification categories as used above.

Figure 11 shows that there are large differences in English-based document literacy between people with and without English as a first language. These differences are evident both for people not in employment and for those in employment.

Figure 11
Average document literacy by employment status, highest qualification and first language



Employment

Figure 12 shows the observed differences in employment rates by first language and qualification level, without controlling for literacy, age or gender. The results shows that there are differences in employment rates between people with and without English as a first language. These differences are statistically significant for people with no qualifications, with level 4 to 7 certificates and diplomas and with degrees.

Figure 12
Employment rates by first language and highest qualification (observed values)

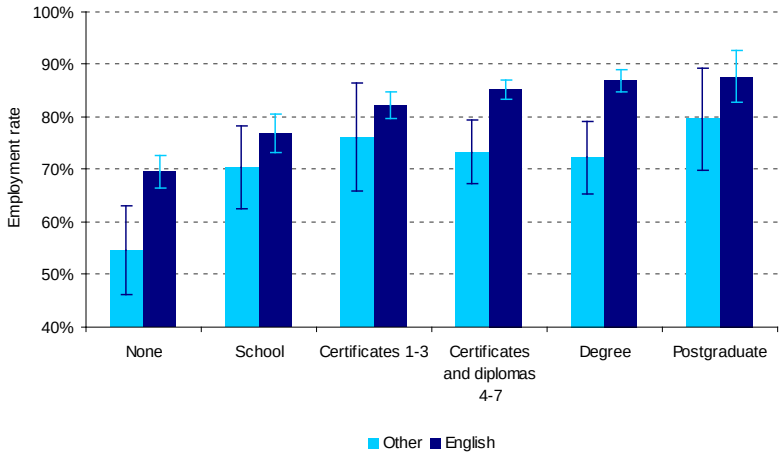
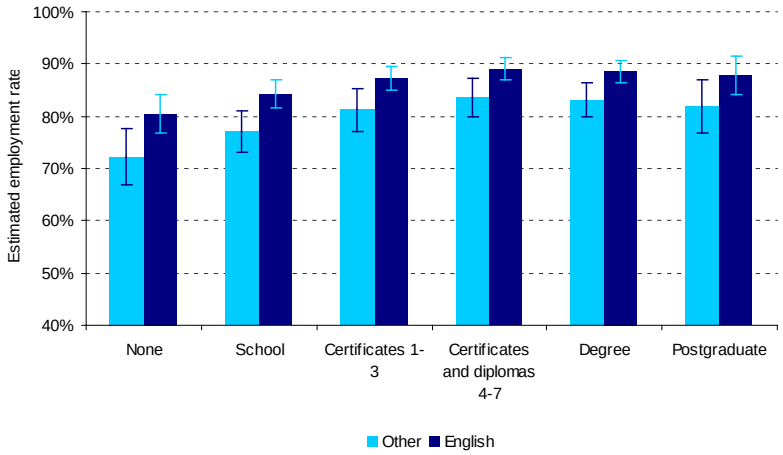


Figure 13 shows the predicted values from the employment model, which controls for literacy, age and gender.[3] The results show that once differences in English-based literacy are controlled for, the gap is reduced. However, some differences remain.

Figure 13
Employment rates by first language and highest qualification (predicted values)



Note: Reference group is men with average document literacy, aged 30.

Wages

Figure 14 shows the observed values for hourly wages by first language and highest qualification. The results show a persistent difference in wages at each level between people with English as a first language and people with English as an additional language.

[3] The interaction between qualification level and first language was not statistically significant, so the results of the basic model are presented here.

Figure 14
Average hourly wages by first language and highest qualification (observed values)

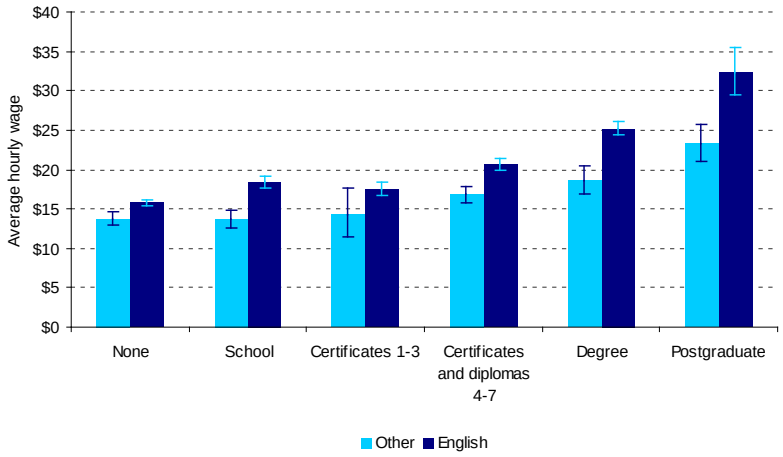
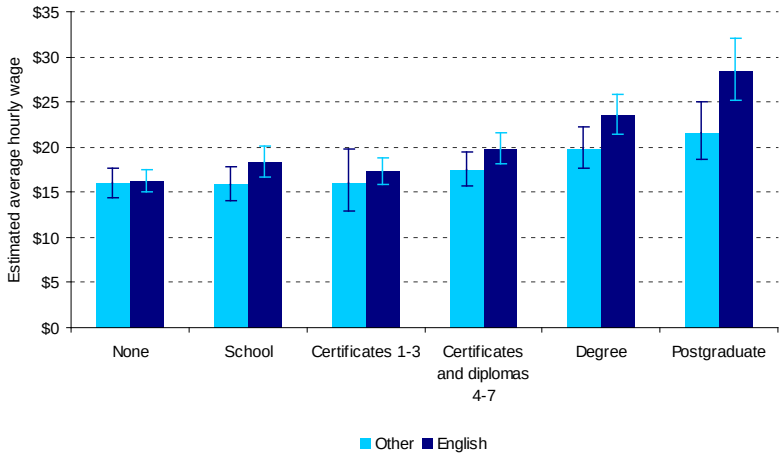


Figure 15 shows the predicted values for hourly wages, after controlling for English-based document literacy (Model D). The results show that there is no statistically significant difference in wages at each level, with the exception of postgraduate qualifications.

Figure 15
Average hourly wages by first language and highest qualification (predicted values)



Note: Reference group is men with average document literacy, aged 30.

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Technical notes

The ALL survey was conducted in 2006 and had an achieved sample of 7,131 New Zealanders aged 16 to 65. The survey had a response rate of 64 percent. The survey was validated against official statistics to ensure it was representative of the New Zealand population. The technical notes in Earle (2009a) provide further details about the extent to which results from the ALL survey match other official data sources.

This analysis looks at those aged 25 to 65. This is a subsample of 6,049 respondents. Of this group, 4,561 were employed and 3,277 had valid data from which to derive an hourly wage.

The regression models were all run using SAS survey procedures (PROC SURVEYLOGISTIC and PROC SURVEYREG). The procedures used the population weight and the 30 replicate weights provided in the ALL data set. The procedures were run using each of the five plausible values of document literacy. The estimates are the average of the estimates across the results from the five runs. The standard error is the square root of the sample variation and the imputation variance. The sample variance is the mean of the variances across the five plausible values. The imputation variance is the variance of the estimates.

In general, the same definitions of variables were used as listed Appendix A of Earle (2009b). Of particular note are that:

- The employment rate is the proportion of people in employment out of the total population within the specified age group.
- Document literacy has been standardised for the entire population aged 16 to 65 to a mean of 0 and a standard deviation of 1. The average document literacy of people in employment has been used to create the reference groups for predicted values.
- First language refers to the language the respondent first learned at home and still understands.

The error bars on the graphs display the 90 percent confidence intervals. Using this interval, it can be generally assumed that if the bars are not overlapping, the differences between groups are statistically significant at the 95 percent level. The error bars for predicted values apply only to the specified reference groups and may vary in different ways across the various dimensions of the model.

Models:
Two main models were run: a logistic regression for employment and a log-linear regression for wages. Variations of these models were run using the following interactions:

Basic: y = document literacy + highest qualification + age + age squared + gender + first language

A: y = document literacy + highest qualification + (document literacy * highest qualification) + age + age squared + gender + first language

B: y = document literacy + highest qualification + age + age squared + (highest qualification * age) + (highest qualification * age squared) + gender + first language

C: y = document literacy + highest qualification + age + age squared + gender + (highest qualification * gender) + first language

D: y = document literacy + highest qualification + age + age squared + gender + first language + (highest qualification * first language)

The output of the models is available on http://www.educationcounts.govt.nz, along with the electronic version of this paper.