



MINISTRY OF EDUCATION

*Te Tāhuhu o te Mātauranga*

# Measuring the returns on investment in tertiary education three and five years after study



Beyond tertiary study

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This report forms part of a series called Beyond tertiary study.  
Other topics covered by the series include how graduates' earnings change over time, labour market outcomes, education and economic growth, and qualifications and income.

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**Disclaimer:**

Access to the data used in this study was provided by Statistics New Zealand under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the author, not Statistics New Zealand.

The Student Loan Scheme Borrowers dataset combines information from the Ministry of Social Development, Inland Revenue and the Ministry of Education. The dataset has been approved by Statistics New Zealand as a data integration project. Only approved researchers who have signed Statistics New Zealand's declaration of secrecy can access the integrated data in the Data Laboratory. For information concerning confidentiality matters relating to this study, please contact Statistics New Zealand.

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# Measuring the returns on investment in tertiary education three and five years after study

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## 1 Summary

This report presents the results of a study of people's earnings in the years following tertiary study. The earnings of those who used the Student Loan Scheme, and left study between 1997 and 2001, were related to their personal, educational and employment-related industry factors – factors commonly found to influence income levels. The study used a logistic regression model and a bagging technique. This approach was intended to isolate the independent relationship of each factor to earnings. This report extends an earlier study of earnings three years after tertiary study.

The study found that the individual's industry of employment, their type of tertiary education provider, the field and the level of study significantly influenced their earnings. The person's prior activity was also a significant influence on their earnings. The completion of a qualification, in combination with level and field of study, emerged as another strong influence on earnings. The interaction effects of some of the factors exerted a greater influence on earnings than when these factors were considered individually.

The earnings advantages, or the premiums, for tertiary education summarised here were estimated for each factor while holding constant the other factors that influenced earnings.

Gender and age on leaving tertiary study influenced earnings. Age was one of the strongest factors influencing earnings – largely because it is a proxy that captures the effects of previous labour market experience on income. The disparity in earnings due to gender and ethnic group narrowed for those with higher levels of study.

The higher the level of study, the higher were people's earnings. The completion of a tertiary qualification at any level also increased earnings. The highest premium was earned by people who had completed a bachelors degree. Individuals with a bachelors degree earned 28 percent more than those who did not complete their bachelor-level studies. The second largest premium earned was among those who completed a level 5 to 7 diploma. This group earned 14 percent more than those who studied towards level 5 to 7 diplomas but did not complete their studies. The premium for completing a postgraduate qualification was lowest because these individuals already earned a premium for their bachelors degree.

Of those with a tertiary qualification, the predicted earnings of individuals with a bachelors degree were about 36 percent higher than the predicted earnings of those who completed a level 1 to 3 certificate. People who held a postgraduate qualification earned about 19 percent more than those with a bachelors degree.

Study in technical or vocational fields increased the chance of higher earnings and working in an industry linked to their field of study further enhanced this. A completed bachelors degree in a technical or vocational field of study boosted earnings compared to those who studied in generic fields like society and culture.

Comparing the incomes of people who undertook tertiary study without completing a qualification, the predicted earnings of those who studied at bachelors level were about 24 percent higher than the predicted earnings of those who studied towards level 1 to 3 certificates. People who studied at postgraduate level earned about 30 percent more than individuals who studied at bachelors level.

There were no significant differences in the average earnings among the five three-years-after-study cohorts. Likewise, there were no significant differences among the three five-years-after-study cohorts. However, people's earnings were, on average, significantly higher five years after leaving study than three years after leaving study. There was also considerable variation in earnings that

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related to the type of tertiary education provider. The analysis showed that the interaction of the type of provider and the field of study significantly influenced earnings. When the prior activity of individuals was combined with other factors, the model predicted significant increases in earnings. The study results clearly showed that the accumulation of work experience results in an increase in the probability of higher earnings.

## 2 Introduction

There is an extensive literature on the returns on investment in tertiary education. Many of the variations in the estimates published reflect genuine differences as to the types of educational qualifications and individuals being analysed, while data quality and the methodologies of the various studies also explain some of this variation. Nevertheless, the literature does reveal a wide range of estimates (Maani, 1999; Maani and Maloney, 2004; Hyatt and Smyth, 2006).

More longitudinal data has now become available from the integrated Student Loan Scheme Borrowers (ISLSB) dataset<sup>1</sup> allowing us to improve our measure of the returns to people on investing in tertiary education. In a previous study using the integrated dataset, Nair (2006) measured the impact of tertiary education on earnings but that study was confined to an analysis of individuals three years after leaving study. Nair considered people who had left study between 1997 and 1999 and their earnings for the years 2000 to 2002. With more earnings data having become available, it was possible to re-examine the impact of education on earnings using additional cohorts and extending the time period to five years after leaving study. The aim of this paper is to highlight the new estimates of the labour market returns to holders of tertiary qualifications while controlling for other personal, study and employment factors. This paper emphasises the impact on earnings of a completed tertiary qualification while controlling for all the other factors.

The results given here augment Nair's previous report by looking at earnings five years after study. Studying the impact of tertiary qualifications on earnings after a longer period was considered important. Our premise here was that individual earnings three years after leaving study may not fully reflect the impact of tertiary education, due to the unsettled employment history associated with taking up jobs that are not commensurate with the individual's qualifications and skills. This was considered to be the case for those individuals who have attained generic skills, through a qualification in natural and physical sciences, social science and humanities, as well as for those with qualifications in specific technical or vocational skills. It was assumed that over the five years since leaving study, most individuals were more likely to get settled in employment and their earnings were more likely to reflect their qualifications and skills.

As in Nair's 2006 study, the integrated data from the Student Loan Scheme was used to assess the impact on earnings of several personal, educational and employment-related industry factors.<sup>2</sup> A change in methodological approach was made to address some of the difficulties encountered in the analysis in the previous report and to improve the quality of the estimates.

The previous report lists the studies available in the literature that estimate the intrinsic relationship between a person's tertiary qualifications and their earnings. A question that always needs to be raised when interpreting our estimates is whether the higher earnings observed for better-educated individuals are the result of their higher education or whether individuals with greater potential for earning are those who have acquired higher qualifications.

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<sup>1</sup>The ISLSB data includes individual data for five cohorts each covering three years after study and three cohorts each covering five years after study. The ISLSB contains more than 250,000 records and 12 variables. All earnings in the model used in this study have been converted to 2004 dollars using the New Zealand Labour Cost Index as a deflator.

<sup>2</sup> While the ISLSB data includes about 70 percent of full-time students in each cohort, it only covers 50 percent of the total student population in New Zealand, that is, those students who have taken out a student loan. Results from this study therefore relate to Student Loan Scheme borrowers only and hence inferences about the general population need to be drawn with caution.

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When looking at the relationship between a person's earnings and schooling, there are potential sources of bias that arise due to individual educational choices. It may be possible that high-ability individuals gain more, on average, from education than low-ability individuals do.<sup>3</sup> If this is the case, the more able would have an incentive to stay at school longer and would, in any case, perform better in the workplace. This means that educational attainment and earnings will be positively correlated even if tertiary education had no effect on earnings at all. The possibility that the observed earnings premium for education might include the effect of ability is called the problem of ability bias.<sup>4</sup> In this study, the level of study attempted has been included as a proxy for ability. The earnings of those who did complete their studies are compared to the earnings of those who studied at the same level without completing.<sup>5</sup>

The following parts of this paper contain discussion of the methods of analysis, the results and their interpretation, and a conclusion. The results section discusses the impact of three types of factors – demographic, educational and employment-related industry factors – and it also discusses the associated interaction effects. This section also attempts to interpret the results in line with the study objectives.

### 3 Methodology

The report findings are based on an analysis of the integrated dataset of Student Loan Scheme Borrowers, managed and maintained by Statistics New Zealand. The dataset integrates information from students collected by the Ministry of Education from tertiary education providers with data on borrowers collected by StudyLink and information held by Inland Revenue on incomes, loan balances and loan repayments.

The dataset covers students who have studied in formal tertiary education and used the Student Loan Scheme. In this study, we focus on those who studied, whether they completed their studies or not. The earnings of individuals who left study between 1997 and 1999 were considered five years after leaving, that is, their earnings for the years 2002 to 2004. The earnings of individuals who left study in any year between 1997 and 2001 were considered three years after leaving, that is, their earnings for the years 2000 to 2004. Three demographic variables, seven study-related factors and one industry-related variable were included in the analysis. The earnings from different employers were derived from the Inland Revenue income profile that forms part of the dataset. The three cohorts for the five-years-post-study analysis and the five cohorts for the three-years-post-study analysis comprised more than 250,000 records. The underlying assumptions of this study and the description of variables are similar to those discussed in Nair's previous report.

A statistical model using multinomial logistic regression and a bagging technique were used to analyse the study variables. The earnings of individuals were regressed against their age, gender, ethnic group, level and field of study, having completed a qualification or not, industry of employment, activity prior to study, and type of provider. All of these factors were important to this study and were thought to influence an individual's earnings, after taking into account the differences in their educational attainment, and their personal and employment characteristics (Le, Gibson and Oxley, 2005).

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<sup>3</sup>The ability bias question is of great practical importance. If education causes the higher earnings, then increasing educational attainment will be an effective strategy for increasing incomes. Economists have tried a number of techniques to separate the effects of ability from schooling (including studies of the earnings of identical twins).

<sup>4</sup> Card (1999) has reviewed this issue thoroughly and concludes that schooling and ability are positively correlated and that the simple estimates do overstate the returns on schooling. However, this upward bias is small, only "of the order of 10 percent". In addition, Card concludes that schooling is subject to diminishing returns. Holding ability constant, the return for early years of schooling is greater than the return for later years.

<sup>5</sup> For an explanation of the rationale for this approach, see Hyatt and Smyth (2006).

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The analytical method used in this study is slightly different from that of the previous report. In this study, the logistic regression model used a bootstrap aggregating technique, wherein 100 bootstrap samples were used to fit the multivariate logistic model. The model was then used to estimate the probability of an individual being in a particular income band. The number of income bands in this study was reduced from 10 in the previous study to nine by collapsing the top two income bands, while the number of study levels was increased from three to five categories. In the case of the industry-related variables, employment in electricity, water, telecommunication services and mining were merged into one category.

The average estimated earnings were computed by taking the sums of products of the event probability (predicted probability estimates from the logistic regression model) and the mid-point of each income band. The individual effect of each explanatory variable was estimated by keeping all other factors constant.

The earnings advantage, or the premium, for tertiary education was measured by the ratio of the estimated average annual earnings of, for example, those who studied for a bachelors qualification with the estimated average annual earnings of those who studied towards a level 1 to 3 certificate. The premium for completion of a tertiary qualification was measured by comparing the estimated average annual earnings of someone who was successful in completing a qualification with the average earnings of those who started but left without completing.

## 4 Study results

The generalised logistic regression model explained about 73 percent of the variability in the dependent variable – the earnings of the individuals. The key findings from this study are that people's earnings following their tertiary education are influenced by their:

- industry of employment
- level of study
- field of study
- completing of a qualification
- prior activity
- tertiary education provider.

Some of the factors exerted a greater influence on earnings when combined with another variable than they did when considered individually. For instance, the combined effects of level of study and

- industry of employment
- field of study
- type of provider
- prior activity, and
- completing a qualification

were the major determinants of earnings.<sup>6</sup> Field of study in combination with industry of employment was also an important determinant of earnings.

The demographic variables of age and gender emerged strongly as factors that influenced earnings. Age was an important factor – largely because it is a proxy that captures the effects of previous labour market experience on income. These demographic factors had an important role in influencing earnings when considered in combination with other factors like qualification level and field of study.<sup>7</sup>

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<sup>6</sup> The combined effect of two or more factors is termed an "interaction effect". The impact of some factors could only be felt in the presence of other factors. For example, the combined effect of level of study and completing a qualification was significant, while completing a qualification was estimated to be a weak determinant of earnings when it was considered independently of the level of study.

<sup>7</sup> The earnings distributions reflect the fact that tertiary education cannot be fully equated with the concept of proficiency and skills. Skills and experience, other than those gained from tertiary education, are rewarded in the labour market.



There were no significant differences in the average earnings among the five three-years-after-study cohorts. Likewise, there were no significant differences among the three five-years-after-study cohorts. This indicated that cohort differences did not influence the earnings within a particular post-study period. The earnings of individuals three years after leaving study varied significantly from those five years after leaving study, with higher earnings five years post-study.

There was evidence of a significant earnings effect by type of provider and there were also interaction effects of this factor with level and field of study. This suggests that the labour market rewards differently the various types of education obtained from different providers. The activity of the individual before starting study was also a significant factor. The interaction of prior activity with level and field of study gave clear evidence that the accumulation of qualifications and work experience resulted in an increase in the probability of higher earnings for individuals.

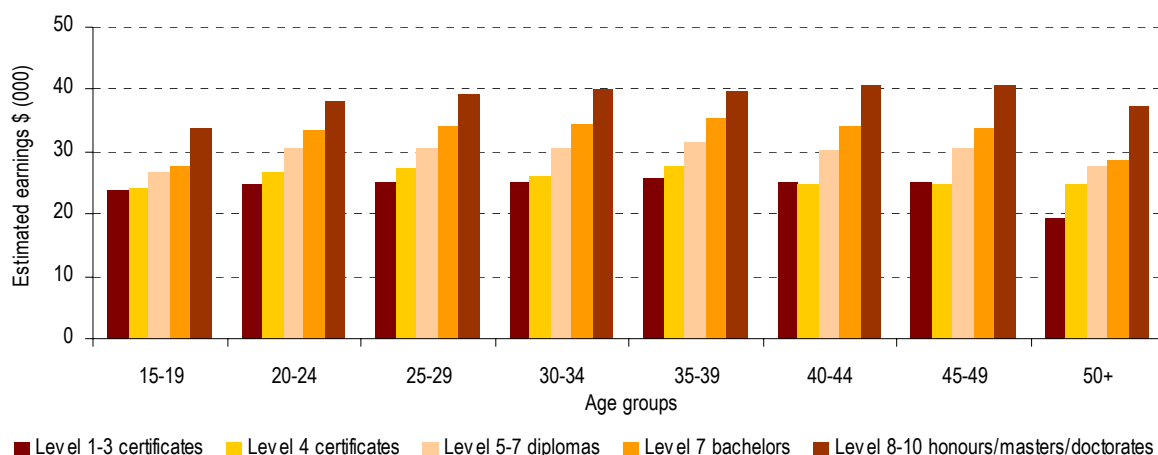
The report identifies that the earnings premium for tertiary education will vary according to field of study, the level of study, employment, industry and provider, as well as whether or not a qualification has been completed, the age at completion, and the activity of the individual prior to study.

#### 4.1 The impact of age on earnings

The analysis showed age as one of the key demographic factors that significantly impacted on earnings. Age and the prior activity of the individual were included in the model to capture the person's previous labour market experience. Prior activity refers to the activity linked to an individual before taking up studies and is treated as a proxy for work experience in the model.

Comparing all individuals in the study, there was no significant difference in the estimated earnings of those aged between 25 and 50 years at the same qualification level, when controlling for other factors. However, variations in earnings were observed for those aged below 25 years and above 50 years (Figure 1).<sup>8</sup> The trend was similar for individuals three and five years after leaving study, with the highest estimated earnings observed for those in the 40 to 50 years age group.

**Figure 1: Estimated earnings of the 5-years-after-study cohorts by level of study and age group**



<sup>8</sup> Estimated earnings refer to earnings calculated from the sum of products of event probabilities determined from the statistical model and the mid-point of the corresponding income band.

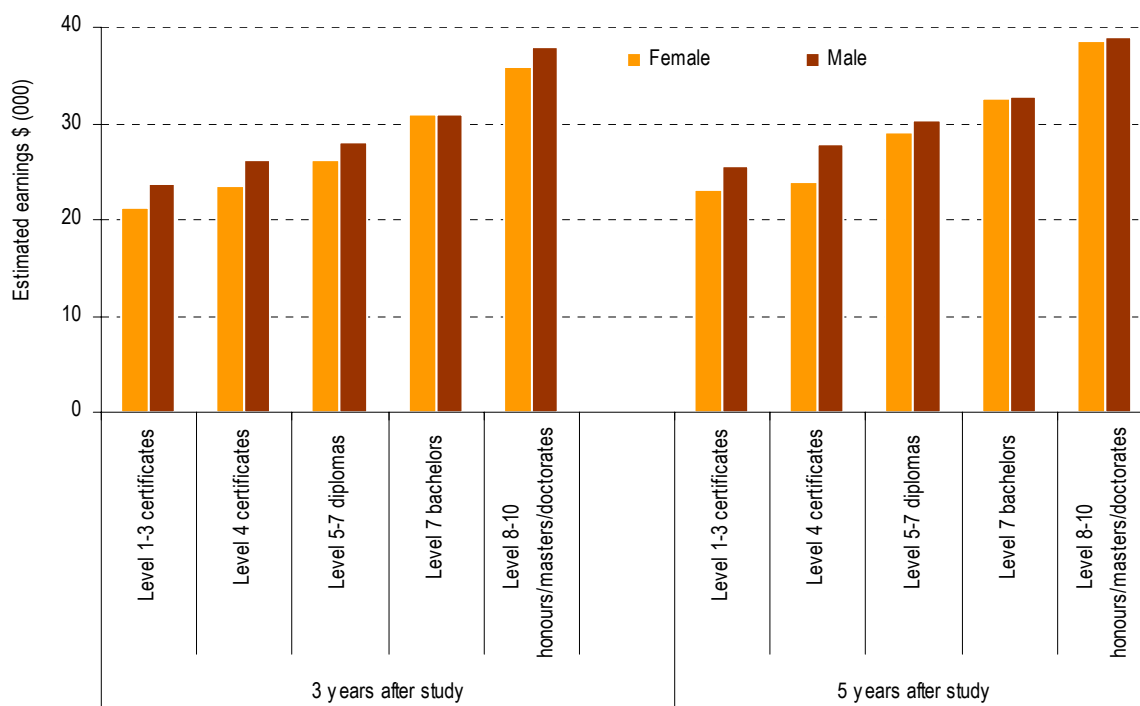
## 4.2 Reduced gender- and ethnicity-based income disparity for the higher qualified

The study showed that there were gender disparities in earnings, with men earning more than women who studied at the same level. However, the disparities in earnings diminished over time for women with higher levels of tertiary study (Figure 2).

The earnings disparity due to gender for people studying towards level 1 to 4 certificates ranged between 10 and 16 percent in favour of men. The difference narrowed to 8 percent for level 5 to 7 diplomas and it was less than 6 percent for the bachelors or higher levels of study. The earnings disparity for people who studied at bachelors or higher levels was noticeably lower five years after leaving study compared to three years after leaving study.

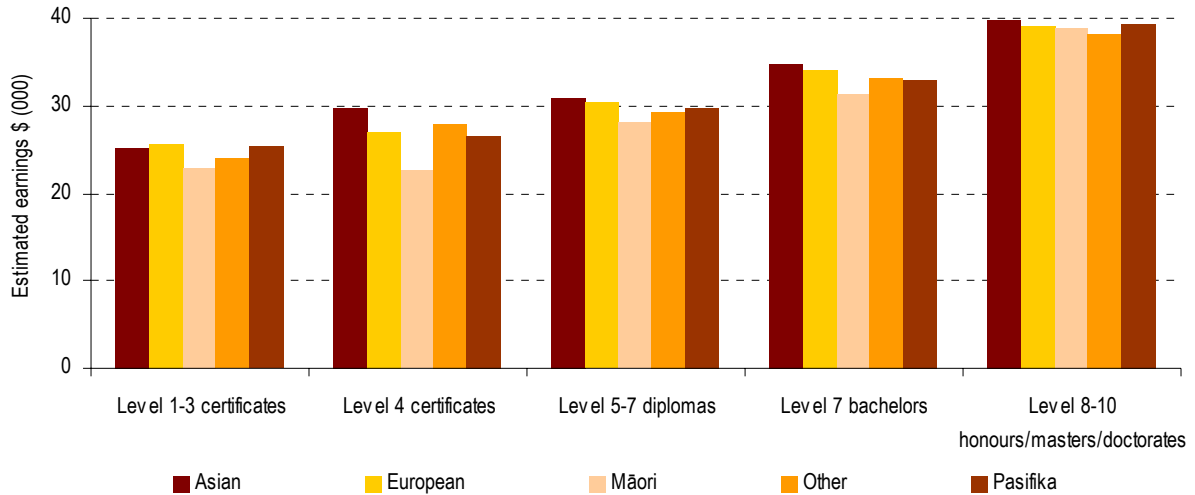
The gender gap in the earnings for people at the same level of study may be attributable partly to the choice of field of study, industry of employment and time spent in the labour force. While the model controls for field of study and industry of employment it does not account of the time spent by people in the labour force, for example, part-time employment or breaks in employment.

**Figure 2: Estimated earnings of the study population by level of study and gender**



The earnings disparities among different ethnic groups were most noticeable at the lower levels of study and the differences narrowed considerably for those who studied at a higher level. The differences in earnings were more pronounced for some ethnic groups (such as Māori and Pasifika) due to the fact that they tend to study at lower qualification levels. The differences in earnings narrowed considerably for those who studied towards higher qualifications (Figure 3). This result illustrates another positive effect on society of studying at higher levels of tertiary education.

**Figure 3: Estimated earnings of the 5-years-after-study cohorts by study level and ethnic group**



### 4.3 Studying at higher levels leads to higher earnings

Level of study and field of study were very important factors influencing economic returns on investment in tertiary education. Although each of these factors influenced earnings independently, their interaction effect with industry, a completed qualification, prior activity, type of provider and other factors showed a much stronger impact on earnings.

The premium associated with higher levels of study is shown in Figure 4. The predicted earnings for people who studied for a bachelors degree were around 36 percent more than for those studying in level 1 to 3 qualifications. People who studied at postgraduate level earned about 19 percent more than someone who had studied for a bachelors degree, after adjusting for other factors. This result highlights the fact that the level of study exerts a substantial causal effect on earnings.

**Figure 4: Earnings premium of the study population by level of study relative to certificates level 1 to 3**

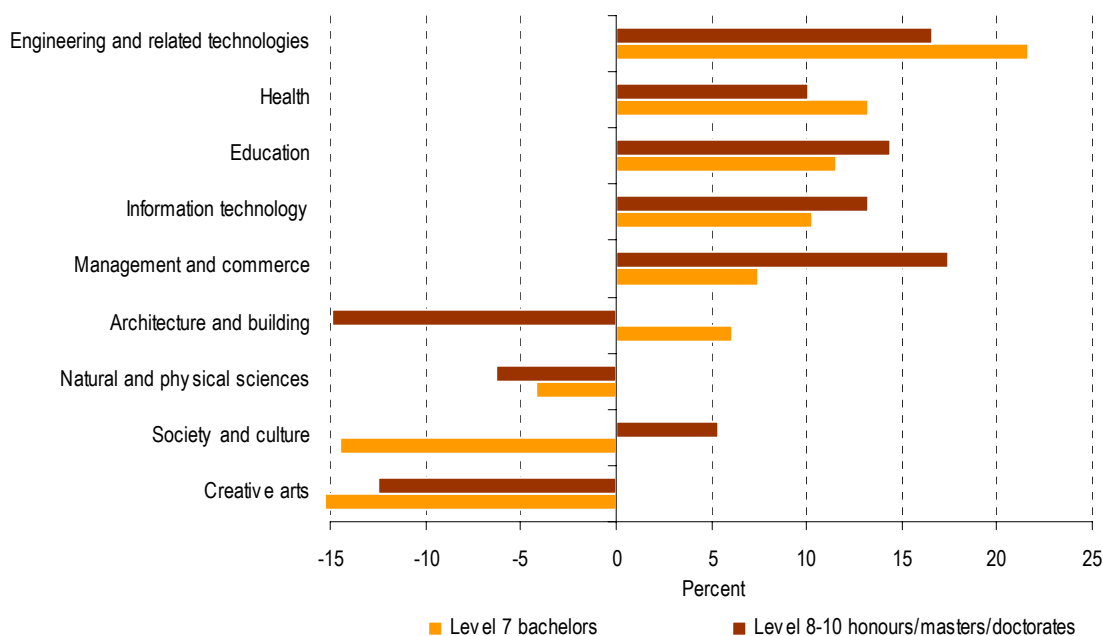


#### 4.4 Higher earnings for industry-related fields of study

The choice of field of study had a considerable impact on earnings. People who studied in different fields and at different levels of study were found to have quite distinct earnings profiles. A higher but varying premium was observed for individuals who had studied in a technical or vocational field at any level of study. For example, study at the bachelors level in the field of engineering and related technologies or information technology, was more likely to lead to higher earnings than bachelors-level study in fields like society and culture or creative arts.<sup>9</sup>

The estimated earnings premium associated with different fields of study at bachelors or higher levels, three and five years after leaving study, are shown in Figures 5 and 6. The earnings premiums, expressed in percentages, were calculated for different fields of study relative to agricultural and related studies.

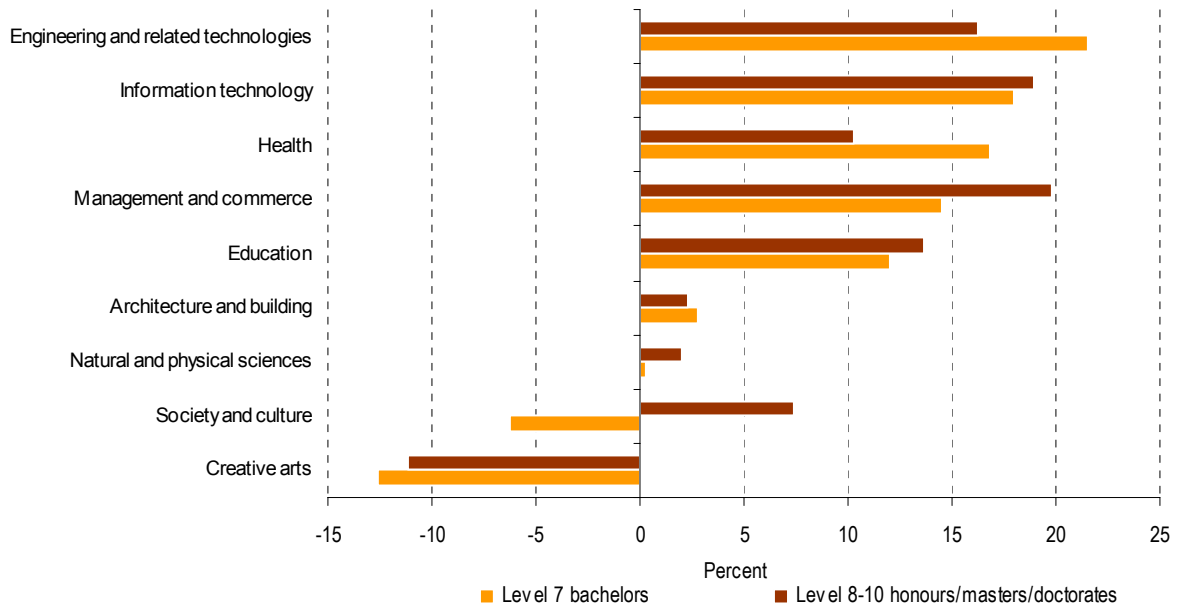
**Figure 5: Earnings premiums for the 3-years-after-study cohorts by field of study relative to agricultural studies**



Considerable variation existed in people's earnings due to their field of study at bachelors or higher study levels, both three and five years after leaving study (Figures 5 and 6). The earnings premium was higher for bachelors-level study, at 22 percent, than for postgraduate study, at 17 percent, for those in the fields of engineering and health. A relatively higher premium was observed for fields like education (12 percent), information technology (10 percent), and management and commerce (7.5 percent) compared to agricultural studies. Fields like natural and physical sciences, society and culture, and creative arts were shown to have a negative premium relative to agricultural studies of 4.2 percent, 15 percent and 16 percent, respectively – meaning that the earnings for people who studied in those fields were less than the earnings of those who undertook agricultural study.

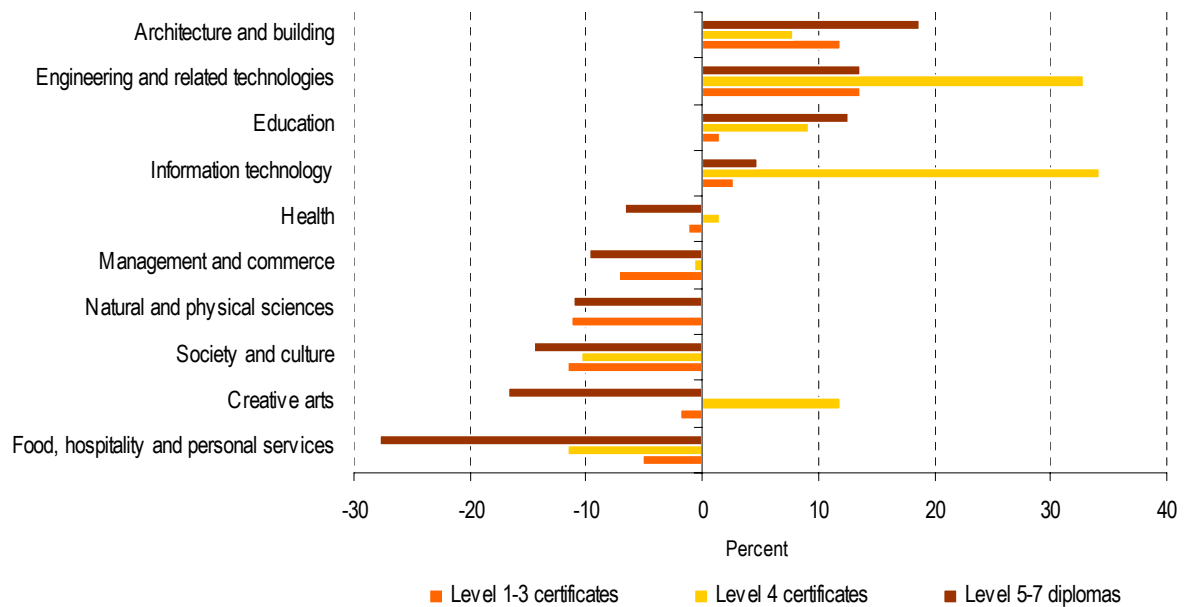
<sup>9</sup> Technological, economic and social change in a country could also alter the earnings linked to the level of educational attainment in addition to an individual's innate ability (OECD, 2006).

**Figure 6: Earnings premiums for the 5-years-after-study cohorts by field of study relative to agricultural studies**



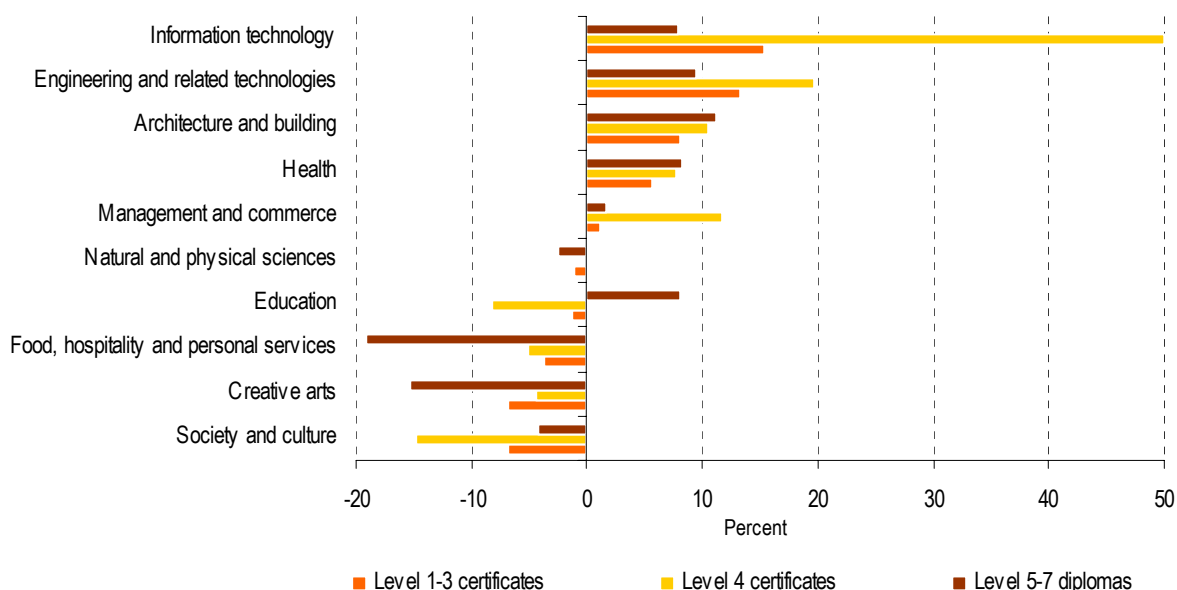
Individuals who studied towards level 1 to 4 certificates in engineering, information technology, architecture and building, and education earned a higher premium than those who studied in fields such as society and culture, or creative arts, both three and five years after leaving study (Figures 7 and 8).

**Figure 7: Earnings premiums for the 3-years-after-study cohorts by field of study relative to agricultural studies**



The premiums earned for studying at level 1 to 3 certificates and level 5 to 7 diplomas had a similar pattern across the two post-study periods, while the premium for studying at level 4 certificate level exhibited greater variation.

**Figure 8: Earnings premiums for the 5-years-after-study cohorts by field of study relative to agricultural studies**



These results indicated that engineering and related studies, information technology, health studies management and commerce, and education were the most likely fields of study to be associated with higher earnings for all levels of study. Fields like natural and physical sciences, society and culture, and creative arts were observed to have a relatively lower premium. These results were in line with the findings in Australia.<sup>10</sup> The fields that were associated with higher earnings were likely to be technical or vocational skills-based, whereas those with lower earnings were associated with generic skill fields.<sup>11</sup> The widespread use of information and computer technologies in the workplace requires many individuals with high technical skills and this may have resulted in higher premiums for these individuals than for those with generic qualifications.

#### 4.5 Higher earnings for industry of employment

Industry of employment had a considerable impact on an individual's earnings premium. This factor is one of the most important determinants of the economic returns on investment in tertiary education because the premium can be explained to a great extent by institutional factors operating in a country's labour market.<sup>12</sup> The varying trends in employment in high-wage versus low-wage industries and pay rate changes all influence the earnings of an individual.

Inclusion of this factor in the model also controls for some generic and specific skill factors. There was considerable variation in individual earnings due to the combined effect of industry and level of study, identifying the fact that qualification- and industry-based wage structures exist in New Zealand.<sup>13</sup> The interactions of industry with level and field of study were the two most important factors that influenced earnings. The industry-specific earnings premiums for the various levels of study are shown in Figures 9 and 10 for each industry relative to agriculture.

<sup>10</sup> In Australia, Borland (2002) showed that estimated returns are relatively high for business and administration and engineering graduates whereas they are relatively low for graduates in the fields of society and culture and science.

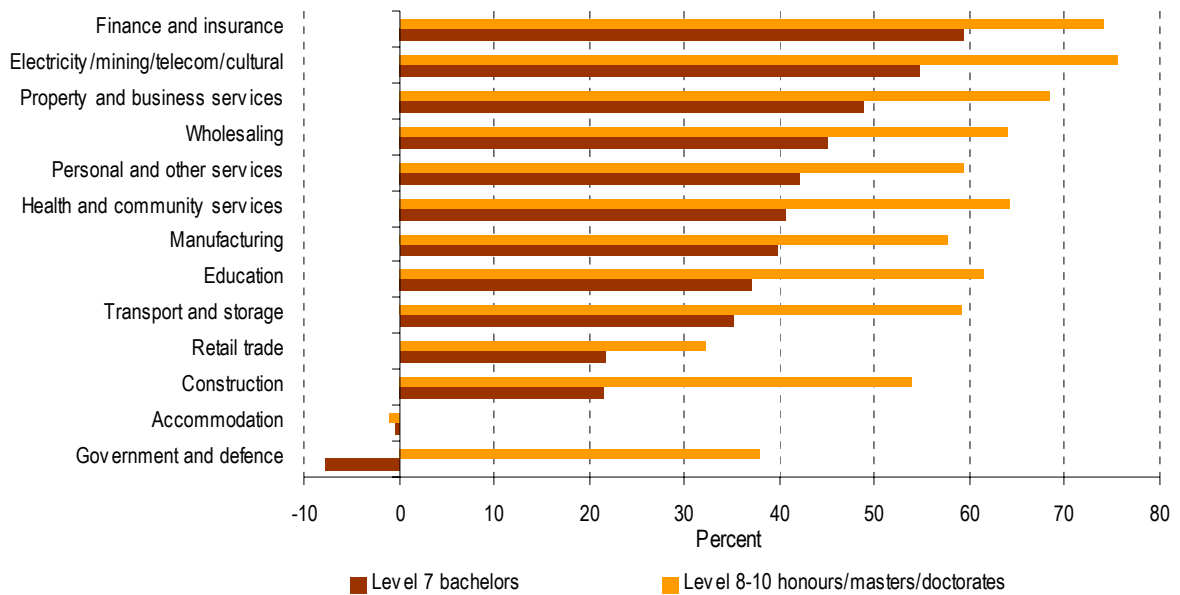
<sup>11</sup> Engineering is a sector in which 'shortages' are often reported (Belgium, Australia, New Zealand) – (Machin and McNally, 2007).

The Department of Labour recently investigated shortages in 10 professional occupations from a range of industries including construction, electronics, information technology, engineering, and social services (Department of Labour, 2005).

<sup>12</sup> Borland (2000) stated that "generally the extent to which labour market adjustment occurs through the distribution of earnings or through effects on employment appears to depend critically on the employers or institutions present in a country".

<sup>13</sup> Bellman and Gartner (2003) found evidence for Germany in the qualifications- and sector-based wage structures, which is consistent with the hypothesis of skill-biased technology change.

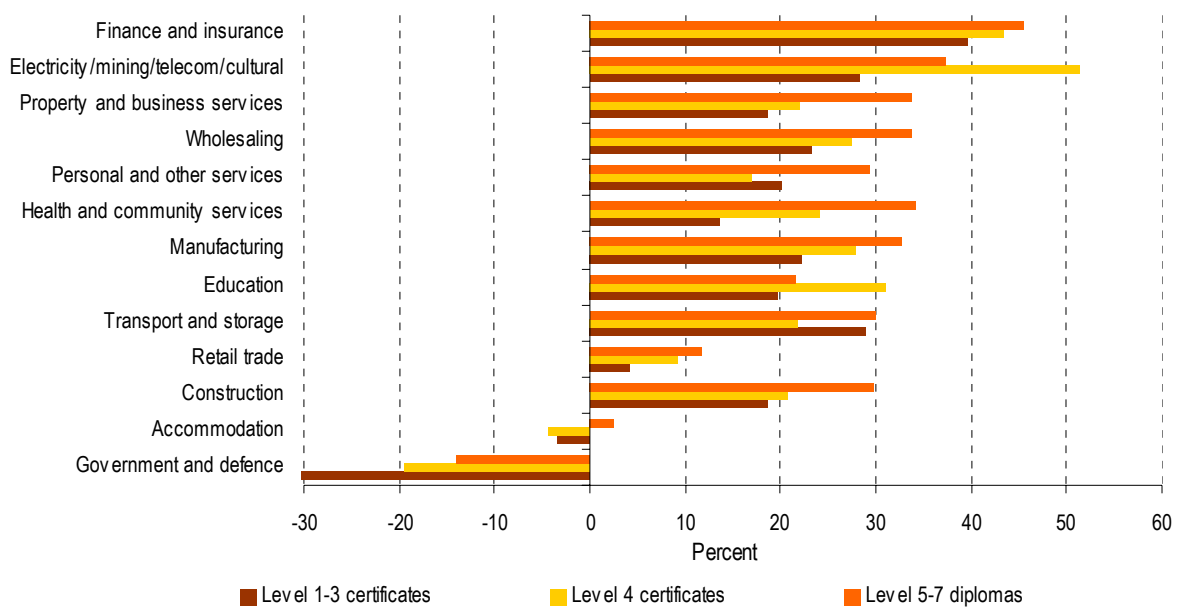
**Figure 9: Earnings premiums for the 5-years-after-study cohorts by level of study and by industry of employment relative to agriculture**



The highest earnings premiums, relative to agriculture, were observed for finance and insurance, electricity and related industries, and property and business services. The order remained the same at all levels of study for the first five industries. Individuals employed in accommodation or government and defence who studied for a certificate or bachelors degree had a negative premium in relation to agriculture. However, individuals in government and defence who studied at postgraduate level earned a higher premium than those in the retail trade.

At all levels of study, individuals employed in technical and vocational skills-based industries, like electricity and mining, finance and insurance, and telecommunications, or those employed in the retail trade and transportation, earned the highest premiums compared to individuals in agriculture.

**Figure 10: Earnings premiums for the 5-years-after-study cohorts by level of study and by industry of employment relative to agriculture**



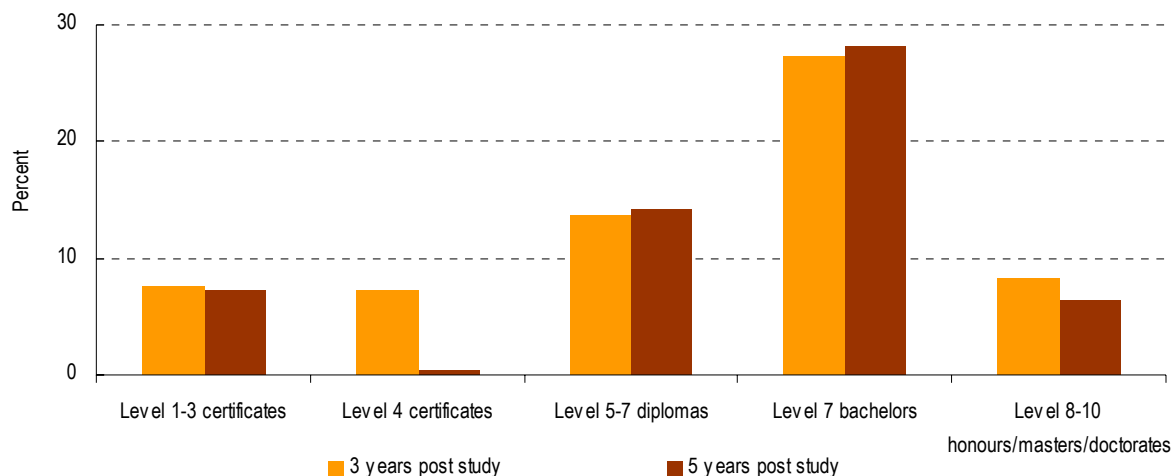
Other research results on earnings in industry and fields of study also showed that people with technical and vocational skill-based fields employed in matching industries are likely to earn more than those in generic skill-based industries.<sup>14</sup>

## 4.6 Higher earnings for completed qualifications

The completion of a qualification showed a significant impact on earnings, when considered independently, but to a lesser degree than level of study, field of study, industry, provider and age. However, the impact of a completed qualification in the presence of level of study and field of study was much stronger.

The premium for those who completed a qualification, compared to those who studied at the same level but did not complete their studies, is shown in Figure 11 for the three-years-after-study and five-years-after-study learning cohorts. The premium for a completed bachelors degree, at 28 percent, was highest. The second highest premium earned, at 14 percent, was for a completed level 5 to 7 diploma. It is interesting to note that the premium for completing a postgraduate degree was very small, at about 7 percent, compared to other qualification levels. The reason for this was that holders of a postgraduate qualification already earned a premium for their bachelors degree.

**Figure 11: Income premiums for a completed qualification**



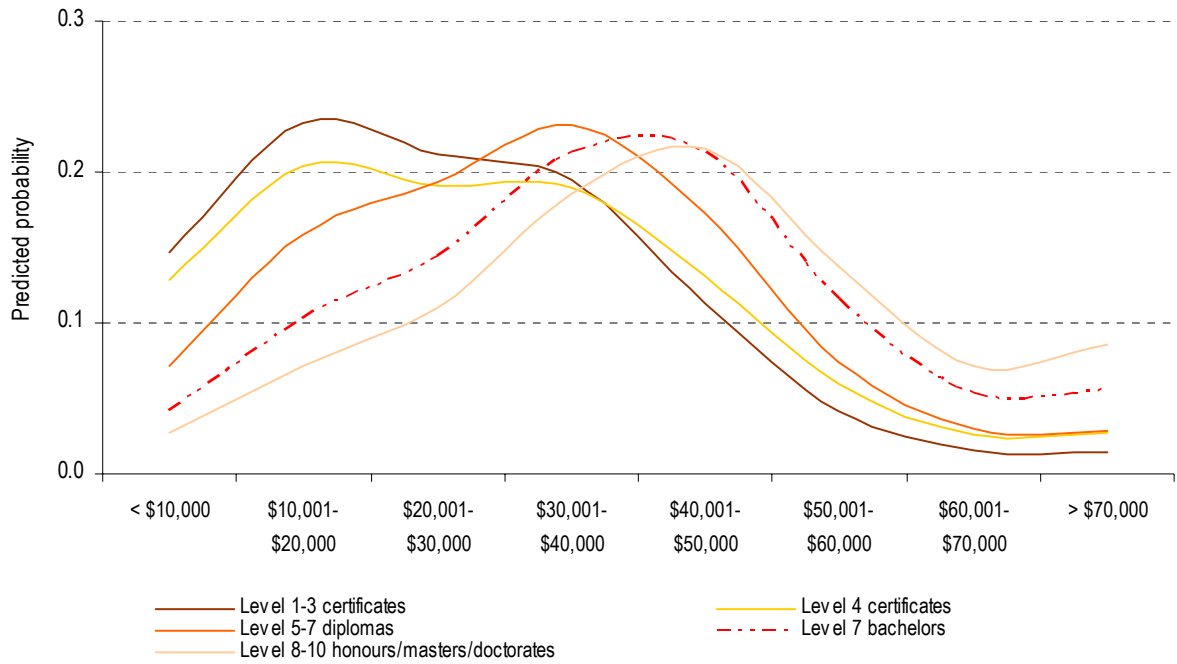
The results also indicated that the premium remained similar for both the three- and five-year learning cohorts with the exception of holders of a postgraduate degree or a level 4 certificate. These premiums were higher three years after leaving study than five years after leaving study.

When comparing the predicted income of those who had completed a tertiary qualification with the predicted income of those who had not, the curve showed a substantial shift to the right for people who attained qualifications. Figure 12(a) shows the estimated earnings curve for individuals with qualifications at the various levels and Figure 12(b) charts the earnings estimates for those who did not complete their studies. The graphs show that the earnings of those with a qualification were higher, on average, at all levels of study, than the earnings of those who had partially completed their studies. The shift to the right is particularly noticeable at bachelors level and for level 4 certificates.

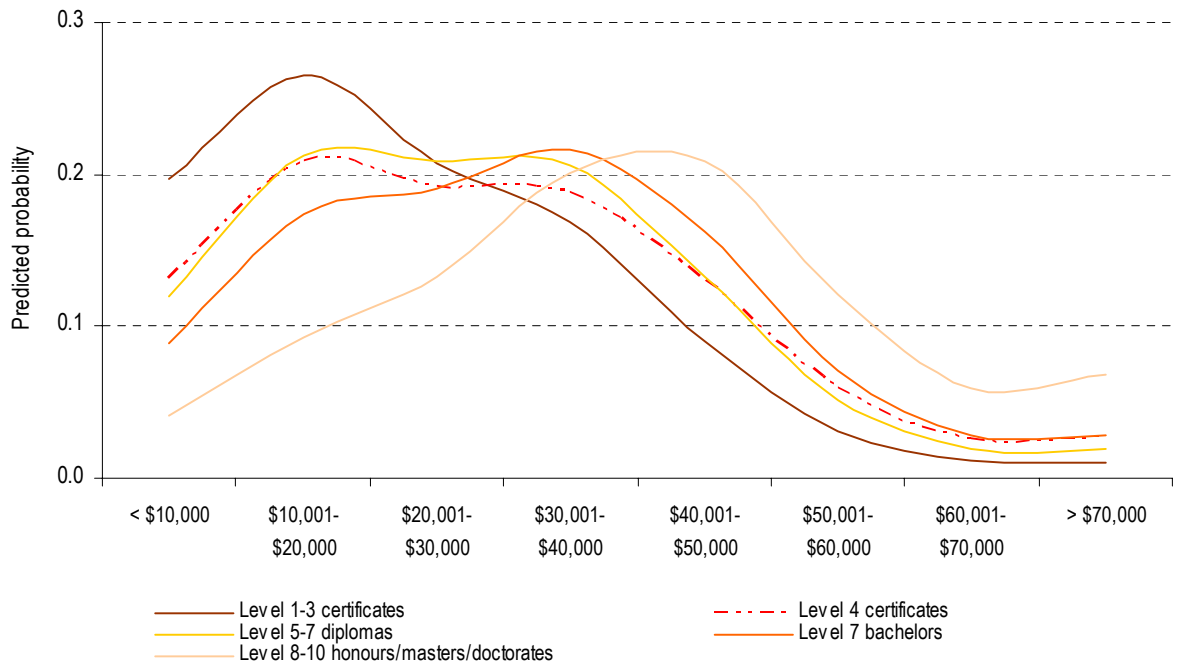
<sup>14</sup>Mare and Liang (2006) referred to this type of industry as “in-field” employment. Analysing census data they found that for graduates aged between 18 and 65, the median income of those who were employed “in-field” was 11 percent higher than for those employed “out-of-field”. However, the premium for working “in-field” falls as the graduates get older.



**Figure 12(a): Estimated range of earnings for the 5-years-after-study cohorts for a completed tertiary qualification**



**Figure 12(b): Estimated range of earnings for the 5-years-after-study cohorts for those who did not complete a tertiary qualification**

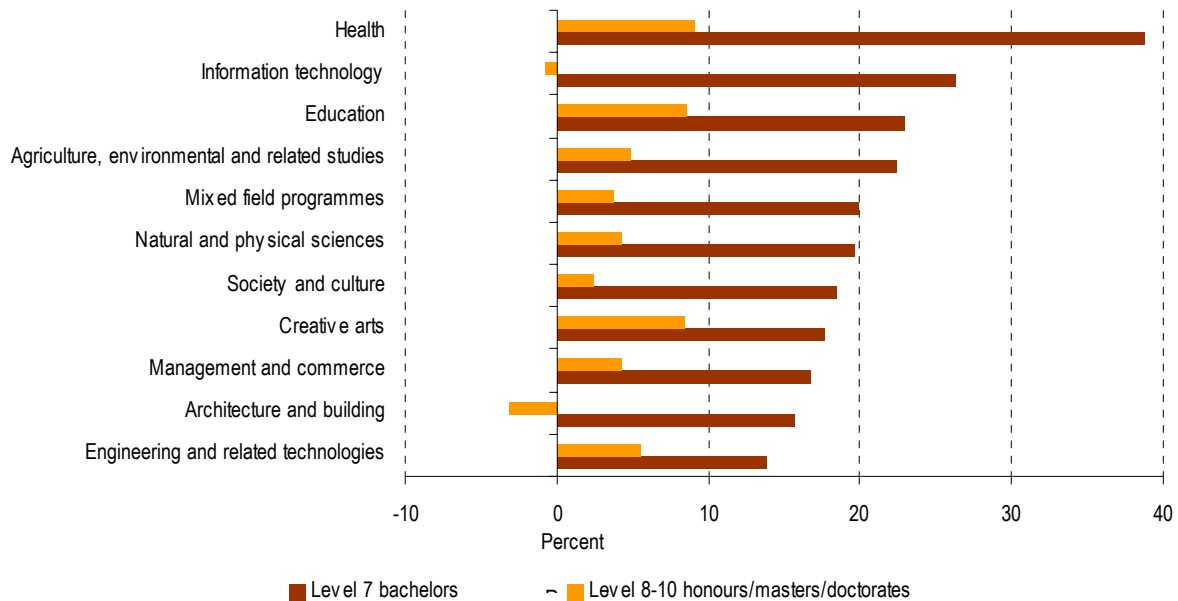


#### 4.7 Higher earnings for technical or vocational fields of study

In Figures 13 to 16, the premiums for a completed tertiary qualification at the various levels by field of study are shown for the three-years-after-study and five-years-after-study cohorts. The result indicated that completing a qualification impacted on earnings, and its interaction effect with level and

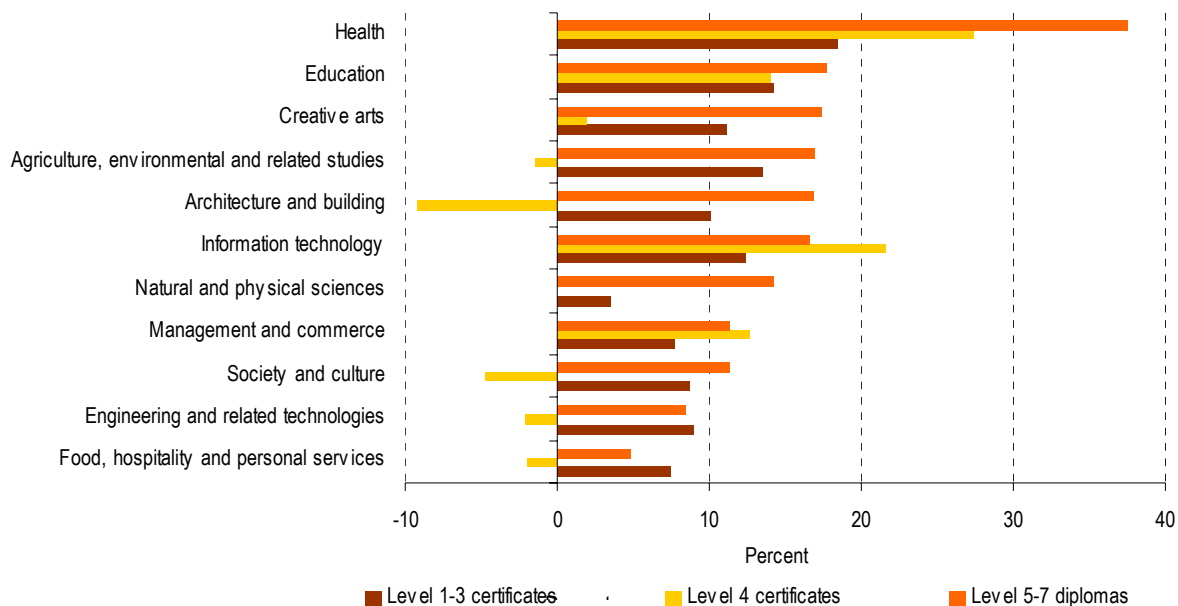
field of study showed an even stronger impact. Across the various fields of study, completing a qualification provided a higher premium both at bachelors and at certificate level.

**Figure 13: Earnings premiums for the 3-years-after-study cohorts for bachelors and postgraduate qualifications by field of study**



The largest premium, at bachelors level, was earned by those who studied health, information technology or education. Individuals in these fields consistently earned a higher premium three and five years after leaving study. Similarly, there was a higher premium earned by those who had completed a postgraduate qualification in the fields of education, creative arts or health, however, this premium was smaller because these individuals already earned a premium for their bachelors degree.

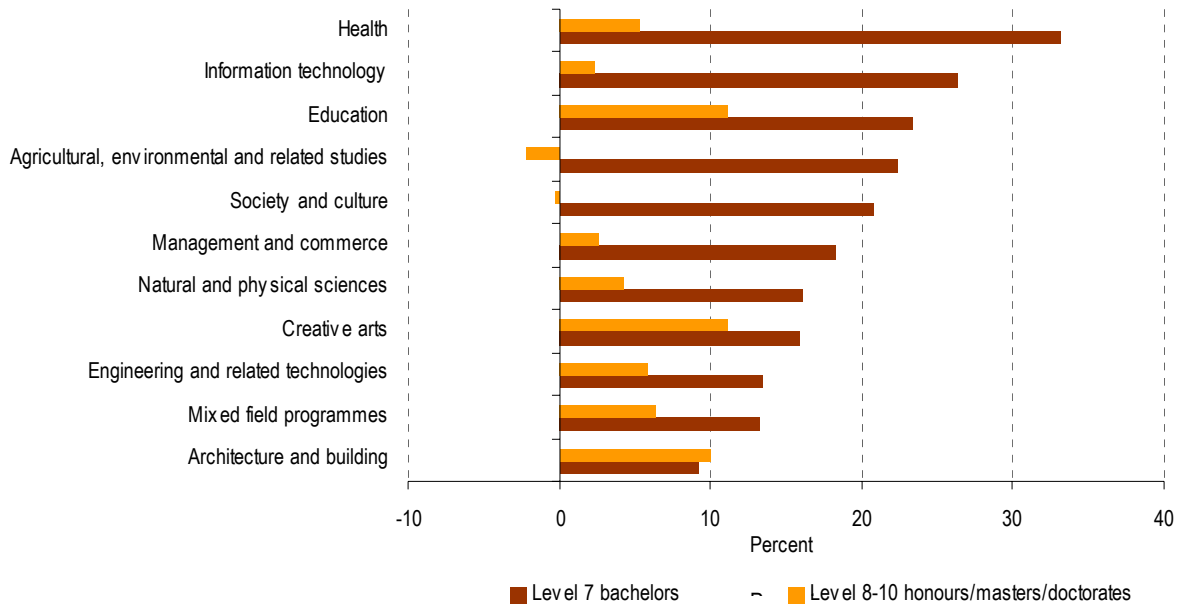
**Figure 14: Earnings premiums for the 3-years-after-study cohorts for certificates and diplomas by field of study**



The largest premium for completed level 1 to 4 certificates and level 5 to 7 diplomas was earned by people who studied in the field of health, followed by those who studied education, information technology, or management and commerce (Figures 14 and 16). Level 5 to 7 diplomas and level 1 to

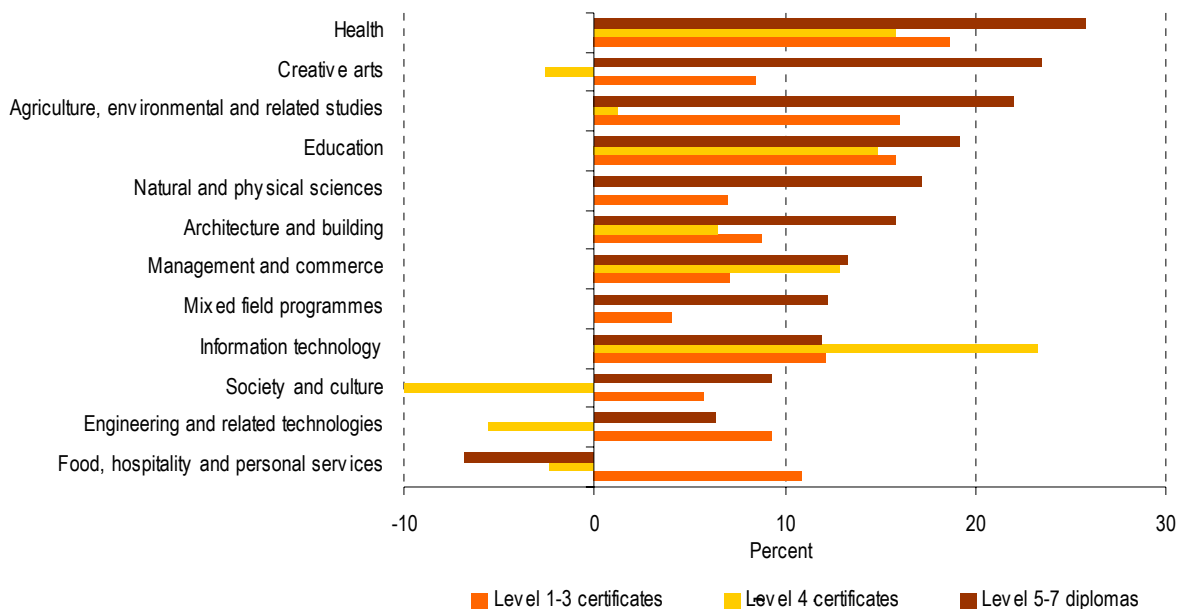
3 certificates showed a similar trend, while level 4 showed larger premiums for information technology followed by health studies. The premium for a completed qualification in other fields of study exhibited greater variation both three and five years after leaving study.

**Figure 15: Earnings premiums for the 5-years-after-study cohorts for bachelors and higher qualifications by field of study**



The analysis showed that the estimated earnings premium for people with a level 4 certificate in the fields of society and culture, engineering, or food, hospitality and personal services was negative.

**Figure 16: Earnings premiums for the 5-years-after-study cohorts for certificates and diplomas by field of study**



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## 4.8 The influence of provider type on earnings

Attending different types of tertiary education providers will also lead to variation in individual earnings. Overall, those who studied at a university were likely to have higher earnings than those who studied at other tertiary education provider types. However, the earnings of some people who studied particular qualifications at a provider other than a university, may be higher than those who studied at a university. This will be the subject of a forthcoming analysis from the Ministry of Education.

## 4.9 The influence of prior activity on earnings

The prior activity of students and its interaction effect with the other variables provided evidence that accumulation of work experience results in the likelihood of higher earnings. Those with a prior activity such as self-employed or wage or salary workers had a greater likelihood of earning significantly more than those who were either students, unemployed or house persons. Individuals studying part-time were likely to earn significantly more than those who study full-time. Part-timers were either wage or salary earners or self-employed and were older than full-time students. All these factors contributed to their having a higher earning capacity than those who studied full-time. Individuals studying full-time were more likely to have been in study before starting their tertiary education and they were younger than part-timers. The effect of these factors was that they tended to have low earnings. Also, the rate of completing a qualification among part-timers was lower than that for the full-timers.

## 5 Conclusion

The study found that there were significant financial benefits to people from their investment in tertiary education, with higher returns to those who completed a qualification. The results are also an indicator of the value of the tertiary education system in contributing to human capital.

The study used a robust statistical model that explained about 73 percent of the variability in people's earnings. The key study findings showed that the factors related to people's tertiary education explained a considerable amount of their earnings. The study also found that the influence of the factors relating to tertiary education did not diminish over time.

Due to the longitudinal nature of the integrated Student Loan Scheme Borrowers dataset this study will be able to be updated over the years to track the contribution of tertiary education to incomes.

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## 6 Bibliography

- Bellmann, L. & Gartner, H. (2003) Fakten zur entwicklung der qualifikatorischen und sektoralen lohnstruktur, *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, 4/2003.
- Borland, J. (2000) *Economic explanations of earnings distribution trends in the international literature and application to New Zealand*, Treasury Working Paper 00/16, Wellington: The Treasury.
- Borland, J. (2002) *New estimate of the private rate of return to university education in Australia*, Melbourne Institute Working Paper No. 14/02, Melbourne Institute of Applied Economic and Social Research, University of Melbourne.
- Bühlmann, P. & Yu, B. (2002), Analysing bagging, *Annals of Statistics*, 30, 927-961.
- Card, D. (1999) *The causal effect of education on earnings* in *Handbook of Labor Economics*, Volume 3, Orley Ashenfelter and David Card, editors, New York: North-Holland.
- Department of Labour (2005) *Overview from the findings of ten professional occupation skill shortage assessment reports*, Wellington: Department of Labour.
- Hyatt, J. & Smyth, R. (2006) *How do graduates' earnings change over time?* Wellington: Ministry of Education.
- Le, T., Gibson, J. & Oxley, L. (2005) *Measures of human capital: a review of the literature*. <http://www.treasury.govt.nz/workingpapers/2005/wp05-10.asp>.
- Maani, S.A. (1999) *Private and public returns to investments in secondary and higher education in New Zealand over time: 1981-1996*, Wellington: The Treasury.
- Maani, S.A. & Maloney, T. (2004) *Returns to post-school qualifications: new evidence based on the HLFS income supplement (1997-2002)*, report to the Labour Market Policy Group, Wellington: Department of Labour.
- Machin, S. & McNally, S. (2007) *Tertiary education systems and labour markets: tertiary review*. A paper commissioned by the Education and Training Policy Division, OECD, for the Thematic Review of Tertiary Education, Paris: OECD.
- Mare, D. & Liang, Y. (March 2006) *Labour market outcomes for young graduates*, presentation at the Department of Labour, Wellington.
- Nair, B. (2006) *What factors impact on graduates' earnings three years post-study?* Wellington: Ministry of Education,.
- Organisation for Economic Cooperation and Development (2006), *Education at a glance: OECD indicators 2006*, Paris: OECD.
- Penny, N. (2005) *The approach to measuring the returns to secondary and tertiary qualifications in New Zealand: an investigation and update using data from the 2001 Census*, unpublished thesis.
- Rose, H. & Betts, J.R. (2004) The effect of high school courses on earnings, *Review of Economics and Statistics*, May 86(2), pages 497-513.



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