Returns to post-school qualifications: New evidence based on the HLFS Income Supplement (1997-2002)

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ABSTRACT

This study provides evidence on the returns to post-school qualifications in New Zealand, using a new data set (the Household Labour Force Survey (HLFS) Income Supplements 1997-2002). The Income Supplements have two major desirable features: One is that they include data on *earnings* and the *hourly wage* in addition to *income*, allowing a comparison of returns to education analyses using these alternative dependent variables. In addition, they provide information on the types of post-school qualifications, allowing for a more in-depth analysis of returns to education. In this study we estimate returns to education that are compatible with Maani (1999) using the Income Supplement. The analysis is then extended to the estimation of four models across the years 1997 to 2002 on income, earnings, hourly wage, and weekly hours of work. The richness of the data is then explored in the estimation of the impact of vocational and multiple post-school qualifications.

EXECUTIVE SUMMARY

There is an extensive overseas literature on estimated private rates of return to post-school education. Until recently, however, similar empirical studies in New Zealand have been hampered by a lack of consistent unit-record data on individual labour market earnings from reasonably large samples. This present study examines both the stability and detailed nature of private rates of return to post-school qualifications in this country using data from recently available Household Labour Force Survey (HLFS) Income Supplements over a six-year period (1997 to 2002). The Income Supplements provide extensive information on weekly incomes, weekly and hourly earnings and demographic characteristics on approximately 10,000 prime-age workers in each year. One advantage of the HLFS, which has not been exploited by researchers thus far, is the availability of information on the highest school and all post-school qualifications obtained by the individual. We use these more detailed data on human capital investments to produce a more comprehensive picture of the actual payoffs to these formal qualifications in the labour market.

Characteristics of the Sample are discussed in Section II. In Section III, regression models of returns to education based the Income Supplement are estimated for years 1997 and 2002, using a modelling approach and sample specification that are similar to Maani, 1999, which were based on the Census years 1981-1996. These results are generally compatible with the Census results in showing higher returns for post-school qualifications. In addition, similar to the estimates based on the Census, the returns to post-school qualifications are higher for females, despite lower mean income levels. This reflects the higher returns to higher education for females, relative to females without school qualifications.

A comparison of the estimates of returns to post-school qualifications based on the Income Supplement for 1997, and the Census for 1996 (the closest that one can get to an overlap of years based on the two data sets), shows that for both males and females the estimated returns to education are slightly lower based on the Income Supplement in 1997. For example, for the sample of the full-time employed males the coefficient for the returns to the Bachelor's degree is 0.56 based on the Census, compared to 0.54 based on the Income Supplement. Likewise, for a Post-graduate degree the coefficients are, respectively, 0.68 based on the Census and 0.65 based on the Income Supplement. For full-time employed females, the estimated coefficient for returns to a Bachelor's degree based on the Census are 0.50, compared to 0.49 based on the Income Supplement, and the estimated coefficient for the returns to a Post-graduate degree is estimated at

0.69 based on the Census, compared to 0.63 based on the Income Supplement. These differences are expected to reflect the inevitable differences in the two data sets. For example, the information on income in the Census is based on the annual income of the previous year, but in the Income Supplement it is based on the actual income for the previous week. Another difference between the data sets is that the information on income in the Census is in 13 categories, while in the Income Supplement it is continuous. Therefore, given these differences, and our results above, we suggest that considering time trends across the two data sets is not advisable, but within each data set comparisons across time is recommended. However, the results further confirm that the estimates based on the Census and the Income Supplement with the same modelling approach are generally within a narrow band.

In Sections IV-VI data from all of the six years of the Income Supplement is used in regression analyses. We find no statistical support for the hypothesis that average rates of return have been rising or falling for the highest formal qualification between 1997 and 2002. This result holds across the three dependent variables (weekly income, weekly earnings and hourly earnings) and separate regressions for males and females in Section IV. While the estimates of returns to post-school education based on weekly income and weekly earnings are very compatible, the estimates based on earnings are generally higher than those based on income. This relationship in the estimated results is understandable, as earnings are expected to reflect employment rewards through the labour market more closely than income would, which has other unearned income and self-employment income components. For example the estimated rate of return coefficient of 0.206 for a Diploma for males based on income measures can be compared to 0.259 for weekly earnings, for a Bachelor's degree of 0.451 to 0.476, and a coefficient of 0.563 for a Post-graduate degree based on income compared to 0.623 based on earnings. Likewise, a rate of return coefficient of 0.518 for a Bachelor's degree for females can be compared to a coefficient of 0.701 based on earnings. This analysis also indicates that previous studies may have underestimated at least some of these rates of return by using income data from the Population Census, which combines both labour and non-labour sources of income.

In general, the addition of control variables for various demographic characteristics in Section IV has relatively minor effects on our estimated rates of return. Weekly hours of work are positively associated with post-school qualifications for females, but not for males. It is difficult to know from the present analysis, however, whether these differences in weekly hours of work by highest qualification across females represent additional returns to education or labour supply propensities that may have influenced earlier human capital investment decisions. Sample selection bias issues

are therefore, addressed in estimating the rates of return to education among females in Section V. However, the lack of suitable variables from the HLFS that can be included in the participation equation, but reasonably excluded from the earnings equation raises some serious questions about the value of this approach.

Finally, consideration of the diversity of human capital investments represented by various combinations of school and post-school qualifications in Section VI provides much richer and interesting picture of the way in which qualifications matter in labour market. In this analysis, we use the depth and breadth of the Income Supplement to examine the effect of potentially multiple post-school qualifications. Therefore, in our analyses of post-school qualifications in this section, each qualification obtained is counted, making it possible to examine the frequency and nature of multiple qualifications. We would expect the labour market to generally reward individuals for their entire educational portfolio. A useful feature of this form of specification is that it is possible to know about the effects of vocational qualifications compared to other professional qualifications, and the effect of combined qualifications, such as a Bachelor's degree combined with a Teacher's qualification, or a Diploma.

The Income Supplement shows that nearly 3 out of 10 individuals without any school qualification reported obtaining some form of post-school qualification. These tend to be concentrated in certificates and diplomas below the university level. Yet, the proportions of individuals with post-school qualifications rise steadily with the level of school qualifications. Individuals obtaining a qualification from a polytechnic were more likely to come from those with a School or Sixth Form Certificate. Nearly 3 out of 4 individuals with Bursary had some form of post-school qualification. Although they obtained post-school qualifications from a wide number of areas, Bursary holders are much more likely to obtain a university degree.

One result that stands out in the analysis of multiple qualifications is the lower relative pay for teachers especially when the combination of a Bachelor's and Teaching degree is taken into account. For the few male nurses a similar disadvantage is not apparent. The result regarding the lower returns to education for teachers, relative to others holding a Bachelor's degree, are prominent for both males and females. Somewhat surprisingly, this result shows that the lower hourly wage of teachers is also associated with higher hours of work.

While the results for the sample of males, show little variation in the 'hours of work', with the main result that the hours of work were greater for those in Trades and those with Post-graduate

degrees, the results for females show a variety of significant estimated coefficients for hour of work variations. These analyses show the highest hours of work for females holding a Bachelor's, or a Teacher's degree, followed by those holding Post-graduate degrees, followed by Technician Degrees and Certificates.

Overall, in addition to the availability of information on earnings, the hourly wage and hours of work, the feature of the study which incorporates analyses with multiple and vocational qualifications is promising in allowing estimations of returns to education that can account for a variety of skill combinations, and we find that there is significant scope for future use of these features of the Income Supplement.

I. Introduction

In this research report we present evidence on the 'returns to post-school qualifications' in New Zealand, using a new data set (the HLFS Income Supplements 1997-2002). The income supplement, which provides information on a wide range of income and earnings-related variables is available since its introduction in 1997 through 2002. This data set has two major desirable features: One is that it includes data on *earnings*, and the *hourly wage* in addition to *income*. Up to this time, information on income has been available through the Census, and this analysis allows a comparison of estimations of returns to education using these three alternative indicators. In addition, the Income Supplement provides information on a wide range of *vocational* post-school qualification and *multiple qualifications*, allowing extensions of the previous analysis of returns to education (see for example, Maani 1994, 1996, 1997, 1999).

The study, as presented in the next four sections, has four major objectives: First, it provides an update of the analysis of returns to education with the Income Supplement using a modelling specification that is compatible with previous research based on Census data (Maani, 1999). Second, for broad categories of Post-school qualifications, it extends previous research by providing estimates for a greater set of outcome indicators on highest educational attainment. These allow us to compare returns to education estimates for three alternative specifications based on *income, earnings,* and the *hourly wage.* An additional model provides estimates of weekly *hours of work* corresponding to different Post-school educational qualifications. Third, the effect of adjusting for potential sample selection is investigated. Finally, the report uses the information in the Income Supplement to examine the effect of a wider range of vocational qualifications, and multiple qualifications (compared to the highest qualification) on the returns to education.

The link between educational qualifications and income levels has been of interest for a number of reasons, including the income distribution effects of educational investments, and the international literature in this area is vast and growing. These studies have generally utilised cross section analyses for one time period (e. g. Miller, 1982, and McNabb and Richardson, 1989 for Australia; Ogilvy, 1970 and Hunt and Hicks, 1985 for New Zealand; Demetriades and Psacharopoulos, 1987 for Cyprus; Rumberger, 1987, and Raymond and Sesnowitz, 1983 for the U.S.; and Vaillancourt, 1986 for Canada).[1] The analysis of rates of return to education that are comparable over time has, however, been addressed in relatively few studies. For example, Miller (1984) and Chia (1990) have examined changes in returns to higher education in Australia over time, while Ryoo (1988), Wilson (1985), and Psacharopoulos (1985, and 1994) provide international evidence on this

question. Maani (1999) provided evidence on returns to education in New Zealand over 4 Census years.

Earlier research for New Zealand utilising 1981, 1986, 1991 and 1996 census data (Maani, 1994, 1997, 1999) has shown that the returns to higher education are positive and significant in New Zealand. Moreover, the results have strongly indicated that consistent with the significant increases in participation rates, market rewards to education have been significant and increasing during the 1981-1991 decade, and stabilising around 1996. This report extends this earlier research.

The plan of this report is as follows: In the next section, the returns to secondary and tertiary education in 1997 and 2002 are examined, based on 'earnings-function' regression analysis of income levels that are compatible with Maani (1999), which had incorporated Census data. In Section III, this analysis is extended to a greater set of models and expanded model specifications. In Section IV, adjustments for sample selection bias are examined in estimating the returns to education for women. In Section V, the returns to education for vocational degrees and multiple degrees are considered. Finally, conclusions are presented in Section VI.

II. Characteristics of the Sample

The data for this study are taken from the 1997-2002 Income Supplements to the Household Labour Force Survey (HLFS). The HLFS is a survey of the resident, non-institutional New Zealand population, and collected quarterly since December 1985. The current sample size is approximately 15,000 households and 30,000 individuals aged 15 years and over. The HLFS provides data on the demographic characteristics and current activities for individuals in the working-age population. The survey is used to estimate aggregate labour market outcomes (e.g., labour force participation and unemployment rates).

The HLFS contains two questions on the educational qualifications of household members. The first asks about the highest school qualification, while the second asks about all post-school qualifications.[2] It is important for what we do later in this report to recognise that only the highest school qualification is recorded, while all post-school qualifications are recognised.

One of the deficiencies of the HLFS is that it had never included questions on the income or earnings of individuals. Since June 1997, the New Zealand Income Supplement has been

administered annually as a supplement to the HLFS. The Income Supplement collects pre-tax income information on earnings, government transfers, interest and investment income and other sources of non-labour income for each individual in the HLFS household aged 15 years and over.

Except for the results in Tables 4 and 5, (which for comparability with the Census studies (Maani, 1996, 1997, 1999) are based on the age group 16-64), the samples considered throughout the rest of the report are for the age group 25-59. The variables in the Income Supplement used in the current report are also as follows: 'Total actual weekly Income', 'Total actual weekly earnings from all jobs', 'Total actual hourly earnings', and 'Total usual weekly hours of work'.[3]

The overall sample in the Income Supplement used for the study (as in Table 1) includes both the employed and the not employed, and this feature of the data set is used for controlling for sample selection. However, the study is mainly focused on the 'employed' samples, which are of interest in analyses of returns to education. For analyses based on *income*, the income measures include income from all sources including wages and salaries, income from self employment, rent, profits and benefits for the sample that was employed and reported positive values of income and hours of work. This is a similar specification to the earlier studies based on the Census and returns to education based on income measures (Maani 1997, 1999). For all of our extended analyses based on *earnings*, the *hourly wage* and *hours of work*, the Income Supplement variables are based on samples of the wage and salary earners. For the analyses on these three related variables, we have included observations that have reported positive values for each and all of these three variables. We have not restricted the samples for income variables to comply with this definition to allow for the greater components that income measures represent. Throughout the study separate analyses for male and female samples are reported.

Table 1 provides the means and standard deviations of the full samples of males and females in 1997 and 2002, and Table 2 provides characteristics of the samples of the employed used in the econometric analyses of this report. As Table 1 shows, in 2002, 53% of the sample (25-59 year olds in the Income Supplement) was female, 13.2% was Maori, and 19.9% were immigrants (born overseas).

Table 1 is consistent with the increasing trend in obtaining qualifications between 1997 and 2002, as reflected by the small but consistent decline in the percentage that had either School Certificate or Sixth Form Certificate as their highest qualification, and the small but again consistent increase in the proportion that had obtained post-school qualifications of a Diploma, a Bachelor's degree or

a Post-graduate degree.[4] As Table 1 shows, in 2002, 9.2 per cent of the sample had a Bachelor's degree, compared to 7.3% in 1997, and 3.8% of the sample had a Post-graduate Degree in 2002, compared to 3.3% in 1997. In 2002, 23.7% of the sample was married as couples without children, 33.9% were married and had one or more children, and 6.0% in the sample were sole parents.

In addition, Tables A1 and A2 in Appendix A show the mean values on the four dependent variables in this study (weekly personal income, weekly personal earnings, the hourly wage (all before tax values and in 2002 dollars), and weekly hours of work) for each of the 6 years of the study, for the seven educational qualifications, and for males and females. These summaries reflect the higher income and earnings returns to higher educational qualifications, and greater hours of work for females with higher qualifications. In general, in our samples the correlation between real actual weekly *income* and real actual weekly *earnings* is quite high, ranging from 0.96 to 0.98 in the years 1997 to 2002.

For the purposes of these descriptive statistics (and subsequent regression analysis) the detailed information on school and post-school qualifications has been collapsed into six variables that measure the highest educational qualification. Individuals who tick the 'Other' category for school qualifications are combined with School Certificate group. This School Cert category represents the lowest educational qualification in our list. The next highest educational group combines those with a Higher School or Higher Leaving Certificate with those obtaining a Sixth Form Certificate under the Sixth Form title. The highest school qualification group combines those with an Overseas qualification and those with University Bursary under Bursary heading. The Diploma category includes any post-school qualification other than a university bachelor's degree or Post-graduate qualification. These higher post-school qualifications form the last two categories for our initial measures of highest educational qualifications. Note that these categories are mutually exclusive and have a definite ordinal ranking. An individual can only have a single 'highest educational qualification', and higher categories dominate lower categories in this list. The excluded group includes individual who have none of these school or post-school qualifications.

Table 2, which is set up in a way that is compatible with Maani (1999, which was based on the Census) contains the mean sample values for the two sub-samples of the 'employed' and those who were employed 'full-time' (i.e., working 30 or more hours per week) for these two groups, for males and females. The results in Table 2 are consistent with the increasing trend in obtaining

qualifications between 1997 and 2002 for the samples of 'employed' and 'full-time employed'.

Tables 1 and 2 further show mean weekly *income, earnings*, and the *hourly wage* in 2002 as compared to 1997 (in both nominal terms, and 2002 dollars). These means reflect higher values for *income, earnings* in 2002, compared to 1997, and not significantly different proportions that were working full-time. In addition, on average the number of *hours* worked per week within each category does not vary noticeably across time.

Returning to the responses to the original HLFS question on all post-school qualifications, Table 3 gives the percentages of the sample with these potentially multiple qualifications. For example, if a person has a Bachelor's degree, a Post-graduate degree, and a teaching degree, they would be included in each of the three categories. These mean values show that the proportion of males and females in full-time work with a Bachelor's or a Post-graduate degree are very similar, while there is much greater differentiation by gender in the trades, nursing and teaching.

A feature of the Income Supplement is that for those observations for which full information has not been available on income or some of its components, income is imputed. The method of imputation used by Statistics New Zealand is to *match* the person with missing information with others in the sample with the same set of relevant characteristics to impute the missing information based on the available observations. In the Income Supplement, a variable does identify individuals who have some imputed aspect in their income information, but the exact nature of the imputation is not identified. In the pooled sample over the six years of 1997-2002 and for the age group 25-59, 20.2% of the sample has some imputation in the data. Given the large proportion of individuals with imputed data, excluding the group from the sample would have resulted in relatively significant loss of information, and this group was not excluded from our analysis. However, for comparison purposes, we provide a set of estimates in Appendix C, which are compatible with some of our main estimated regressions in Section IV (equivalent to results in columns 1 and 3 of Tables 6, 7, 8 and 9 for each of our four dependent variables and for each gender), but are based on the samples *excluding* all observations with any imputations. This exercise provides a comparable set of results when excluding observations with imputed income values.

More statistical summaries on the relationship between highest secondary level of education and post-school qualifications, and the propensity of multiple degrees are given in Section VI.

III. Income Returns to Secondary and Tertiary Education

The models estimated are semi-logarithmic with binary variables for educational qualifications (see for example, Heckman and Polacheck, 1974; and Dougherty and Jimenez, 1991), as in equation 1 below:[5] The models estimated in this section are specified as in Maani (1999) for comparability.

$$\ln Y_{it} = \alpha_t + X'_{it}\beta_t + \delta_{1t}A_{it} + \delta_{2t}A_{it}^2 + v_{it} \quad (1)$$

In Model 1, the dependent variable is the natural log of annual income in current dollars in the first models, (and earnings, and the hourly wage, etc. in the later models). The vector X_{it} contains 6 binary Educational Qualifications variables for individual *i* in year *t* (1997 and 2002), and A_{it} and A_{it}^2 are age and age squared, respectively. The qualification binary variables are for School Certificate, Sixth Form Certificate[6], Bursary, Diploma, Bachelor's Degree, and Postgraduate Degree. The excluded educational qualification level represents the group with no school qualifications. The model incorporates before-tax income levels. All standard error estimations throughout the study are 'White' adjusted for consistent standard errors. All models are estimated for males and females separately.

The variable for age serves as a proxy for overall potential experience, in the usual quadratic form.[7] In these initial models in this section, in defining the vector of X variables, a parsimonious approach is taken, for compatibility with the Census study Maani (1999) for the overall rates of return to an educational degree. This set of variables is extended to include variables on ethnicity, locality, immigrant status, and regional dummy variables, in our extended models in the next Section.

In addition, since the purpose of this section is to use a specification, which is most compatible with the Census study, we use 'usual' weekly income for the age group 16-64, in Tables 4 and 5. In addition, for comparison purposes, estimates that are equivalent to Tables 4 and 5, but are based on the sample of 25-59 year-olds and the 'actual' weekly income (as in the rest of the report), are also provided in Appendix B.

Since model (1) is semi-logarithmic, the coefficients for continuous variables may be interpreted as a proportional change in income (or a percentage change when multiplied by 100) due to an increase in age by one year. The coefficients for educational qualifications may be interpreted as the change in the natural logarithm of income in relation to the education level, while for the binary variables, in order to interpret these coefficients as a percentage gain in income, the usual adjustment is made by taking the anti-logarithm of the coefficient and the subtraction of value 1 (as: $g_j = [\exp(b_j) - 1]$ times 100, where g_j reflects the percentage gain relating to this education level, and b_j is the regression coefficient (Halvorsen and Palmquist (1980)).

The regressions in this section (similar to Maani, 1999), are estimated for two samples of 'all employed', and 'full-time employed', and for two separate samples for males and females. Individuals are considered to be 'full-time' employed, if they work 30 or more hours per week. These results for 1997 and 2002 are summarised in Tables 4 and 5, and they are generally compatible with the Census results in showing higher returns for post-school qualifications.

In addition, similar to the estimates based on the Census, the returns to post-school qualifications are higher for females, despite lower mean income levels. This reflects the higher returns to higher education for females, relative to females without school qualifications.

A comparison of the estimates of returns to post-school qualifications based on the Income Supplement for 1997, and the Census for 1996 (the closest that one can get to an overlap of years based on the two data sets), shows that for both males and females the returns to education are slightly lower based on the Income Supplement in 1997. For example, for the sample of the 'full-time employed' males, the coefficient for the returns to the Bachelor's degree is 0.56 based on the Census, compared to 0.54 based on the Income Supplement. Likewise, for a Post-graduate degree the coefficients are, respectively, 0.68 based on the Census and 0.65 based on the Income Supplement. For full-time employed females, the estimated coefficient for returns to a Bachelor's degree based on the Census are 0.50, compared to 0.49 based on the Income Supplement, and the estimated coefficient for the returns to a Post-graduate degree is estimated at 0.69 based on the Census, compared to 0.63 based on the Income Supplement.

These differences are expected to reflect the inevitable differences in the two data sets. For example, the information on income in the Census is based on the annual income of the previous year, but in the Income Supplement it is based on the usual income for the previous week. Another difference between the data sets is that the information on income in the Census is in 13

categories, while in the Income Supplement it is continuous. Therefore, given these differences, and our results above, we suggest that considering time trends across the two data sets is not advisable, but within each data set comparisons across time is recommended. However, the results further confirm that the estimates based on the Census and the Income Supplement with the same modelling approach are generally within a narrow band.

Since the above are measures of returns to higher education based on weekly income, these income gains would include the combined effects of changes in hours of work per week, and the hourly wages. For example, during periods of increased demand for new skills, and given that acquiring higher education requires time, responses to increased demand can increase income through more hours of work, more job stability, and a higher hourly wage.

Therefore, we are further interested in the results in the next section, which control for a wider range of variables, and provide estimates for the *hourly wage* rate, and the weekly *hours of work,* in addition to *income* and *earnings*.[8]

It may be noted that the largest component of income is earnings, but it also includes unearned income such as interest, rent, and government assistance. To the extent that higher unearned income is likely to be positively correlated with higher earned income, the overall effect of the inclusion of these incomes may be to result in rates of return that are higher than those based on earnings alone. However, the inclusion of government assistance as a part of income in the Census and Income Supplement is likely to introduce a negative correlation, thereby decreasing the above effect.

It may further be noted that since the models do not directly control for innate academic ability of individuals, these returns to educational qualifications may be best interpreted as the combined effect of educational qualifications and academic ability on income levels. One of the implications of this effect is that if the distribution of innate ability remains unchanged in a population, during periods of rapid increase in participation rates in higher education it is plausible that the average level of innate ability of university graduates decreases. To the extent that innate ability can influence income levels when combined with education, increased participation can place a negative effect on observed income returns for those who have educational qualifications over time. However, an increase in the supply of graduates, even when keeping ability constant, is expected to exert an effect on the earnings of graduates in combination with demand effects. In this case, the forces of increased demand for post-compulsory education

have obviously been at least as large as the effect of supply increases in the post reforms period.

IV. Returns to Education (Income, Earnings, Hourly Wage, and Hours of Work)

Four models are estimated in this section. These are extended versions of Model (1) with four alternative dependent variables for *Income, Earnings, Hourly Wage, and Hours of Work*. These models are semi-logarithmic regression models, where the dependent variables are the natural log of the variables, and income, earnings and the hourly wage are in real terms (in 2002 dollars), with samples that are pooled across the six years (1997-2002), including time trends, year control variables, and time interaction effects with educational qualifications. The specification of education in these models, as above, is the Highest Educational Qualification. The samples are all employed males and females between the ages of 25 and 59 for each of the years 1997 to 2002. The estimated results of these models are discussed below.

IV.A 'Income' Returns to Education

The first model is an extension of Model (1) above, which includes six new control variables on ethnicity and locality, and nine regional control variables for ten regions. There are two binary variables for *Maori*, and *Pacific Island* ethnicity, a binary variable for *immigrant* status (defined as born overseas), an 'interaction effect' for immigrant status, and the *inverse of years since migration*. Maani (1999) has shown the significance of recent immigrant status on earnings and returns to educational qualifications, and this specification, with the inverse of years since migration, allows a negative potential impact to be greater for recent immigrants, and decreasing over time. This specification allows for a flexible functional form, where the effect of years since migration does not have to disappear entirely, as it asymptotically approaches the estimated coefficient on the *immigrant* dummy variable. There are also two locality binary variables for *urban* living and living in a *town* (combining town and minor or secondary urban), with the base category reflecting rural locality. The omitted and base category for the ten regions is the Auckland area.

These results for 1997 to 2002 are summarised in Table 6 below for males and females respectively. The pooled samples allow testing the usefulness of alternative specifications by first including a 'time trend' over the six-year period, and including 'year' interaction effects with all educational qualification variables. The results in columns 1 and 3 of Table 6 *exclude*, and those

in columns 2 and 4 *include* 'time trend' interaction effects with the educational qualification variables. In addition, we provide results based on alternative specifications on the pooled samples and by including 'year' control variables for each year, and 'interaction effects' for each year and all educational qualifications, as in Appendix D.

The extended model performs well, as reflected by the higher adjusted R squared statistics in all cases, and significant incremental F tests. These results support the relatively higher income levels for urban relative to rural females, and the lower income levels of recent immigrants.

In addition, the estimates for the returns to post-secondary education are generally stable across the two versions of the model (compared to results in Tables B1 and B2 in Appendix B), and the extended versions in Table 6. For example, in 2002, the coefficient for the returns to a Bachelor's degree for the male sample is 0.45 in the two sets of results, and the returns to a Post-graduate degree is 0.59 in the extended model (which relates to the base categories controlled for in the extended model), and 0.56 in the shorter version of the model.

As the results in Table 6 show, there is no statistical evidence of significant change in the rates of return to higher educational qualification for personal income over these six years, as the time trend interaction effects are collectively statistically insignificant, as reflected by the adjusted R-squared measures of the two versions of the model, with and without time trend interactions, and statistically insignificant incremental F-tests at the conventional levels. In addition, they are individually statistically insignificant at any conventional probability levels for all degrees for males and for most degrees for females. Therefore, we focus on the results in columns 1 and 3, which pool the years together, without time trend interactions.

These results are also consistent with the additional specifications of the pooled model (and reported in column 1 of Tables D1 and D2 in Appendix D), which allowed a different specification when the time trend variables were replaced by individual year dummy variables for each year, and interaction effects between each year and each of the educational qualification variables. This alternative specification (as reported in Appendix D) is used to provide returns to education for each educational degree by allowing separate rates of return estimates for *each year*. These estimated results are summarised for returns to a Bachelor's degree and a Post-graduate degree in Figures 1 to 4 based on the set of results in this section. The results in Table 6 and in Appendix D suggest that while there are some differences between the raw data and the estimated results for each of these years, statistical support for a 'trend' effect is not strongly established

across the degrees for this relatively short time period. Figure 1, for example, provides a visual representation of the differences across the years, and that a 'trend' is not obviously present.

The three models below on weekly earnings, the Hourly Wage and the Weekly Hours of Work, present further results of interest.

IV.B 'Earnings' Returns to Education

The *earnings* regressions are based on similar specifications to the extended income models above, by including the highest educational qualifications, and control variables for ethnicity, immigrant status and locality, and regional controls. As noted earlier, the dependent variable for earnings from the Income Supplement is the natural logarithm of actual weekly before-tax earnings. These results are summarised in Table 7 and Figure 2. The results are of special interest, since the earlier estimates of returns to education based on the Census have been based on Income, and the Income Supplement allows the estimation of post-school rates of return estimates based on earnings.

An examination of Tables 6 and 7 reveals that while the two set of estimates are very compatible, estimates of returns to post-school education based on earnings are generally higher than those based on income. For example the estimated rate of return coefficient of 0.206 for a Diploma for males based on income measures can be compared to 0.259 for weekly earnings, for a Bachelor's degree of 0.451 to 0.476, and a coefficient of 0.563 for a Post-graduate degree based on income compared to 0.623 based on earnings. Likewise, a rate of return coefficient of 0.518 for a Bachelor's degree for females can be compared to a coefficient of 0.701 based on earnings. This relationship in the estimated results is understandable, as earnings are expected to reflect employment rewards through the labour market more closely than income would, which has other unearned income and self-employment income components.

IV.C 'Hourly Wage' Returns to Education

The *hourly wage* regressions are again specified similarly to the extended models above, by including the highest educational qualifications, and control variables for ethnicity, immigrant status and locality. The dependent variable for the Hourly Wage from the income Supplement is the natural logarithm of actual Hourly wage before tax from earnings. These results for males and females are summarised in Tables 8. Again, the estimates based on the earnings are of special interest in that they provide estimates of returns to education, where the effect of the weekly hours of work is already isolated. A comparison of these estimates to the two previous set of results based on income and earnings and with the same model definition is of interest. This comparison shows that the estimates of rates of return to Post-school qualifications based on *earnings*, the *hourly wage* and *income* are compatible, but estimates based on *earnings* are higher than those based on either the hourly wage, or income. Since earnings combine both the effect of the hourly wage, and hours of work in response to higher hourly wage rates, this result is reasonable.

The *hourly wage* models, which in effect, control for hours of work, show significantly higher explanatory power as reflected by higher adjusted R squared and F values. The estimates of the returns to post-school qualifications are again generally compatible with the results based on earnings. The main difference is that earnings effects combine the effects of the *hourly wage*, and *hours of work*.

Figure 3, which presents a plot of rates of return estimates for separate years based on the results in Appendix D is consistent with the finding that a time trend in this short time period is not obviously present in our estimated results.

IV.D 'Weekly Hours of Work' and Education

The *hours of work* model has as its dependent variable the natural logarithm of the actual weekly hours of work. This model allows us to examine whether there are differences in the hours of work by highest educational qualifications, and other personal characteristics such as ethnicity, immigrant status, and locality. The results of *hours of work* estimates for males and females are summarised in Table 9, and in Figure 4.

These results indicate that urban, and Maori and Pacific Island women worked significantly more hours per week, while there is evidence that Maori and Pacific Island men and recent immigrants

had fewer hours of work. For example, Maori women reported hours of work that are 5.9% higher (coefficient of .058), and Pacific Island women 11.3% higher (coefficient of 0.107) than the base group, and urban women reported hours of work that are 12.6% higher than rural women. Moreover, Maori men reported hours of work that are 3.2 % lower, and Pacific Island men 2.9% less than the base group. The interpretation of the coefficients for the effect of the variables for immigrant status is that immigrants on average had income levels that were 5.9% lower (coefficient of -0.058). The coefficient on the inverse of years since migration, in turn, estimates income levels that *in addition to* the – 5.9% effect, were 24.3 lower (coefficient of -0.218) for immigrants of *one* year since migration, 4.4% lower for *five* years since migration, 2.2% lower for *ten* years, and 1% lower for *twenty* years since migration.

While the effect on the *hours of work* for males with Post-compulsory education is not very strong in these results, there are statistically significant reported *hours of work* effects for males with Post-graduate degrees, and there is strong evidence supporting significantly more hours of work by females with post-school qualifications. All of these results for females are statistically significant at better than 1% level of significance. In addition, the *hours of work* effect is higher for those with a Bachelor's degree (a coefficient of 0.228, as in col. 3) compared to a Diploma (a coefficient of 0.097), and for those with a Post-graduate degree (a coefficient of 0.277). This is consistent with both a higher demand effect for greater skills, and a supply effect through higher hourly wages, and most likely a combination of the two effects, and the relatively lower adjusted R squared result in these models is indicative of the other potential contributing factors to the hours of work chosen by each individual. These are, however, best interpreted as equilibrium labour market outcomes, and we are not attempting here to separate the demand and supply effects. These results are consistent with the common finding that the substitution effect dominates for females, but largely cancels out with the income effect for males. But the results are also consistent with the interpretation that demand constrains the number of hours that individuals may be willing to work, and these constraints may be less binding for workers with higher qualifications. In this case, the results are consistent with post-school qualifications lifting hours constraints for females, but not males. We can't distinguish between these two interpretations in this analysis, but data in the HLFS on the existence of hours constraints could be used in subsequent work to explore the basis for these different weekly hours effects of education between males and females.

Finally, as before, the results in Appendix D provide estimates of an Hours of Work effect to each educational qualification for each of the years 1997-2002. Figure 4 further shows a plot of the

estimated hours of work effects for each year for a Bachelor's and Post-graduate degree. Figure 4 visually reflects the results as in Table 9 that the 'time trend' interaction effects with educational qualifications were individually and collectively statistically insignificant, so that a 'trend' is not statistically verified for the time period.

These results in addition to the hourly wage results have been useful in explaining the earlier results for females based on earnings, which combine the two effects. Since the *hours of work* effects in this section reflect the hours of work for those who are already employed, the analyses of the next section are useful in controlling for the link between the probability of employment and post-school qualifications.

V. Sample Selection

One issue concerning our previous estimates for the rates of return to education is sample selection bias. These coefficient estimates come from regressions that restrict the relevant sample to those who are working and reporting income or earnings in a given year. This could result in biased estimates of overall rates of return because workers in these samples are not randomly drawn from the population.

Consider the following simple representation of a sample selection model.

$$\ln W_i = X_i'\beta + u_i \tag{2}$$

$$P_i^* = Z_i'\alpha + v_i \tag{3}$$

The primary equation of interest is (2). The natural logarithm of the wage facing each individual is a linear function of the factors contained in the vector X_i. This vector includes the dummy variables on highest educational qualification. We want estimates of the rates of return to this human capital investment facing all individuals. However, hourly earnings are only observed for those working and reporting weekly earnings and hours of work. Equation (3) captures this sample selection process. The dependent variable P_i^* is latent, depicting the propensity of the individual to work and report their hourly earnings. Its observed counterpart is a binary variable P_i that takes on a value of 1 if the individual is working and reporting hourly earnings; zero otherwise.

Equation (2) can only be estimated when the dependent variable is observable. Thus, the conditional expectation of log wage for the sub-sample of workers can be written:

$$E(\ln W_i \mid X_i', P_i = 1) = X_i'\beta + E(u_i \mid v_i > Z_i'\alpha) \tag{4}$$
$$= X_i'\beta + \rho\sigma_u \frac{\phi(Z_i'\alpha)}{\Phi(Z_i'\alpha)}$$
$$= X_i'\beta + \theta\hat{\lambda}_i$$

where ρ is the correlation coefficient between u_i and v_i, σ_u is the standard deviation of u_i, and $\phi(\cdot)$ and $\Phi(\cdot)$ are probability density and cumulative density functions for the standard normal, respectively Heckman's lambda term $\hat{\lambda}_i$ is estimated after regressing P_i on Z_i'. Sample selection bias comes down to the correlation between the disturbances in equations (2) and (3). Unmeasured factors like motivation and perseverance may simultaneously influence both the propensity of working and the market wage faced by the individual. Only by incorporating this sample selection process into the estimation of our hourly earnings equation can we produce unbiased estimates of β (i.e., the rates of return facing all individuals in the population).

One of the practical barriers to the use of this sample selection approach is the difficulty of finding 'pseudo instruments' for this first-stage Probit model. Unless we find explanatory variables that directly influence the propensity of working and reporting earnings, but do not influence wages directly, the estimation of θ will be based entirely on nonlinearities in the system. Variables in the HLFS or Income Supplement must be found that are in Z_i, but are appropriately excluded from X_i.

Two sets of variables are used as pseudo instruments. These are 'household type' and 'other household income'. It is assumed at the outset that these factors influence the value of non-market time, but not the market wage rate.[9]

These sample selection regressions are estimated only for females when the dependent variables in the primary equation are either hourly or weekly earnings. It was assumed that sample selection bias would be particularly problematic among females. This initial concern seems warranted from the data. For example, in our pooled 1997-2002 sample there were 53,695 women in our sample (Table 10). Only 30,408 of these women (or 56.6%) were working and reporting positive weekly earnings and hours of work (Table 11).

The results from the first-stage, sample selection regressions are reported in Table 10. This selection Probit model was estimated for the Pooled 1997-2002 sample of females, where the dependent variable is binary, for whether or not the respondent was employed and reported positive earnings. We are using household type and other income in the household for the stage one Probit. This model performs well in terms of its overall significance and the number of explanatory variables that are statistically significant. For the second stage we have estimated both the Sample Selection Adjustment, and also Maximum Likelihood estimation for the coefficients for both the sample selection and the Primary equation. Since the two set of results were compatible, for brevity we are reporting the two-stage sample selection results.

In the first stage estimates, our instruments for household type are a binary variable for whether or not the person was married. In addition, a set of variables, which control for whether or not a person belonged to any of the categories: a household consisting of a couple without children, having one child, having more than one child, being a sole parent, a household with dependents other than children. The default or the excluded category consists of single persons without dependents. Finally, the instrument on other household income measures the proportion of total household income, which comes from sources other than the individual's income.

These estimated effects of household type all have the expected effects on the probability of working and reporting weekly earnings. In particular, women with children are substantially less likely to be included in the second-stage regression on weekly earnings. The estimated coefficients on other household income are negative and statistically significant at better than 1% levels in the last four years.

As expected, the model predicts significantly higher probabilities of employment for females with both secondary and post-school qualifications, and it shows significantly higher probabilities of employment for a Bachelor's and a Post-graduate degree compared to other educational degrees. Again, this is likely to reflect both demand for skills and supply effects, in response to higher hourly wage rates with higher post-school qualifications.

We estimate new versions of the weekly earnings and the hourly wage for females, with controls for sample selection. The second-stage results including the estimated coefficients on the constructed lambda terms are reported in Tables 11 and 12, where the dependent variable is respectively the log of weekly earnings, and the log of the hourly wage. The first column of Tables 11 and 12 present the previous results without controls for sample selection. Columns 2-4,

in turn, give the results with sample selection adjustments. The results in column 2 include lambda. The estimates in columns 3 and 4, in turn, presents the results in which we examine the validity of the instruments by including the instruments in the second stage regression. We do this in two stages, by including only the household type instruments first, in column 3, and also including other income in column 4.

There are two sets of results from these regressions that deserve particular mention. Firstly, in both Tables 11 and 12 the estimated coefficients on the lambda terms in column 2 is negative and statistically significant at better than a 1% level. This suggests that the disturbance terms in the sample selection and primary equations are negatively correlated. Unmeasured factors associated with greater work participation are associated with unmeasured factors that lead to lower market wages. This result is at odds with our expectation that these disturbance terms would be positively correlated. This result is also confirmed by negative *rho* (error correlation) measures across the two models in Maximum Likelihood estimates.

Secondly, once we control for this sample selection process, the estimated rates of return on post-school qualification among females decline substantially and uniformly across types of qualifications and years. This can be seen through the comparison of the results in columns 1 and 2 of Tables 11 and 12. This effect is more pronounced in the earnings model compared to the hourly wage model, but the effect is present in both. According to the specification of these regression model and if we were convinced that the instruments were theoretically and statistically valid, we would have concluded that the earlier estimates of much higher returns to post-secondary qualifications were biased upward by the sample selection process, with the interpretation that once we control for this sample selection regime, the 'true' rates of return are substantially lower.

However, when the instruments are directly included to the second stage regressions in columns 3 and 4, we find that the household type and other income coefficients are sometimes significant, indicating that our earlier concerns regarding the finding of suitable instruments is justified. In addition, our concern is confirmed through the switching and instability of the sign and significance of both lambda and also the changes in the coefficients on returns to educational qualifications when these adjustments are made.

A similar set of results is found when the dependent variable in the primary equation is altered from weekly earnings to hourly earnings. Comparing the results in columns 1 and 2 of Table 12,

we again see evidence of a negative sample selection process, and somewhat lower rates of return to post-school qualifications. We also found similar instability in the results when Maximum Likelihood estimations were used.

We would recommend largely ignoring these sample selection results. This is entirely due to the difficulty of finding valid pseudo instruments for this analysis. Household structure and other income clearly do influence the propensity that females will be working and reporting earnings at the time of the survey. However, it is unlikely that these same factors legitimately can be excluded from the log earnings or wage equations. There are many reasons why household structure and financial situations might directly influence the wages that working women receive. Thus, we recommend that little weight be placed on these sample selection results. Unless much better pseudo instruments can be found, the previous, simpler regression approach most likely produces more accurate estimates of the true rates of return to education. In the end, these results are to be interpreted as rates of returns estimates for those who are already employed.

VI. Vocational and Multiple Qualifications

The analyses in Sections III-V have incorporated the Highest Educational Qualification as is common in the rates of return to education literature. In this section, we use the depth and breadth of the Income Supplement to examine the effect of potentially multiple post-school qualifications. Therefore, in our analyses of post-school qualifications in this section, each qualification obtained is counted, making it possible to examine the frequency and nature of multiple qualifications. Our concern is that condensing detailed information on educational attainment into the 'highest qualification' may obscure important facets of the human capital investment process. We would expect the labour market to generally reward individuals for their entire educational portfolio. Dummy variables on the highest qualification may represent a form of measurement error, and misrepresent the true returns to complex educational histories. In particular, interaction effects between various post-school qualifications are suppressed by this simple regression specification.

A useful feature of this form of specification is that it is possible to know about the effects of vocational qualifications compared to other professional qualifications, and the effect of combined qualifications, such as a Bachelor's degree combined with a Teacher's qualification, or a Diploma.

Table 13 shows the number of individuals in the combined Income Supplement samples from 1997 to 2002, who held each of the 10 post-school qualifications. The values in each column

show the number of observations with a given school qualification and their corresponding post-school qualifications. Post-school qualifications are not restricted to individuals with the highest forms of school qualifications. For example, nearly 3 out of 10 individuals without any school qualification reported obtaining some form of post-school qualification. These tend to be concentrated in certificates and diplomas below the university level. Yet, the proportions of individuals with post-school qualifications rise steadily with the level of school qualifications. Individuals obtaining a qualification from a polytechnic were more likely to come from those with a School or Sixth Form Certificate. Nearly 3 out of 4 individuals with Bursary had some form of post-school qualification. Although they obtained post-school qualifications from a wide number of areas, Bursary holders are much more likely to obtain a university degree.

Table 13 provides further information on the link between secondary school and vocational and other post-school qualifications. This is of special interest, since most vocational qualifications are available after completing School Certificate, but university degrees generally require Bursary or Sixth Form. Table 13 shows the percentage of school leavers who had left with the four possibilities: (1) leaving school beyond age 16 and without school qualifications, (2) School Certificate (Year 11), (3) Sixth Form Certificate (Year 12), and (4) Bursary (Year 13). Table 13 shows the post-school qualification destinations of school leavers, which is useful in interpreting the rates of return estimates for different combinations of qualifications. In addition, these summary statistics highlight that of those who leave school without qualifications, a majority (70.3%) do not obtain further qualifications, and less than 1% obtain a tertiary diploma or a degree. In comparison, a minority of those who leave school with a bursary, a minority (23.0%) do not have further qualifications, and more than one-half (61.1%) have a tertiary diploma, or a Bachelor's or a Post-graduate degree.

Table 14, in turn, displays the various combinations of post-school qualifications for all individuals in the 1997-2002 samples. The column totals are the number of individuals with a given post-school qualification. An examination of Table 14 reveals that the combination of a Bachelor's degree with a Teaching qualification and a Post-graduate qualification are prominent in terms of frequency.

An implication of this form of specification with multiple qualifications is that the interpretation of coefficients is different from the results so far, in that the effect of each qualification is additive, and with multiple qualifications the total return to qualifications will be equivalent to the sum of the coefficient for each qualification. For example, when a person has a Bachelor's and a Post-

graduate degree, the combined effect is obtained by the sum of these coefficients. This further makes it possible to estimate rates of return for all of those individuals who have combinations of qualifications as in Table 14.

In this section, we re-estimate the models for the *hourly wage*, and *hours of work*, where vocational and post-school qualifications allow multiple qualifications. We have chosen these two indicators since they represent various aspects of the overall returns to education on wages and employment. These results are summarised in Tables 15 and 16. The first set of results reported for each model in the first column has the *multiple-degree* specification for vocational and post-school degrees. The second set of results presented in the second column for each model further includes 'interaction effects' for a Bachelor's degree. (Secondary school qualifications are still reflecting the highest qualification at the time of leaving secondary school with No qualifications, a School Certificate, a Sixth Form Certificate, and Bursary). These models also control for ethnicity, immigrant status and locality, as before, but only the educational qualification coefficients are reported for brevity.

The results in Tables 15 and 16 show the usefulness of specifying multiple and vocational qualification in this flexible way. In interpreting these estimated coefficients, the coefficient for each secondary school qualification represents the highest secondary school qualification relative to the base group of no-secondary-school qualification. The coefficients for vocational or post-school qualifications represent the returns to that degree, compared to having no-post-secondary school qualification. For example, for the group with both a Trade qualification, and a Technician qualification, the estimated coefficients are interpreted as the returns to each qualification, and their sum provides the estimated return for the multiple qualifications. If the highest secondary school qualification is a School Certificate, the sum of these coefficients will be the return to these qualifications compared to having no school qualification.

One result that stands out is the lower relative pay for teachers especially when the combination of a Bachelor's and Teaching degree is taken into account. For the few male nurses a similar disadvantage is not apparent. As column 2 in Table 15 further indicates, the combined returns to a Post-graduate degree can be obtained from the sum of the coefficients for a Bachelor and Post-graduate degree or 0.259+0.352-0.262=0.342, where -0.262 is the estimated combined interaction effect of the two degrees, plus the effect of a Bursary degree, which leads to tertiary study, has an additional returns coefficient of 0.204, therefore, the estimates for a Post-graduate degree based on this specification in relation to No school qualifications is the sum of these or 0.546 (the

comparative estimate in Table 8 based on the highest educational qualification in column 1 is slightly higher but not far off, at 0.560). An interesting aspect of these new results is that not everyone goes down this same path. The previous estimates showed that individuals with a post-grad qualification have a rate of return of 0.560. These new results allow a more complicated set of outcomes. A Bursary-Bachelor's-Post-Grad combination is 0.546, but a Bursary-Post-grad combination is 0.556, and a Bursary-Teacher-Bachelor's-Post-Grad combination is only 0.361. Our previous results would have predicted the same rates of return in all three of these scenarios. Our new results suggest that the entire educational histories of individuals are important.

The result regarding the lower returns to education for teachers, relative to others holding a Bachelor's degree are prominent for both males and females.

The results of the 'Hours of Work' model are summarised in Table 16. While the results for the sample of males, show little variation in the hours of work, with the main result that the hours of work were greater for those in Trades and those with Post-graduate degrees, the results for females show a variety of significant estimated coefficients for hour of work variations. These results in column 4 show the highest hours of work for females holding a Bachelor's, or a Teacher's degree, followed by those holding Post-graduate degrees, followed by Technician Degrees and Certificates. This result shows that the lower hourly wage of teachers is also associated with higher hours of work.

A result that is consistent across the two models in this section is that compared to the earlier specification of these models (comparing Tables 8 and 9 to their equivalent Tables 15 and 16), this specification approach, which includes an expanded list of vocational and flexible qualifications results in increased explanatory power of the model. This is confirmed through incremental F-tests of two models that show significantly higher overall explanatory power at better than 1 per cent level, and as reflected by the higher 'adjusted R-squares' in the multiple qualifications model. In addition, the set of interaction effects with a Bachelor's degree, added in the second column are also statistically significant at better than 1% level, again as reflected by their higher adjusted R-squares.

VII. Conclusion

The analyses in this study, which have taken advantage of the variable structure in the HLFS Income Supplement have extended the previous findings of returns to education based on the

Census. First, our estimates of returns to education, in Section III, based on income and model specifications of highest qualification similar to the Census analyses, reproduce rates of return that are generally comparable. In addition, similar to the estimates based on the Census, the weekly earnings and weekly income returns to post-school qualifications are higher for females than males, despite lower mean income levels. This gender difference disappears, however, when differences in hours are controlled for. Returns to education, measured in terms of hourly earnings, are similar for men and women.

A comparison of the estimates of returns to post-school qualifications based on the Income Supplement for 1997, and the Census for 1996 (the closest that one can get to an overlap of years based on the two data sets), shows that for both males and females the estimated returns to education are slightly lower based on the Income Supplement in 1997. For example, for the sample of the full-time employed males the coefficient for the returns to the Bachelor's degree is 0.56 based on the Census, compared to 0.54 based on the Income Supplement. Likewise, for a Post-graduate degree the coefficients are, respectively, 0.68 based on the Census and 0.65 based on the Income Supplement. These differences are expected to reflect the inevitable differences in the two data sets. For example, the information on income in the Census is based on the annual income of the previous year, but in the Income Supplement it is based on the actual income for the previous week. Another difference between the data sets is that the information on income in the Census is in 13 categories, while in the Income Supplement it is continuous. Therefore, we suggest that considering time trends across the two data sets is not advisable, but within each data set comparisons across time is recommended. However, the results further confirm that the estimates based on the Census and the Income Supplement with the same modelling approach are generally within a narrow band.

The extended models, in Section IV, with the four alternative dependent variables, and added control variables for ethnicity, immigrant status, and locality perform well. We find that while these extended models have higher explanatory power, in general, the addition of control variables for various demographic characteristics has relatively minor effects on our estimated rates of return.

In Sections IV-VI data from all of the six years of the Income Supplement is used in regression analyses. We find no statistical support for the hypothesis that average rates of return have been rising or falling for the highest formal qualification between 1997 and 2002. This result holds across the three dependent variables (weekly income, weekly earnings and hourly earnings) and

separate regressions for males and females in Section IV.

While the estimates of returns to post-school education based on weekly income and weekly earnings are very compatible, the estimates based on earnings are generally higher than those based on income. This relationship in the estimated results is understandable, as earnings are expected to reflect employment rewards through the labour market more closely than income would, which has other unearned income and self-employment income components. For example the estimated rate of return coefficient of 0.206 for a Diploma for males based on income measures can be compared to 0.259 for weekly earnings, and for a Bachelor's degree of 0.451, to 0.476 based on earnings. This analysis also indicates that on this account, previous studies may have underestimated at least some of these rates of return by using income data from the Population Census, which combines both labour and non-labour sources of income.

Weekly hours of work are positively associated with post-school qualifications for females, but not for males. It is difficult to know from the present analysis, however, whether these differences in weekly hours of work by highest qualification across females represent additional returns to education or labour supply propensities that may have influenced earlier human capital investment decisions. Sample selection bias issues are therefore, addressed in estimating the rates of return to education among females in Section V. However, the lack of suitable variables from the HLFS that can be included in the participation equation, but reasonably excluded from the earnings equation raises some serious questions about the value of this approach.

Finally, our analyses in section VI with multiple and vocational qualifications are satisfactory and promising in allowing estimations of returns to education that can account for a variety of skill combinations. The consideration of the diversity of human capital investments represented by various combinations of school and post-school qualifications provides much richer and interesting picture of the way in which qualifications matter in labour market. In this analysis, we use the Income Supplement to examine the effect of potentially multiple post-school qualifications. Therefore, in our analyses of post-school qualifications in this section, each qualification obtained is counted, making it possible to examine the frequency and nature of multiple qualifications. We would expect the labour market to generally reward individuals for their entire educational portfolio. A useful feature of this form of specification is that it is possible to know about the effects of vocational qualifications compared to other professional qualifications, and the effect of combined qualifications, such as a Bachelor's degree combined with a Teacher's qualification, or a Diploma. One result that stands out in the analysis of multiple

qualifications is the lower relative pay for teachers especially when the combination of a Bachelor's and Teaching degree is taken into account. This result is prominent for both males and females, and somewhat surprisingly, this result shows that the lower hourly wage of teachers is also associated with higher hours of work.

While the results for the sample of males, show little variation in the 'hours of work', with the main result that the hours of work were greater for those in Trades and those with Post-graduate degrees, the results for females show a variety of significant estimated coefficients for hour of work variations. These analyses show the highest hours of work for females holding a Bachelor's, or a Teacher's degree, followed by those holding Post-graduate degrees, followed by Technician Degrees and Certificates.

Overall, in addition to the availability of information on earnings, the hourly wage and hours of work, the feature of the study which incorporates analyses with multiple and vocational qualifications is promising in allowing estimations of returns to education that can account for a variety of skill combinations, and we find that there is significant scope for future use of these features of the Income Supplement.

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Footnotes

1 Schultz (1988) provides an overview of relevant issues. Tan (1989) provides evidence for the Philippines, Anderson (1988) for El Salvador, and Jamison and Van der Gaag (1987) provide estimates for the People's Republic of China.

2 The second question is only asked of those who reported that they had obtained a qualification since leaving school. The seven categories for school qualifications are: *(i)* Primary Proficiency Examination, *(ii)* School Certificate in one or more subjects, *(iii)* Sixth Form Certificate or University Entrance in one or more subjects, *(iv)* Higher School or Higher Leaving Certificate, *(v)* University Bursary or Scholarship, *(vi)* Overseas Qualification, and *(vii)* Other. The ten categories for post-school qualifications are: *(i)* Trade Certificate or Advanced Trade Certificate, *(ii)* Nursing Certificate or Diploma, *(iii)* New Zealand Certificate or Diploma *(iv)* Technicians Certificate, *(v)* Local Polytechnic Certificate or Diploma, *(vi)* Teachers Certificate or Diploma *(vii)* University Certificate or Diploma Below Bachelor Level, *(viii)* Bachelors Degree *(ix)* Postgraduate Degree, Certificate or Diploma, and *(x)* Other Qualification.

3 The variables in the Income Supplement used in the current report are as follows: Total actual weekly earnings from all jobs (variable dv5_1), Total actual hourly earnings (variable dv5_2), and Total usual weekly hours of work (variable dv5_6). These three variables use the same sample and are for the wage and salary earners. Total actual weekly *income* in the Income Supplement has income from all sources, and this is comparable to the Census analyses in Maani (1999). The actual weekly income variable used, in response to LMPG suggestion, is the revised version, which is derived by (variables dv16 - dv6+dv1+de5_1), where dv6 is replaced by dv1, thereby excluding usual weekly income for self employed workers, and instead including the actual value.

4 In New Zealand, schooling starts during a child's fifth year and continues for thirteen years. Education is compulsory in New Zealand up to and including the Fifth Form (Year 11, and age 16), at the end of which nationally administered School Certificate examinations on up to six subjects are taken (also called NCEA, National Certificate of Educational Achievement). Traditionally, School Certificate has been the highest educational qualification for at least half of the New Zealand population, and many vocational, clerical and trade professions require it. Bursary examinations at the end of the 7th Form (Year 13) are nationally administered examinations, which determine eligibility for application to various university majors. Admission to the universities in New Zealand requires Year 13 Bursary, while a number of polytechnic diplomas and degrees require Sixth Form Certificate (Year 12) or Year 11 School Certificate. Nevertheless, some students choose to complete Years 12 or 13 and then go to polytechnic. As a result, it is noteworthy that the idea of the completion of secondary school has a wider application in New Zealand by referring to either 12 or 13 years.

5 Heckman, J. and S. Polachek (1974) and Dougherty, C.R. and E. Jimenez (1991) have provided tests of the functional form for the earnings function, and they support the semi-log specification as the most appropriate of the conventional transformations. Heckman et al. (1996) have provided further evidence that educational degrees have the most effect once they are completed. This, referred to as the 'sheepskin effect', is consistent with the specification adopted here.

6 Sixth Form Certificate refers to the successful completion of examinations at the end of Year 12.

7 The New Zealand Census and the Income Supplement do not provide information on the actual years of experience. In the original human capital models, variables for experience and experience squared are included instead of age, where experience is specified as 'age - years of schooling - 5'. Using a specification as above instead of age results in returns to education that are somewhat higher, especially at higher levels of education. Using age compares two individuals of the same age but varying years of education and potential job experience. We are using *age* for its comparability with Maani (1999), and its advantage in being less restrictive in assuming the number of years it may take different individuals to complete a degree, especially when we examine the returns to vocational and multiple qualifications, which may be taken from different points and levels of secondary school and school leaving.

8 In addition, it may be noted that the analyses of the returns to education are compatible with both 'human capital' theory, adopted here, and ' screening' or 'signalling' models, in that in either type of model a person is expected to invest in education up to the point where the marginal benefits of investment are equal to marginal costs. While human capital theory emphasises the role of increased productivity due to increased education, screening hypotheses emphasise the role of education as a positional good. Signalling models further emphasise the role of educational qualifications as a signal of individual ability. The distinction is less significant in relation to personal investments in education, but more so in interpreting the social value of education in producing increased labour productivity and economic growth. (The reader may also refer to the new growth models and the link between educational investments and increased productivity and economic growth).

9 There are nine categories for household type in the HLFS. This includes such categories as single adult, married couple without children, married couple with one child, etc. All nine of these dummy variables for household type are include in the Probit estimation of the sample selection equation. Other Income includes all income of household members other than the respondent.

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Table 1: Characteristics of the Full Samples

Personal Characteristics	1997		2002	
	Mean	Standard Deviation	Mean	Standard Deviation
AGE	40.448	9.53	41.353	9.47
FEMALE	0.525	0.50	0.531	0.50
MAORI	0.118	0.32	0.132	0.34
PAC_ISLAND	0.054	0.23	0.057	0.23
MIGRANT	0.201	0.40	0.199	0.40
SCHOOL CERT	0.106	0.31	0.101	0.30
SIXTH FORM	0.067	0.25	0.065	0.25
BURSARY	0.035	0.18	0.040	0.20
DIPLOMA	0.392	0.49	0.418	0.49
BACHELOR	0.073	0.26	0.092	0.29
MASTERS	0.033	0.18	0.038	0.19
URBAN	0.737	0.44	0.709	0.45
TOWN	0.163	0.37	0.180	0.38
INCOME (Nominal $)	444.763	482.37	541.465	595.36
EMPLOYED	0.745	0.44	0.767	0.42
FULL-TIME	0.443	0.50	0.468	0.50
ONE CHILD	0.178	0.38	0.099	0.30
MORE CHILDREN	0.229	0.42	0.240	0.43
SOLE PARENT	0.046	0.21	0.060	0.24
OTHER DEPENDENTS	0.267	0.44	0.275	0.45
COUPLE	0.222	0.42	0.237	0.43
OTHER INCOME	0.384	0.52	0.451	0.61
Sample Size	17,267		17,902	

Samples consist of the age group 25-59, employed and not employed.

Table 2: Characteristics of the Samples

Means

Personal Characteristics	1997				2002			
	All Employed		Full-Time Employed		All Employed		Full-Time Employed	
	Males	Females	Males	Females	Males	Females	Males	Females
AGE	39.722	39.874	39.739	39.673	40.650	41.064	40.617	40.843
	(9.37)	(9.23)	(9.31)	(9.51)	(9.34)	(9.16)	(9.25)	(9.31)
MAORI	0.108	0.100	0.105	0.102	0.123	0.130	0.121	0.346
PAC_ISLAND	0.055	0.050	0.055	0.061	0.060	0.050	0.059	0.238
MIGRANT	0.195	0.187	0.197	0.198	0.194	0.173	0.191	0.388
SCHOOL CERT	0.081	0.135	0.080	0.131	0.080	0.122	0.079	0.316
SIXTH FORM	0.066	0.075	0.066	0.077	0.056	0.077	0.058	0.271
BURSARY	0.026	0.033	0.027	0.034	0.034	0.032	0.032	0.183
DIPLOMA	0.448	0.406	0.451	0.404	0.466	0.421	0.471	0.492
BACHELOR	0.087	0.076	0.087	0.092	0.097	0.101	0.098	0.328
MASTERS	0.047	0.033	0.048	0.042	0.050	0.039	0.052	0.216
URBAN	0.759	0.771	0.761	0.796	0.725	0.731	0.727	0.427
TOWN	0.168	0.155	0.166	0.142	0.191	0.179	0.192	0.369
INCOME (weekly)								
(Nominal $)	724.879	459.073	758.003	586.720	816.334	564.044	850.765	697.242
	(398.66)	(276.08)	(390.56)	(258.02)	(434.50)	(430.27)	(422.81)	(312.41)
(2002 $)	794.650	503.260	830.962	643.192	--	--	--	--
	(437.03)	(302.66)	(428.15)	(282.85)	--	--	--	--
EARNINGS (weekly)								
(Nominal $)	710.896	435.903	751.249	578.701	801.877	529.009	845.681	686.759
	(396.65)	(284.15)	(384.83)	(257.32)	(439.34)	(434.62)	(423.93)	(308.63)
(2002 $)	779.321	477.859	823.558	634.402	--	--	--	--
	(434.83)	(311.50)	(421.87)	(282.09)	--	--	--	--
WAGE (hourly)								
(Nominal $)	16.896	13.667	16.502	13.786	21.372	17.050	18.765	16.390
	(16.42)	(7.33)	(8.07)	(5.79)	(84.40)	(40.51)	(8.94)	(6.57)
(2002 $)	18.522	14.983	18.090	15.113	--	--	--	--
	(18.00)	(8.04)	(8.85)	(6.35)	--	--	--	--
HOURS (weekly)	43.225	31.972	45.986	42.212	42.935	32.687	45.356	41.851
	(12.55)	(14.78)	(9.72)	(8.03)	(11.36)	(13.95)	(8.51)	(7.80)
FULL-TIME	0.897	0.594	-	-	0.906	0.610	-	-
Sample Size	5181	5043	4648	2997	5459	5602	4948	3418

Table 3: Percentage of Sample with Vocational and Multiple Qualifications

Percentages

Qualifications	1997				2002			
	All Employed		Full-Time Employed		All Employed		Full-Time Employed	
	Males	Females	Males	Females	Males	Females	Males	Females
TRADE	23.0	4.3	23.3	4.6	22.9	3.3	23.6	3.1
NURSING	0.7	6.8	0.6	6.3	0.3	7.2	0.3	7.3
CERTIFICATE	7.7	8.4	7.8	8.7	8.9	8.9	9.1	8.9
TECHNICIAN	2.0	0.5	2.0	0.6	1.4	0.3	1.5	0.4
POLYTECH	6.2	11.9	6.2	11.8	7.9	13.0	7.9	12.7
TEACHER	3.0	7.8	3.1	9.0	2.5	7.7	2.4	8.8
DIPLOMA	2.9	2.7	2.8	2.9	2.9	3.1	3.0	3.5
BACHELOR	12.4	10.2	12.5	12.5	13.1	12.8	13.2	15.6
POST – GRAD	4.7	3.3	4.8	4.2	5.0	3.9	5.2	4.9
OTHER –PS	7.6	7.2	7.6	6.9	10.4	8.6	10.2	8.2
Sample Size	5,181	5,043	4,648	2,997	5,459	5,602	4,948	3,418

Table 4: 'Income' Effects of Secondary and Tertiary Education of Males: 1997 and 2002

(Dependent Variable: The Natural Logarithm of Weekly Income)

Least Squares Regression Coefficients
(t-ratios)

Explanatory Variables	All Employed Males		Employed Full-Time Males	
	1997	2002	1997	2002
Constant	4.240**	4.539**	4.737**	5.113**
	(49.97)	(65.49)	(85.01)	(105.92)
School Certificate	0.102**	0.122**	0.159**	0.114**
	(3.66)	(5.23)	(7.84)	(6.41)
UE or Sixth Form Cert.	0.175**	0.141**	0.266**	0.195**
	(5.91)	(4.80)	(12.27)	(8.72)
Bursary	-0.109*	-0.119**	0.209**	0.067*
	(2.11)	(2.89)	(5.32)	(2.13)
Diploma	0.224**	0.185**	0.280**	0.199**
	(12.44)	(11.84)	(19.35)	(16.47)
Bachelor's Degree	0.454**	0.405**	0.539**	0.457**
	(14.20)	(14.42)	(24.35)	(21.20)
Postgraduate Qualification	0.551**	0.580**	0.645**	0.589**
	(12.42)	(15.87)	(20.42)	(19.91)
Age	0.094**	0.087**	0. 071**	0.060**
	(21.50)	(24.26)	(23.41)	(23.22)
Age^2	-0.001**	-0.0009**	-0.0007**	-0.0006**
	(19.01)	(22.06)	(19.73)	(19.48)
F	160.56	194.10	258.04	234.24
$\bar{R}^2$	0.137	0.154	0.297	0.242
Sample Size	8,023	8,503	4,860	5,839

Note-Samples cover age groups 16-64 for comparisons with Census studies (Maani, 1996, 1997, 1999). Comparable results for age groups 25-59 are also available in Table B1 in Appendix B.

** Significant at 1% Level.
* Significant at 5% Level.

Table 5: 'Income' Effects of Secondary and Tertiary Education of Females: 1997 and 2002

(Dependent Variable: The Natural Logarithm of Weekly Income)

Least Squares Regression Coefficients
(t-ratios)

Explanatory Variables	All Employed Females		Employed Full-Time Females	
	1997	2002	1997	2002
Intercept	4.754**	4.628**	4.939**	5.228**
	(47.91)	(54.38)	(77.83)	(94.06)
School Certificate	0.187**	0.101**	0.162**	0.094**
	(5.88)	(3.57)	(8.57)	(5.03)
UE or Sixth Form Cert.	0.150**	0.195**	0.258**	0.200**
	(3.67)	(5.83)	(11.03)	(8.51)
Bursary	-0.013	-0.042	0.133**	0.156**
	(0.26)	(0.93)	(4.11)	(5.39)
Diploma	0.296**	0.2196**	0.252**	0.204**
	(11.57)	(10.49)	(16.45)	(14.17)
Bachelor's Degree	0.605**	0.499**	0.492**	0.4562**
	(15.98)	(16.09)	(21.09)	(21.85)
Postgraduate Qualification	0.746**	0.674**	0.626**	0.614**
	(11.69)	(13.57)	(16.89)	(18.54)
Age	0.042**	0.062**	0.054**	0.047**
	(7.98)	(14.07)	(15.77)	(15.80)
Age^2	-0.0005**	-0.0007**	-0.0006**	-0.0005**
	(6.90)	(12.63)	(13.67)	(13.53)
F (8, N-9)	63.44	94.58	133.56	142.00
$\overline{R}^2$	0.067	0.090	0.247	0.220
Sample Size	6,864	7,538	3,228	3,995

Note-Samples cover age groups 16-64 for comparisons with Census studies (Maani, 1996, 1997, 1999). Comparable results for age groups 25-59 are also available in Table B2 in Appendix B.

** Significant at 1% Level.
* Significant at 5% Level.

Table 6: Extended Regression Results for 'Income' Effects of Highest Qualifications : 1997-2002

(Dependent Variable: The Natural Logarithm of Annual Income)
Least Squares Regression Coefficients

(t-ratios)

Variables	Males Without Time Trend Interactions		Females With Time Trend Interactions	
Constant	5.078**	5.073**	5.714**	5.705**
	(84.64)	(83.87)	(75.74)	(74.65)
AGE	0.062**	0.062**	0.006	0.006
	(21.31)	(21.28)	(1.64)	(1.66)
AGE^2	-0.0007**	-0.0007**	-0.0001	-0.0001
	(-20.02)	(-19.99)	(-1.36)	(-1.37)
MAORI	-0.082**	-0.082**	0.042**	0.042**
	(-8.54)	(-8.55)	(3.56)	(3.58)
PACIFIC	-0.203**	-0.203**	-0.039*	-0.040*
	(-16.24)	(-16.23)	(-2.44)	(-2.48)
MIGRANT	-0.058**	-0.058**	-0.012	-0.012
	(-5.52)	(-5.52)	(-0.97)	(-0.95)
INV MIG YEARS	-0.218**	-0.217**	-0.119**	-0.119**
	(-7.22)	(-7.18)	(-3.09)	(-3.09)
URBAN	0.083**	0.083**	0.096**	0.096**
	(7.45)	(7.44)	(6.42)	(6.43)
TOWN	0.073**	0.726**	-0.008	-0.008
	(5.84)	(5.83)	(-0.48)	(-0.46)
SCHOOL CERT	0.109**	0.105**	.109**	0.143**
	(9.15)	(3.78)	(8.42)	(4.71)
SIXTH FORM	0.206**	0.190**	0.197**	0.161**
	(15.31)	(6.31)	(11.72)	(3.95)
BURSARY	0.123**	0.172**	0.094**	0.072
	(6.18)	(3.55)	(4.12)	(1.35)
DIPLOMA	0.206**	0.220**	0.222**	0.245**
	(27.25)	(12.53)	(22.19)	(10.31)
BACHELOR	0.451**	0.487**	0.518**	0.527**
	(34.51)	(16.40)	(34.10)	(14.67)
MASTERS	0.563**	0.556**	0.676**	0.706**
	(29.51)	(13.12)	(32.09)	(13.11)

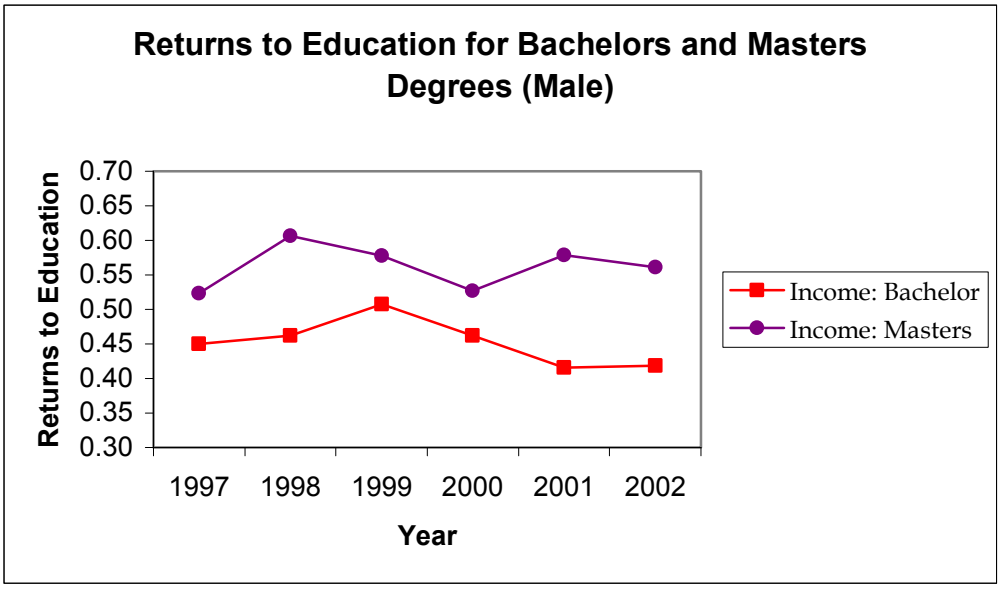
Table continues

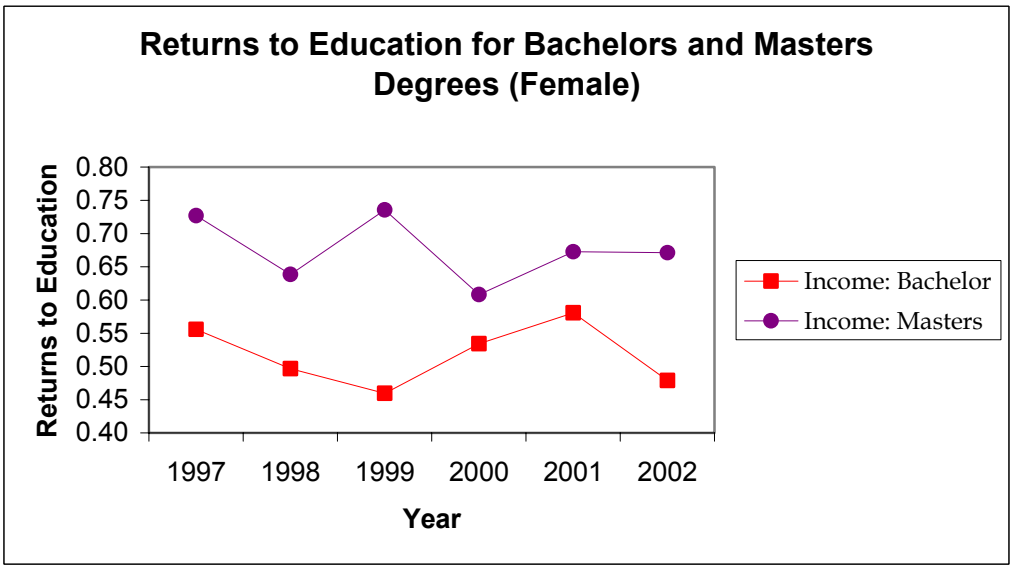
Table continued

Time Trend Interaction Effects:				
T_SCHOOL CERT	- -	0.0009 (0.14)	- -	-0.009 (-1.24)
T_SIXTH FORM	- -	0.005 (0.58)	- -	0.010 (0.98)
T_BURSARY	- -	0.014 (-1.19)	- -	0.01 (0.50)
T_DIPLOMA	- -	-0.004 (-0.94)	- -	-0.007 (-1.133)
T_BACHELOR	- -	-0.010 (-1.36)	- -	-0.003 (-0.31)
T_MASTERS	- -	0.002 (0.01)	- -	-0.008 (-0.64)
F $\overline{\mathbf{R}}^{\mathbf{2}}$	F[30, 39688] = 135.09 0.092	F[36, 39682] = 112.72 0.092	F[30, 34840] = 108.82 0.085	F[36, 34834] = 90.86 0.085
Sample Size	39,719	39,719	34,871	34,871

** Significant at 1% Level *Significant at 5% Level

Figure 1: 'Income' Returns To Post-school Qualifications: 1997-2002





Note: Estimated regression coefficients on the vertical axis. Estimates are based on results as reported in Tables D1 and D2 in Appendix D.

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Table 7: Extended Regression Results for 'Earnings' Effects of Highest Qualifications

(Dependent Variable: The Natural Logarithm of Weekly Earnings)
Least Squares Regression Coefficients (t-ratios in brackets)

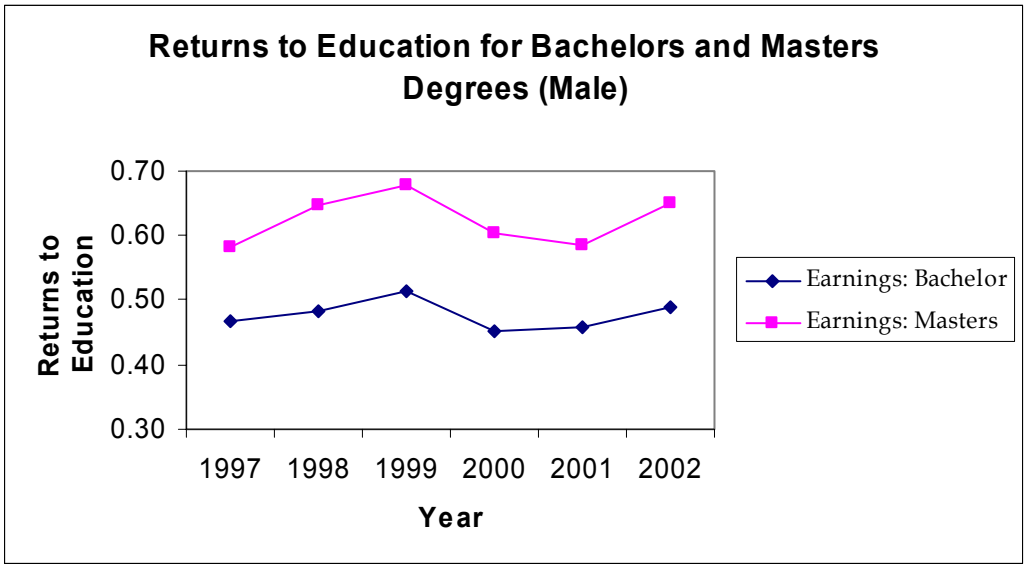
Variables	Males		Females	
	Without Time Trend Interactions	With Time Trend Interactions	Without Time Trend Interactions	With Time Trend Interactions
Constant	4.863**	4.865**	5.443**	5.407**
	(72.22)	(71.62)	(60.66)	(59.42)
AGE	0.074**	0.736**	0.010*	0.010*
	(22.44)	(22.43)	(2.32)	(2.35)
AGE^2	-0.0008**	-0.0008**	-0.0001	0.0001
	(-20.95)	(-20.94)	(-1.55)	(-1.57)
MAORI	-0.114**	-0.114**	-0.032*	-0.032*
	(-10.29)	(-10.30)	(-2.18)	(-2.17)
PACIFIC	-0.233**	-0.233**	-0.052**	-0.053**
	(-16.16)	(-16.15)	(-2.71)	(-2.76)
MIGRANT	-0.036**	-0.036**	-0.036*	-0.036*
	(-3.30)	(-3.32)	(-2.50)	(-2.47)
INV MIG YEARS	-0.263**	-0.262**	-0.078	-0.078
	(-7.76)	(-7.71)	(-1.83)	(-1.85)
URBAN	0.031*	0.031*	0.150**	0.151**
	(2.44)	(2.44)	(8.38)	(8.43)
TOWN	0.042**	0.042**	0.024	0.025
	(3.06)	(3.06)	(1.18)	(1.23)
9 REGIONAL DVs	YES	YES	YES	YES
SCHOOL CERT	0.144**	0.154**	0.181**	0.251**
	(11.33)	(5.63)	(11.70)	(7.20)
SIXTH FORM	0.253**	0.237**	0.328**	0.337**
	(16.82)	(7.28)	(17.16)	(7.56)
BURSARY	0.157**	0.207**	0.189**	0.178**
	(7.02)	(4.05)	(7.12)	(3.00)
DIPLOMA	0.259**	0.253**	0.330**	0.413**
	(29.24)	(13.16)	(27.55)	(15.27)
BACHELOR	0.476**	0.478**	0.701**	0.730**
	(33.91)	(15.70)	(40.55)	(18.44)
MASTERS	0.623**	0.612**	0.850**	0.851**
	(34.15)	(15.67)	(36.03)	(14.38)

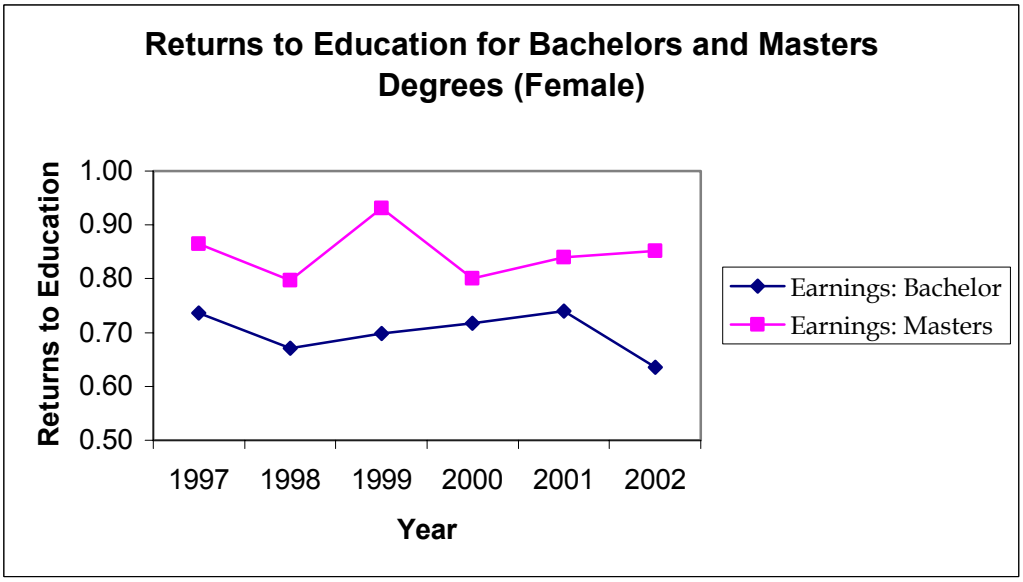
Table Continues

Table continued

Time Trend Interaction Effects:				
T_SCHOOL CERT	- -	-0.003 (-0.37)	- -	-0.020* (-2.28)
T_SIXTH FORM	- -	0.005 (-0.54)	- -	-0.003 (-0.26)
T_BURSARY	- -	-0.014 (-1.10)	- -	0.003 (0.20)
T_DIPLOMA	- -	0.002 (0.37)	- -	-0.024** (-3.45)
T_BACHELOR	- -	-0.0005 (-0.06)	- -	-0.009 (-0.92)
T_MASTERS	- -	0.003 (0.33)	- -	-0.001 (-0.09)
F	F[30, 30142] = 139.86	F[36, 30136] = 116.61	F[30, 30585] = 136.45	F[36, 30579] = 114.25
$\overline{R}^2$	0.121	0.121	0.117	0.118
Sample Size	30,173	30,173	30,616	30,616

Figure 2: 'Earnings' Returns To Post-school Qualifications: 1997-2002





Note: Estimated regression coefficients on the vertical axis. Estimates are based on results as reported in Tables D1 and D2 in Appendix D.

Table 8: The 'Hourly Wage' and Highest Qualifications

(Dependent Variable: The Natural Logarithm of the Hourly Wage)
Least Squares Regression Coefficients (t-ratios in brackets)

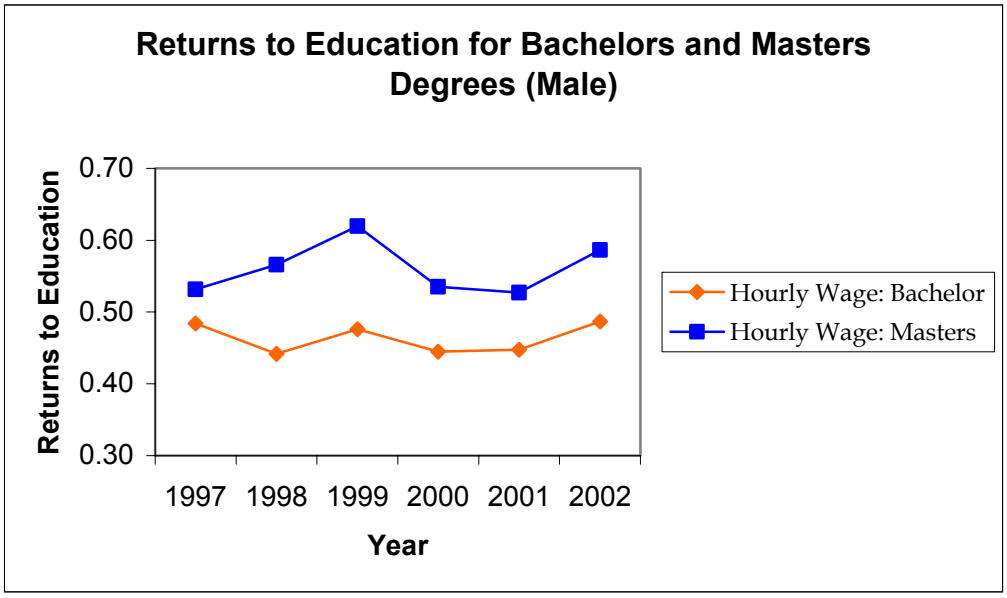
Variables	Males		Females	
	Without Time Trend Interactions	With Time Trend Interactions	Without Time Trend Interactions	With Time Trend Interactions
Constant	1.538**	1.537**	2.020**	2.008**
	(31.57)	(31.30)	(45.42)	(44.82)
AGE	0.052**	0.052**	0.023**	0.023**
	(21.74)	(21.73)	(10.63)	(10.65)
AGE^2	-0.0006**	-0.0006**	-0.0003**	-0.0002**
	(-19.37)	(-19.35)	(-9.49)	(-9.502)
MAORI	-0.082**	-0.082**	-0.090**	-0.090**
	(-10.54)	(-10.55)	(-11.90)	(-11.87)
PACIFIC	-0.203**	-0.203**	-0.159**	-0.159**
	(-18.85)	(-18.85)	(-14.51)	(-14.56)
MIGRANT	-0.025**	-0.025**	-0.023**	-0.023**
	(-3.00)	(-3.01)	(-2.86)	(-2.84)
INV MIG YEARS	-0.166**	-0.166**	-0.096**	-0.096**
	(-6.59)	(-6.57)	(-4.12)	(-4.17)
URBAN	0.049**	0.049**	0.032**	0.033**
	(5.37)	(5.37)	(3.74)	(3.80)
TOWN	0.036**	0.037**	-0.025**	-0.025**
	(3.58)	(3.59)	(-2.62)	(-2.58)
9 REGIONAL DVs	YES	YES	YES	YES
SCHOOL CERT	0.145**	0.159**	0.127**	0.148**
	(15.53)	(7.81)	(17.70)	(9.47)
SIXTH FORM	0.244**	0.236**	0.238**	0.244**
	(23.39)	(10.31)	(24.84)	(11.44)
BURSARY	0.168**	0.196**	0.122**	0.091**
	(10.60)	(5.11)	(8.46)	(2.78)
DIPLOMA	0.236**	0.237**	0.234**	0.269**
	(37.92)	(17.04)	(40.61)	(21.15)
BACHELOR	0.464**	0.463**	0.473**	0.490**
	(44.64)	(20.42)	(48.09)	(22.29)
MASTERS	0.560**	0.551**	0.570**	0.504**
	(38.67)	(18.88)	(37.90)	(13.26)

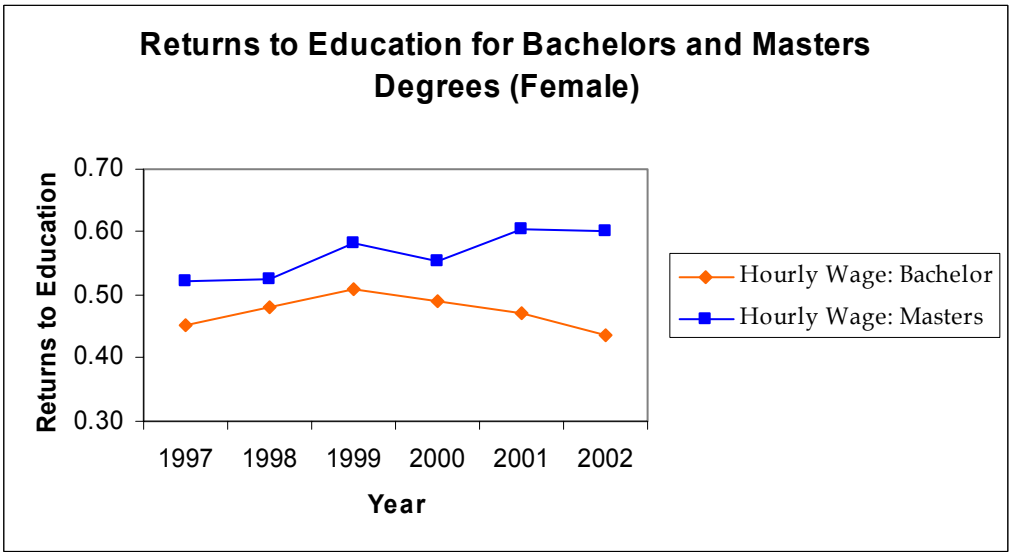
Table Continues

Table continued

Time Trend Interaction Effects:				
T_SCHOOL CERT	-	-0.004	-	-0.006
	-	(-0.79)	-	(-1.50)
T_SIXTH FORM	-	0.002	-	-0.195
	-	(0.39)	-	(-0.34)
T_BURSARY	-	-0.008	-	0.009
	-	(-0.81)	-	(1.02)
T_DIPLOMA	-	-0.0003	-	-0.010**
	-	(-0.07)	-	(-3.09)
T_BACHELOR	-	0.0002	-	-0.005
	-	(0.03)	-	(-0.91)
T_MASTERS	-	0.003	-	0.017
	-	(0.35)	-	(1.91)
F	F[30, 30142] = 201.15	F[36, 30136] = 167.65	F[30, 30585] = 221.69	F[36, 30579] = 185.53
$\overline{R}^2$	0.166	0.166	0.178	0.178
Sample Size	30,173	30,173	30,616	30,616

Figure 3: 'Hourly Wage' Returns To Post-school Qualifications: 1997-2002





Note: Estimated regression coefficients on the vertical axis. Estimates are based on results as reported in Tables D1 and D2 in Appendix D.

Table 9: 'Hours of Work' and Highest Qualifications

(Dependent Variable: The Natural Logarithm of Weekly Hours Worked)
Least Squares Regression Coefficients (t-ratios in brackets)

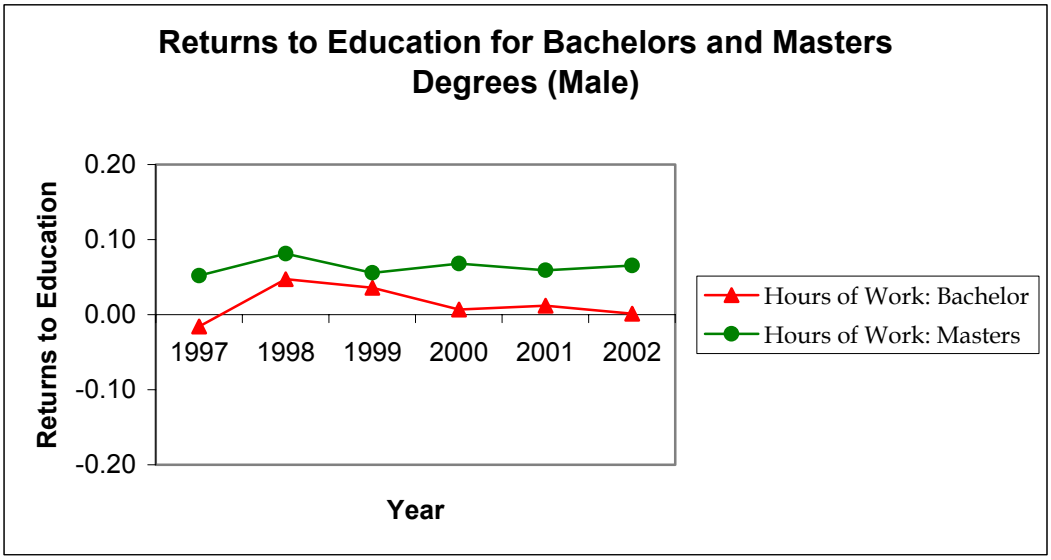
Variables	Males		Females	
	Without Time Trend Interactions	With Time Trend Interactions	Without Time Trend Interactions	With Time Trend Interactions
Constant	3.325**	3.327**	3.417**	3.394**
	(67.75)	(67.31)	(45.18)	(44.14)
AGE	0.022**	0.022**	-0.012**	-0.012**
	(9.13)	(9.12)	(-3.40)	(-3.37)
AGE^2	-0.0003**	-0.0003**	0.0001**	0.0002**
	(-9.35)	(-9.34)	(3.61)	(3.59)
MAORI	-0.032**	-0.032**	0.058**	0.058**
	(-3.74)	(-3.75)	(4.78)	(4.78)
PACIFIC	-0.029**	-0.029**	0.107**	0.107**
	(-2.81)	(-2.81)	(6.72)	(6.68)
MIGRANT	-0.010	-0.011	-0.014	-0.014
	(-1.41)	(-1.43)	(-1.14)	(-1.12)
INV MIG YEARS	-0.098**	-0.097**	0.019	0.019
	(-4.35)	(-4.31)	(0.56)	(0.55)
URBAN	-0.018*	-0.018*	0.119**	0.120**
	(-1.98)	(-1.98)	(7.68)	(7.71)
TOWN	0.007	0.007	0.049**	0.050**
	(0.74)	(0.73)	(2.82)	(2.85)
9 REGIONAL DVs	YES	YES	YES	YES
SCHOOL CERT	0.0001	-0.005	0.055**	0.106**
	(0.01)	(-0.24)	(4.20)	(3.52)
SIXTH FORM	0.009	0.002	0.090**	0.091*
	(0.86)	(0.07)	(5.67)	(2.47)
BURSARY	-0.012	0.011	0.075**	0.103*
	(-0.77)	(0.34)	(3.39)	(2.11)
DIPLOMA	0.023**	0.016	0.097**	0.145**
	(3.74)	(1.20)	(9.48)	(6.24)
BACHELOR	0.013	0.018	0.228**	0.241**
	(1.39)	(0.86)	(14.97)	(6.84)
MASTERS	0.064**	0.061*	0.277**	0.334**
	(5.74)	(2.52)	(14.19)	(7.12)

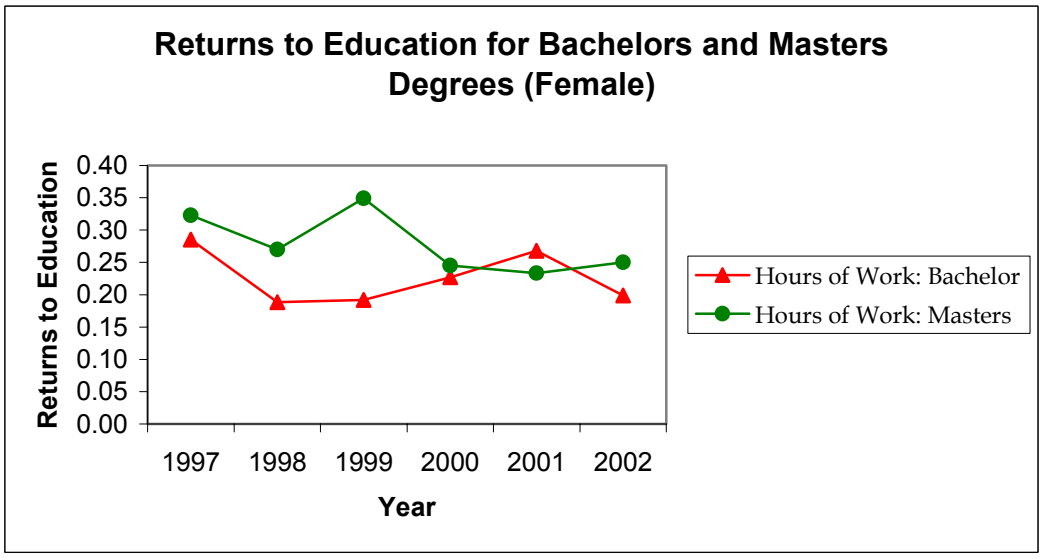
Table continues

Table continued

Time Trend Interaction Effects	0.064** (5.74)	0.061* (2.52)	0.277** (14.19)	0.334** (7.12)
T_SCHOOL CERT	- -	0.001 (0.28)	- -	-0.014 (-1.915)
T_SIXTH FORM	- -	0.002 (0.37)	- -	-0.001 (-0.07)
T_BURSARY	- -	-0.006 (-0.76)	- -	-0.008 (-0.654)
T_DIPLOMA	- -	0.002 (0.64)	- -	-0.014* (-2.38)
T_BACHELOR	- -	-0.001 (-0.23)	- -	-0.004 (-0.05)
T_MASTERS	- -	0.001 (0.10)	- -	-0.016 (-1.40)
F	F[30, 30142] = 9.65	F[36, 30136] = 8.09	F[30, 30585] = 35.13	F[36, 30579] = 29.52
$\overline{\mathbf{R}}^{\mathbf{2}}$	0.009	0.008	0.032	0.032
Sample Size	30,173	30,173	30,616	30,616

Figure 4: 'Hours of Work' Effects of Post-school Qualifications: 1997-2002





Note: Estimated regression coefficients on the vertical axis. Estimates are based on results as reported in Tables D1 and D2 in Appendix D.

Table 10: (Stage One) Sample Selection Probit

Maximum Likelihood Coefficients and t-ratios

Variables	Coefficient	t - ratio
Constant	-2.748**	-23.45
AGE	0.140**	24.76
AGE^2	-0.002**	-26.05
MAORI	-0.118**	-6.66
PACIFIC	0.063*	2.32
MIGRANT	-0.098**	-5.151
INV MIG YEARS	-0.728**	-15.45
URBAN	0.374**	19.27
TOWN	0.323**	14.59
SCHOOL CERT	0.314**	16.42
SIXTH FORM	0.311**	13.21
BURSARY	0.169**	5.39
DIPLOMA	0.456**	31.98
BACHELOR	0.528**	21.72
MASTERS	0.652**	17.74
MARRIED	-0.0005	-0.03
COUPLE	-0.026	-0.89
ONE CHILD	-0.434**	-13.46
MORE CHILDREN	-0.611**	-21.10
SOLE PARENT	-0.709**	-23.17
OTHER DEPENDENTS	-0.228**	-8.45
OTHER INCOME	0.371**	-4.042
Log Likelihood	-34385.92	
Rest Log Likelihood	-36744.95	
Chi-Squared (14)	4718.065	
Significance	< 0.0000	
Sample Size	53695	

Note-Based on Pooled sample for YEARS 1997-2002.
** Significant at 1% Level *Significant at 5% Level

Table 11: Sample Selection Regression Results for Females (Weekly Earnings)

(Dependent Variable: The Natural Logarithm of Weekly Earnings)
Stage 2 Least Squares Regression Coefficients

Variables	Without Sample Selection		With Sample Selection					
	Coefficient	t - ratio	Specification 1	t - ratio	Specification 2	t - ratio	Specification 3	t - ratio
Constant	5.443**	60.66	7.650**	51.99	4.489**	9.44	3.485**	6.28
AGE	0.010*	2.32	-0.039**	-6.42	0.070**	4.30	0.104**	5.48
AGE^2	-0.0001	-1.55	0.0005**	7.08	-0.0008**	-4.20	-0.0013**	-5.39
MAORI	-0.032*	-2.18	0.098**	4.98	0.005	0.24	-0.023	-1.05
PACIFIC	-0.052**	-2.71	-0.049	-1.67	-0.004	-0.20	0.011	0.44
MIGRANT	-0.036*	-2.5	0.0419*	2.08	-0.021	-1.21	-0.042*	-2.16
INV MIG YEARS	-0.078	-1.83	0.437**	7.67	-0.145	-1.48	-0.332**	-2.96
URBAN	0.150**	8.38	-0.118**	-5.00	0.164**	3.54	0.256**	4.80
TOWN	0.024	1.18	-0.200**	-7.79	0.047	1.11	0.128**	2.64
SCHOOL CERT	0.181**	11.7	-0.041	-1.86	0.209**	5.15	0.288**	6.19
SIXTH FORM	0.328**	17.16	0.087**	3.30	0.334**	8.02	0.412**	8.67
BURSARY	0.189**	7.12	0.053	1.52	0.186**	5.63	0.227**	6.30
DIPLOMA	0.330**	27.55	0.007	0.34	0.354**	6.56	0.4669**	7.44
BACHELOR	0.701**	40.55	0.299**	10.43	0.694**	11.05	0.818**	11.33
MASTERS	0.850**	36.03	0.389**	9.90	0.862**	11.27	1.012**	11.51
MARRIED	-	-	-	-	-0.025	-1.88	-0.334*	-2.37
COUPLE	-	-	-	-	0.033	1.58	0.026	1.14
ONE CHILD	-	-	-	-	-0.297**	-5.86	-0.398**	-6.77
MORE CHILDREN	-	-	-	-	-0.438**	-6.34	-0.584**	-7.23
SOLE PARENT	-	-	-	-	-0.477**	-5.78	-0.647**	-6.75
OTHER DEPENDENTS	-	-	-	-	-0.160**	-5.62	-0.217**	-6.48
OTH ER INCOME	-	-	-	-	-	-	0.291**	3.38
LAMBDA	-	-	-1.207**	-27.10	0.073	0.37	0.489*	2.16
F	F[30, 30585] = 136.45		F[31, 30376] = 180.54		F[37, 30370] = 153.96		F[38, 30369] = 150.29	
$\overline{R}^2$	0.117		0.155		0.157		0.157	
Prob Value	< 0.0000		< 0.0000		< 0.0000		< 0.0000	
Sample Size	30,616		30,408		30,408		30,408	

Note: Based on Pooled sample for years 1997-2002. The models include 9 Regional control variables

Table 12: Sample Selection Regression Results for Females (Hourly Wage)

(Dependent Variable: The Natural Logarithm of Hourly Wage)
Stage 2 Least Squares Regression Coefficients

Variables	Without Sample Selection		With Sample Selection					
	Coefficient	t - ratio	Specification 1	t - ratio	Specification 2	t - ratio	Specification 3	t - ratio
Constant	2.020**	45.424	2.385**	41.55	2.840**	11.10	1.822**	6.36
AGE	0.023**	10.627	0.014**	6.08	0.002	-0.23	0.032**	3.27
AGE^2	-0.0003**	-9.490	-0.0001**	-5.08	0.0001	0.56	-0.0004**	-2.98
MAORI	-0.090**	-11.900	-0.067**	-8.53	-0.048**	-4.18	-0.762**	-6.74
PACIFIC	-0.159**	-14.510	-0.158**	-13.54	-0.157**	-11.98	-0.142**	11.88
MIGRANT	-0.023**	-2.860	-0.010	-1.32	-0.002	-0.21	-0.023*	-2.36
INV MIG YEARS	-0.096**	-4.120	-0.012	-0.49	0.064	1.21	-0.125*	-2.16
URBAN	0.032**	3.741	-0.013	-1.32	-0.044	-1.77	0.049	1.78
TOWN	-0.025**	-2.620	-0.062**	-5.94	-0.092**	4.02	-0.010	-0.41
SCHOOL CERT	0.127**	17.700	0.091**	10.31	0.053*	2.39	0.132**	5.53
SIXTH FORM	0.238**	24.842	0.199**	18.99	0.160**	7.06	0.239**	9.82
BURSARY	0.122**	8.459	0.100**	7.02	0.079**	4.27	0.120**	6.65
DIPLOMA	0.234**	40.610	0.182**	23.44	0.131**	4.52	0.244**	7.55
BACHELOR	0.473**	48.090	0.406**	36.35	0.349**	10.29	0.475**	12.77
MASTERS	0.570**	37.899	0.497**	32.92	0.430**	10.34	0.581**	12.86
MARRIED	-	-	-	-	0.034**	4.51	0.025**	3.70
COUPLE	-	-	-	-	-0.004	-0.31	-0.011	-1.04
ONE CHILD	-	-	-	-	0.035	1.27	-0.068*	-2.25
MORE CHILDREN	-	-	-	-	0.645	1.73	-0.084*	-2.01
SOLE PARENT	-	-	-	-	0.043	0.96	-0.129**	-0.13
OTHER DEPENDENTS	-	-	-	-	-0.017	-1.09	-0.076**	-4.47
OTH ER INCOME	-	-	-	-	-	-	0.030**	6.92
LAMBDA	-	-	-0.198**	-11.19	-0.377**	-3.64	0.045	0.38
F	F[30, 30585] = 221.69		F[31, 30376] = 219.22		F[37, 30370] = 188.23		F[38, 30369] = 184.82	
$\overline{R}^2$	0.178		0.182		0.186		0.187	
Prob Value	< 0.0000		< 0.0000		< 0.0000		< 0.0000	
Sample Size	30,616		30,408		30,408		30,408	

Note: Based on samples for years 1997-2002. The model also includes 9 Regional control variables

Table 13: Combination of Secondary School and Post-School Qualifications

(Percentage of each column)

Secondary School Qualifications	No Qualifications n = 39,325 (38%)	School Certificate n = 23,614 (23%)	Sixth Form Certificate n = 23,028 (23%)	Bursary n = 16,210 (16%)
Further Post-School Qualifications	%	%	%	%
No Post-School Qualification	70.3	45.7	29.7	23.0
Trade	12.5	20.4	10.0	6.7
Nursing	1.2	4.1	6.2	3.3
Certificate	4.8	9.3	12.8	5.3
Technician	0.4	1.1	1.6	0.8
Polytechnic	5.7	12.1	13.7	6.5
Teacher	0.4	2.1	10.1	7.9
Diploma	0.4	1.6	5.4	5.2
Bachelor	0.4	1.7	15.7	41.4
Post-Graduate	0.2	0.6	4.1	14.5
Other	6.7	8.8	8.4	10.7

Based on Pooled samples for years 1997-2002.

Table 14: Combination of Post-School Qualifications

(Number of Observations in Combined Categories)

Post-School Qualification	Trade	Nursing	Certificate	Technician	Polytechnic	Teacher	Diploma	Bachelor	Post-Graduate	Other
Trade	-									
Nursing	15	-								
Certificate	547	159	-							
Technician	177	4	127	-						
Polytechnic	537	132	669	87	-					
Teacher	94	47	184	10	142	-				
Diploma	65	72	189	15	166	284	-			
Bachelor	106	236	342	37	242	1,392	329	-		
Post-Graduate	29	108	84	2	59	360	124	2,533	-	
Other	556	201	363	36	528	200	135	577	205	-
Total Column Qualification	13,051	3,407	7,874	922	9,282	4,249	2,613	10,894	3,481	8,367

Sample Size: 155,505 (1997 – 2002), Note: Combination of more than one Post-School Qualification is possible.

Table 15: 'Hourly Wage' and Vocational and Multiple Qualifications

(Dependent Variable: The Natural Logarithm of Hourly Wages)
Least Squares Regression Coefficients

Variable	Males		Females	
	Multiple Degrees	With Interaction Effects	Multiple Degrees	With Interaction Effects
CONSTANT	1.549**	1.557**	2.058**	2.045**
AGE	-0.051**	0.051**	0.021**	0.021**
AGE^2	-0.0006**	-0.0005**	-0.0002**	-0.0002**
MAORI	-0.068**	-0.066**	-0.069**	-0.069**
PACIFIC	-0.191**	-0.188**	-0.144**	-0.141**
MIGRANT	-0.049**	-0.047**	-0.049**	-0.049**
INV MIG YEARS	-0.173**	-0.176**	-0.115**	-0.119**
URBAN	0.048**	0.048**	0.038**	0.039**
TOWN	0.040**	0.041**	-0.017	-0.016
SCHOOL CERT	0.123**	0.121**	0.111**	0.109**
SIXTH FORM	0.223**	0.214**	0.216**	0.209**
BURSARY	0.222**	0.204**	0.221**	0.209**
TRADE	0.089**	0.094**	0.029*	0.034**
NURSING	0.077**	0.078**	0.157**	0.159**
CERTIFICATE	0.081**	0.088**	0.048**	0.056**
TECHNICIAN	0.084**	0.089**	0.067	0.071
POLYTECH	0.010	0.018	0.023**	0.031**
TEACHER	-0.043**	0.037	0.099**	0.138**
DIPLOMA	0.107**	0.110**	0.153**	0.154**
OTHER	0.096**	0.100**	0.041**	0.045**
BACHELOR	0.204**	0.259**	0.206**	0.262**
POST-GRAD	0.171**	0.352**	0.174**	0.289**
BAC_TEAC	-	-0.195**	-	-0.143**
BAC_POLY	-	-0.111*	-	-0.148**
BAC_CERT	-	-0.063	-	-0.101**
BAC_GRAD	-	-0.262**	-	-0.184**
9 REGIONAL DVs	YES	YES	YES	YES
F	F[37, 30124] = 172.96	F[41, 30120] = 160.13	F[37, 30561] = 206.39	F[41, 30557] = 189.79
$\overline{R}^2$	0.174	0.178	0.199	0.202
Sample Size	30,162	30,162	30,599	30,599

Table 16: 'Hours of Work' and Vocational and Multiple Qualifications

(Dependent Variable: The Natural Logarithm of Hours of Work)
Least Squares Regression Coefficients

Variable	Males		Females	
	Multiple Degrees	With Interaction Effects	Multiple Degrees	With Interaction Effects
CONSTANT	3.330**	3.330**	3.459**	3.453**
AGE	0.022**	0.022**	-0.014**	-0.014**
AGE2	-0.0003**	-0.0003**	0.0002**	0.0002**
MAORI	-0.029**	-0.029**	0.061**	0.061**
PACIFIC	-0.027**	-0.027**	0.104**	0.105**
MIGRANT	-0.013	-0.013	-0.007	-0.007
INV MIG YEARS	-0.098**	-0.098**	0.03	0.029
URBAN	-0.018*	-0.018*	0.121**	0.122**
TOWN	0.006	0.041**	0.052**	0.052**
SCHOOL CERT	0.008	0.009	0.049**	0.049**
SIXTH FORM	0.005	0.006	0.063**	0.061**
BURSARY	0.008	0.009	0.045**	0.041**
TRADE	0.040**	0.039**	0.035	0.037
NURSING	-0.069*	-0.069*	0.025	0.025
CERTIFICATE	0.015	0.013	0.054**	0.057**
TECHNICIAN	0.010	0.009	0.103*	0.104*
POLYTECH	-0.017	-0.017	0.017	0.02
TEACHER	0.030	0.019	0.131**	0.133**
DIPLOMA	-0.001	-0.002	0.062**	0.062**
OTHER	0.016	0.016	-0.004	-0.002
BACHELOR	0.007	0.001	0.118**	0.137**
POST-GRAD	0.052**	0.042*	0.104**	0.193**
BAC_TEAC	-	0.025	-	-0.014
BAC_POLY	-	0.005	-	-0.048
BAC_CERT	-	0.037	-	-0.042
BAC_GRAD	-	0.015	-	-0.136**
9 REGIONAL DVs	YES	YES	YES	YES
F	F[37, 30124] = 9.19	F[41, 30120] = 8.34	F[37, 30561] = 30.81	F[41, 30557] = 28.04
$\overline{R}^2$	0.010	0.010	0.035	0.035
Sample Size	30,162	30,162	30,599	30,599

APPENDIX A

Table A1: Mean Labour Market Outcomes for Males by Highest Educational Qualification and Year

Year	No Qual.	School Cert.	Sixth Form	Bursary	Diploma	Bachelor's Qual.	Postgrad. Qual.
			Mean Real Personal Weekly Income				
1997	$630.71	$708.90	$792.89	$829.50	$811.32	$1036.24	$1173.92
1998	$641.69	$733.67	$783.38	$756.38	$821.22	$1076.18	$1262.33
1999	$629.85	$737.62	$875.30	$761.11	$841.26	$1096.32	$1288.58
2000	$644.85	$752.11	$837.29	$717.97	$826.85	$1104.37	$1259.11
2001	$651.05	$720.54	$856.01	$745.71	$849.31	$1092.82	$1289.18
2002	$632.64	$738.70	$856.62	$717.94	$818.52	$1068.62	$1241.72
			Mean Real Weekly Earnings				
1997	$618.32	$693.06	$781.24	$814.20	$795.39	$1020.53	$1145.42
1998	$626.20	$725.69	$773.06	$749.44	$812.80	$1070.41	$1238.05
1999	$611.34	$715.52	$854.54	$730.94	$827.79	$1074.26	$1274.61
2000	$624.40	$730.91	$822.09	$695.38	$809.28	$1075.78	$1241.28
2001	$632.34	$709.47	$832.15	$732.87	$830.52	$1065.11	$1240.70
2002	$614.89	$729.81	$841.71	$690.24	$807.02	$1050.63	$1225.71
			Mean Real Hourly Earnings				
1997	$14.36	$17.02	$18.48	$19.20	$19.24	$24.06	$25.39
1998	$14.97	$17.18	$18.45	$18.02	$19.20	$24.60	$28.08
1999	$15.42	$18.58	$20.15	$17.59	$19.40	$25.37	$30.16
2000	$14.78	$19.68	$19.32	$16.98	$22.19	$24.58	$28.09
2001	$14.76	$16.81	$19.53	$17.57	$22.26	$25.23	$27.98
2002	$14.54	$17.08	$19.53	$17.54	$21.72	$28.40	$28.04
			Mean Weekly Hours Worked				
1997	43.55	41.45	42.48	42.28	43.39	42.90	45.17
1998	41.87	43.23	42.01	41.58	42.88	43.96	43.95
1999	41.83	41.88	43.70	40.89	42.89	43.03	43.64
2000	42.58	41.71	42.39	41.12	43.00	42.95	44.71
2001	42.77	41.47	42.53	41.28	43.27	42.97	44.34
2002	42.09	42.80	43.03	40.83	43.34	42.77	44.68

Note: Age group 25-59. The Consumer Price Index from Statistics New Zealand taken from the June quarters between 1997 and 2002 were used to put all dollar figures in this table in constant June 2002 dollars.

APPENDIX A

Table A2: Mean Labour Market Outcomes for Females by Highest Educational Qualification and Year

Year	No Qual.	School Cert.	Sixth Form	Bursary	Diploma	Bachelor's Qual.	Postgrad. Qual.
			Mean Real Personal Weekly Income				
1997	$382.56	$458.26	$508.86	$455.69	$523.34	$712.78	$883.09
1998	$414.34	$463.96	$531.76	$498.23	$537.95	$750.19	$856.91
1999	$429.32	$456.49	$554.95	$500.73	$558.34	$757.65	$941.32
2000	$422.07	$502.72	$559.66	$468.46	$562.90	$795.43	$837.45
2001	$423.95	$485.60	$560.30	$491.01	$556.74	$806.30	$881.95
2002	$452.24	$490.68	$572.50	$539.26	$552.43	$770.19	$962.43
			Mean Real Weekly Earnings				
1997	$348.69	$435.54	$480.89	$441.32	$499.36	$697.63	$862.39
1998	$368.62	$425.99	$517.48	$478.64	$507.53	$732.63	$842.80
1999	$370.89	$425.03	$528.85	$473.36	$522.13	$729.23	$898.11
2000	$368.65	$464.76	$536.15	$445.69	$525.23	$768.63	$817.76
2001	$381.36	$451.33	$528.59	$471.71	$517.31	$785.16	$867.05
2002	$413.79	$447.34	$542.49	$511.05	$515.36	$751.62	$946.34
			Mean Real Hourly Earnings				
1997	$11.73	$13.89	$15.27	$14.47	$15.76	$19.80	$22.58
1998	$12.27	$14.02	$15.99	$13.95	$15.86	$21.15	$22.40
1999	$12.23	$14.13	$15.96	$14.73	$16.23	$22.94	$23.47
2000	$15.48	$14.44	$16.40	$14.47	$16.40	$27.76	$25.25
2001	$12.23	$14.07	$15.97	$14.40	$16.10	$23.99	$24.42
2002	$13.05	$16.80	$20.06	$15.06	$16.39	$20.47	$26.20
			Mean Weekly Hours Worked				
1997	29.64	31.15	31.07	32.38	32.20	37.30	39.08
1998	29.73	30.21	31.56	33.79	32.03	36.27	37.70
1999	29.81	29.70	32.03	31.90	31.65	35.53	38.63
2000	29.56	31.42	31.72	31.33	32.16	36.42	36.21
2001	30.17	31.04	32.44	32.78	32.06	38.17	36.93
2002	31.30	30.45	32.21	33.95	32.32	37.27	38.87

Note: Age group 25-59. The Consumer Price Index from Statistics New Zealand taken from the June quarters between 1997 and 2002 were used to put all dollar figures in this table in constant June 2002 dollars.

APPENDIX B

Table B1: Income Effects of Highest Secondary and Tertiary Qualifications for Males: 1997 and 2002

(Based on Sample for the Age Group 25-59)

(Dependent Variable: The Natural Logarithm of Weekly Income)

Least Squares Regression Coefficients
(t-ratios)

Explanatory Variables	All Employed Males		Employed Full-Time Males	
	1997	2002	1997	2002
Constant	4.966** (33.24)	5.164** (38.48)	5.112** (47.59)	5.356** (50.30)
School Certificate	0.087* (2.79)	0.130** (4.99)	0.134** (5.80)	0.152** (7.26)
UE or Sixth Form Cert.	0.235** (7.22)	0.240** (7.35)	0.274** (11.24)	0.273** (10.21)
Bursary	0.126* (2.25)	0.028 (0.67)	0.197** (4.17)	0.077* (2.10)
Diploma	0.236** (12.01)	0.214** (12.72)	0.252** (16.72)	0.232** (17.07)
Bachelor's Degree	0.488** (14.48)	0.456** (15.74)	0.518** (22.04)	0.486** (21.02)
Postgraduate Qualification	0.537** (11.67)	0.592** (15.85)	0.590** (17.87)	0.608** (20.36)
Age	0.066** (8.58)	0.057** (8.55)	0.060** (11.11)	0.049** (9.26)
Age^2	0.001** (-8.10)	-0.001** (-8.04)	-0.001** (-10.03)	-0.534** (-8.28)
F	56.58	71.80	120.85	114.76
$\bar{R}^2$	0.061	0.074	0.171	0.156
Sample Size	6,800	7,093	4,655	4,922

**Significant at 1% Level. * Significant at 5% Level.

APPENDIX B

Table B2: Income Effects of Highest Secondary and Tertiary Qualifications for Females: 1997 and 2002

(Based on Sample for the Age Group 25-59)

(Dependent Variable: The Natural Logarithm of Weekly Income)

Least Squares Regression Coefficients
(t-ratios)

Explanatory Variables	All Employed Females		Employed Full-Time Females	
	1997	2002	1997	2002
Intercept	5.853** (30.54)	5.164** (38.48)	5.486** (39.07)	5.356** (50.30)
School Certificate	0.190** (5.63)	0.130** (4.99)	0.166** (8.22)	0.152** (7.26)
UE or Sixth Form Cert.	0.208** (4.18)	0.240** (7.35)	0.262** (9.43)	0.273** (10.21)
Bursary	0.156* (2.56)	0.028 (0.67)	0.153** (4.32)	0.077* (2.10)
Diploma	0.281** (10.20)	0.214** (12.72)	0.261** (14.81)	0.232** (17.07)
Bachelor's Degree	0.595** (14.26)	0.456** (15.74)	0.483** (17.79)	0.486** (21.02)
Postgraduate Qualification	0.779** (11.69)	0.592** (15.85)	0.645** (15.26)	0.608** (20.36)
Age	-0.006 (-0.63)	0.572** (8.55)	0.033** (4.57)	0.049** (9.26)
Age^2	0.0001 (0.75)	-0.0006** (-8.04)	-0.0003** (-4.177)	-0.0005** (-8.28)
F (8, N-9)	38.56	71.80	72.40	114.76
$\bar{R}^2$	0.049	0.074	0.160	0.156
Sample Size	5,779	7,093	3,002	4,922

** Significant at 1% Level *Significant at 5% Level.

APPENDIX C

Table C1: Estimated Returns to Education Based on Weekly Income, Weekly Earnings, the Hourly Wage, and Hours of Work for Males

(Sample Excludes Observations with 'Imputed' Income Values)

Variables	INCOME	EARNINGS	HOURLY WAGE	HOURS OF WORK
Constant	5.123**	4.927**	1.564**	3.363**
AGE	0.061**	0.072**	0.050**	0.021**
AGE^2	-0.0007**	-0.0008**	-0.0005**	-0.0003**
MAORI	-0.089**	-0.119**	-0.083**	-0.034**
PACIFIC	-0.202**	-0.229**	-0.206**	-0.023*
MIGRANT	-0.073**	-0.045**	-0.028**	-0.017*
INV MIG YEARS	-0.265**	-0.299**	-0.191**	-0.109**
URBAN	0.096**	0.028*	0.059**	-0.030**
TOWN	0.082**	0.047**	0.044**	0.005
SCHOOL CERT	0.111**	0.131**	0.138**	-0.007
SIXTH FORM	0.220**	0.260**	0.256**	0.004
BURSARY	0.115**	0.138**	0.157**	-0.020
DIPLOMA	0.199**	0.252**	0.224**	0.028**
BACHELOR	0.500**	0.505**	0.497**	0.010
MASTERS	0.623**	0.672**	0.605**	0.067**
F	F[30, 31853] = 139.92	F[30, 25095] = 132.77	F[30, 25095] = 193.22	F[30, 25095] = 10.15
$\overline{R}^2$	0.116	0.136	0.187	0.011
Sample Size	31,884	25,126	25,126	25,216

Note: Based on pooled sample for years 1997-2002. The models also include 9 Regional control variables, as in the earlier models

** Significant at 1% Level *Significant at 5% Level

APPENDIX C

Table C2: Estimated Returns to Education Based on Weekly Income, Weekly Earnings, the Hourly Wage, and Hours of Work for Females

(Sample Excludes Observations with 'Imputed' Income Values)

Variables	INCOME	EARNINGS	HOURLY WAGE	HOURS OF WORK
Constant	5.716**	5.482**	2.053**	3.425**
AGE	0.006	0.007	0.021**	-0.014**
AGE^2	-0.0001	-0.0000	-0.0002**	0.0002**
MAORI	0.042**	-0.022	-0.085**	0.063**
PACIFIC	-0.036*	-0.045*	-0.153**	0.109**
MIGRANT	-0.020	-0.039*	-0.029**	-0.011
INV MIG YEARS	-0.170**	-0.108*	-0.121**	0.013
URBAN	0.101**	0.165**	0.037**	0.129**
TOWN	-0.016	0.032	-0.023*	0.055**
SCHOOL CERT	0.116**	0.193**	0.125**	0.069**
SIXTH FORM	0.223**	0.369**	0.256**	0.113**
BURSARY	0.103**	0.205**	0.128**	0.086**
DIPLOMA	0.234**	0.344**	0.236**	0.108**
BACHELOR	0.563**	0.748**	0.502**	0.246**
MASTERS	0.725**	0.905**	0.611**	0.294**
F	F[30, 29648] = 108.97	F[30, 26727] = 132.91	F[30, 26727] = 223.46	F[30, 26727] = 33.90
$\overline{R}^2$	0.098	0.129	0.200	0.036
Sample Size	29,679	26,758	26,758	26,758

Note: Based on Pooled sample for the 1997-2002 years. The models also include 9 Regional control variables, as in the earlier models

** Significant at 1% Level *Significant at 5% Level

APPENDIX D

Table D1: Extended Regression Results for 'Income', 'Earnings', 'Hourly Wage', and 'Hours of Work' Effects of Highest Qualifications

(Dependent Variable: The Natural Logarithm of Weekly Earnings)
Least Squares Regression Coefficients

Models with 'Year' and 'Year & Qualification Interaction Effects'

Males

Variables	INCOME	EARNINGS	HOURLY WAGE	HOURS OF WORK
Constant	5.078**	4.867**	1.524**	3.344**
AGE	0.062**	0.074**	0.052**	0.022**
AGE^2	-0.0007**	-0.001**	-0.001**	-0.0003**
MAORI	-0.082**	-0.114**	-0.082**	-0.031**
PACIFIC	-0.202**	-0.232**	-0.203**	-0.029**
MIGRANT	-0.057**	-0.036**	-0.025**	-0.011
INV MIG YEARS	-0.217**	-0.262**	-0.166**	-0.097**
URBAN	0.082**	0.03**	0.049**	-0.019*
TOWN	0.072**	0.043**	0.037**	0.007
REGIONAL DV s	YES	YES	YES	YES
T98	0.039**	0.030	0.067**	-0.037*
T99	0.028**	-0.015	0.040**	-0.053**
T00	0.043**	0.033	0.062**	-0.030
T01	0.074**	0.039	0.059**	-0.020
T02	0.073**	0.011	0.031**	-0.020
SCL_97	0.069*	0.140**	0.178**	-0.037
SCL_98	0.131**	0.164**	0.115**	0.05*
SCL_99	0.146**	0.186**	0.161**	0.027
SCL_00	0.111**	0.116**	0.154**	-0.038
SCL_01	0.083**	0.079**	0.101**	-0.022
SCL_02	0.110**	0.183**	0.159**	0.024
SIX_97	0.206**	0.244**	0.264**	-0.02
SIX_98	0.128**	0.187**	0.182**	0.007
SIX_99	0.286**	0.358**	0.287**	0.07**
SIX_00	0.216**	0.232**	0.237**	-0.004
SIX_01	0.198**	0.233**	0.241**	-0.008
SIX_02	0.207**	0.271**	0.256**	0.016

Table continues

Table continues

BUR_97	0.142**	0.212**	0.215**	-0.002
BUR_98	0.107*	0.143**	0.141**	0.002
BUR_99	0.185**	0.177**	0.186**	-0.01
BUR_00	0.131**	0.155**	0.146**	0.009
BUR_01	0.146**	0.154**	0.174**	-0.019
BUR_02	0.043**	0.11	0.152**	-0.035
DIP_97	0.216**	0.253**	0.254**	-0.002
DIP_98	0.199**	0.245**	0.211**	0.036*
DIP_99	0.225**	0.289**	0.247**	0.041*
DIP_00	0.205**	0.246**	0.224**	0.022
DIP_01	0.197**	0.256**	0.232**	0.024
DIP_02	0.193**	0.267**	0.245**	0.022
BAC_97	0.450**	0.466**	0.484**	-0.016
BAC_98	0.462**	0.483**	0.442**	0.047*
BAC_99	0.507**	0.514**	0.476**	0.036
BAC_00	0.462**	0.452**	0.445**	0.007
BAC_01	0.415**	0.459**	0.447**	0.012
BAC_02	0.418**	0.488**	0.487**	0.001
MAS_97	0.523**	0.583**	0.531**	0.052
MAS_98	0.606**	0.647**	0.566**	0.081**
MAS_99	0.577**	0.677**	0.620**	0.056
MAS_00	0.526**	0.603**	0.535**	0.068*
MAS_01	0.578**	0.586**	0.527**	0.059*
MAS_02	0.561**	0.651**	0.586**	0.066**
F	F[60, 39658] = 68.09	F[60, 30112] = 70.38	F[60, 30112] = 101.02	F[60, 30112] = 5.27
$\overline{R}^2$	0.092	0.121	0.166	0.008
Sample Size	39,719	30,173	30,173	30,173

** Significant at 1% Level *Significant at 5% Level

APPENDIX D

Table D2: Extended Regression Results for 'Income', 'Earnings', 'Hourly Wage', and 'Hours of Work' Effects of Highest Qualifications

(Dependent Variable: The Natural Logarithm of Weekly Earnings)
Least Squares Regression Coefficients
Models with 'Year' and 'Year & Qualification Interaction Effects'

Females

Variables	INCOME	EARNINGS	HOURLY WAGE	HOURS OF WORK
Constant	5.067**	5.393**	2.006**	3.383**
AGE	0.060	0.01*	0.023**	-0.012**
AGE^2	-0.00006	-0.0001	-0.0002**	0.0002**
MAORI	0.042**	-0.032*	-0.090**	0.058**
PACIFIC	-0.401**	-0.053**	-0.160**	0.107**
MIGRANT	-0.012	-0.035*	-0.023**	-0.013
INV MIG YEARS	-0.119**	-0.078	-0.096**	0.019
URBAN	0.096**	0.151**	0.032**	0.120**
TOWN	-0.0007	0.025	-0.025**	0.051**
REGIONAL DVs	YES	YES	YES	YES
T98	0.1229**	0.096**	0.051**	0.048
T99	0.147**	0.087*	0.051**	0.037
T00	0.155**	0.109**	0.008**	0.03
T01	0.149**	0.130**	0.066**	0.064*
T02	0.192**	0.190**	0.077**	0.114**
SCL_97	0.182*	0.279**	0.166**	0.114**
SCL_98	0.085**	0.142**	0.112**	0.031
SCL_99	0.052	0.143**	0.123**	0.024
SCL_00	0.133**	0.233**	0.115**	0.118**
SCL_01	0.105**	0.179**	0.115**	0.064*
SCL_02	0.091**	0.103**	0.125**	-0.022
SIX_97	0.186**	0.312**	0.228**	0.084*
SIX_98	0.110**	0.314**	0.241**	0.070
SIX_99	0.261**	0.373**	0.259**	0.114**
SIX_00	0.184**	0.330**	0.248**	0.082
SIX_01	0.230**	0.359**	0.224**	0.135**
SIX_02	0.202**	0.277**	0.227**	0.050

Table continues

Table continues

BUR_97	0.098	0.192**	0.101**	0.092
BUR_98	0.101*	0.197**	0.087**	0.126**
BUR_99	0.060	0.154*	0.162**	0.020
BUR_00	0.054	0.175**	0.104**	0.072
BUR_01	0.099	0.205**	0.127**	0.078
BUR_02	0.143**	0.204**	0.149**	0.055
DIP_97	0.274**	0.408**	0.265**	0.141**
DIP_98	0.189**	0.326**	0.235**	0.096**
DIP_99	0.212**	0.344**	0.251**	0.093**
DIP_00	0.217**	0.344**	0.222**	0.122**
DIP_01	0.225**	0.304**	0.222**	0.081**
DIP_02	0.208**	0.258**	0.210**	0.048*
BAC_97	0.556**	0.737**	0.452**	0.285**
BAC_98	0.496**	0.671**	0.480**	0.189**
BAC_99	0.459**	0.698**	0.508**	0.192**
BAC_00	0.534**	0.717**	0.490**	0.227**
BAC_01	0.580**	0.74**	0.472**	0.268**
BAC_02	0.479**	0.635**	0.437**	0.199**
MAS_97	0.726**	0.865**	0.523**	0.323**
MAS_98	0.638**	0.797**	0.525**	0.270**
MAS_99	0.735**	0.931**	0.582**	0.349**
MAS_00	0.608**	0.800**	0.554**	0.245**
MAS_01	0.672**	0.839**	0.606**	0.233**
MAS_02	0.671**	0.852**	0.602**	0.250**
F	F[60, 34810] = 55.08	F[60, 30555] = 68.92	F[60, 30555] = 111.66	F[60, 30555] = 18.18
$\overline{\mathbf{R}}^{\mathbf{2}}$	0.085	0.117	0.178	0.033
Sample Size	39,719	30,616	30,616	30,616

** Significant at 1% Level *Significant at 5% Level