THE ECONOMIC RECORD, VOL. 80, NO. 248, MARCH, 2004, 101–124

Why Have Maori Relative Income Levels Deteriorated Over Time?*

SHOLEH A. MAANI*
Department of Economics, The University of Auckland, New Zealand

In 1986 two thirds of the Maori population had left secondary school by age 16 without school qualifications. A decade later, while educational attainment of the New Zealand population had increased significantly, over 60 per cent of the Maori population remained without qualifications. This paper provides comprehensive evidence on how income returns to postcompulsory and higher education have contributed to a widened income gap over the decade following the economic reforms. Utilising individual-level Census data for 1986 and 1996, stability tests and decompositions, it establishes the significance of educational attainment as a strategy for reducing disparity. An important feature of the study is the distinction between full and part-Maori.

I Introduction

In 1986 two thirds of Maoris had left secondary school by age 16 without school qualifications. A decade later, while educational attainment of the New Zealand population had increased significantly, more than 60 per cent of the Maori population still remains without school qualifications. In addition, over the decade, average income levels of Maori have significantly deteriorated relative to European income levels.

The question of relative Maori income levels and how best to close the income gap has been a major topic of debate in New Zealand. Closing the gap would entail changes at several levels. This paper focuses on the role of educational attainment in the relative income position of Maori, and related strategies for addressing the income gap.

The link between educational attainment (and human capital), and income is well established in the economics literature, as skills and higher labour productivity are expected to be financially rewarded in the labour market – partly through fewer episodes of unemployment, jobs that offer steady or more hours of work and employment in occupations with higher hourly wages.

The role of education in explaining the income gap in New Zealand has further increased in importance in recent years. Since the economic reforms of the mid-1980s and 1990s New Zealand has experienced a far greater reliance on markets, globalisation and an information economy. In addition, many aspects of the reforms, such as the reduction of industrial subsidies, reduction of import protection, the Employment Contracts Act, and the privatisation of government enterprises have significantly increased the effect of market forces in the labour market and on earnings (Harbridge & Moulder 1993; Evans *et al*. 1996; Lang 1998). During this transition, the population with higher education, skills and training has experienced greater employment opportunities as reflected by lower unemployment rates, greater hours of work and hourly wages and employment in

* This paper is related to a larger research project commissioned by the New Zealand Treasury. I would like to thank Ron Crawford, external referees for the Treasury, Simon Chapple and Dave Mare, for insightful comments on the study; Peter McMillan and Theva Thevathasan at Statistics New Zealand for providing the data sets and assistance with data processing; and Adam Warner and Calvin Chan at the University of Auckland for research assistance. None of the above individuals or organisations is, of course, responsible for the views expressed.

Correspondence: Associate Professor Sholeh A. Maani, Department of Economics, the University of Auckland, Private Bag 92019, Auckland New Zealand. Email: s.maani@auckland.ac.nz

 ISSN 0013–0249

occupations that have experienced growth in demand (Maani 1997; Lang 1998).

The New Zealand population responded to the increased demand for skills, and participation in postcompulsory and higher education has increased significantly since the 1980s (Maani 1997). However, during this time the Maori population, which had a large proportion without school qualifications, was in a disadvantageous position and was unable to obtain tertiary education levels similar to the rest of the population. In addition, employed Maori were more heavily concentrated in elementary and low skilled jobs, which did not experience growth to the extent that professional and other skill-based occupations have in the decade.

While income levels between Maori and non-Maori may in general be influenced by a wider range of factors, such as changes in policies of social security for old age, or changes in social welfare policy and eligibility criteria, the focus of this study is on the working age group, and the employed in most part, in examining the link between education and income levels over time.

This study utilises individual level data for the 1996 and 1986 census years, and provides evidence of how relative income levels, and in particular the income returns to postcompulsory and higher education (education beyond age 16) have contributed to the rising income gap. The study extends the literature by providing evidence on the role of educational attainment in explaining the relative income levels of the Maori population over time. It further provides formal stability tests of relative changes in returns to education by ethnicity over time, and decompositions of the effect of mean group characteristics and returns to education over time. The use of data over the 10-year period allows the analysis of changes in relative educational attainment and income levels over a significant decade. The fact that both the 1986 and 1996 years represent comparable economic activity levels and non-recession years has been considered in study design and is important for comparisons across time.

A feature of the study is that while the focus is on Maori and non-Maori comparisons, it takes a comprehensive approach by considering four separate ethnic categories of 'Maori', 'Part-Maori', 'European' and 'Other Ethnicity'. The distinction between Maori and Part-Maori (where Maori refers to identifying solely with the Maori ethnicity, and Part-Maori refers to identifying with both Maori and at least one other ethnicity), has been known to show distinctive characteristics, and this allows a more in depth examination of Maori education and income levels relative to the non-Maori population. Kuhn and Sweetman (2002) who have recently examined the relative education and labour market outcomes for the 'multiple-origin' compared to the 'single-origin' aboriginal population in Canada, based on the 1991 Canadian Census, have findings that are in many ways parallel to the results of this study. They apply the concept of immigrant 'contact/assimilation' to the case of the more favourable educational and labour market outcomes of the multiple origin aboriginal population, and hypothesise that intermarriages with nonaboriginals, living outside of reservations, and outside the northern territories provide 'social' and 'geographical mobility'. The approach in this study for New Zealand provides evidence on this hypothesis of international interest.

The specification also allows the separate consideration of the solely European population from the Other Ethnic groups. This is especially useful because of notable differences between the European and 'Other Ethnic groups' populations, which includes the Pacific Island group, and also other non-European non-Maori immigrants with higher education. This is due to New Zealand immigration policy since 1991, where language barriers and other experiences of new immigrants are expected to affect the 1996 'Other Ethnic' returns to higher education (see e.g., Maani 1999 and Winklemann & Winklemann 1998).

The plan of the paper is as follows: Section II provides a brief review of the literature, Section III contains a description of the data set, statistical characteristics of the samples, and establishes the change in relative Maori income levels over the decade. In Section IV econometric analyses based on human capital models, and formal stability tests are provided to establish the contribution of returns to education to the change in the income gap over time. The results of expanding this analysis by incorporating the effect of hours of work, occupation, industry etc., as factors through which educational attainment has partly contributed to the income gap is further discussed. The analysis also incorporates the effect of locality and rural living. Section IV, further provides decompositions (Oaxaca 1973; Oaxaca & Ransom 1999) of the effect of group characteristics and coefficients, and establishes results on the relative significance of educational attainment and returns to education for Maori in explaining the income gap. An important question addressed by the decompositions is the extent to which lower educational attainment, or alternatively difficulties in translating qualifications to income returns by Maori explain the income gap and its increased status since the mid 1980s. Finally, conclusions are drawn in Section V.

The results throughout the paper provide persuasive evidence on the contribution of educational attainment levels, rather than low returns to educational investments by Maori, to the income gap.

II Literature Review

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 field is vast and growing (See e.g., McNabb & Richardson 1989 for Australia; Hunt & Hicks 1985, Maani 1996, 1997 and 1999; Gibson 1998; Dixon 1998 for New Zealand).[1]

The analysis of rates of return to education that are comparable across more than one time period has, in turn, been pursued in fewer but a growing number of studies. Among studies in this group, Miller (1984), Chia (1991), Gregory (1996) and Nevile and Saunders (1998) have examined changes in returns to higher education in Australia over time; Borland (1999) has provided a comprehensive survey of analyses on changes in the income distribution in Australia and the contribution of educational attainment and earnings to it; for New Zealand Maani (1997, 1999) has examined the returns to postcompulsory education across four census years; and Ryoo (1988), Behrman and Birdsall (1987), and Psacharopoulos (1994) provide international evidence on this question. These studies provide international support for the link between educational attainment and income levels, that these returns change over time and that the changes are greater with market deregulation.

Maani's (1999) results for New Zealand have shown that the returns to higher education are positive and significant. Moreover, consistent with the significant increases in participation rates in postcompulsory education, market rewards to education have been significant and higher in 1996 compared with 1981 and 1986.

A few studies have examined the *employment* but not relative income outcomes for the Maori population since the reforms of the 1980s (e.g. Hertzog 1997; Winklemann & Winklemann 1997; Chapple & Rea 1999). Hertzog, for example, concludes on the basis of the Household Labour Force Survey 1984–92, that Maori (and Pacific Islanders considered as one group) had significantly higher involuntary job separations than the European population. Hertzog's analysis points to the effect of 'returns' to qualifications by ethnicity as the main source of the unemployment variation. Unfortunately, the study did not control for human capital factors such as language proficiency, especially since Maori and Pacific Island groups were combined in the study. Among Australian studies on ethnicity and labour market results, Daly and Liu (1997) estimate the rates of return to education for indigenous Australians and Daly (1993) shows evidence that 20 per cent of the difference in the rates of employment of Aboriginal men and women could be attributed to differences in their education levels and other endowments.

This paper extends the literature by providing extensive evidence on the role of educational attainment in explaining the relative income levels of the Maori population in New Zealand over time; by incorporating the multiple origin of Maori ethnicity, and by examining the impact of a larger number of variables, in particular, hours of work, occupation and locality of residence of Maori.

III Data and Group Characteristics

The study utilises individual level data from the New Zealand Census of Population & Dwellings for 1996 and 1986. The samples consist of those in the age group 16–65 years. Of the various New Zealand data sets, the census utilised for this study is preferred because it represents the overall New Zealand population, and provides comparable information across ethnicity and time. A 20 per cent sample was utilised in Section III, and a 50 per cent sample in Section IV to allow naturally larger numbers of Maori population at the higher education levels and in various occupations and industries.

Education is compulsory in New Zealand up to and including the Year 11 (Fifth form, and age 16), at the end of which nationally administered School Certificate examinations on up to six subjects are taken. 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. Admission to the universities in New Zealand requires either Year 12 or Year 13 results, and a number of polytechnic diplomas and degrees require Sixth Form Certificate (Year 12) or Year 11 School Certificate. Therefore, the idea of completing secondary school has a broader interpretation in the New Zealand setting, and Year 12 is emphasised in the comparisons throughout the study for international comparability.

The census has information on an individual's highest educational qualifications, making a distinction

[1] Hunt and Hicks (1985); and Maani (1996, 1997, 1999) have provided estimates on the basis of the NZ Census of Population; Gibson 1998, a sample of twins; and Dixon (1998) has used the NZ Household Labour Force Survey. These studies are generally compatible.

between no school qualifications, Year 11, Year 12, Year 13, post-school diploma, university Bachelor's degree, and postgraduate degrees.

The largest component of income in the census 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 is likely to introduce a negative correlation, and somewhat flatten the age-income profiles, thereby decreasing the above effect. Since higher education may result in both increased earned and unearned income, the marginal returns estimated may be considered as the differences in the relative standard of living associated with different education levels.[2]

A summary of the characteristics of the 1986 and 1996 samples for the Maori and non-Maori populations are provided in Tables 1a and 1b for men and women, respectively. Most significantly, this analysis highlights the magnitude of the lower education and income levels for the Maori population across the two census years. The Part-Maori population, in turn, has characteristics more favourable than for Maori, but less favourable than the European population. The analysis further confirms the usefulness of considering Maori and Part-Maori separately, as the two groups show consistently different characteristics.[3]

Table 1a further highlights the very modest improvement in Maori male educational attainment over the decade toward reducing the educational gap. For example, in 1986, the majority of the Maori male population (64.2 per cent) had no school qualifications, compared with 32.2 per cent of the European population, and 42.8 per cent of the Part-Maori population. By 1996, all ethnic groups showed increased educational attainment. However, the attainment for the Maori men was alarmingly modest compared to all other groups, as a decade later, still the majority (63.5 per cent) had no school qualifications. The improvement for this level of education for Maori was the most modest at 0.7 per cent or less than one percentage point, compared to 2.8 per cent for the European, and 7.7 per cent for the 'Other Ethic' groups.[4]

Educational attainment at the tertiary level has also been markedly different for the Maori and non-Maori populations over the decade. For example, in 1986 less than 1 per cent of the Maori population, or 1 out of 120 Maori men had a Bachelor's degree. By 1996, this percentage had improved to 1.6 or 1 out of 63 Maori men. In comparison, 8.8 per cent of Europeans had a Bachelor's degree by 1996.

Table 1b with results for women is consistent with Table 1a in showing educational disadvantage for Maori and Part-Maori women. However, Table 1b further shows significantly greater relative educational achievement for Maori and Part-Maori women compared to the male samples over the decade. Likewise, while in 1986 only 0.2 per cent or 1 in 454 Maori women had postgraduate qualifications, by 1996, the percentage had increased to 0.7 per cent.

Tables 1a and 1b further show that the sample of Other Ethnicity had the proportionally highest tertiary educational levels. These 'higher education' attainment levels, and their significant growth over the decade, however, mainly reflect the effect of the immigration policy in New Zealand since 1991 with greater emphasis on the educational attainment criteria.

In general, the Maori population is disproportionately over-represented in the 'No Qualifications' group and under-represented in postcompulsory secondary and tertiary educational attainment groups. For example, in 1996, while Maori men comprised 7.0 per cent of the sample, they constituted 13.6 per cent of those without qualifications, but 0.9 per cent of those with postgraduate qualifications, and 1.3 per cent of those with Bachelor's qualifications. Despite increased participation rates of Maori youth in tertiary education over the decade, these ratios represented very modest improvements in the relative average educational qualifications of the overall Maori population over the decade. This is partly due to increases in educational attainment of all ethnic groups over the decade, but also the increased number of immigrants with higher educational degrees since 1991. Nevertheless, this analysis highlights the relatively adverse educational position of the Maori and Part-Maori populations.

In addition, Tables 1a and 1b show changes in mean income differentials between the Maori and

[2] For further details of the census data utilised, or education and income characteristics of the overall New Zealand population in 1981, 1986, 1991 and 1996 the reader may refer to Maani (1997, 1999).

[3] This is consistent with Chapple and Rea's (1999) results for employment outcome for Maori and Part-Maori using data from the Household Labour Force Survey.

[4] The improvement of 7.7 per cent in the case of 'Other Ethnic' groups is expected to also reflect the effect of New Zealand immigration policy and it's emphasis on qualifications in the 1990s.

TABLE 1a
Sample Characteristics: Men (Means)

Personal Characteristics	Maori		Part-Maori		European		Other	
	1986	1996	1986	1996	1986	1996	1986	1996
Age (years)	33.08	35.99	31.48	33.60	37.85	39.27	33.56	35.07
	(12.26)	(12.16)	(11.98)	(11.70)	(13.74)	(12.90)	(11.78)	(11.69)
Annual Income ($)								
1986 Dollars	$14 349	–	$16 597	–	$19 521	–	$15 025	–
	($7 953)	–	($9 808)	–	($11 845)	–	($10 177)	–
1996 Dollars	$23 575	$20 470	$27 269	$26 217	$32 072	$34 071	$24 687	$22 662
	($13 067)	($16 160)	($16 115)	($21 660)	($19 462)	($27 400)	($16 721)	($22 771)
Relative to European Mean Income in the Census Year	73.5%	63.8%	85.0%	76.9%	100%	100%	76.9%	66.5%
Highest Qualification (Percentage of Sample)								
No Qualifications	64.2%	63.5%	42.8%	38.1%	32.2%	29.4%	45.1%	37.3%
School Certificate (Age 16)	10.8%	11.6%	13.7%	14.6%	11.6%	11.7%	11.6%	7.4%
Year 12	4.1%	6.4%	7.5%	10.4%	8.3%	9.7%	7.3%	7.3%
Year 13	1.2%	3.7%	3.7%	8.3%	3.8%	7.0%	6.5%	10.5%
Diploma	18.5%	12.6%	27.7%	22.4%	35.6%	28.7%	19.8%	14.5%
Bachelor's Degree	0.8%	1.6%	2.6%	4.5%	5.2%	8.8%	6.2%	15.2%
Postgraduate Qualification	0.4%	0.6%	2.0%	1.7%	3.3%	4.7%	3.5%	7.8%
Sample Proportion with:								
Bachelor's Degree	1/120	1/63	1/38	1/22	1/19	1/11	1/16	1/7
Postgraduate Qualification	1/270	1/167	1/50	1/58	1/30	1/21	1/29	1/13
Labour Force Status (Percentage of Sample)								
All Employed	83.1%	65.1%	88.4%	77.9%	87.5%	83.8%	83.8%	66.3%
Employed Full-Time	77.1%	57.6%	83.7%	71.1%	84.4%	77.3%	79.7%	58.1%
Unemployed	7.4%	12.8%	5.0%	8.3%	2.5%	3.84%	5.2%	9.9%
Out of Labour Force	9.2%	22.1%	6.3%	13.8%	9.6%	12.3%	10.6%	23.8%
Sample Size	14 962	12 157	3 875	9 204	157 667	138 392	8 658	12 888
Percentage of Sample	8.1%	7.0%	2.1%	5.3%	85.2%	80.2%	4.6%	7.5%

Standard deviations in parentheses.

TABLE 1b
Sample Characteristics: Women (Means)

Personal Characteristics	Maori		Part-Maori		European		Other	
	1986	1996	1986	1996	1986	1996	1986	1996
Age	33.34	35.95	31.10	33.62	38.13	39.32	33.85	34.84
	(12.23)	(12.06)	(11.80)	(11.56)	(13.80)	(12.82)	(12.22)	(11.55)
Annual Income ($)								
1986 Dollars	$8 301	–	$9 167	–	$9 841	–	$8 943	–
	($5 821)	–	($6 915)	–	($7 891)	–	($7 209)	–
1996 Dollars	$13 638	$14 238	$15 061	$16 561	$16 170	$19 145	$14 693	$14 525
	($9 564)	($11 863)	($11 360)	($14 370)	($12 965)	($17 658)	($11 845)	($14 695)
Relative to European Mean Income in the Census Year	84.3%	74.4%	80.8%	86.5%	100%	100%	90.7%	75.9%
Highest Qualification (Percentage of Sample)								
No Qualifications	67.5%	60.8%	43.8%	37.1%	38.8%	29.9%	47.4%	40.2%
School Certificate (Age 16)	14.1%	13.7%	18.9%	17.4%	16.4%	16.3%	14.6%	8.9%
Year 12	4.6%	8.0%	10.5%	12.9%	9.4%	11.7%	7.3%	7.6%
Year 13	1.0%	3.5%	2.7%	7.7%	3.1%	6.2%	5.6%	9.8%
Diploma	12.2%	11.8%	20.8%	19.6%	27.0%	25.2%	18.6%	15.4%
Bachelor's Degree	0.4%	1.5%	2.3%	4.1%	3.4%	7.3%	4.5%	13.3%
Postgraduate Qualification	0.2%	0.7%	1.0%	1.2%	1.9%	3.4%	2.0%	4.8%
Sample Proportion with:								
Bachelor's Degree	1/232	1/65	1/44	1/24	1/29	1/14	1/22	1/8
Postgraduate Qualification	1/454	1/151	1/99	1/83	1/52	1/29	1/51	1/21
Labour Force Status (Percentage of Sample)								
All Employed	54.1%	46.9%	63.4%	61.5%	63.8%	69.4%	62.1%	52.5%
Employed Full-Time	43.2%	33.3%	49.7%	43.2%	46.0%	45.8%	51.4%	39.0%
Unemployed	9.3%	11.8%	6.8%	8.2%	3.8%	3.5%	6.1%	8.6%
Out of Labour Force	36.4%	41.2%	29.6%	30.3%	32.2%	27.1%	31.6%	38.9%
Sample Size	13 339	12 109	3 945	10 147	147 210	140 557	7 988	13 273
Percentage of Sample	7.7%	6.9%	2.3%	5.8%	85.4%	79.8%	4.6%	7.5%

Standard deviations in parentheses.

non-Maori populations across the decade, for men and women. In 1986, the mean income for Maori men was at 73.5 per cent of the mean income of European men. In 1996, this ratio had deteriorated to about 64 per cent. The income levels for Part-Maori men were relatively higher at 85 per cent of the European mean income in 1986 and about 77 per cent in 1996. Mean female income levels were closer across ethnic groups, and this partly reflects the generally lower income levels of women of all ethnic groups.

Finally, Tables 1a and 1b show that Maori and Part-Maori had higher unemployment rates, they were more likely to be out of the labour force and less likely to be employed full-time than the Part-Maori and the European populations. The Maori population, in particular, had consistently less advantageous educational attainment and labour market outcomes than the Part-Maori. These labour market outcomes were more accentuated by 1996. For example, the Maori unemployment rate in 1996 was 1.5 times the Part-Maori and 3.3 times European unemployment.

A characteristic of the data set is that in the 1996 census, and compared to the 1991 and 1986 census years, a relatively larger number of individuals had identified themselves as Part-Maori (see e.g., Tables 1a and 1b). This has resulted from the combination of: the younger age composition of the Part-Maori population, a lesser out-migration of the group, a greater identification with Maori ethnicity in general due to the public effect of the Waitangi Settlements, and/or simply the way that the 1996 Census question was phrased (see e.g., Statistics New Zealand 2001).[5] This has some implications in comparing the relative educational attainment and income levels of the Part-Maori to the European population over the decade. For example, in examining the relative educational attainment and income levels of the Part-Maori group over the decade, changes to some extent reflect the composition of the group, with the inclusion of some individuals who were classified as European in 1986 as Part-Maori in 1996.[6]

However, it is reassuring that the results on employment, or educational attainment, etc. by ethnicity for the Census are compatible with those based on other New Zealand data sources such as the Household Labour Force survey for the same time period (e.g. Chapple & Rea 1999 and Dixon 1998). In addition, and importantly, there is no evidence, based on the Census, and other auxiliary surveys (as noted below) that the newly increased number of Part Maori in 1996 has socio-economic characteristics that are different from those in that category in the previous censuses (see e.g., Kukutai 2003; Pool 1998).

The New Zealand census uses an 'ethnic group' approach to ethnicity, as opposed to a solely 'blood/ancestry' approach of a few decades ago. Therefore, the question of self-identification with Maori ethnicity and the possibility of potential endogeneity is relevant. For example, if individuals of Maori descent who are disadvantaged are more likely than others to identify as Maori rather than part-Maori or European, the estimates of educational attainment and the income gap between Maori and other groups would be over-estimated. In contrast, if economically advanced individuals of Maori descent are more likely to identify as Maori, the opposite would be true, and there would be an under-estimation of the gap. The expectation, however, is that identification with an ethnicity is exogenous to educational attainment or income levels.

Pool (1998), for example, notes that while the past trend in national identity in New Zealand, to acknowledge Maori ancestry, had for most previous decades been away from Maori identity, recently there has been a reversal. He notes that it is common for national identity of populations of mixed backgrounds, such as descendents of immigrants or indigenous populations, to change over time; and that while group identity is admittedly a complex phenomenon, increased self identification with Maori ethnicity 'has been stimulated in part by genuine interest in genealogical background emanating from the Waitangi process'.

It is interesting that during the same time period, identification with aboriginal ethnicity has also increased in the Australian census. Hunter (1998) has

[5] The census questions on 'What is your ethnic origin?' have remained consistent in the 1986 and 1996 census years. This is fortunate in terms of constructing the Maori, Part-Maori and European ethnicity variables. However, the 1996 included two additional questions later in the questionnaire that asked about 'whether the respondent was a descendant from a NZ Maori', and if the person 'knew the name of the iwi (tribe or tribes)'. In 1986 respondents were asked to 'Tick the box or boxes that apply to you'; in 1996 they were asked to 'Tick as many circles as you need to show which ethnic group(s) you belong to'. It is not possible to ascertain if these additional questions had also prompted greater identification with Part-Maori ethnicity, but an analysis by Statistics New Zealand (2001) confirms the relatively significant increase in the Part-Maori and a decrease in the Maori categories between the 1991 and 1996 Census years noted in the 1986–96 measures in this paper.

[6] This would tend to lead to an overestimation of the closing of the gap between the Part-Maori and the European populations over the decade.

closely examined the characteristics of 'marginal' aboriginals, or the population that had identified with aboriginal ethnicity in the 1996 census, but not in the earlier census years. Using the Post-Enumeration Survey (PES) of the Australian census for 1986, 1991 and 1996, on ethnicity, age and educational qualifications, and by constructing synthetic cohorts of individuals in various age cohorts, the study provides persuasive evidence that 'the newly identified' indigenous population had similar educational endowments (or more precisely, similarly disadvantageous educational endowments, as measured by school leaving at age 15) to those in previous censuses.

Likewise, in the New Zealand setting, there has been no evidence that the changes in self-identification with Maori and Part Maori in New Zealand are connected with educational characteristics or income levels. A series of analyses including matched subsamples of those who had changed reported Maori ethnicity in the 1991 and 1996 New Zealand Census, a change in ethnic identity was found to be unrelated to socioeconomic factors, but most influential was a change in the respondent's environment and proportion of Maori in his or her area of residence (Coope & Piesse 1997; Kukutai 2003). An important implication of the apparent lack of evidence on any significant compositional effect on education outcomes in the above census years is that even if the recent changes in indigenous identification had affected the composition of the census, the evidence indicates that the effect was small, supporting the validity and usefulness of intercensus analyses of returns to educational endowments in the Australian (Hunter 1998), and New Zealand settings.

TABLE 2a
Income and Unemployment Rates by Ethnicity and Highest Educational Qualification: Men (Means)

	Highest Qualification					
Personal Characteristics	None	School Cert (Age 16)	Year 12	Diploma	Bachelor's	Postgraduate
1986:						
Income (1996 dollars)						
Maori	$21 887	$22 881	$24 242	$28 844	$33 679	$43 586
	($11 906)	($12 163)	($12 938)	($14 126)	($22 800)	($25 198)
Part-Maori	$23 816	$25 257	$24 612	$32 128	$40 627	$46 424
	($13 053)	($13 997)	($14 125)	($16 061)	($23 673)	($28 024)
European	$27 145	$28 490	$29 600	$35 270	$46 282	$53 305
	($16 053)	($17 403)	($18 704)	($17 934)	($26 160)	($26 404)
Other Ethnicity	$21 845	$22 622	$22 997	$28 977	$35 826	$45 125
	($12 079)	($12 955)	($15 344)	($16 191)	($25 446)	($28 371)
Unemployment Rate						
Maori	8.7%	6.5%	5.1%	4.3%	5.2%	1.8%
Part-Maori	6.8%	3.6%	5.5%	2.2%	3.9%	3.8%
European	3.1%	2.7%	2.5%	1.6%	2.3%	1.4%
Other Ethnicity	5.4%	4.8%	4.9%	3.7%	4.5%	2.7%
1996:						
Income (1996 dollars)						
Maori	$18 229	$22 048	$24 096	$26 190	$33 467	$53 572
	($13 928)	($15 819)	($17 750)	($17 859)	($27 743)	($32 955)
Part-Maori	$21 557	$25 558	$27 120	$31 626	$43 810	$51 290
	($17 006)	($19 418)	($21 710)	($21 653)	($34 004)	($35 726)
European	$26 379	$31 619	$33 793	$36 251	$51 449	$60 286
	($21 138)	($23 767)	($26 228)	($24 086)	($36 838)	($37 995)
Other Ethnicity	$17 792	$24 391	$23 154	$26 338	$29 659	$38 243
	($14 337)	($19 728)	($20 373)	($22 148)	($29 351)	($36 218)
Unemployment Rate						
Maori	14.9%	10.8%	8.1%	7.7%	6.2%	2.7%
Part-Maori	11.3%	8.4%	6.0%	5.4%	3.8%	4.4%
European	5.1%	3.9%	3.4%	2.6%	2.9%	2.5%
Other Ethnicity	10.2%	8.0%	6.5%	8.5%	12.1%	12.8%

Standard deviations in parentheses.

TABLES 2b
Income and Unemployment Rates by Ethnicity and Highest Educational Qualification: Women (Means)

	Highest Qualification					
Personal Characteristics	None	School Cert (Age 16)	Year 12	Diploma	Bachelor's	Postgraduate
1986:						
Income (1996 dollars)						
Maori	$12 330	$13 928	$16 290	$19 075	$22 735	$29 327
	($8 337)	($9 239)	($10 582)	($12 382)	($13 848)	($21 595)
Part-Maori	$12 909	$13 563	$16 399	$18 912	$26 103	$26 313
	($9 386)	($9 990)	($11 640)	($13 277)	($15 428)	($17 650)
European	($13 232)	$15 412	$16 980	$19 107	$24 124	$28 563
	($10 691)	($11 823)	($12 139)	($13 989)	($17 764)	($20 242)
Other Ethnicity	$13 006	$14 461	$16 571	$17 516	$21 107	$21 290
	($9 925)	($10 671)	($11 820)	($12 375)	($18 965)	($19 986)
Unemployment Rate						
Maori	9.6%	10.7%	6.2%	6.8%	7.0%	3.3%
Part-Maori	6.9%	7.9%	6.7%	5.4%	9.0%	7.5%
European	3.6%	3.7%	3.7%	3.3%	4.4%	2.6%
Other Ethnicity	6.0%	6.3%	4.9%	6.2%	5.3%	8.0%
1996:						
Income (1996 dollars)						
Maori	$12 251	$15 258	$16 741	$19 158	$24 943	$42 111
	($9 933)	($11 245)	($12 374)	($13 786)	($19 657)	($27 427)
Part-Maori	$13 465	$16 290	$18 494	$19 804	$26 855	$35 824
	($11 024)	($13 511)	($15 562)	($14 942)	($20 266)	($26 487)
European	$14 395	$18 643	$19 635	$21 940	$27 709	$34 522
	($13 788)	($16 855)	($16 776)	($17 511)	($22 340)	($26 588)
Other Ethnicity	$11 775	$16 939	$17 095	$16 770	$18 330	$23 604
	($11 536)	($12 035)	($13 507)	($14 975)	($18 955)	($24 127)
Unemployment Rate						
Maori	12.9%	11.3%	9.8%	9.5%	4.9%	1.2%
Part-Maori	9.8%	8.8%	6.1%	6.4%	5.3%	0.8%
European	3.7%	3.2%	3.2%	2.9%	3.4%	2.9%
Other Ethnicity	7.9%	7.4%	5.8%	8.1%	11.2%	13.9%

Standard deviations in parentheses.

Continuing with Tables 2a and 2b and Figure 1 (based on these Tables), they further show higher mean income levels and lower unemployment rates by 'educational attainment', and the widened income gap, especially for men over the decade. Since these income levels are based on overall samples, they incorporate the effects of a number of factors including employment outcomes, hours of work, human capital levels and occupation and industry of employment, all of which are addressed later in the paper.

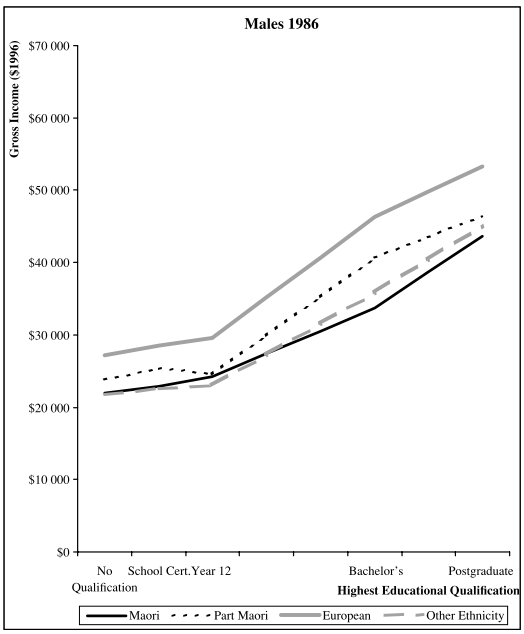
These statistics indicate that the Maori population has a greater share of unemployment, and lower income levels associated with lower relative educational attainment levels. They further show that within each educational category Maori and Part-Maori income levels are generally lower than for the European group. This indicates disadvantage in either transferring education to market rewards, or the effect of other factors such as a difference in the quality or the field of study in the education received.

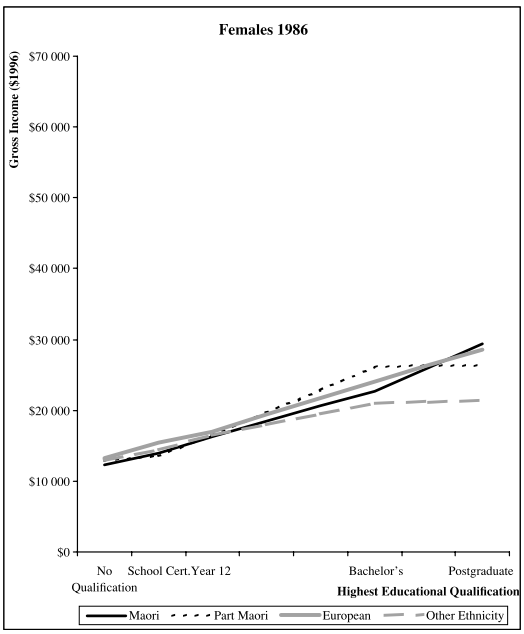
A second and more positive result as reflected by Tables 2a and 2b and the analyses in the next sections is that 'ethnicity' may not have to dictate one's 'income destiny', and that the dispersion of income by education within ethnic groups is far greater than the differences in mean income levels for the same education level and across ethnic groups.

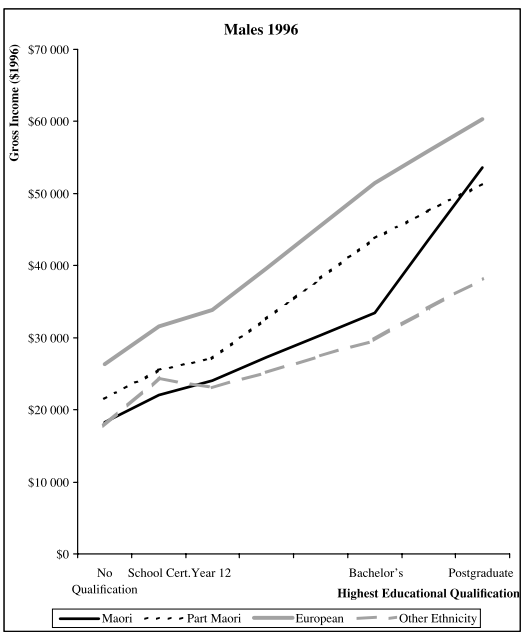
When the sample of 'full-time employed' men and women, and their mean income levels were considered (tables are not included for brevity), while income levels are lower for Maori, and to a lesser extent Part-Maori, within each educational attainment

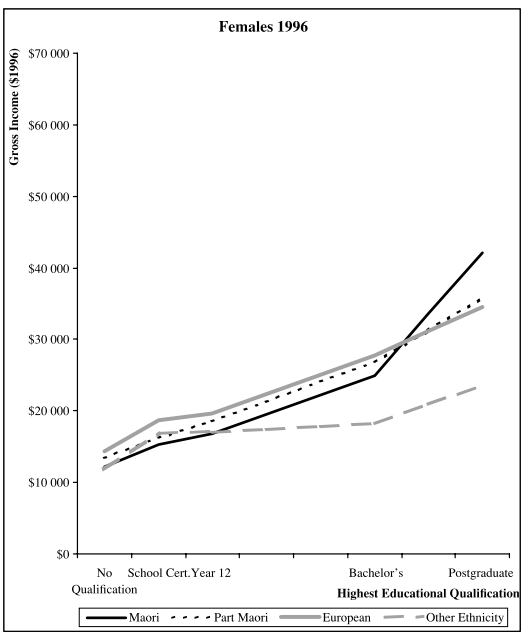
FIGURE 1

Income Dispersion by Highest Educational Qualification and Ethnicity: Employed, Unemployed and out of the Labour Force Men and Women in 1986 and 1996









category, the income gap is narrower. For example, the 1996 mean income of Maori men with 'no qualifications' is at 77.5 per cent of the European mean income levels, and with 'Bachelor's qualifications' it is at 71.4 per cent. For women, the gap was also narrower at 82.5 per cent for 'no qualifications', and 86.5 per cent with 'bachelor's qualifications'.

Finally, one would note in Tables 1a and 1b the younger composition of Maori and Part-Maori compared to the European population, which could partly explain lower income levels for Maori across and within each educational category. This age difference is however, less pronounced among tertiary graduates by 1996, indicating more comparable age structures for graduates. This age effect is controlled for in the following econometric models through 'years of experience' variables throughout the study.

IV Econometric Analyses and Stability Tests

The objective of the analyses in this section is to formally examine the relative contribution of educational qualifications to Maori and non-Maori income levels, when adjustments are made for educational qualifications and years of experience. In order to compare groups that are comparable in relation to employment these analyses incorporate the 20 per cent sample of all those in the working age group who were working full-time (working 30 or more hours per week). These models examine whether the income levels associated with similar higher educational attainment for Maori and non-Maori differ in 1986 and 1996. This question is of further interest, since expected lifetime rewards to educational investments are expected to influence participation rates in postcompulsory education, where consistently lower rewards for an ethnic group would in turn result in lower educational investments and attainment over time. This further examines whether there is support for the hypothesis that lower income returns to educational investments are responsible for lower Maori educational investments. The analysis is extended in this section for formal stability tests of Maori relative income returns to education over time.

The models estimated are semilogarithmic with binary variables for educational qualifications (see e.g., Heckman & Polachek 1974; Dougherty & Jimenez 1991), as in equation 1 below:[7]

$$\ln Y_{ikt} = a_{kt} + \sum b_{jkt} X_{ijkt} + d_{1kt} \mathrm{EXP}_{ikt} + d_{2kt} \mathrm{EXP}^2_{ikt} + v_{ikt} \quad (1)$$

Model 1 is estimated for 1986 and 1996, for men and women and each of the four ethnic groups separately, where the dependent variable is the natural log of annual income in current dollars, k stands for each of the four ethnic groups, X i_j represent six binary educational qualifications variables for individual i, and qualification j, and t is the year (1986 and 1996). The excluded educational qualification level is 'with no school qualifications', and the base and omitted ethnic category is the European. Variable EXP measures the years of work experience by educational qualification level, in the usual quadratic form.[8] The model incorporates before-tax income levels.[9,10]

[7] Heckman and Polachek (1974) and Dougherty and Jimenez (1991) have provided tests of the functional form for the earnings function, and they support the semilog 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. Gibson (2001) finds evidence in favour of this hypothesis for Maori and Pacific Islanders.

[8] Years of experience is specified as 'age – years of schooling – 5' since school starts at age 5 in New Zealand. Since some individuals would have actually worked for more or fewer years, this widely used measure of experience is actually a reflection of potential years of experience for a given number of years of schooling.

[9] The income information in the New Zealand census (similar to Australia) is reported in 13 categories, based on an annual gross income. The annual income categories in the census for the sample of the employed were $1–$2 500, $2 501–$5 000, up to $100 000 or more. For each category the mid-point of the categories was used as a measure of income. For the highest category, based on Statistics New Zealand estimates a mid-point of $130 960 was assumed (in 1996), based on median income information from a group of other data sources, including the Household Economic Survey. The validity of using mid-points for the other categories was also verified through checks with mean and median incomes for income levels in the income categories. However, given the interval nature of census data on income, alternative estimation methods, such as Interval and Quantile regressions can provide further comparative analysis in future studies.

[10] Given the interval nature of income information in the census, if Maori in the highest income category actually have lower income levels than the European population in that category, the effect of education on income for Maori could be overestimated. But such possible effect is expected to be small, given that the highest income category covers a very small group of the population (0.4 per cent of Maori and 1.4 per cent of the New Zealand overall population in 1996). Hence, 99.6 per cent of the Maori population is covered by the other income categories. Also, evidence against this potential problem is that the highest educated Maori worked more hours in both census years, and were in high labour market demand (Maani 2001).

Tests of whether a restriction across ethnicity holds indicated the usefulness of unrestricted specifications, which allow coefficients of returns to each educational degree to vary across ethnic groups.[11] While the restriction could not be rejected for the female samples in 1996, it is significantly rejected in the case of male earnings functions, indicating that income rewards to education vary significantly for men with ethnicity, and unrestricted models were pursued. In addition, sample characteristics and age-income profiles are significantly different for men and women. Therefore, throughout separate analyses are presented for the two groups. It may be further noted that for the analyses in this paper educational degree and years of potential experience are mainly considered for overall rates of return to an educational degree. Further extensions, however, which control for a wider number of variables including occupation and industry do not change any conclusions of the study. All estimations reported utilise the White adjustment for consistent estimates of coefficient variances.

The results of Tables 3a and 3b indicate that the returns to postcompulsory education have been significant over the 1986–96 decade for the four ethnic groups considered, while the returns vary across ethnic groups. The results further show that Maori base-level incomes for 'no qualifications' were lower at statistically significant levels in both 1986 and 1996.

These estimates show flatter income profiles in relation to the experience for women and for Maori. Within each ethnic group, the returns to post-compulsory secondary and tertiary education are also significant. In particular, in the case of women, Maori, and Other Ethnic groups the returns to higher education are greater, since they are relative to lower income levels for the base group with no school qualifications. For example, as column 5 of Table 3a indicates, a Bachelor's degree was associated with income levels that were 106 per cent higher than with no school qualifications for Maori men working full-time in 1996 (a coefficient of 0.725).[12] This compared to 92.6 per cent higher for the European group (coefficient of 0.674). For Maori women, in turn in Table 3b, the comparable results were 129 per cent higher and for European women 82.4 per cent.[13] These results are consistent with results of Gibson (1998) for a sample of twins in New Zealand, which also finds higher returns to education for Maori, but lower educational attainments for Maori.

In the case of women, while Maori women had lower income levels, the gap by ethnicity is generally smaller or non-significant, especially at higher education levels. For both men and women with tertiary education, however, the group with Other Ethnicity has the lowest relative income position. This is especially true by a significant margin in the case of a Bachelor's degree, which is expected to reflect the employment outcomes for recent immigrants from non-traditional non-English speaking countries, but with higher educational qualifications.

(i) Stability Tests of Maori Income Levels in Each Time Period and Over Time

Differences in Coefficients by Ethnicity

For formal statistical tests and inferences on the *differences* in coefficients by ethnicity in a given year and over time, which is of special interest in this study, auxiliary stability tests were conducted and incorporated in the t-statistics reported in Tables 4a and 4b. The tests involved pooling together the samples for the 1986 and 1996 census years, with the binary variable technique and the Wald test.[14] Inference on the differences of coefficients by ethnicity, and the stability of each coefficient over time is made through *t*-tests relating to interaction effects for all coefficients over the two census years.

To facilitate a comparison of the coefficients by ethnicity in each year and their relative changes over time, Tables 4a and 4b provide the coefficients of these stability tests in comparison to the base European group in each year (columns 1–6) and over time (columns 7–10).

[11] The restricted model across ethnic groups for each year is: $\ln Y_i = a_k + \Sigma\, b_j X_{ij} + c_1 M_i + c_2 PM_i + c_3 O_i + d_{1k}\, EXP_{ik} + d_{2k} EXP_{ik}^2 + u_i$, where M_i, PM_i, and O_i are binary variables for the three ethnic groups.

[12] The usual relevant adjustments are made to interpret the coefficients as a *percentage* gain in income in relation to dichotomous (binary) variables for educational qualifications, given the semilogarithmic functional forms of the 'earnings functions' (see, e.g. Halvorsen & Palmquist 1980). For example, the *percentage* gain in income from an education level is derived 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.

[13] Respectively, corresponding to coefficients of 0.832 and 0.601.

[14] For more details on the tests, the reader may refer to Ramanathan (2002), pp. 156–8 and 314–16. In the pooled samples, interaction effects for 'ethnicity' and 'year' with all variables basically estimate coefficients that are equivalent to separate regressions by ethnicity and year, but they also provide *t*-tests of differences in coefficients, which take into account the covariances across coefficients for the respective subpopulations and years.

TABLE 3a

Income Effects of Secondary and Tertiary Education of Men Employed Full-time: 1986 and 1996; Dependent Variable: The Natural Logarithm of Annual Income (Unrestricted Model Least Squares Regression Coefficients)

Explanatory Variables	1986				1996			
	Maori	Part-Maori	European	Other	Maori	Part-Maori	European	Other
Intercept	9.071 (663.91)	9.058 (451.95)	9.115 (2 087.94)	9.040 (481.09)	9.237 (374.35)	9.341 (398.81)	9.385 (1 387.57)	9.190 (336.99)
School Certificate (Age 16)	0.111 (8.19)	0.138 (6.58)	0.088 (18.70)	0.111 (5.77)	0.186 (9.59)	0.178 (8.84)	0.134 (21.88)	0.309 (12.40)
Year 12	0.257 (14.93)	0.285 (10.59)	0.207 (38.45)	0.252 (11.31)	0.313 (14.22)	0.268 (11.86)	0.259 (38.84)	0.445 (18.06)
Diploma	0.262 (24.27)	0.296 (16.48)	0.279 (83.85)	0.311 (20.11)	0.304 (16.63)	0.340 (18.80)	0.302 (62.39)	0.495 (24.61)
Bachelor's Degree	0.519 (9.58)	0.562 (17.70)	0.613 (89.43)	0.744 (30.87)	0.725 (17.96)	0.695 (20.89)	0.674 (91.16)	0.640 (23.96)
Postgraduate Qual.	0.470 (7.12)	0.689 (19.66)	0.680 (88.49)	0.819 (28.80)	0.900 (18.87)	0.783 (20.68)	0.783 (86.40)	0.922 (30.22)
Experience	0.046 (33.23)	0.056 (28.39)	0.052 (129.34)	0.040 (21.07)	0.063 (29.27)	0.067 (31.46)	0.071 (122.25)	0.055 (23.35)
Experience^2	−0.00084 (26.79)	−0.00096 (20.59)	−0.00091 (99.63)	−0.00064 (14.48)	−0.00104 (23.55)	−0.0012 (23.95)	−0.00125 (97.43)	−0.00084 (16.46)
F	269.97	237.78	5 325.94	298.16	227.18	261.83	4 038.62	251.00
$\bar{R}^2$	0.1580	0.3744	0.2441	0.2578	0.2075	0.2438	0.2334	0.2134
Sample Size	11 463	3 165	131 925	6 844	6 910	6 472	106 089	7 374

t-ratios in parentheses, based on White Consistent Standard Errors.

TABLE 3b

Income Effects of Secondary and Tertiary Education of Women Employed Full-time: 1986 and 1996; Dependent Variable: The Natural Logarithm of Annual Income (Unrestricted Model Least Squares Regression Coefficients)

Explanatory Variables	1986				1996			
	Maori	Part-Maori	European	Other	Maori	Part-Maori	European	Other
Intercept	8.884 (490.50)	8.800 (321.09)	8.977 (1 362.04)	8.964 (392.85)	9.151 (273.89)	9.280 (342.62)	9.319 (1 009.70)	9.128 (288.84)
School Certificate (Age 16)	0.155 (8.04)	0.177 (5.95)	0.173 (25.66)	0.149 (7.10)	0.263 (10.33)	0.206 (8.37)	0.181 (22.01)	0.351 (13.63)
Year 12	0.330 (13.65)	0.468 (13.73)	0.288 (37.41)	0.401 (17.26)	0.508 (18.90)	0.328 (12.64)	0.313 (35.44)	0.433 (14.38)
Diploma	0.380 (19.97)	0.459 (17.09)	0.345 (54.39)	0.314 (14.13)	0.479 (19.71)	0.383 (16.29)	0.343 (46.10)	0.449 (17.20)
Bachelor's Degree	0.767 (11.08)	0.929 (21.62)	0.619 (51.37)	0.618 (14.07)	0.832 (19.86)	0.664 (20.47)	0.601 (58.87)	0.601 (20.82)
Postgraduate Qual.	0.559 (8.06)	0.846 (13.66)	0.705 (47.04)	0.730 (15.04)	0.969 (21.20)	0.835 (22.61)	0.763 (61.24)	0.958 (24.80)
Experience	0.027 (13.54)	0.045 (17.66)	0.028 (42.10)	0.026 (11.78)	0.044 (15.44)	0.046 (19.64)	0.050 (65.37)	0.040 (14.52)
Experience^2	−0.00045 (9.22)	−0.00079 (11.33)	−0.00049 (30.18)	−0.00045 (8.48)	−0.00075 (11.80)	−0.00080 (14.25)	−0.00092 (51.46)	−0.00058 (8.99)
F	98.53	131.94	946.60	78.67	135.34	178.70	1328.47	144.46
$\bar{R}^2$	0.1201	0.3375	0.1009	0.1331	0.2144	0.2480	0.1428	0.1844
Sample Size	5 714	1 899	67 425	4 046	3 938	4 311	63 746	5 076

t-ratios in parentheses, based on White Consistent Standard Errors.

TABLE 4a

*Changes in Relative Income Returns to Educational Attainment by Ethnic Group over Time: **Men Employed Full-time**; Dependent Variable: The Natural Logarithm of Annual Income (Least Squares Regression Coefficients)*

	1986			1996			Relative Change 1986–96			
Explanatory Variables	Maori b_{M86}-b_{E86}	Part-Maori b_{P86}-b_{E86}	Other b_{O86}-b_{E86}	Maori b_{M96}-b_{E96}	Part-Maori b_{P96}-b_{E96}	Other b_{O96}-b_{E96}	European b_{E96}-b_{E86}	Maori $(b_{M96}$-$b_{E96})$ $-(b_{M86}$-$b_{E86})$	Part-Maori $(b_{P96}$-$b_{E96})$ $-(b_{P86}$-$b_{E86})$	Other $(b_{O96}$-$b_{E96})$ $-(b_{O86}$-$b_{E86})$
Intercept	−0.044	−0.058	−0.075	−0.148	−0.045	−0.196	0.270	−0.104	0.014	−0.121
	(3.06)	(2.88)	(3.88)	(5.81)	(1.87)	(6.94)	(33.55)	(3.57)	(0.43)	(3.54)
School Certificate (Age 16)	0.022	0.050	0.022	0.052	0.043	0.174	0.046	0.030	–0.006	0.152
	(1.56)	(2.35)	(1.13)	(2.55)	(2.11)	(6.77)	(5.93)	(1.19)	(0.22)	(4.68)
Year 12	0.051	0.078	0.046	0.054	0.008	0.186	0.053	0.003	–0.070	0.140
	(2.80)	(2.89)	(2.00)	(2.35)	(0.37)	(7.25)	(6.13)	(0.11)	(1.96)	(4.07)
Diploma	–0.017	0.018	0.033	0.002	0.038	0.193	0.023	0.019	0.020	0.160
	(1.50)	(0.98)	(2.06)	(0.11)	(2.07)	(9.30)	(3.97)	(0.87)	(0.79)	(6.15)
Bachelor's Degree	−0.094	−0.052	0.131	0.051	0.021	−0.034	0.061	0.145	0.072	–0.165
	(1.72)	(1.61)	(5.21)	(1.25)	(0.63)	(1.23)	(6.04)	(2.13)	(1.57)	(4.41)
Postgraduate Qual.	–0.211	0.009	0.138	0.117	–0.001	0.138	0.103	0.327	–0.010	–0.00006
	(3.17)	(0.26)	(4.70)	(2.41)	(0.02)	(4.34)	(8.69)	(3.98)	(0.19)	(0.001)
Experience	−0.0064	0.0032	−0.0127	−0.0078	−0.0034	−0.0152	0.0181	−0.0014	−0.0066	−0.0025
	(4.43)	(1.64)	(6.56)	(3.53)	(1.55)	(6.20)	(25.59)	(0.54)	(2.25)	(0.80)
Experience^2	0.000079	−0.000042	0.00027	0.00021	0.000082	0.00041	–0.00033	0.00013	0.00012	0.00013
	(2.44)	(0.91)	(6.05)	(4.45)	(1.67)	(7.66)	(21.19)	(2.23)	(1.84)	(1.90)

t-ratios in parentheses, based on White Consistent Standard Errors.

TABLE 4b

Changes in Relative Income Returns to Educational Attainment by Ethnic Group over Time; Women Employed Full-time; Dependent Variable: The Natural Logarithm of Annual Income (Least Squares Regression Coefficients)

	1986			1996			Relative Change 1986–96			
Explanatory Variables	Maori b_{M86}-b_{E86}	Part-Maori b_{P86}-b_{E86}	Other b_{O86}-b_{E86}	Maori b_{M96}-b_{E96}	Part-Maori b_{P96}-b_{E96}	Other b_{O96}-b_{E96}	European b_{E96}-b_{E86}	Maori (b_{M96}-b_{E96}) −(b_{M86}-b_{E86})	Part-Maori (b_{P96}-b_{E96}) −(b_{P86}-b_{E86})	Other (b_{O96}-b_{E96}) −(b_{O86}-b_{E86})
Intercept	−0.093	−0.177	−0.012	−0.167	−0.038	−0.190	0.342	−0.075	0.138	−0.178
	(4.75)	(6.38)	(0.52)	(4.88)	(1.37)	(5.76)	(30.12)	(1.90)	(3.52)	(4.39)
School Certificate (Age 16)	−0.017	0.005	−0.024	0.082	0.025	0.171	0.008	0.099	0.021	0.194
	(0.84)	(0.15)	(1.08)	(3.10)	(1.01)	(6.29)	(0.77)	(2.96)	(0.53)	(5.57)
Year 12	0.042	0.180	0.113	0.195	0.015	0.119	0.025	0.153	−0.166	0.006
	(1.63)	(5.25)	(4.63)	(6.96)	(0.54)	(3.80)	(2.15)	(4.03)	(3.81)	(0.16)
Diploma	0.035	0.114	−0.031	0.135	0.040	0.105	−0.001	0.100	−0.074	0.136
	(1.73)	(4.22)	(1.35)	(5.38)	(1.66)	(3.87)	(0.13)	(3.11)	(2.05)	(3.83)
Bachelor's Degree	0.148	0.310	−0.001	0.230	0.063	−0.00006	−0.017	0.082	−0.248	0.001
	(2.08)	(7.08)	(0.03)	(5.40)	(1.90)	(0.002)	(1.10)	(0.99)	(4.50)	(0.02)
Postgraduate Qual.	−0.146	0.141	0.025	0.207	0.072	0.195	0.058	0.352	−0.068	0.170
	(2.03)	(2.25)	(0.49)	(4.41)	(1.91)	(4.80)	(2.95)	(4.10)	(0.93)	(2.62)
Experience	−0.00071	0.0188	−0.0018	−0.0056	−0.0045	−0.0095	0.0221	−0.0048	−0.0223	−0.0077
	(0.34)	(7.06)	(0.79)	(1.90)	(1.43)	(3.30)	(21.93)	(1.34)	(6.19)	(2.10)
Experience^2	0.000041	−0.00029	0.000043	0.00017	0.00013	0.00034	−0.00043	0.00013	0.00042	0.00030
	(0.77)	(4.19)	(0.77)	(2.65)	(2.21)	(5.16)	(17.59)	(1.58)	(4.64)	(3.48)

t-ratios in parentheses, based on White Consistent Standard Errors.

The differential coefficients in columns 1–8 are equivalent to differences in coefficients in Tables 3a and 3b. For example, the first column of the table represents (b_{M86}-b_{E86}) or the difference in the coefficient for an educational level for Maori compared to the European group with the same level of education in 1986, with the corresponding *t*-value for the test of the significance of the *difference* in the coefficients in that year.

Column 7 provides the differences over time in the coefficients for the base European group between 1986 and 1996, while columns 8–10 provide the relative change in the coefficients for each of the other three ethnic groups *relative* to the European group with the same characteristic over the decade. The corresponding *t*-statistic, in turn, is in relation to the difference over time.

Notably, Table 4a statistically confirms the earlier findings that compared to the European population, and controlling for educational attainment, the Maori population had lower income levels in both 1986 and 1996. For Maori and Other Ethnic men with no school qualifications the disadvantage had increased over the decade.

For example, column 4 of Table 4a for men in 1996 indicates that Maori men with no school qualifications had income levels that were 15.9 per cent lower (a coefficient differential of −0.148) than non-Maori European men with similar qualifications in that year. This suggests that the labour market outcome for not having school qualifications creates more disadvantage for Maori than for the European population. In comparison, the income levels of Part-Maori were not significantly different from the control group, while the Other Ethnicity group had the lowest relative income levels at levels 21.6 per cent lower.

In comparison, Maori women with 'no school qualifications' had income levels that were 18.2 per cent lower, and the Other Ethnic group had incomes 20.9 per cent lower than European women. For women, a statistically significant difference between Part-Maori and European income levels was not present.

These results further indicate that obtaining postcompulsory education was associated with relative income gains for Maori that were significantly higher than the European group. For example, as column 4 indicates, additional income returns to Year 12 were 5.5 per cent higher for Maori men and 21.5 per cent higher for Maori women. Higher income returns for Maori are statistically significant for most education levels. In the case of postgraduate education, the expected returns for Maori men were 12.4 per cent higher than for Europeans and for Maori women they were 22.9 per cent higher.

These significant differences partly reflect greater employment opportunities and access to new occupations with postcompulsory education, and are partly due to the lower base income levels of Maori without school qualifications. Nevertheless, these results suggest that postcompulsory education provides serious options for Maori in raising their absolute and relative income levels.[15]

(ii) Changes in Rewards to Education Over Time

Columns 7–10 of Tables 4a and 4b of *changes* in the income returns to various educational degrees over time show that the returns to postcompulsory educational degrees had increased across ethnic groups, and that the *changes* to income returns to education over the decade were also variable across ethnicity.

As column 7 indicates, the returns to all educational degrees had increased for *European* men, and for postcompulsory secondary, Bachelor's and postgraduate degrees had increased for women, over the decade.[16]

Notably, column 8 results, which are of interest, statistically confirm the earlier finding that compared to the European population, and controlling for educational attainment, the Maori population had lower income levels in both 1986 and 1996. For Maori and Other Ethnic men with no school qualifications the disadvantage had increased over the decade. For example, for Maori men, and compared to European men with no school qualifications, the income differences of 4.5 per cent in 1986, compared to 15.9 per cent in 1996. For 'Part-Maori' with no school qualifications, in turn, a 6 per cent income disadvantage in 1986 had changed to income levels that were not statistically different in 1996.

Interestingly, for Maori women with educational qualifications, in turn, the gap with European incomes had decreased significantly, and in the case of Part-Maori the gap had disappeared. Only in the case of women of Other Ethnicity the income difference

[15] This is consistent with the results of Chapple and Rea (1999) and Winklemann and Winklemann (1997) who have provided evidence on the link between schooling and *employment*, respectively, using the Household Labour Force Survey data and the New Zealand Census.

[16] Studies by Dixon (1998) using the Household Labour Force Survey data, and Maani (1999) using 1981–96 census data, have shown that the increase in the returns to education since 1986 are mainly in the 1986–91 period, with a plateau and a slight decrease in the 1991–96 period as the supply of graduates has increased.

was far more significant in 1996, at income levels that were 19.5 per cent lower than for the European full-time employed women.[17] This result is expected to also partly reflect labour market outcomes for immigrants.

A notable result is that the returns to a Bachelor's degree for the Maori sample were significantly higher in 1996 compared to a decade earlier. For example, the income returns to a Bachelor's Degree were 15.6 per cent higher in 1996 for full-time employed Maori men than in 1986. Likewise, the returns to a postgraduate degree had increased by 38.7 per cent for full-time employed Maori men, and by 42.2 per cent for full-time employed Maori women. Column 8 of Table 4b further reveals that for Maori women the returns to most postcompulsory educational qualifications had increased significantly over the decade, a result that is consistent with the significant increases in the participation of Maori women in postcompulsory education over the decade (as apparent in Tables 1b and 2b).

The results for Part-Maori do not show consistent significant differences from the European group in changes to returns to educational qualifications over the decade. Since Part-Maori income levels with higher education have not been significantly lower than European income levels, this result indicates the changes for the two groups have been comparable over the decade.

An interesting question worthy of further analysis in future studies is why Part-Maori have educational attainment and income levels that are more similar to the European population than the Maori population. For example, one explanation is that Part-Maori ethnicity reflects language, cultural, and other characteristics that are more similar to the European population, and that therefore they result in investments in education and links into the job market that more closely resemble the European population. This is consistent with the hypothesis that Maori face greater economic or informational barriers to obtaining higher education, due to their family education and income levels, rural living and other cultural factors, or greater educational barriers due to having left school without qualifications. The results are further quite parallel to Kuhn and Sweetman's (2002) results for the 'multipleorigin' compared to the 'single-origin' aboriginal population in Canada, and the more favourable educational and labour market outcomes of Part-Maori.

Finally, the results for the Other Ethnic groups show significant increases to returns to post-compulsory secondary education and diplomas over the decade. This result is expected to reflect the effect of increased educational participation of Pacific Island and other ethnic groups over the decade, opening new job opportunities for both men and women. The returns to a *Bachelor's degree* for men of Other Ethnicity, however, showed a significant deterioration over the decade. As discussed earlier this finding is expected to reflect the less advantageous labour market outcomes experienced by immigrants since 1991 partly due to initial language barrier, despite higher educational qualifications.

The results of the stability tests in this section have shown that the returns to various educational qualifications had generally increased over the decade. For Maori men the returns to tertiary education were significantly higher relative to no school qualifications in 1996 than they were in 1986. The returns to education are greater for Maori compared to non-Maori, despite lower attainment levels. This is primarily since Maori with no qualifications are relatively more disadvantaged with respect to non-Maori than are Maori with qualifications. For Maori women, the returns to all postcompulsory secondary degrees, diplomas, and postgraduate studies had also grown significantly over the decade.

The results of this analysis confirm that for those with 'no school qualifications' the income gap between Maori and European had increased over the decade. However, with postcompulsory secondary or tertiary education levels the returns to education for Maori were higher, and the gap was narrowing or not changing at statistically significant levels.

(iii) Other Control Variables (Occupation, Hours of Work, and Locality)

The analyses of the previous section have established that Maori relative income levels had deteriorated by 1996, and compared to 1986. The analysis in this section incorporates the effect of occupation and industry, hours of work and locality of workers. For this, the model from the previous section was extended to include a larger number of explanatory variables to incorporate the impact of hours of work, occupation, industry and locality in explaining relative Maori income levels over time:

$$\ln Y_{ikt} = a_{kt} + \sum b_{jkt} X_{ijkt} + \sum c_{jkt} Z_{ijkt} + d_{1kt} \mathrm{EXP}_{ikt} + d_{2kt} \mathrm{EXP}^2_{ikt} + v_{ikt} \quad (2)$$

[17] The 19.5 per cent differential corresponds with the coefficient of –0.178, of the relative change in the intercepts between the two census years, as in row 1, column 11 of Table 4b.

where Zi_j, control for occupation and industry (18 one digit variables),[18,19] weekly hours of work, marital status ('married' or 'de facto' vs other categories), and locality of residence ('major urban' and 'rural' vs. 'semiurban'). As before, the model is unrestricted by ethnicity, gender and for each year. In incorporating the effect of variations in 'hours of work', in this part of the study the sample of 'all employed' which provides variation in the hours of employment is used for estimations.

It may be noted that earlier when the Zi_j variables were not included, the estimates for educational qualifications represent the overall associations between educational qualification and income levels, and when these variables are included, the model provides further information on the mechanisms through which education and income levels are connected.

In 1996 a disproportionately large percentage of all employed Maori men (47.0 per cent compared to 18.5 per cent for the European sample) were engaged in 'elementary and low skilled' occupations. This was true to a smaller extent for women at 26.3 per cent compared to 8.7 per cent for the European sample. By the same token, a notably smaller proportion of the overall Maori employed population was in 'managerial' and 'professional' occupations in 1996. However, when controlling for educational attainment, by 1996 the ethnic proportional difference in professional occupations for men with higher education had decreased significantly. For Maori, Part-Maori and European women the difference had virtually disappeared by 1996, signalling the importance of educational attainment as a means of access to professional and managerial occupations and for reducing the income differentials.

There was also a greater dispersion in average hours of work for men by ethnicity in 1996 where the European male population experienced on average 3.5 more hours of work per week (equivalent to 21.9 more 8 h days of employment per year). As hours of work per week were generally higher for higher education levels (reflecting both demand effects for skill-based employment and possibly supply effects through higher opportunity cost of time), the majority of Maori men were, as a result, obtaining fewer hours of work, by virtue of belonging to the lower educational attainment and low skill occupations. In contrast, Maori women worked more hours per week on average, than other groups.[20]

While the expected sign for 'hours of work' is positive, the effects of 'locality of residence' and 'marital status' are a-priori not entirely clear, and examining their effect is of interest, in particular across ethnic groups. However, there is wide empirical evidence on a positive link between income levels and a 'married' status, which one would expect to represent mainly supply side-effects. In addition, 'urban' living is expected to have a positive coefficient if urban job and employment opportunities are greater than in rural or semiurban areas, but the extent of it may very well vary for the Maori population.

Table 5 provides the extended regression results for Maori men and women. (The regression coefficients for the other ethnic groups are summarised in the decomposition analyses below, but are not presented individually for brevity.)[21] A comparison of the coefficients in specifications 1 and 2 in Table 5 (with and without hours of work, occupation and industry) is useful in revealing the impact of the added variables. These results confirm that 'educational qualifications' impact income levels to a great extent through access to occupations and industries otherwise not open to an individual, and through hours of work.[22] In addition, decreases in the estimated returns to education coefficients in specifications 1 and 2 (with and without the added variables) support the hypothesis that the effect of education is partly through access to occupations and industries, and partly within those categories. This impact on

[18] The 1996 and 1986 census occupation classifications were somewhat different and therefore different specifications for the two years are chosen. The Occupation categories in 1986 were: (1) Managerial/Administrative, (2) Professional, (3) Clerical, (4) Service, (5) Agricultural, (6) Production/Transport Workers and (7) Sales. In 1996 the categories were: (1) Managerial/Administrative, (2) Professional, (3) Clerical, (4) Service, (5) Agricultural, (6) Trade Oriented, (7) Plant and Machine Operator, (8) Elementary/Low-Skilled and (9) Technical.

[19] Nine one digit 'Occupation' and nine 'Industry' categories were controlled for. The Industry categories in both years were: (1) Agriculture, Hunting, Forestry, Fishing, (2) Mining and Quarrying, (3) Manufacturing, (4) Electricity, Gas, and Water, (5) Construction, (6) Wholesale and Retail Trade, Restaurants and Hotels, (7) Transport, Communication, (8) Business and Financial Services, (9) Community, Social and Personal Services.

[20] More details on occupation and hours of work by ethnicity over time are available in Maani (2001), especially Table 5 and Figures 2 and 3.

[21] The effect of these variables, especially occupation and locality on the Maori income gap is addressed elsewhere in detail for all ethnic groups (see Maani 2001).

[22] Incremental F-tests in relation to specifications 1 and 2 in Table 5, support the overall significance of the added variables, with P-values smaller than 0.01.

TABLE 5

Income Effects of Secondary and Tertiary Education of Maori *All Employed Men and Women(Incorporating Hours of Work, One Digit Occupation & Industry): 1986 and 1996; Dependent Variable: The Natural Logarithm of Annual Income (Least Squares Regression Coefficients)*

Explanatory Variables	1986 Men		1996 Men		1986 Women		1996 Women	
	1	2	1	2	1	2	1	2
Intercept	9.0322	8.9329	9.0563	8.7321	8.7167	8.1840	8.7213	8.4494
	(770.58)	(326.95)	(429.97)	(225.61)	(477.07)	(175.73)	(319.20)	(168.81)
Highest Qualification								
School Certificate (Age 16)	0.1062	0.0822	0.1580	0.1296	0.1340	0.0718	0.2347	0.1266
	(10.97)	(8.63)	(10.84)	(9.31)	(8.38)	(4.88)	(13.03)	(7.59)
Year 12	0.2061	0.1541	0.3048	0.2497	0.3064	0.1626	0.4288	0.2644
	(12.63)	(9.32)	(16.42)	(13.77)	(14.06)	(7.75)	(19.81)	(12.90)
Diploma	0.2529	0.2267	0.2919	0.2364	0.3983	0.2524	0.4626	0.2703
	(33.20)	(29.60)	(20.84)	(16.69)	(26.86)	(16.15)	(25.61)	(14.42)
Bachelor's Degree	0.4544	0.3864	0.4591	0.3482	0.7008	0.4269	0.7895	0.4903
	(9.93)	(8.21)	(10.80)	(8.15)	(12.12)	(7.48)	(19.67)	(12.46)
Postgraduate Qual.	0.5512	0.4778	0.8273	0.6497	0.5942	0.3189	1.0744	0.7290
	(12.51)	(10.62)	(16.01)	(11.97)	(4.32)	(2.85)	(19.00)	(13.54)
Hours Worked (per Week)	No	0.0056	No	0.0105	No	0.0189	No	0.0141
		(19.17)		(25.94)		(31.74)		(31.54)
Marital Status (Married)	0.1688	0.1478	0.2147	0.1740	–0.2092	–0.1436	–0.0951	–0.1069
	(25.44)	(23.09)	(20.15)	(17.29)	(15.95)	(12.25)	(6.73)	(8.45)
Location								
Major Urban	–0.0165	–0.0321	0.0108	0.0004	0.1525	0.0675	0.1724	0.1043
	(2.22)	(4.38)	(0.88)	(0.04)	(10.59)	(5.21)	(10.47)	(6.99)
Rural	–0.1361	–0.0933	–0.1571	–0.0945	–0.0954	–0.0545	–0.0921	–0.0495
	(13.58)	(9.44)	(9.16)	(9.62)	(4.52)	(2.83)	(4.02)	(2.37)
Occupation	No	Yes	No	Yes	No	Yes	No	Yes
Industry	No	Yes	No	Yes	No	Yes	No	Yes
Experience	0.04522	0.04275	0.07065	0.06325	0.02826	0.03044	0.05898	0.05259
	(40.34)	(39.03)	(39.13)	(36.34)	(16.50)	(124.84)	(27.27)	(25.79)
Experience^2	–0.00084	–0.00079	–0.00127	–0.00111	–0.00045	–0.00047	–0.00100	–0.00089
	(33.70)	(32.70)	(33.83)	(30.88)	(10.92)	(12.30)	(21.61)	(20.47)
F	642.49	358.07	444.28	275.86	133.18	213.81	192.77	203.44
Sample Size	28 659	28 659	18 219	18 219	16 898	16 898	13 241	13 241

t-ratios in parentheses, based on White Consistent Standard Errors.

the results is relatively more significant for Maori (and Other Ethnicity) samples than for the European and Part-Maori groups, indicating a greater role played in 1986 and 1996 by access to higher-paying occupations and industries, and work opportunities.

The results further show that 'locality' does have a statistically significant effect on ethnic income differentials. For example, Maori men residing in rural areas had the greatest disadvantage in income levels, compared to all other ethnic groups. In addition, while European and Part-Maori men and all women had relatively higher income levels if residing in a major urban area and compared to a semiurban area, Maori men did not show such an advantage. This indicates that the relatively higher proportion of Maori men resident in semiurban areas is consistent with income incentives estimated in this study. By the same token, these results indicate that Maori men residing in major urban and rural areas were less able to attain educational qualifications, and were engaged in employment resulting in less income returns.

Overall, these results provide strong support for the hypothesis that the link between educational attainment and income is partly through access to certain highly demanded occupations, and greater hours of work. Decompositions of these results shed further light on the relative impact of these effects.

(iv) Decompositions

An important question is the extent to which lower educational attainment, or alternatively difficulties in translating qualifications to income returns by Maori explain the income gap and its increased status over the 1986–1996 years.

Decompositions based on estimates of model 2 from section IV(iii) further examine the relative contribution of educational attainment and the other relevant factors to the income gap (see Oaxaca 1973; Oaxaca & Ransom 1999). Model 2 is the preferred model for the decomposition by controlling for additional relevant explanatory variables. Decompositions based on model 1 are also referred to below, as a sensitivity analysis. The decompositions are based on the following equations for each ethnic group relative to the European equations:

$$\overline{\ln Y_E} - \overline{\ln Y_M} = (b_{0E} - b_{0M}) + \sum_{i=1}^{k} b_{iE}(\bar{X}_{iE} - \bar{X}_{iM}) + \sum_{i=1}^{k} \bar{X}_{iM}(b_{iE} - b_{iM}) \quad (3)$$

where E denotes European, M Maori (or P for Part-Maori, and O for Other Ethnicity depending on the comparison), k the number of explanatory variables, b_i regression coefficients, $\bar{X}_i$ mean characteristics, $(b_{0E} - b_{0M})$ is the differential in log incomes due to the difference in intercepts, $\sum_{i=1}^{k} b_{iE}(\bar{X}_{iE} - \bar{X}_{iM})$ reflects income differential as explained by differences in mean personal characteristics, and $\sum_{i=1}^{k} \bar{X}_{iM}(b_{iE} - b_{iM})$ reflects the income differential explained by coefficients. These decompositions reported in Table 6 examine the extent to which both lower 'qualifications' and lower 'income returns' to qualifications for Maori are contributing to the increasing income gap.

The usual index number question in choosing the base group for coefficients and mean characteristics was also considered, and for comparison purposes, the decomposition based on alternative weights (with $\sum_{i=1}^{k} b_{iM}(\bar{X}_{iE} - \bar{X}_{iM})$ and $\sum_{i=1}^{k} \bar{X}_{iE}(b_{iE} - b_{iM})$) was also estimated. As expected, this alternative specification results in estimates of the effect of coefficients that are usually greater than those reported based on equation 3 results, providing a range for the estimates. For example, the *difference* in the *estimated differentials* in Table 6, due to the two specifications of the effect of characteristics in explaining Maori, non-Maori income differentials had a range of 0.0001 to 0.02.

The decompositions, summarised in Table 6, provide noteworthy results. First, the major proportion of the income differential for both men and women (65.5 per cent of the differential for men and 74.7 per cent of the differential for women in 1996, based on equation 3 weights) can be explained by the higher educational qualifications and other control variables. These results strongly support the hypothesis that the contribution of education and other work-related characteristics is far more significant than the effect of transferring similar characteristics to employment and income by the Maori population. Second, the results for both male and female Part-Maori groups show higher income returns for characteristics similar to the European group. The decomposition results further support the hypothesis that men from Other Ethnic groups have lower returns to similar characteristics, which is likely to reflect the effect of language and other factors influencing the labour market experience of immigrants as part of this group.[23]

[23] The Neumark (1988) method is an alternative, but due to the large number of observations for the four ethnic categories the Oaxaca method, as opposed to combining all samples, was pursued.

TABLE 6

Decompositions of Income Differentials based on Alternative Specifications: All Employed Men and Women (Oaxaca Method, Based on Model 2); Numerical Differentia (Percentage Contribution to the Overall Difference in the Income Differential in parentheses))

Income Differential Explained by:	1986			1996		
	$\overline{\ln Y_E} - \overline{\ln Y_M}$	$\overline{\ln Y_E} - \overline{\ln Y_P}$	$\overline{\ln Y_E} - \overline{\ln Y_O}$	$\overline{\ln Y_E} - \overline{\ln Y_M}$	$\overline{\ln Y_E} - \overline{\ln Y_P}$	$\overline{\ln Y_E} - \overline{\ln Y_O}$
Men						
Overall Difference	**0.25064**	**0.16121**	**0.22514**	**0.35388**	**0.23317**	**0.31301**
Equation 3 weights:						
Effect of Characteristics	0.18199	0.14181	0.04331	0.23184	0.18064	0.04812
$\sum_{i=1}^{k} b_{iE}(\bar{X}_{iE} - \bar{X}_{iM\|P\|O})$	(72.6%)	(88.0%)	(19.2%)	(65.5%)	(77.5%)	(15.4%)
Effect of Coefficients	0.06865	0.0194	0.18183	0.12204	0.05253	0.26489
$(b_{0E} - b_{0M\|P\|O})$	(27.4%)	(12.0%)	(80.8%)	(34.5%)	(22.5%)	(84.6%)
$+ \sum_{i=1}^{k} \bar{X}_{iM\|P\|O}(b_{iE} - b_{iM\|P\|O})$						
Alternative weights:						
Effect of Characteristics	0.16509	0.13680	0.09981	0.22114	0.17654	0.13153
$\sum_{i=1}^{k} b_{iM\|P\|O}(\bar{X}_{iE} - \bar{X}_{iM\|P\|O})$	(65.9%)	(84.9%)	(44.3%)	(62.5%)	(75.7%)	(42.0%)
Effect of Coefficients	0.08542	0.0244	0.12533	0.13274	0.05663	0.18148
$(b_{0E} - b_{0M\|P\|O})$	(34.1%)	(15.1%)	(515.7%)	(37.5%)	(24.3%)	(58.0%)
$+ \sum_{i=1}^{k} \bar{X}_{iE}(b_{iE} - b_{iM\|P\|O})$						
Women						
Overall Difference	**0.09795**	**0.04198**	**0.00642**	**0.15531**	**0.10585**	**0.08972**
Equation 3 Weights:						
Effect of Characteristics	0.09007	0.02963	–0.00510	0.11610	0.08367	0.02149
	(92.0%)	(70.6%)	(–79.5%)	(74.7%)	(79.0%)	(24.0%)
Effect of Coefficients	0.00788	0.01235	0.01152	0.03921	0.02218	0.06823
	(8.0%)	(29.4%)	(179.5%)	(25.3%)	(21.0%)	(76.0%)
Alternative weights:						
Effect of Characteristics	0.08997	0.03045	0.00590	0.13769	0.08893	0.04932
	(91.9%)	(72.5%)	(91.9%)	(88.7%)	(84.0%)	(55.0%)
Effect of Coefficients	0.00798	0.01153	0.00052	0.01762	0.01692	0.0404
	(8.1%)	(27.5%)	(8.1%)	(11.3%)	(16.0%)	(45.0%)

Sensitivity analyses of the decomposition, based on Model 1 specification in Table 5, which includes educational attainment, but not hours of work, occupation or industry were also undertaken. These decompositions resulted in 'characteristics effects' that are in magnitude about 70 per cent of the original 'characteristics effects' for both men and women in 1996, and they were higher in 1986, at levels greater than 80 per cent of the original results.

These decompositions provide supportive evidence for the importance of differences in educational attainment in explaining why relative Maori income levels have deteriorated. Estimated coefficients and decompositions support the hypothesis that educational qualifications have been exerting their influence on the income differential over the decade. This influence has been to some extent through occupation and hours of work effects. This has important policy implications.

V Conclusions

The results of this paper provide persuasive evidence on the contribution of educational attainment to the income gap, and its increase between 1986 and 1996. During this period the New Zealand economy has experienced major changes leading to higher demand for skills. Given that a large proportion of the Maori population had left school without

qualifications and was engaged in elementary occupations, Maori men, in particular, faced barriers in responding to the increased demand in high skill occupations.

Given that all ethnic groups have experienced increased participation in postcompulsory education over the decade, and the greater link between employment and educational attainment in New Zealand over the 1980s and 1990s, this meant that the relative position of Maori in terms of income and employment has deteriorated over the decade. The analyses in this study have shown that the Maori income disadvantage was partly associated with less employment, greater unemployment and fewer hours of work.

An important finding is that, while there are significant differences in the educational attainment of Maori and non-Maori groups, once educational attainment is controlled for, much of the income gap disappears – particularly in 1996. As a result, the income gap at the higher education levels has narrowed over the period.

The Part-Maori population has qualification levels that are more favourable than the Maori population, but less advantageous than the European population. This finding is consistent throughout the study, and supports the hypothesis of positive economic mobility of the Part-Maori population. The results also show that, other things being equal, Maori in rural areas face particular disadvantages.

The decomposition results highlight the relative importance of 'characteristics', such as education, hours of work and occupation, compared to differential returns to higher skills by ethnicity in explaining the income gap over time. Indeed, returns to educational investments for Maori were higher at every level of education. This is partly a reflection of relatively lower income levels for Maori without school qualifications, which in turn indicates a higher opportunity cost for Maori of not pursuing postcompulsory education. Consistent with this result, Maori participation in postcompulsory education increased over the period of the study. Nevertheless, the Maori population, which had a large proportion without school qualifications, was in a disadvantaged position and did not attain tertiary educational levels similar to the rest of the population.

Thus, a remaining concern is that the Maori population has not experienced educational attainment at the same rate as other ethnic groups. This suggests that continuing barriers have a strong negative effect on Maori demand for further education. These include financial, socioeconomic, language, locality and school quality factors, and the already large numbers without school qualifications making access to further education less attainable.

Nevertheless the results of the study suggest that investing in higher education provides important options for the Maori population in reducing the income gap. This is supported by the findings throughout the study that the income gap based on educational attainment within the ethnic group is far greater than the income gap across the ethnic groups and when controlling for educational attainment.

REFERENCES

Behrman, J.R. and Birdsall, N. (1987), Comment on Returns to Education: a Further International Update and Implications. *Journal of Human Resources* **22**, 603–6.

Borland, J. (1999) Earnings Inequality in Australia: Changes, Causes and Consequences. *Economic Record* **75**, 17–202.

Chapple, S. and Rea, D. (1999), Time Series Analysis of Disparity Between Maori and Non-Maori Labour Market Outcomes in the Household Labour Force Survey'. In: Morrison, P.S. (ed.) *Proceedings of the Eighth Conference on Labour Employment and Work in New Zealand*. Victoria University of Wellington; 18–29.

Chia, T.T. (1991), Has the Value of a Degree Fallen? Cross-section Versus Time Series Evidence? *Economic Record* **67**, 41–52.

Coope, P. and Piesse, A. (1997), 1991–96 Inter-Censal Consistency Study, Revised Unpublished Paper, Statistics New Zealand, Wellington.

Daly, A. (1993), The Determinants of Employment for Aboriginal People. *Australian Economic Papers*, 32, June, 134–45.

Daly, A.E. and Liu, J. (1997), Estimating the Private Rates of Return to Education for Indigenous Australians. *Australian Economic Papers*, September, **36,** 100–112.

Dixon, S. (1998), Growth in the Dispersion of Earnings: 1984–97. *Labour Market Bulletin*, 1 & 2, 71–107.

Dougherty, C.R.S. and Jimenez, E. (1991), The Specification of Earnings Functions: Tests and Implications. *Economics of Education Review* **10**, 85–98.

Evans, L., Grimes, A., Wilkinson, B. and Teece, D. (1996), Economic Reform in New Zealand 1984–95: The Pursuit of Efficiency. *Journal of Economic Literature*, 34, December, 1856–1902.

Gibson, J. (1998), *Ethnicity and Schooling in New Zealand: an Economic Analysis Using a Survey of Twins*. Institute of Policy Studies: Wellington.

Gibson, J. (2001), Sheepskin Effects in the Returns to Education in New Zealand: Do they Differ by Ethnic Group?. *New Zealand Economic Papers* **34**, 201–20.

Gregory, R.G. (1996), Deregulation and the Welfare of the Less Well Off. *Economic Record* **72**, 7–23.

Halvorsen, R. and Palmquist, R. (1980) Variables in Semilogarithmic Equations. *American Economic Review* **70**, 474–5.

Harbridge, R. and Moulder, J. (1993), Collective Bargaining and New Zealand's Employment Contracts Act: One Year On. *Journal of Industrial Relations*, 35, March, 62–83.

Heckman, J., Layne-Farrar, A. and Todd, P. (1996), Human Capital Pricing Equations With an Application to Estimating the Effect of Schooling Quality on Earnings. *Review of Economics and Statistics* **78**, 562–610.

Heckman, J. and Polachek, S. (1974), Empirical Evidence on the Functional Form of the Earnings Schooling Relationship. *Journal of American Statistical Association* **69**, 350–4.

Hertzog, H.W. Jr (1997), Ethnicity and Job Tenure in a Segmented Labour Market: The Case for New Zealand. *Australian Economic Review* **30**, 167–84.

Hunt, D. and Hicks, J. (1985), Economic Returns to University Education in New Zealand. *New Zealand Journal of Educational Studies* **20**, 170–85.

Hunter, B.H. (1998), Assessing the Validity of Intercensal Comparisons of Indigenous Australians, 1986–96. *Journal of the Australian Population Association* **15**, 51–67.

Kuhn, P. and Sweetman, A. (2002), Aboriginals as Unwilling Immigrants: Contact, Assimilation and Labour Market Outcomes. *Journal of Population Economics* **15**, 331–55.

Kukutai, T. (2003), The Dynamics of Ethnicity Reporting: Maori in New Zealand (A discussion Paper Prepared for Te Puni Kokiri). Ministry of Maori Development, January.

Lang, K. (1998), The Effect of Trade Liberalization on Wages and Employment: The Case of New Zealand. *Journal of Labor Economics*, 16, October, 792–814.

Maani, S.A. (1996), Private and Social Rates of Return to Secondary and Higher Education in New Zealand: Evidence from the 1991 Census. *Australian Economic Review* **113**, 82–100.

Maani, S.A. (1997), *Investing in Minds: the Economics of Higher Education in New Zealand*. Institute of Policy Studies, Wellington.

Maani, S.A. (1999), Private and Public Returns to Investments in Secondary and Higher Education in New Zealand Over Time: 1981–96. Research Report commissioned by the New Zealand Treasury. (Published electronically.) Available from: http://www.treasury.govt.nz/workingpapers/default.htm.

Maani, S.A. (2001), *The Effect of Education, Occupation, Industry, and Locality on Maori Relative Income Levels*, Research Report Commissioned by the New Zealand Treasury, June.

McNabb, R. and Richardson, S. (1989), Earnings, Education and Experience: Is Australia Different? *Australian Economic Papers* **28**, 5775.

Miller, P.W. (1984), Education and the Distribution of Earnings. In Blandy R. and. Covick, O. (eds). *Understanding Labour Markets in Australia*. Allen & Unwin, Sydney.

Neumark, D. (1988), Employers' Discrimination Behaviour and the estimation of Wage Discrimination. *Journal of Human Resources* **23**, 279–95.

Nevile, J.W. and Saunders, P. (1998), Globalization and the Return to Education in Australia. *Economic Record* **74**, 279–86.

Oaxaca, R.L. (1973), Male–female Wage Differentials in Urban Labor Markets. *International Economic Review* **14**, 693–709.

Oaxaca, R.L. and Ransom, M.R. (1999), Identification in Detailed Wage Decomposition. *Review of Economics and Statistics* **81**, 154–7.

Pool, I. (1998), Population Trends and National Identity in a settler Society. In: Ball, D. and Pool, I. (eds). *The Building Blocks of National Identity: Population in New Zealand's History*. University of Waikato; 38–48.

Psacharopoulos, G. (1994), Returns to Investment in Education: a Global Update. *World Development* **22**, 1325–43.

Ramanathan, R. (2002), *Introductory Econometrics with Applications*, 5th edn. Harcourt: College Publishers.

Ryoo, J.K. (1988), Changes in Rates of Return to Education Over Time: The Case Study of Korea. PhD Dissertation, Stanford University.

Statistics New Zealand (2001), Background Paper', *Review of Measurement of Ethnicity,* Statistics New Zealand, February.

Winkleman, L. and Winkleman, R. (1997), Determining the Relative Labour Force Status of Maori and Heteroscedasticity Using a Multinomial Logit Model. *Labour Market Bulletin* **1**, 24–62.

Winklemann, L. and Winklemann, R. (1998), 'Immigrants in the New Zealand Labour Market: a Cohort Analysis using 1981, 1986, and 1996 Census Data. *Labour Market Bulletin* 1 & 2, 34–70.