

**TRENDS IN THE CONTRIBUTION
OF TERTIARY EDUCATION
TO THE
ACCUMULATION OF EDUCATIONAL
CAPITAL IN NEW ZEALAND:
1981–2001**

for the Ministry of Education



MINISTRY OF EDUCATION

Te Tāhuhu o te Mātauranga

AUGUST 2006

PREPARED BY

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M E R A

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Unless otherwise mentioned, statistics presented here are based on custom MERA tabulations and are not official Statistics NZ statistics. All statistics from the Census of Population and Dwellings have had the 2001 random rounding and small domain filtering protocols applied.

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EXECUTIVE SUMMARY

MEASUREMENT OF NEW ZEALAND HUMAN EDUCATIONAL CAPITAL

This report summarises census derived statistics on 1981 to 2001 trends in the accumulation of post-secondary qualifications in the New Zealand resident population. This is used as an indicator of human educational capital¹. The analysis applies the established statistical framework for measuring human resources in science and technology (HRST) (OECD, 1995; Statistics NZ, 2003). Throughout the report most attention is given to changes in degree level post-secondary educational attainment. This has the advantage of being measured/reported consistently since 1981, unlike other educational qualification levels.

The report summarises New Zealand trends in

- long term changes in the highest educational attainment of residents (“human educational capital stock”);
- the demography (age, sex, ethnicity) of educational attainment level of residents of different birth generations and at different life cycle stages;
- the human resources in science and technology (HRST) components of human educational capital stocks;
- educational capital accumulation flows as measured by intercensal gains and losses in residents with any given level of educational attainment (including some changes in birth cohort lifecycle patterns); and
- the contribution of migration flows to the accumulation of human educational capital stocks.

OVERALL TRENDS

From 1981 to 2001, the proportion of New Zealand residents aged 15 years or over with no educational qualification halved from 55.2 to 27.6% while the proportion with a university degree tripled from 3.8 to 11.8%. The rise in tertiary education attainment was typical amongst OECD countries. In 2001, 17.7% of New Zealand residents aged 25 to 34 had a degree qualification compared with an OECD country mean of 18.4%.

Standardised and comparable measurement of non-degree post-secondary qualifications is more difficult. A fifth of New Zealand residents had a non-degree post-secondary qualification in 2001 compared with one in six in 1981. OECD (2003) estimated that in 2001, 15.8% of 35-44 year old New Zealanders held a “tertiary type B”² qualification compared with an OECD country mean of only 8.5%. For younger age groups, New Zealand was closer to the OECD average.

1 Human capital was defined by the OECD (2001) as ‘the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being’. An alternative definition, found in Paul David, *Knowledge, Capabilities and Human Capital Formation in Economic Growth* Treasury Working Paper 01/13 New Zealand Treasury 2001, is ‘a particular set of acquired human capabilities, ... [which are] durable traits yielding some positive effects upon the person’s performance in one or more among a wide variety of socially valued activities’.

2 A Tertiary Type B qualification is a non-degree post-secondary qualifications involving at least two years full time study at tertiary level.

TRENDS IN NEW ZEALAND HUMAN EDUCATIONAL CAPITAL BY AGE GROUP

Degree Qualifications

- The proportion of 25 to 29 year old New Zealanders with a degree increased from 7.1% in 1981 to 19.1% in 2001.
- The largest gains in the “stock” of residents in net gaining a degree between ages 20 and 24 occurred over the 1991 to 1996 period.
- The proportion gaining a degree level qualification between ages 15-19 and 20-24 increased from 6% over the 1981 to 1986 period up to 14% between 1996 and 2001.
- The proportion gaining a degree qualification between ages 20-24 and 25-29 years increased from 4% over the 1981 to 1986 period up to 8% between 1996 and 2001.
- The net increase in the proportion of NZ residents who gained degrees at age 30 or older was highest between 1991 and 1996, slightly lower between 1996 and 2001 and lowest between 1986 and 1991.

Sub Degree Post-Secondary Qualifications

- Of New Zealand residents aged 15 years or over, 23% had a non-degree post-secondary qualification in 1981 and 23.1% in 2001.
- There were recent small increases in non-degree post-secondary participation in the mid to late 1990's;
- This was reduced by significant net international migration loss of people with non-degree post-secondary qualifications between 1996 and 2001.
- In 1981, 25-29 year olds were the age group with the highest proportion at post-secondary non-degree qualification level.
- In 2001, 25.9% of 40 to 44 years olds had reached post-secondary non-degree qualification as their highest level of educational attainment compared with 26.7% in 1996. The decrease in attainment of this level of qualification is dwarfed by the concurrent increase in degree level qualification attainment.

No Qualifications and Corresponding Change in those with School Level Qualifications Only

- By 2001, only 15.1% of New Zealand residents aged 20 to 24 years had no qualification of any kind compared with 34.3% in 1981.
- The proportion of those aged 30 to 34 years old with no qualification dropped from 47% in 1981 to 20% in 2001, a drop of 27%.
- 16.3% of the decrease in the proportion with no qualifications at age 30 to 34 years corresponded with an increase of the proportion with a school level qualification.
- The remaining 10% was accounted for by an increase in the proportion with a post-secondary qualification.
- The proportion of school leavers who stayed on to higher school leaving level more than doubled after 1991.

TRENDS IN NEW ZEALAND HUMAN EDUCATIONAL CAPITAL BY ETHNIC GROUP

From 1981 to 2001, among all ethnic groups the proportion reaching either the “non-degree post-secondary” or “degree” levels increased. Nonetheless, large inequalities in educational achievement between ethnic groups remain.

Some key statistics are:

- In 1981, persons of NZ European ethnic origin were six times more likely to have a degree than a NZ Maori and six and a half times more likely than a person of Pacific Island ethnic origin.
- By 2001, persons of NZ European ethnic origin were only two and a half times more likely to have a degree than a NZ Maori and three times more likely than a person of Pacific Island ethnic origin.
- In 1981, persons of NZ European ethnic origin were two and a half times more likely to be at “non-degree post-secondary” qualification level than a NZ Maori and three times more likely than a person of Pacific Island ethnic origin.
- By 2001, persons of NZ European ethnic origin were only one third more likely to be at “non-degree post-secondary” qualification level than a NZ Maori and three quarters more likely than a person of Pacific Island ethnic origin.
- The proportion of Asian ethnic subpopulations with a degree was three times that of NZ European ethnic groups in 1981 and decreased to double by 2001.
- The Asian and Other ethnic subpopulations were less likely than the NZ European ethnic group to be at non-degree post-secondary educational qualification level.

TRENDS IN NEW ZEALAND HUMAN EDUCATIONAL CAPITAL BY GENDER

The increase from 1981 to 2001 in degree level educational attainment by females has made a much larger contribution to educational capital gains than have gains made by males. For degree level qualifications, post 1991 a larger percentage of females aged 20 to 24 had gained a degree than males. By 2001, the proportion of females aged 20 to 24 years with a degree reached 16.7% compared with only 11.1% of males. From 1996 to 2001, there were 45% more degree completions by females aged 20 to 24 than males.

In 1981, males had higher levels of post-secondary qualifications than females. By 2001, these differences had narrowed overall and reversed amongst Maori and Pasifica people.

ACCUMULATION OF HUMAN CAPACITY IN RESEARCH, SCIENCE AND TECHNOLOGY RELATED SKILLS

As identified by occupational category and the possession of a degree, the core science and technology workforce³ (referred to as HRSTC) tripled in size between 1981 and 2001. HRSTC now comprise roughly one in ten of the working population, although the rate of increase has slowed since 1986.

The largest proportion increase has been in “specialised managers” who increased from 4,000 in 1981 to 28,000 in 2001. Professional Group 1 (which includes Physics, Mathematical and Engineering Science Professionals, Life Science and Health Professionals) increased by 160% from 1981 to 2001.

The percent of workers with a degree and the growth rate of degree qualified employees vary widely between industry sectors. Two thirds of all degree qualified workers worked in the private sector in 2001 compared with 46.6% in 1981. Over that same time, the proportion of degree qualified workers in central government (excluding tertiary education and scientific research institutes) decreased from 41% to 25%.

MIGRATION EFFECTS ON EDUCATIONAL CAPITAL ACCUMULATION

Using an educational capital stock and flows model of the 1996 to 2001 period, it is estimated that about 3 in 10 of New Zealand residents with a degree aged 20 to 24 years of age moved overseas. Adjusted for migration gains, there was a net loss of 2 in 10 of the degree qualified population stock aged 20 to 24 years.

Across those aged 20 to 59 years, there was an estimated net loss of 23,000 people with a degree from 1996 to 2001. This compared with an estimated net gain of 100,000 new degree level completions from 1996 to 2001. It is estimated that New Zealand had a net loss of 3,000 degree educated residents between 1991 and 1996 due to a much lower 10,000 net migration loss of New Zealand educated residents. It is anticipated that a net loss of 8,000 degree educated residents will be recorded for the 2001 and 2006 period.

The increase in overseas degree holders was lowest in the health, education and creative arts fields. Persons with degrees in “Engineering and Related Technology” and “Information Technology” were more likely to have gained that qualification overseas than any other degree field of study in 2001 (36%) and increased by the largest margin between 1981 and 1996. The 30-39 age group has had the largest increase in degree holders born and educated overseas.

Net 1996 to 2001 migration losses of residents with a non-degree post-secondary qualification are estimated to be higher than for those degree qualified and are more evenly spread across all age groups.

Locally obtained education qualifications continue to play the major role in the accumulation of New Zealand educational capital. Exchanges of departing New Zealand educated residents and arriving overseas educated residents are large but are typically in balance or produce a modest gain. Imbalance can exist when individual fields of study or age groups are examined.

3 The standard international approach to the measurement of “human educational capital” is the “HRST” (human resources in science and technology, OECD, 1995) workforce. An adaptation of that approach was used in the Statistics NZ (2003) report on the subject and has also been used in this study. In essence, the HRST defined by occupation (HRSTO) includes members of the three highly skilled occupations at level 1 of the NZ standard classification of occupations, excluding all managers in group 1 except “specialised managers”. It also includes all those with a degree qualification or better (HRSTQ). Those people who have a degree and are also working in HRSTO occupations are defined as the “core” HRST - referred to as HRSTC.



INTRODUCTION

The measurement of human educational capital has a range of dimensions. New Zealand aspires to drive its economy from knowledge based industries and value added to its primary resources. Engagement in research, science and technology is a measure of progress towards a knowledge rich economy. The total pool of residents with a particular educational qualification type is a measure of the local capacity available to meet the demands of corresponding knowledge and skill based occupations in the work force.

This report summarises statistics on the accumulation of post-secondary qualifications in the New Zealand resident population based on an analysis of the Population Census.

Qualifications are a frequently used although imperfect indicator of human capital. As defined by the OECD⁴, human capital is “the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being”. Qualifications identify some of the attributes but may not accurately capture knowledge, skills and competence actually acquired or drawn upon.

The study designed, prepared and analysed statistics on highest educational qualification and related variables from the New Zealand Census of Population and Dwellings of 1981, 1986, 1991, 1996 and 2001. These statistics are applied to four issues.

4 This definition comes from an OECD report: *The Well-being of Nations: The Role of Human and Social Capital*. Centre for Educational Research and Innovation, OECD, Paris, 2001. (Refer to page 18). An alternative definition, found in Paul David, *Knowledge, Capabilities and Human Capital Formation in Economic Growth* Treasury Working Paper 01/13 New Zealand Treasury 2001, is ‘a particular set of acquired human capabilities, ... [which are] durable traits yielding some positive effects upon the person’s performance in one or more among a wide variety of socially valued activities’.

- 1 Trends in the stock of human educational capital in the New Zealand resident population as measured by the highest educational level attained 1981 to 2001.**

What is the stock of human capital, as measured by the acquisition of qualifications and the average years of education, held by New Zealand residents on each census from 1981 to 2001?

- 2 The educational attainment level profile of New Zealand residents by age, gender, ethnic origin and birthplace.**

What is the stock broken down by gender, ethnicity, age group and whether education was attained in New Zealand or overseas?

- 3 Cohort effects in the accumulation of educational qualification levels of New Zealand residents including consideration of external migration flows**

What cohort effects are present in the acquisition of qualifications?

- 4 The nature and composition of the “New Zealand research and development workforce” as applied in Statistics New Zealand (2001) interpretation of the OECD (1995) standard definition.**

What is the trend in the proportion of the workforce engaged in research and development, broken down by age group, ethnicity, gender and migrant status?

2

DISCUSSION OF METHODS AND DATA ISSUES

2.1 CORE INDICATORS AND GENERAL ASSUMPTIONS

The “highest educational qualification level gained” is the core indicator used in this analysis of trends in the New Zealand population. This indicator has been included or can be derived in some form for every Census from 1981 to 2001 but some inconsistencies need to be worked around in the meaning of some categories used at different times. Other indicators used to provide more depth to the analysis are

- field of study (of post secondary qualification);
- research and development workforce;
- occupation;
- ethnic origin;
- industry sector of employment;
- industry.

The development of this statistical report has involved providing work arounds for many differences in classifications and statistics for these and other variables.

Apart from age and gender, most variables have been affected by changes since 1981 to standard classifications, the wording of census questions or both (Table 2.1). There have been changes of standard classifications used to group responses to standard questions (such as occupation) and changes in the presentation and/or interpretation of the census questions themselves (such as the abrupt change in self-definition of ethnicity attributes between the 1991 and 1996 census).

Table 2.1 presents a summary view by census of the compatibilities for key variables used in the study. Changes in attribute classifications or meanings are represented by assigning a different letter for any distinct sub-series within the 1981 to 2001 study period. Where no letter is given no useable statistic for this attribute is available from a census.

TABLE 2.1 Intercensal variation in classifications for key statistical indicators across the 1981 to 2001 census

	1981	1986	1991	1996	2001
Highest Educational Qualification Level	A	B	B	C	D
Qualification Field	A	-	-	B	C
Birthplace	A	A	A	A	A
Industry Sector	A	A	A	A	A
Years in NZ	A	A	-	A	A
Ethnicity	A	A	A	B	C
Occupation	A	A	A, B	A, B, C	D

Arriving at coherent comparable measures across the 1981 to 2001 period has involved manipulations of primary codes for individual census variables or combinations of codes to develop more suitable (usable and compatible) derivative classifications and variables.

The remainder of this chapter provides more detail on some of the issues associated with the development of comparable statistics on education and related occupational work force attributes from the census. Some selective comparisons of results obtained during this study with previous published results are used as checks on the underlying robustness of this set of related statistics series.

Unless specifically stated, the term **population** where used in this report means *the usually resident New Zealand population in New Zealand on Census night and aged fifteen years or over*. Any subpopulation, the “New Zealand born” for example, is assumed to be a subset of that main population. The census counts have not been adjusted for census net undercount nor has allowance been made for persons temporarily overseas on census night.

2.2 HIGHEST LEVEL OF EDUCATIONAL QUALIFICATION ATTAINMENT

Information on this attribute was collected from all persons 15 years or over in all of the five censuses from 1981 to 2001. Post census processing derived a “highest educational qualification level” included in the census unit record dataset for all censuses except 1981. Due to variation in the standards and assumptions used for classifying post-secondary non-degree qualifications, classification of non-degree qualifications is not directly comparable across the study period census. Selective comparisons are however feasible as discussed later in this section.

This study has derived a “highest educational qualification level” attribute for 1981 Population Census records by integrating information from the “highest tertiary qualification gained” and “highest school qualification” fields. This approach to generating 1981 codes appears fairly robust from comparison of highest qualification statistics for comparable 1981 and 1986 census cohorts, but the 1981 data does not distinguish bachelor degrees with honours from ordinary bachelor’s degrees. Later census recognise honours degrees as a higher degree with the thesis year ranked as equivalent to a post-graduate diploma or masters degree. This means that the unadjusted 1981 census undercounts the number of higher degree qualifications gained but the overall number of degrees should be comparable. The 1986 and later census do not distinguish a bachelor honours degree from other higher degree types so adaptation of later data to a 1981 basis is not straightforward. Adjustments could be made to take account of this inconsistency using the published statistics on honours degrees completed as a proportion of degrees attained. The “highest educational qualification level” counts for each census are summarised in Table 3.1.

Official data published by Statistics NZ and this study’s 1986 to 2001 statistics on “highest educational qualification level” are summarised in Tables 2.2 and 2.3.

The statistics on highest educational qualification for 1981 through to 2001 have achieved a high level of consistency with published comparable Statistics NZ summary results. There are some minor differences, some of these need to be acknowledged in interpretation of trends, but are in the main of low magnitude.

The preparation of 1981 statistics required that a “highest educational qualification level” variable be constructed through development of new keys and extensive recoding of the base qualification codes. These were in their thousands. A legacy photocopy of the original metadata held by MERA since the early 1980s was the only coding schedule that could be found for this census field. This was scanned, optical character recognition applied, the results extensively cleaned and edited and a provisional key to qualification level and field of study prepared.

The resulting base data is at a high level of detail. The 1981 census sought to capture information on up to four tertiary qualifications, coding this to a list of thousands of individual educational qualification codes. Each 1981 educational qualification code description incorporated the qualification title and a description representing the field of study. This combines what are two

educational qualification attributes in the 1996 and 2001 census. An extensive key was developed of comparable educational attainment level and New Zealand standard classification of educational field of study codes corresponding to each 1981 educational qualification code. A provisional recoding of each qualification code was made to a qualification level coherent with “highest educational attainment level” and a field of study drawn from level 4 of the NZ Standard Classification of Education - Field of Study. The 1981 qualification classification key used in this study is available on the study web site for reference.

Since highest educational qualification gained was not a standard derived variable in the 1981 Census, comparable Statistics NZ statistics are not readily available. Given that the 1981 results are arrived by a different process than for 1986 through to 2001, these are highly consistent with the later results and overall trends.

As discussed earlier, the 1981 results undercount the number of higher degrees. A working approximation from comparison of like 1981 and 1986 cohort statistics is that the 1981 higher degree counts need to be doubled and the simple bachelor degree counts scaled down by the estimated increase in number of higher degrees.

There are some small differences between this study’s result for 1986 and that published in Statistics NZ (2003). These relate wholly to the “qualification not stated” and “no qualification” and school qualification level attainment level categories. The relative magnitude of the differences represent a 2.2% redistribution within the school or lower “highest educational qualification attainment level” range. This study found that for 1986 there were 33,693 less (19%) “qualification not stated” and 21,051 less (2%) with “no qualification”. These were distributed between higher counts for the “other school qualifications” (17%), “fifth form qualification” (9%), “sixth form qualification” (9%), and “higher school qualification” (9%) categories. The reasons for these differences are not clear as yet. Fortunately they do not relate to the estimates of the number of persons with a post-secondary qualification as their highest level of educational attainment.

The 1991 results are wholly consistent with Statistics NZ (2003). There is a 0.6% difference between the MERA and Statistics NZ (2003) results for 1996. This difference is confined to redistribution between the estimates of “qualification not stated” and “no qualification”. This level of difference is not material to this study. The 2001 results are wholly consistent with Statistics NZ (2003).

This study has replicated the Statistics New Zealand standard approach to grouping the 1986 and 1991 highest educational level statistics adopted in published work such as Statistics NZ (2003) and earlier statistical compilations. Analysis of the number of persons with a post-school non-degree qualification presented later in this report suggest an over count of this category compared with earlier and later census and a corresponding undercount of the number with school or no qualifications. The grouping of 1986 and 1991 educational attainment level fields to prepare a highest educational level variable needs to be revised for greater comparability across the 1981 to 2001 period.

TABLE 2.2 Statistics NZ (2003) and MERA estimates of “Highest Educational Qualification Level Counts” for 1986 and 1991

Highest Qualification Level	1986			1991		
	This study	Statistics NZ 2003	Diff.	This study	Statistics NZ 2003	Diff.
Qualification Not Stated	147,543	181,236	-33,693	154,098	154,098	0
No Qualification	946,497	967,548	-21,051	849,339	849,339	0
Other School Qualifications	15,339	13,080	2,259	95,172	95,172	0
Fifth Form Qualification	353,718	324,930	28,788	303,948	303,948	0
Sixth Form Qualification	211,653	194,091	17,562	179,361	179,364	-3
Higher School Qualification	72,810	66,681	6,129	91,266	91,269	-3
Other Post-school Qualifications	593,973	593,973	0	758,574	758,580	-6
Bachelor Degree	78,009	78,009	0	103,191	103,191	0
Higher Degree	48,756	48,753	3	55,326	55,326	0
Usually Resident NZ Population Aged 15 years or over	2,468,301	2,468,301	0	2,590,287	2,590,290	-3

TABLE 2.3 Statistics NZ (2003) and MERA estimates of “Highest Educational Qualification Level Counts” for 1996 and 2001

Highest Qualification Level	1996			2001		
	This study	Statistics NZ 2003	Diff.	This study	Statistics NZ 2003	Diff.
Qualification Not Stated	435,396	432,906	2,490	407,445	407,439	6
No Qualification	895,209	897,699	-2,490	686,220	686,223	-3
Other School Qualifications	59,169	59,172	-3	166,176	166,176	0
Fifth Form Qualification	310,215	310,215	0	389,256	389,259	-3
Sixth Form Qualification	236,859	236,859	0	283,479	283,482	-3
Higher School Qualification	131,550	131,550	0	156,975	156,981	-6
Other Post-school Qualifications	493,581	493,584	-3	507,885	507,891	-6
Bachelor Degree	149,898	149,898	0	199,938	199,932	6
Higher Degree	74,343	74,343	0	92,142	92,151	-9
Usually Resident NZ Population Aged 15 years or over	2,786,223	2,786,220	3	2,889,543	2,889,537	6

2.3 FIELD OF STUDY AT HIGHEST LEVEL OF POST-SECONDARY EDUCATIONAL QUALIFICATION ATTAINED

Application of the NZ Standard Subject Field of Study Classification (NZSCED)

The 2001 Census classification codes are based on the New Zealand Standard Classification of Educational Qualification Field of Study (NZSCED). The 1996 data has been reconciled to that classification. The 1981 census post-secondary qualification fields have been extensively recoded and regrouped to a best guess of highest post-secondary educational level and the associated NZSCED classification code, as follows.

The 1981 census captured a full description of up to four post-secondary qualifications resulting in 1600 educational qualification codes. These 1600 qualification codes have been used to derive two variables: a highest post-school qualification level code and a highest qualification field of study code.

The field of study has been coded into a provisional equivalent of the “New Zealand Standard Classification of Education - Field of Study”. This allows for detail up to the four digit code level in theory. At this level the number of anomalies in the comparison of 1981 and 1996/2001 data is high, indicating inconsistencies in the grouping of specific fields of study. The major problems appear to be with coarse coding of the 1996 data. Reasonable intercensal consistency is achieved at the 3 digit level without much need for ad hoc interpretation of anomalies (Appendix B).

TABLE 2.4 1981, 1996 and 2001 – Estimates of the Number of Residents with Highest Qualifications by NZSCED Field of Study Level 2 and Highest Educational Qualification Level

NZSCED Level 2	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
Field of Study Missing (Not specified, unidentifiable etc.)	8,931	25,545	29,916	1,845	11,985	14,829	15,600	357,393	525,318
00 No Qualification	0	0	0	0	0	0	1,848,483	1,650,399	1,510,968
01 Natural and Physical Sciences	4,218	5,007	8,262	16,215	28,221	39,777	20,874	34,212	50,568
02 Information Technology	447	6,720	14,979	411	4,440	6,885	879	12,471	24,021
03 Engineering and Related Technologies	92,478	132,219	108,864	5,589	14,772	19,545	102,972	173,241	149,370
04 Architecture and Building	30,414	41,493	36,690	1,050	3,450	4,572	31,833	56,466	49,488
05 Agriculture, Environmental and Related Studies	11,529	23,052	21,123	3,231	7,017	5,997	16,908	33,879	32,466
06 Health	66,279	78,495	74,922	7,668	20,490	32,142	75,825	106,812	115,167
07 Education	66,993	60,618	59,130	4,827	17,175	26,007	74,463	80,502	89,184
08 Management and Commerce	39,363	68,520	77,922	6,237	41,106	53,523	48,543	131,169	150,699
09 Society and Culture	5,931	21,387	35,079	32,862	69,468	79,251	39,093	96,225	122,481
10 Creative Arts	5,064	13,350	17,049	1,308	5,760	9,327	9,471	24,723	33,354
11 Food, Hospitality and Personal Services	11,325	17,235	23,805	18	9	90	11,850	28,743	36,450
Population 15 yrs or over	343,077	493,602	507,888	81,267	223,908	292,074	2,296,704	2,786,223	2,889,537

The “research and development” workforce definition used in this study is developed by reference to Statistics New Zealand’s (2003) local adaptation and interpretation of the measurement guidelines outlined in OECD (1995).

This measurement standard defines the “human resources devoted to science and technology” (**HRST**) in terms of those who either:

- have successfully completed education at the third level in a science and technology field of study (**HRSTQ** - human resources in science and technology qualifications); or
- are employed in a science and technology occupation where the above qualifications are normally required (whether or not formally qualified) (**HRSTO** - human resources in science and technology occupations).

The human resources in science and technology core (**HRSTC**, Table 2.7) consists of those who are both qualified at degree level (**HRSTQ**, Tables 2.2 and 2.3) and are currently engaged in a science and technology occupation (**HRSTO**, Table 2.6).

The earlier Statistics NZ (2003) study obtained similar overall 1996 and 2001 estimates of New Zealand **HRSTO** and **HRSTC** as have been derived from analysis of the census in this study. (Tables 2.6 and 2.7). There were larger differences in distribution across the occupational subgroups. This is probably a result of the use of a more aggregated time harmonised common denominator of the NZSCO99, NZSCO95 and NZSCO90 classifications rather than the NZSCO99 classifications used in the Statistics NZ study.

Statistics New Zealand (2003) “Human Capital Statistics” defined the **HRSTO** of the “research and development” workforce from selected subgroups and levels of the 1999 New Zealand Standard Classification of Occupations grouped to correspond with an OECD developed framework.

The occupational groupings included in the **HRSTO** classification are outlined in Table 2.5. The descriptions relate to a lowest common denominator grouping of the 1990, 1995 and 1999 New Zealand Standard Classification of Occupational Codes.

This study makes use of two occupational classifications which correspond closely but not exactly with that **HRSTO** classification regime. For 1991 to 2001 a common denominator of the NZSCO90, NZSCO95 and NZSCO99 is used and grouped as closely as possible to conform to the Statistics NZ study. For 1981 and 1986 a grouping of NZSCO68 is used to achieve as close as possible correspondence with the 1991 to 2001 series.

Those who have reached bachelors or higher degree level define the human resources in science and technology qualifications (**HRSTQ**) classification regime. The measurement standard calls for exclusion of degree level holders whose field of study was:

- 001 General programmes
- 008 Literacy programmes
- 079 Service trade programmes
- 089 Other programmes

No exclusions have been made from the statistics presented here on field of study grounds and the New Zealand census counts do not include degree courses for those fields of study (001 or 008 codes). There is a group coded 0799 (other education) but there are only between 50 and 250 persons recorded at degree level for that field of study - and these are not been excluded from the statistics that follow. There is also a field of study classification 0899 (other management and commerce) with between 0 and 1140 persons recorded at degree level which have been included in the analysis.

TABLE 2.5 Human Resources in Science and Technology Occupational Groupings

Specialised Managers	Specialised Managers (122)
Professional Group 1	Physical, Mathematical and Engineering Science Professionals, Life Science and Health Professionals (21, 22)
Professional Group 2	Teaching and Other Professionals (231, 232, 233, 234, 24)
Technical Group 1	Physical and Engineering Science Associate Professionals, Life Science and Health Associate Professionals (31, 32)
Technical Group 2	Teaching Associate and Other Associate Professionals (235, 33)

TABLE 2.6 Human Resources in Science and Technology Occupational Groupings (HRSTO)

	1996			2001		
	This Study	Statistics NZ (2003)	Diff.	This Study	Statistics NZ (2003)	Diff.
Specialised Managers	134,709	134,706	-3	160,338	160,371	33
Professional Group 1	76,899	80,346	3,447	94,149	103,032	8,883
Professional Group 2	123,024	134,889	11,865	145,545	172,959	27,414
Technical Group 1	59,457	55,956	-3,501	60,105	63,573	3,468
Technical Group 2	105,663	98,067	-7,596	132,060	90,834	-41,226
HRSTO Subtotal	499,752	503,964	4,212	592,197	590,769	-1,428

TABLE 2.7 Human Resources in Science and Technology Qualification 'Core' (HRSTC)

	1996			2001		
	This Study	Statistics NZ (2003)	Diff.	This Study	Statistics NZ (2003)	Diff.
Specialised Managers	18,822	16,908	1,914	27,948	26,628	1,320
Professional Group 1	27,705	27,438	267	40,413	41,457	-1,044
Professional Group 2	61,629	55,119	6,510	77,181	79,149	-1,968
Technical Group 1	8,790	6,441	2,349	11,487	9,930	1,557
Technical Group 2	15,747	12,210	3,537	20,847	12,723	8,124
HRSTO Subtotal	132,693	118,116	14,577	177,876	169,887	7,989

MEASUREMENT OF THE NUMBER AND PROPORTION OF TERTIARY QUALIFICATIONS GAINED OVERSEAS

There is no direct way of using New Zealand census records to determine whether the qualification held by a New Zealand resident individual was gained overseas.

A crude estimate of the contribution of overseas migrants to the pool of people with post-secondary qualifications can be made by cross-referencing information on years in New Zealand with birthplace, age and qualification level. These attributes are used here to make crude assumptions as to whether each individual gained their highest qualification in New Zealand or overseas.

The population can also be segregated into the New Zealand born and not New Zealand born subpopulations and this split used to gain a very crude estimate of the stocks and flows of tertiary qualified people.

Birthplace is a useful indicator on its own but falsely excludes some not New Zealand born who have gained their educational qualifications in New Zealand and falsely includes some New Zealanders who have not. The number of New Zealand born New Zealanders who gain a tertiary qualification overseas and then return to New Zealand can't be measured directly but is likely to make up a small proportion of the population.

The 1981, 1986, 1996 and 2001 Censuses include a question on number of years in New Zealand, but the question was not included in the 1991 Census.

ESTIMATION OF TRENDS IN STOCKS AND FLOWS OF HUMAN EDUCATIONAL CAPITAL

This study estimates the stock of New Zealand resident educational capital for each of the census years as at the beginning of March 1981, 1986, 1991, 1996 and 2001. Going beyond this static picture of changing stocks, chapter 8 examines the contributions to changes in "stocks" over time arising from migration flows⁵ and intercensal onshore qualification completions. The method used for that analysis is outlined in Appendix E.

Limitations to the consistency of long term educational attainment level statistics mean that the only robust classification over the whole 1981 to 2001 period is university degree / no degree. More limited analysis is possible when a non-degree post-secondary educational attainment level is added. The limitation of using three categories is that there is no simple method of estimating the intercensal progressions between the three educational attainment categories as compared with migration gains and losses. Some indication of the range can be made by looking at sensitivity to possible up-skilling to degree level.

Chapter 8 combines a range of other data with the census statistics to gain a better understanding of trends in educational capital over time. Educational attainment levels of migration flows are incomplete, but demographic statistics on migration flows are more comprehensive and provide a rough indication of educational capital flow trends.

5 Of existing residents and permanent long term residential migrants.

3

OVERALL TRENDS IN THE NUMBER OF QUALIFIED NEW ZEALAND RESIDENTS BY HIGHEST EDUCATIONAL QUALIFICATION LEVEL

This section discusses overall trends by highest educational qualification level. Comparisons of the rates of degree level educational qualification attainment are possible for all census years 1981 to 2001. As discussed in section 2.2, other categories of highest educational qualification attainment level can be compared for selected periods only.

3.1 DEGREE AND HIGHER DEGREE QUALIFICATIONS

Statistics permit a distinction between bachelor (first) and higher (second) degrees. As these can represent slightly different levels of qualification, comment is made separately for these levels of degree qualification. A complication is the lack of distinction between honours and basic bachelor degrees in the 1981 data as discussed in section 2.2. The convention post 1981 is to classify bachelor degrees with honours as a higher degree.

From 1981 to 2001, the proportion with a degree as highest qualification increased three fold reaching 11.8% of the population in 2001 (Tables 3.1 and 3.2). Most of this accumulation of educational capital occurred since 1991.

Between 1991 and 1996, the proportion of New Zealand residents with a bachelor degree increased from 4.2 to 6.4 percent, more than any other intercensal period. The next largest increase was from 6.4 to 8.1% of the population from 1996 to 2001.

As illustrated in Table 3.3, the proportion of New Zealanders aged 25 to 34 years with a degree or higher degree qualification was slightly below the OECD mean in 2001. The rising proportion of 20 to 24 years olds attaining tertiary level qualifications in the late 1990s suggests that New Zealand will be approaching the OECD average.

The proportion of the population with a *higher degree* reached 3.7% in 2001 up from 2% of the population in 1981, a doubling of the rate. Most of this increase occurred post 1991.

TABLE 3.1 Highest Educational Qualification Level Counts for the Usually Resident New Zealand Population Aged 15 years or over: 1981 - 2001

Highest Qualification Level	1981	1986	1991	1996	2001
Qualification Not Stated	140,616	147,543	154,098	435,396	407,445
No Qualification	1,190,868	946,497	849,339	895,209	686,220
Other School Qualifications	6,375	15,339	95,172	59,169	166,176
Fifth Form Qualification	273,060	353,718	303,948	310,215	389,256
Sixth Form Qualification	189,984	211,653	179,361	236,859	283,479
Higher School Qualification	71,475	72,810	91,266	131,550	156,975
Other Post-school Qualifications	343,071	593,973	758,574	493,581	507,885
Bachelor Degree	60,759	78,009	103,191	149,898	199,938
Higher Degree	20,484	48,756	55,326	74,343	92,142
Usually Resident NZ Population Aged 15 years or over	2,296,704	2,468,301	2,590,287	2,786,223	2,889,543

TABLE 3.2 Highest Educational Qualification Level as an adjusted Percentage⁶ of the Usually Resident New Zealand Population 15 years or over: 1981 - 2001

Highest Qualification Level	1981	1986	1991	1996	2001
No Qualification	55.2	40.8	34.9	38.1	27.6
Other School Qualifications	0.3	0.7	3.9	2.5	6.7
Fifth Form Qualification	12.7	15.2	12.5	13.2	15.7
Sixth Form Qualification	8.8	9.1	7.4	10.1	11.4
Higher School Qualification	3.3	3.1	3.7	5.6	6.3
Other Post-school Qualifications	15.9	25.6	31.1	21.0	20.5
Bachelor Degree	2.8	3.4	4.2	6.4	8.1
Higher Degree	(2.0) ⁷	2.1	2.3	3.2	3.7

TABLE 3.3 OECD Comparisons⁸ of the percent of the population by age group with a degree qualification in 2001

Country	25-34 yrs	35-44 yrs	45-54 yrs	55-64 yrs	25-64 yrs
OCED NZ estimates	16.9	14.7	14.4	7.2	13.9
This study NZ estimates	17.7	15.0	13.2	8.7	14.2
OECD Country mean	18.4	16.1	14.4	10.5	15.3

3.2 NON-DEGREE POST-SECONDARY QUALIFICATIONS

The proportion of the New Zealand population with a non-degree post secondary qualification as highest educational level increased by 30% between 1981 and 2001. This corresponded with an increase from 15.9% in 1981 to 20.5% in 2001 in the proportion of the population at the non-degree post-secondary qualification level (Table 3.4).

The 30% increase between 1981 and 1996 in the proportion of the population at non-degree post secondary educational qualification level reflects the net effect of different drivers of change. The increase in proportion with non-degree post-secondary qualifications stem in part from a doubling in the proportion of the workforce trained to non-degree post-secondary educational qualification level of those born between 1932 and 1946 and sustained since that time. The increase in the level of non-degree post-secondary training in the immediate post-second world war period reflected national economic growth and associated high levels of human resource investment in skilled technical and trades workers. Some of the effect of this on the population as a whole was not fully realised until after 1981. The 1986 and 1991 period also saw increases in the proportion of a wide range of age groups gaining a post-secondary non-degree qualification. The period since 1996 is estimated to have been affected by a high level of net outflows of residents with a non-degree post-secondary qualification (see section 8.4).

The census data on the number of persons with a non-degree post-secondary qualifications as their highest educational attainment level over time is affected by inconsistencies and ambiguity in what is included and the inclusion of qualifications gained from what may be very short term courses that

6 These percentages exclude highest qualification level not specified from the population

7 The 1981 statistic of only 1% with a higher degree is likely to be a significant underestimate and has been adjusted for some parts of the analysis. The actual 1981 statistic is estimated to be closer to 2% and has been scaled to this level for the comparisons of changes over time. The discrepancy is a result of inclusion of bachelors with honours degrees with bachelors degrees in the 1981 data.

8 The OECD estimates for New Zealand are from OECD (2003) Table A2.4 as compared with population census derived estimates from this study.

may have no vocational value. This makes it difficult to compare with international data that is collected on minimum two year and vocationally oriented qualifications (“OECD tertiary type B” qualifications)

TABLE 3.4 Post-School Educational Qualifications by Level for the Usually Resident New Zealand Population Aged 15 years or over: 1981, 1996, 2001

Highest Qualification Level	1981	1996	2001
Basic Vocational Qualification	53,910	86,810	106,200
Skilled Vocational Qualification	142,640	169,850	137,620
Intermediate Vocational Qualification	23,670	36,610	54,890
Advanced Vocational Qualification	122,870	200,330	209,180
Bachelor Degree	60,770	149,930	199,920
Higher Degree	20,500	73,980	92,150
Post-School Qualifications Subtotal	424,340	717,510	799,960

3.3 SCHOOL LEVEL QUALIFICATIONS ONLY

The proportion of the population who reached sixth form qualification level or higher but held no post-secondary qualification increased from 12.1% in 1981 to 17.7% in 2001. From 1996 to 2001 the proportion of the population with any school level qualification as their highest qualification increased while those with no qualifications decreased.

3.4 NO QUALIFICATIONS

The proportion of the population with no educational qualification dropped from 55.2% in 1981 to only 27.6% in 2001, a halving of the proportion without an educational qualification.

Identifying the progression of changes in the proportion with no qualification for intermediate years between 1981 and 2001 is hampered by inconsistencies in definitions of the intermediate qualification categories.

For example, the estimates of the proportion of people without an educational qualification in 1986 and 1991 would appear to be underestimated due to the unexplained high count of persons with a non-degree post-secondary qualification for those years. The apparent decrease in the proportion of the population with no qualifications between 1996 and 2001 is likely to be in part an artefact of changes in coding of the question. This is indicated by the large decrease in the proportion without a qualification observed for older age groups.

4

TRENDS IN HIGHEST EDUCATIONAL QUALIFICATION LEVEL OF NEW ZEALAND RESIDENTS BY AGE GROUP

4.1 DEGREE LEVEL

The proportion of the population who had gained a bachelor or higher degree qualification by age 25 to 29 increased from only 7.1% in 1981 to 19.1% in 2001 (Table 4.1). The statistics suggest that the proportion of NZ residents who gained degrees at age 30 or older was highest between 1991 and 1996, slightly lower between 1996 and 2001 and lowest between 1986 and 1991. Generally, degree attainment has been increasing for all age groups in recent census periods (Table 4.2).

Individual birth cohort histories of New Zealand born residents between 1981 and 2001 show the continuing increase in the proportion of those with a degree at any given age compared with previous birth cohorts at that same age (Figure 4.1).

TABLE 4.1 Percentage of the usually resident New Zealand population with a degree by age group: 1981 - 2001

	1981	1986	1991	1996	2001
15-19 yrs	0.0	0.1	0.2	0.1	0.1
20-24 yrs	4.6	5.8	7.3	11.4	14.0
25-29 yrs	7.1	8.7	9.5	14.1	19.1
30-34 yrs	6.7	9.1	10.1	13.3	16.4
35-39 yrs	5.4	8.5	10.2	12.9	15.3
40-44 yrs	4.2	7.1	9.3	12.6	14.6
45-49 yrs	3.3	5.6	7.5	11.3	14.0
50-54 yrs	3.1	4.5	5.7	9.0	12.3
55-59 yrs	2.9	4.1	4.3	6.9	9.7
60-64 yrs	2.3	3.7	3.9	5.4	7.5
65-69 yrs	2.3	3.1	3.6	5.0	6.1
70-74 yrs	2.2	3.1	2.9	4.6	5.9
75-79 yrs	1.9	2.8	2.9	3.8	5.6
80-84 yrs	1.6	2.4	2.6	3.8	4.9
85 + yrs	1.2	1.9	1.9	2.9	4.2
15 years or over	3.8	5.5	6.5	9.3	11.8

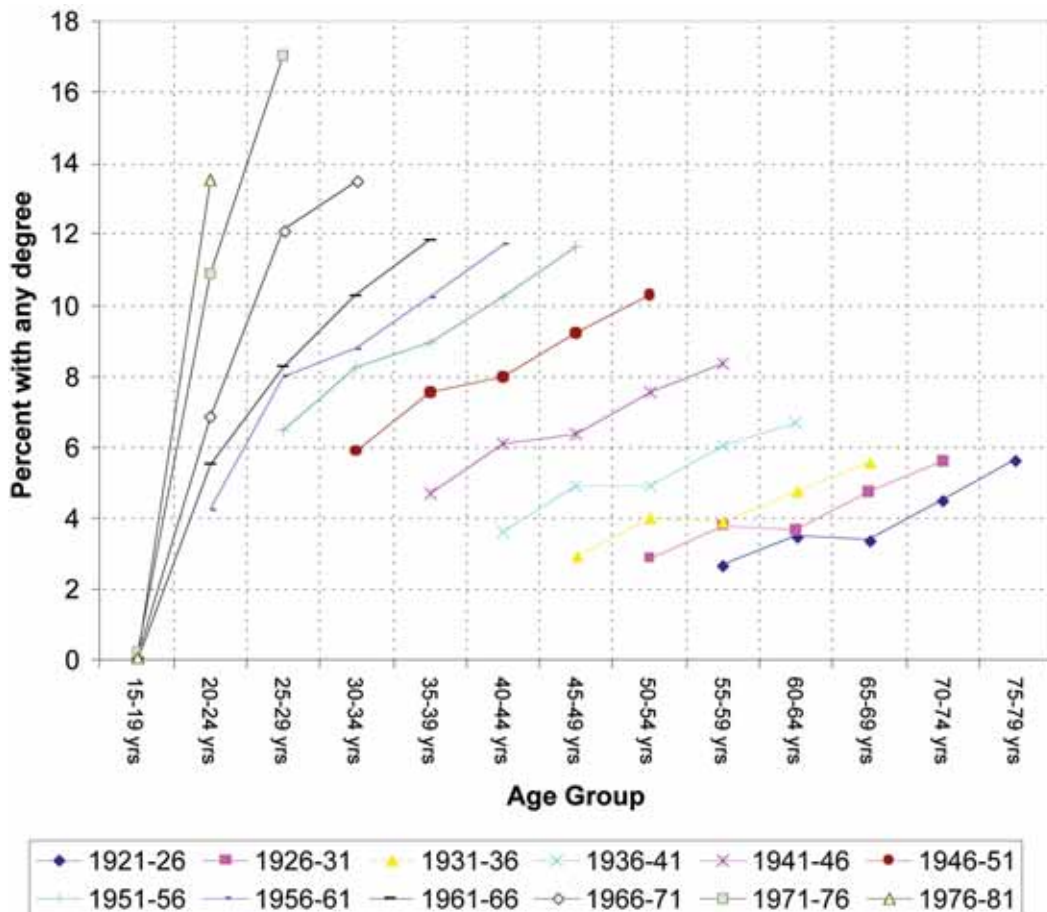
TABLE 4.2

Intercensal change in the percentage of the usually resident New Zealand population with a degree by end of period age group: 1981 - 2001

End of Period Age Group	1981-1986	1986-1991	1991-1996	1996-2001
15-19 yrs	0.1	0.2	0.1	0.1
20-24 yrs	5.8	7.2	11.1	13.9
25-29 yrs	4.1	3.7	6.7	7.7
30-34 yrs	2.0	1.4	3.7	2.4
35-39 yrs	1.8	1.1	2.8	2.0
40-44 yrs	1.7	0.7	2.3	1.7
45-49 yrs	1.4	0.4	2.0	1.5
50-54 yrs	1.1	0.1	1.5	1.0
55-59 yrs	1.0	-0.1	1.2	0.7
60-64 yrs	0.9	-0.2	1.0	0.6
15 years or over	1.7	1.0	2.8	2.5

FIGURE 4.1

1981 to 2001 census trends in percent with any degree qualification by age group for New Zealand born residents in the 1921 to 1986 birth year cohorts



Analysis of trends in the proportion of those with a non-degree post-secondary education level is made difficult by the inconsistencies in the coding for this category over time. The proportion of the overall population with a non-degree post-secondary qualification as their highest level of educational attainment remained static between 1996 and 2001 (Table 4.4). Between 1996 and 2001, there was a significant decline in the proportion of those 40 years or over with a non-degree post-secondary qualification (Table 4.3). A high rate of net loss through net outward international migration over that time is likely to be a factor in this recent loss of educational capital as is explored in section 8.3.

Another influence may be some additional training of workers over 20 received by those born between 1956 and 1981 some time over the 1981 to 1991 period. This is suggested by a high level of intercensal gain in non-degree post-secondary qualifications by those aged 25 years or over between 1986 and 1991 (Table 4.4) and analysis of net change by age between 1981 and 1996 (Table 4.5).

New Zealand had a much higher proportion of most age groups with a non-degree post-secondary qualification than the OECD country mean in 2001 (Table 4.6). The decrease with increasing age in OECD country mean proportion with an "OECD tertiary type B" qualification suggests that internationally the proportion with such a qualification is increasing over time. There is evidence of convergence between high "OECD New Zealand estimates" of non-degree "OECD tertiary type B" rates and the lower OECD mean. This is a result of steady increase in the proportion of the OECD country population with an "OECD tertiary type B" qualification. The OECD estimates for New Zealand also show a decline in the proportion of the population with an "OECD tertiary type B" with decreasing age.

This study was not able to replicate the OECD definition of "OECD tertiary type B" qualifications using census data due to aggregation of categories in the data and lack of information on length of time for completion. Estimates based the census records are much higher than OECD estimates for New Zealand "OECD tertiary type B" qualification levels (Table 3.5).

Comparisons between 1981 to 1986 or 1991 to 1996 intercensal transitions and statistics for this qualification level are unwise due to differences in the definitions used. There was an increase in the proportion of the population at the post-secondary (non-degree) qualification level between 1986 and 1991, but no significant change between 1996 and 2001.

TABLE 4.3 Percentage of the usually resident New Zealand population at non-degree post secondary educational qualification level by age group: 1981 - 2001

	1981	1986	1991	1996	2001
15-19 yrs	3.5	6.2	12.8	5.0	6.3
20-24 yrs	20.1	25.8	33.2	19.9	20.6
25-29 yrs	23.0	31.6	35.7	22.6	23.1
30-34 yrs	22.5	32.6	38.0	24.2	23.3
35-39 yrs	21.5	32.6	38.2	26.9	24.0
40-44 yrs	20.7	31.8	37.2	26.7	25.9
45-49 yrs	19.3	31.1	35.7	25.4	25.1
50-54 yrs	17.0	29.7	34.2	23.5	23.2
55-59 yrs	14.2	27.6	32.2	22.2	21.3
60-64 yrs	10.9	25.0	29.5	20.1	19.6
65-69 yrs	9.1	21.4	26.8	17.1	17.5
70-74 yrs	8.1	18.1	22.9	14.1	15.4
75-79 yrs	7.5	16.9	19.6	11.1	13.2
80-84 yrs	5.9	16.0	18.5	8.9	10.8
85 + yrs	5.2	12.6	16.9	7.9	8.6
15 years or over	15.9	25.6	31.1	20.4	20.5

TABLE 4.4 Intercensal change in the percentage of the usually resident New Zealand population at non-degree post secondary educational qualification level by end of period age group: 1986-1991 and 1996-2001

	1986-1991	1996-2001
15-19 yrs	12.8	6.3
20-24 yrs	27.0	15.6
25-29 yrs	10.0	3.1
30-34 yrs	6.4	0.7
35-39 yrs	5.6	-0.3
40-44 yrs	4.6	-1.1
45-49 yrs	3.9	-1.6
50-54 yrs	3.0	-2.1
55-59 yrs	2.5	-2.2
60-64 yrs	1.9	-2.5
15 years or over	5.5	0.0

TABLE 4.5 Net 1981-1996 change in the percentage of the usually resident New Zealand population at non-degree post secondary educational qualification level for 1981 age cohorts:

1981 Age Group	1981	1996	1981-1996
15-19 yrs	3.5	24.2	20.7
20-24 yrs	20.1	26.9	6.9
25-29 yrs	23.0	26.7	3.7
30-34 yrs	22.5	25.4	2.9
35-39 yrs	21.5	23.5	2.0
40-44 yrs	20.7	22.2	1.5
45-49 yrs	19.3	20.1	0.8
50-54 yrs	17.0	17.1	0.2
55-59 yrs	14.2	14.1	-0.1

TABLE 4.6 OECD Comparisons of the percent of the population by age group with a non-degree post-secondary or “OECD tertiary type B” qualification in 2001

Country	25-34 yrs	35-44 yrs	45-54 yrs	55-64 yrs	25-64 yrs
OCED NZ estimates	11.6	15.8	17.6	17.0	15.3
This study NZ estimates ¹⁰	23.2	24.9	24.2	20.6	23.5
OECD Country mean	9.3	8.5	6.9	5.2	7.7

9 The OECD data is from OECD(2003) for “OECD tertiary type B” qualifications. These are non-degree level and include practical, technical or occupational skills for direct entry to the labour market with a minimum two years of full-time equivalent study at the tertiary level.

10 Note that the New Zealand statistics shown here include all levels of non-degree post-secondary qualification whereas the OECD statistics apply to select higher levels of post-secondary non-degree qualifications and selected subjects

4.3

SCHOOL LEVEL ONLY OR NO EDUCATIONAL QUALIFICATIONS

The population without educational qualifications upskilled between 1981 and 2001 (Table 4.7). The proportion of 15 to 19 year olds without an educational qualification dropped from 43.3% in 1981 to 29.1% in 2001. The proportion of those aged 30 to 34 years old with no qualification dropped from 47% in 1981 to 20% in 2001, a drop of 27%. 16.3% of the decrease in the proportion with no qualifications at age 30 to 34 years corresponded with an increase of the proportion with a school level qualification and the remaining 10% was accounted for by an increase in the proportion with a post-secondary qualification.

TABLE 4.7 Percentage of the usually resident New Zealand population with no qualification by age in 1981, 2001 and 1981 to 2001 intercensal change by end of period age group

	1981	2001	1981 to 2001
15-19 yrs	43.3	29.1	-
20-24 yrs	34.3	15.1	-
25-29 yrs	37.8	15.8	-
30-34 yrs	46.8	20.0	-
35-39 yrs	53.3	20.9	22.4
40-44 yrs	58.4	22.5	11.8
45-49 yrs	62.8	25.0	12.8
50-54 yrs	67.3	33.1	13.7
55-59 yrs	71.0	38.4	14.9
60-64 yrs	75.6	41.8	16.7

The low proportion of 25 to 29 years olds with “no qualifications” in 1986 and 1991 to 1996 is a result of inclusion of certain types of non-vocational training and “other not specified” post-secondary qualification codings as post-secondary qualifications at those two censuses. This probably includes the extensive Department of Labour “Access Training” courses which were offered to unemployed around that time.

The proportion of school leavers who stayed on to higher school leaving level more than doubled between 1991 and 1996 due to an increase in the school leaving age (Table 4.8). This transition to longer periods at school and increased numbers completing a school leaving qualification or a post-secondary qualification in the 1990’s saw 20% of 30 to 34 year olds having no educational qualification in 2001 (Table 4.10) compared with 16% of 25 to 29 year olds (Table 4.9). Statistics for 1986 and 1991 are left out of Tables 4.9 and 4.10 due to the lack of consistency in coding.

TABLE 4.8 Percentage of the usually resident New Zealand population aged 20 to 24 years old with no qualification or school level qualifications only: 1981 - 2001

	1981	1986	1991	1996	2001
No Qualification	34.3	27.6	24.1	21.3	15.1
Other School Quals	0.1	0.3	1.0	1.9	4.2
Fifth Form Qualification	18.9	18.3	14.1	12.4	12.1
Sixth Form Qualification	14.7	14.7	12.1	14.5	13.7
Higher School Qualification	7.5	7.5	8.3	18.6	20.4
Subtotal	75.3	68.4	59.5	68.7	65.5

TABLE 4.9 Percentage of the usually resident New Zealand population aged 25 to 29 years old with no qualification or school level qualifications only: 1981, 1996 and 2001

	1981	1996	2001
No Qualification	37.8	28.2	15.8
Other School Quals	0.2	1.9	4.7
Fifth Form Qualification	18.5	15.2	14.2
Sixth Form Qualification	10.0	13.8	14.6
Higher School Qualification	3.4	4.4	8.5
Subtotal	69.9	63.4	57.8

TABLE 4.10 Percentage of the usually resident New Zealand population aged 30 to 34 years old with no qualification or school level qualifications only: 1981, 1996 and 2001

	1981	1996	2001
No Qualification	46.8	29.2	20.0
Other School Quals	0.4	2.3	5.7
Fifth Form Qualification	14.5	14.8	16.8
Sixth Form Qualification	6.7	13.2	13.8
Higher School Qualification	2.5	3.0	4.0
Subtotal	70.8	62.5	60.3

5

TRENDS IN HIGHEST EDUCATIONAL QUALIFICATION LEVEL OF NEW ZEALAND RESIDENTS BY SEX

5.1 DEGREE QUALIFICATIONS

Between 1981 and 2001 strong gains in attainment of degree level qualifications were achieved by both men and women (Figure 5.1, Table 5.1). Overall, women made the largest gains between 1981 and 2001, increasing the proportion with a degree from 2.5% in 1981 to 11.2% in 2001. By contrast, the proportion of men with a degree increased from 5.1 to 12.4% over the same period. The largest intercensal gain was an increase of 3.3% in the proportion of women with a degree between 1996 and 2001 (Table 5.2). The next largest intercensal gain was an increase of 3% in the proportion of men with a degree between 1991 and 1996.

The increases in educational attainment are the product of gains made by different birth cohorts over their life course. The increase in degree attainment at the lifecycle transition from school to work is a mainly a reflection of gains in qualifications between age 15-19 and 25-29 years. Comparison of the degree qualification attainment by age of residents born in the four intercensal periods 1961-66, 1966-71, 1971-76 and 1976-81 shows a switch from males leading female attainment by age 20-24 years amongst the 1961-66 birth year cohort to much higher female degree attainment by the 1976-81 birth cohort (Figure 5.2). Full detail of the life course degree attainment level reached between 1981 and 2001 by male birth cohorts is illustrated in Figure 5.3 and female birth cohorts in Figure 5.4. The increases in mean educational attainment levels after retirement age are a reflection of lower mortality amongst degree qualified than non-degree qualified people.

The large margin between female and male degree level educational attainment is a recent phenomenon and is illustrated by comparison of the degree level attainment by age and sex in 1996 (Figure 5.5) and 2001 (Figure 5.6). Women exceeded gains by men for the first time over the 1991 to 1996 intercensal period. Gender differences in the net increase in degree qualification at 30 years of age or older have fluctuated over the 1981 to 2001 period. Between 1996 and 2001, 16.6% of women aged 20 to 24 years gained a degree compared with 11% of men. Between 1996 and 2001, over all age groups a higher proportion of women than men gained degrees. By contrast, a higher proportion of men than women gained degrees between 1991 and 1996 in all age groups except 20 to 24 year olds. It may be that some of this is explained by the high level of net international migration gains between 1991 to 1996 compared with other intercensal periods.

If lower gains in degree attainment by males than females are sustained the proportion of females overall with a degree will greatly exceed that of males over time. Educational capital is often cited as a contributor to increases in labour productivity. The much lower contribution by males than females to the increase in educational attainment levels and lower levels of attainment than females amongst recent birth cohorts suggests that lower male educational attainment gains may be a constraint on productivity gains in the New Zealand economy.

TABLE 5.1 Percent of the usually resident New Zealand population with a degree qualification by age and gender: 1981 - 2001

Age Group	1981		1986		1991		1996		2001	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19 yrs	0	0	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.2
20-24 yrs	5.0	4.1	6.2	5.4	7.4	7.2	10.2	12.8	11.1	16.7
25-29 yrs	8.9	5.3	10.1	7.2	10.3	8.8	14.8	13.8	17.2	20.8
30-34 yrs	9.1	4.3	11.0	7.2	11.5	8.6	14.6	12.5	16.2	16.6
35-39 yrs	7.6	3.3	11.1	5.9	12.0	8.4	14.9	11.4	15.8	14.9
40-44 yrs	5.9	2.5	9.4	4.7	11.7	6.8	14.9	10.8	15.6	13.6
45-49 yrs	4.7	2.0	7.5	3.7	9.5	5.4	14.3	8.8	15.4	12.8
50-54 yrs	4.4	1.9	5.9	2.9	7.3	4.1	12.0	6.6	14.5	10.1
55-59 yrs	4.3	1.5	5.6	2.6	5.7	3.0	9.5	4.9	12.0	7.4
60-64 yrs	3.6	1.1	5.4	2.0	5.3	2.5	7.6	3.5	9.8	5.4
15 yrs plus	5.1	2.5	6.9	4.0	7.8	5.3	11.0	8.2	12.4	11.2

TABLE 5.2 Intercensal change in the proportion of the New Zealand resident population with a degree qualification by end of period age group and sex: 1981 - 2001

End of Period Age Cohort	1981-1986		1986-1991		1991-1996		1996-2001	
	Male	Female	Male	Female	Male	Female	Male	Female
15-19 yrs	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.2
20-24 yrs	6.2	5.4	7.3	7.1	9.9	12.4	11.0	16.6
25-29 yrs	5.1	3.1	4.1	3.4	7.2	6.4	7.1	8.2
30-34 yrs	2.1	1.8	1.4	1.4	4.0	3.5	1.7	3.0
35-39 yrs	2.0	1.6	1.0	1.2	3.1	2.5	1.5	2.6
40-44 yrs	1.8	1.5	0.5	1.0	2.6	2.1	1.0	2.4
45-49 yrs	1.6	1.3	0.1	0.7	2.4	1.7	0.7	2.2
50-54 yrs	1.3	1.0	-0.2	0.3	2.2	0.9	0.4	1.5
55-59 yrs	1.2	0.7	-0.3	0.1	1.9	0.6	0.4	1.0
60-64 yrs	1.2	0.6	-0.3	0.0	1.7	0.4	0.6	0.6
15 yrs plus	1.8	1.5	0.9	1.2	3.0	2.7	1.6	3.3

FIGURE 5.1 1981 to 2001 New Zealand resident¹¹ degree qualification trends (%) by sex

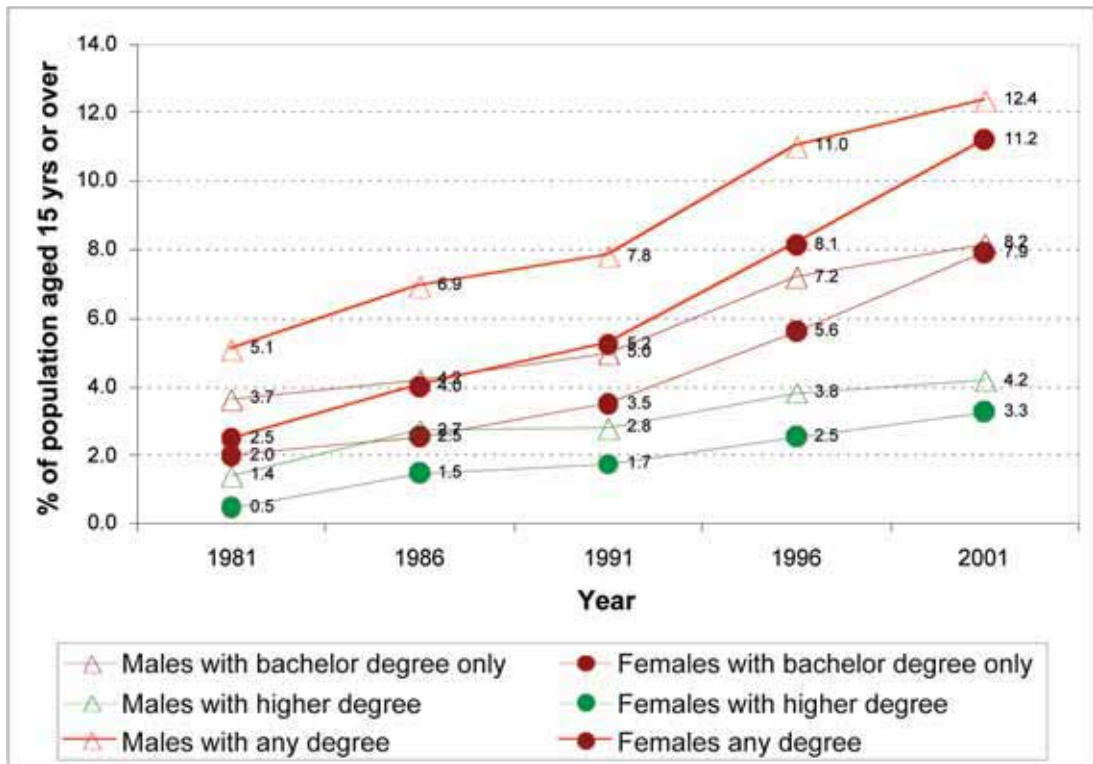
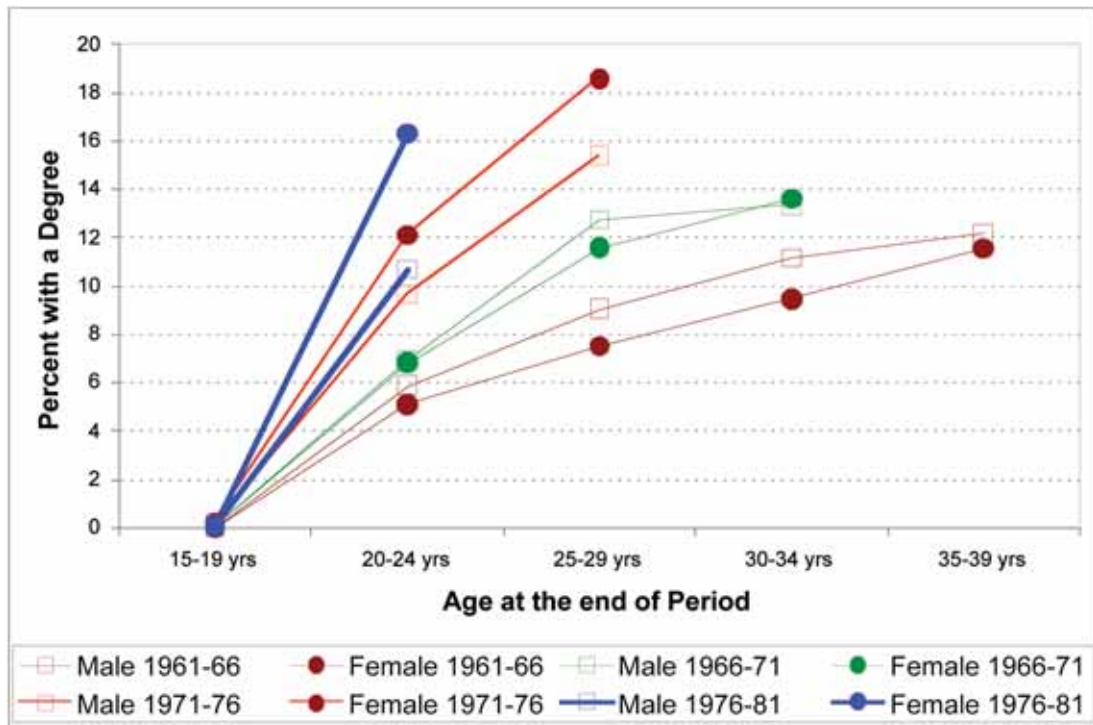


FIGURE 5.2 Comparison of degree attainment history by age group for selected male and female birth cohorts



11 Usually resident NZ population aged 15 years or over as estimated in the Population Census

FIGURE 5.3

1981 to 2001 census trends in percent with any degree qualification for New Zealand born residents of male 1921 to 1986 birth year cohorts by age group

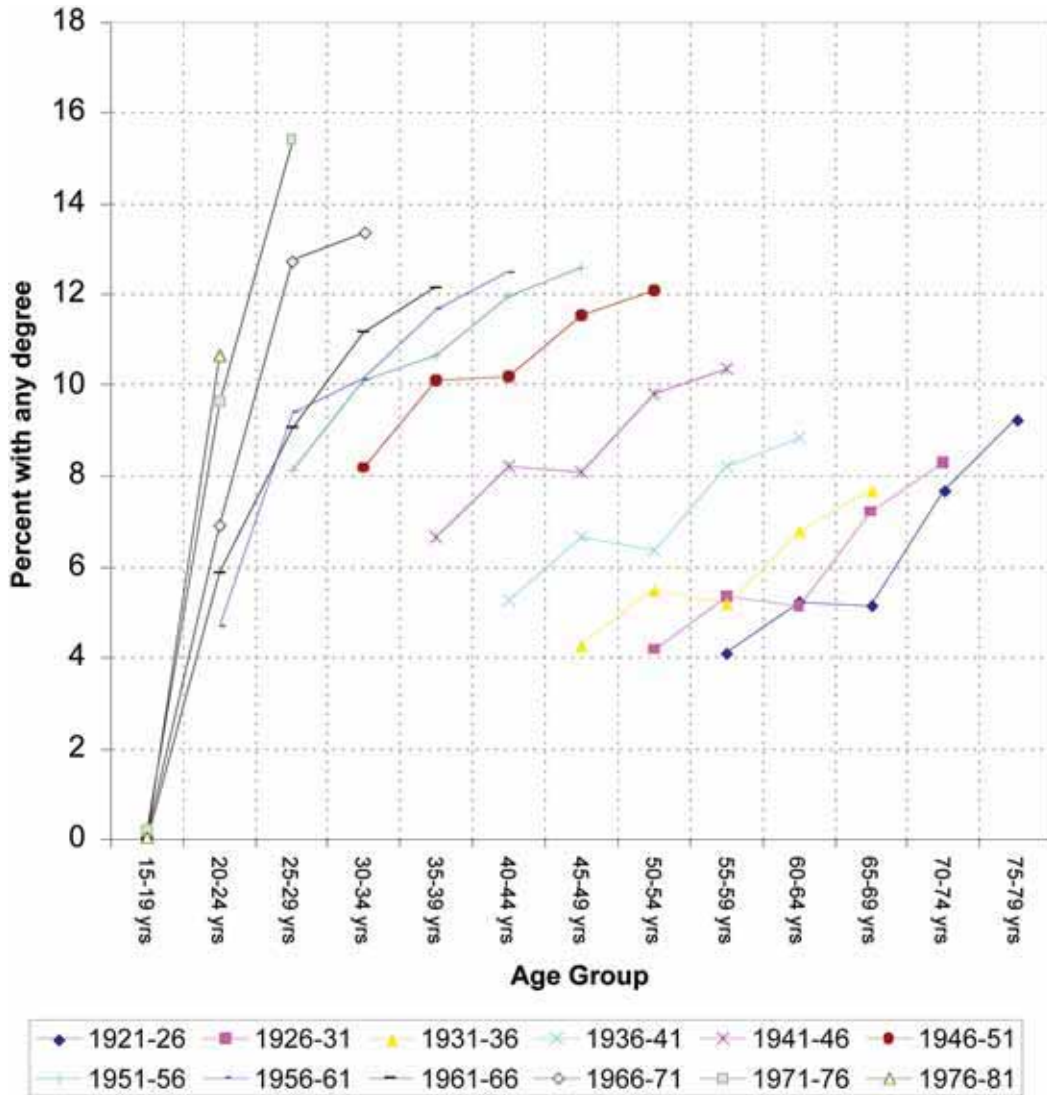


FIGURE 5.4

1981 to 2001 census trends in percent with any degree qualification for New Zealand born residents of female 1921 to 1986 birth year cohorts by age group

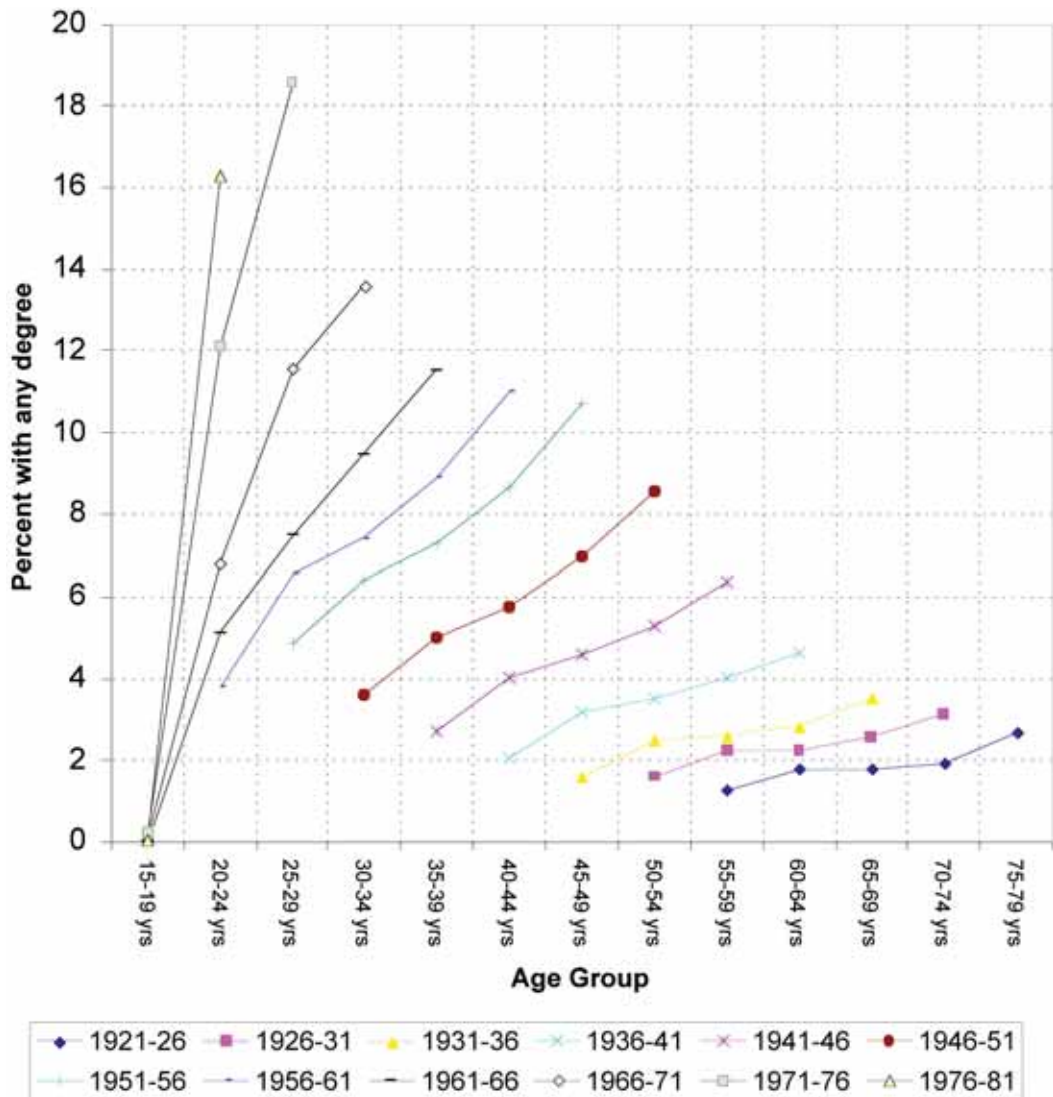


FIGURE 5.5 Percent of the 1996 usually resident New Zealand population with a degree by gender and age group

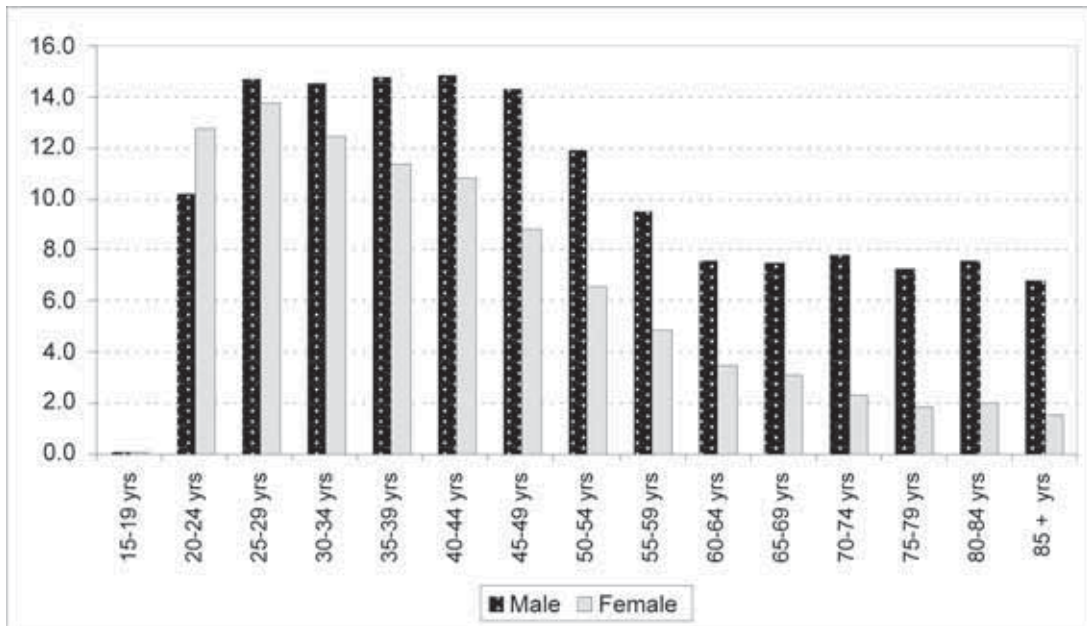
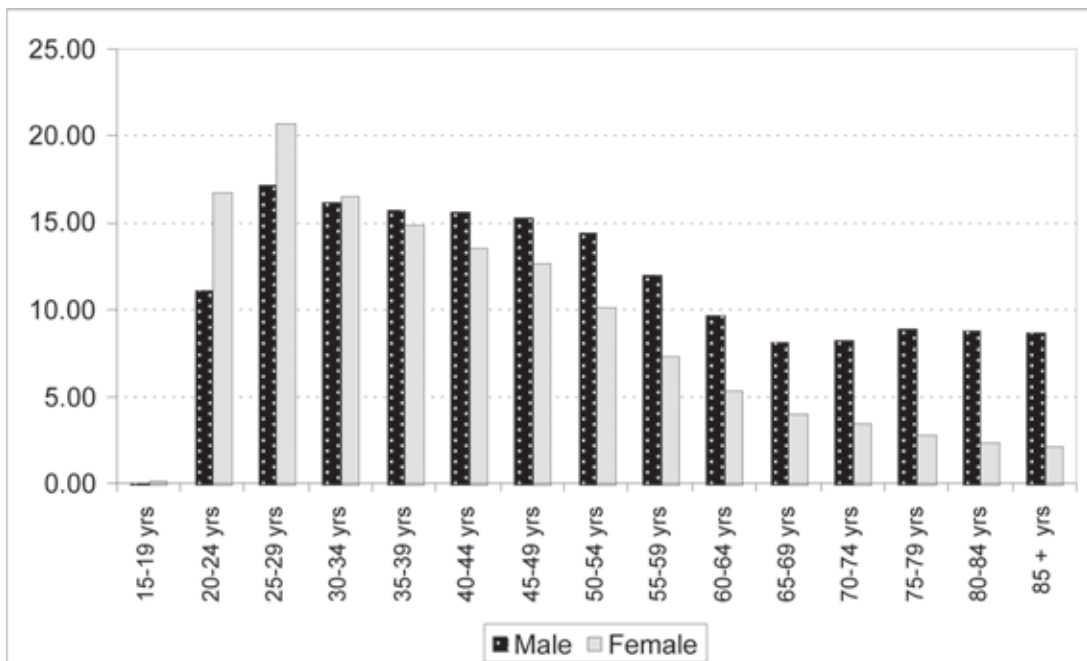


FIGURE 5.6 Percent of the 2001 usually resident New Zealand population with a degree by gender and age group



5.2

NON-DEGREE POST SECONDARY QUALIFICATIONS

In 1981, 17.8% of men 15 years or over were at non-degree post-secondary educational qualification level compared to only 14.1% of women (Table 5.3, Figure 5.7). By 2001, this small gap had narrowed, with 19.7% of women and 21.2% of men reaching non-degree post-secondary qualification level.

The net intercensal increase in the proportion of females reaching non-degree post-secondary educational qualification level between age 15 to 19 and 20 to 24 years was larger for females than males in 1991 to 1996 and 1996 to 2001 (Table 5.4). The proportion of females at post secondary non-degree qualification level at age 25 to 29 in 2001 was lower than males due to an increase of 4.5% in the post-secondary non-degree qualifications of males compared with only 1.5% of females.

TABLE 5.3 Percent of the usually resident New Zealand population at the non-degree post secondary qualification level by age and gender: 1981 - 2001

Age Group	1981		1986		1991		1996		2001	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
15-19 yrs	2.0	5.1	4.6	8.0	11.2	14.5	4.0	6.2	5.5	7.2
20-24 yrs	20.8	19.3	27.7	23.8	34.0	32.4	18.9	21.4	19.1	22.0
25-29 yrs	25.2	20.8	35.5	27.7	38.6	33.0	25.1	20.9	23.2	22.9
30-34 yrs	25.5	19.4	37.0	28.2	41.2	34.8	27.3	22.1	25.4	21.4
35-39 yrs	24.8	18.3	37.4	27.9	41.4	35.0	29.7	25.3	26.1	22.0
40-44 yrs	23.8	17.6	37.1	26.4	40.6	33.8	29.2	25.4	27.2	24.6
45-49 yrs	21.9	16.6	37.1	25.0	39.7	31.5	27.9	24.1	26.1	24.1
50-54 yrs	19.6	14.1	35.9	23.1	39.4	28.8	26.6	22.0	24.3	22.2
55-59 yrs	16.7	11.6	34.3	20.4	38.2	26.0	26.0	20.1	22.6	20.1
60-64 yrs	12.8	9.3	32.1	17.9	36.1	22.7	24.0	18.0	20.7	18.6
15 yrs plus	17.8	14.1	29.8	21.5	34.7	27.7	22.9	19.3	21.2	19.7

FIGURE 5.7 Percent of NZ Residents aged 15 years or older at non-degree post-secondary qualification level by gender in 1981, 1996 and 2001

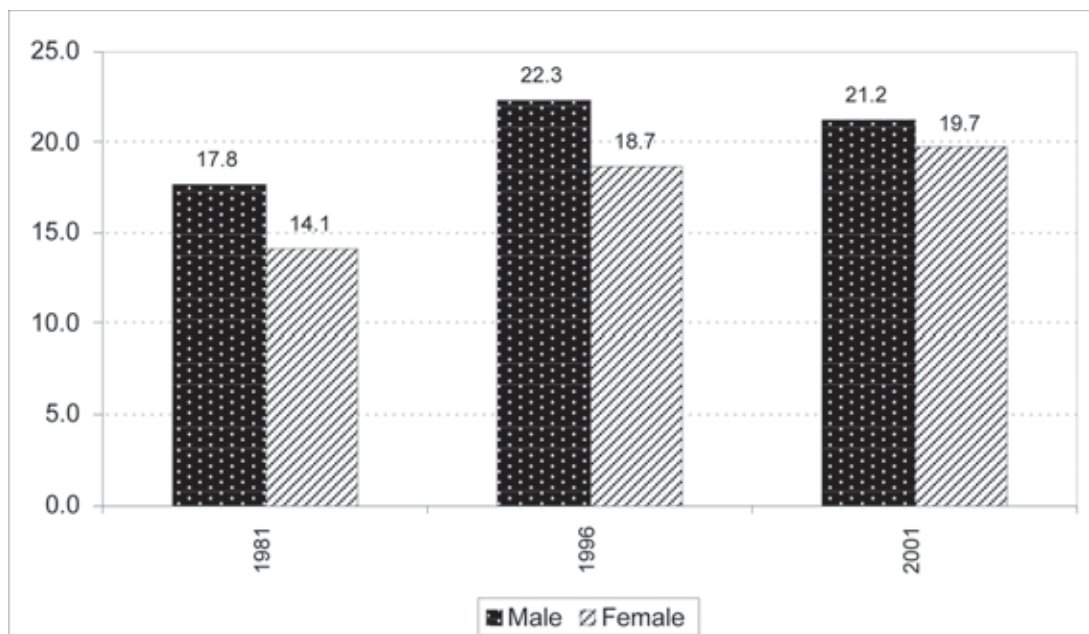


TABLE 5.4 Intercensal change in the percent at the non-degree post secondary qualification level for each usually resident New Zealand population age cohort by sex: 1986-1991 and 1996-2001

End of Period Age Cohort	1986-1991		1996-2001	
	Male	Female	Male	Female
15-19 yrs	11.2	14.5	5.5	7.2
20-24 yrs	29.5	24.4	15.1	15.8
25-29 yrs	10.9	9.3	4.3	1.5
30-34 yrs	5.7	7.1	0.3	0.5
35-39 yrs	4.4	6.9	-1.2	-0.1
40-44 yrs	3.3	6.0	-2.5	-0.7
45-49 yrs	2.6	5.1	-3.1	-1.4
50-54 yrs	2.3	3.8	-3.7	-1.9
55-59 yrs	2.3	2.9	-4.0	-1.9
60-64 yrs	1.8	2.2	-5.3	-1.5
15 yrs plus	4.9	6.2	-1.6	0.5

6

TRENDS IN HIGHEST EDUCATIONAL QUALIFICATION LEVEL OF NEW ZEALAND RESIDENTS BY ETHNIC GROUP

All ethnic groups experienced an increase in the proportion reaching either the “non-degree post-secondary” or “degree” levels comparing 1981 and 2001 (Table 6.1). Nonetheless, ethnic differences in qualification remain marked as indicated by five observations:

- In 1981, persons of NZ European ethnic origin were six times more likely to have a degree than a NZ Maori and six and a half times more likely than Pasifika people.
- By 2001, persons of NZ European ethnic origin were only two and a half times more likely to have a degree than a NZ Maori and three times more likely than Pasifika people.
- In 1981, persons of NZ European ethnic origin were two and a half times more likely to be at “non-degree post-secondary” qualification level than a NZ Maori and three times more likely than Pasifika people.
- By 2001, persons of NZ European ethnic origin were only one third more likely to be at “non-degree post-secondary” qualification level than a NZ Maori and three quarters more likely than Pasifika people.
- The proportion of Asian ethnic subpopulations with a degree was three times that of NZ European ethnic groups in 1981 and decreased to double by 2001. The Asian and Other ethnic subpopulations were less likely than the NZ European ethnic group to be at non-degree post-secondary educational qualification level.

Note that the evolving nature of the concept of ethnicity makes it difficult¹² to interpret time series by ethnic origin.

TABLE 6.1 New Zealand Post School Qualification Levels by Ethnic Group: 1981, 1996 and 2001

	Any Degree Qualification			Non-Degree Post-School Qual Only		
	1981	1996	2001	1981	1996	2001
NZ European Only	4.1	10.0	12.2	17.3	23.3	22.4
NZ Maori	0.7	3.0	4.8	6.8	13.6	16.5
Pasifika People	0.6	2.7	3.9	5.5	10.0	12.9
Asian	13.0	24.7	23.6	10.0	12.0	11.0
Other Ethnic Group	-	30.7	27.7	-	15.7	13.7
All Ethnic Groups	3.8	9.5	11.8	15.9	21.0	20.5

¹² A major discontinuity exists in the interpretation of/response to the ethnic origin question between the 1991 and 1996 census, but shifts and refinements occur between all census. The use of percentages or proportions as presented here masks some of the errors arising from changes due solely to net interethnic drift in individual responses.

6.1 DEGREE QUALIFICATIONS

In 1981, only 0.6% of Pasifika people and 0.7% of NZ Maori aged 15 years or over had gained a degree compared with 4.1% of those NZ European ethnic origin (Table 6.2). By 2001, 4.8% of Maori, 3.9% of Pasifika people compared with 12.2% of NZ European residents aged 15 years or over had a degree. The increase in degree attainment by Pasifika people started to fall behind gains by NZ Maori in the early 1990s and that gap in educational attainment levels appears to have widened over time.

Much of the difference in degree level educational attainment between Maori and Pasifika people is a result of much lower educational attainment gains between school leaving and entry to the workforce from ages 15 to 29 years (Tables 6.3 and 6.4). Between 1996 and 2001, intercensal degree level educational attainment gains by Maori and Pasifika peoples age 35 to 54 years were equal to or larger than those made by NZ European residents (Table 6.4).

The transition from male led to female led gains in educational attainment took place earlier amongst Maori and Pasifika people than NZ Europeans (Table 6.5). By 2001, 5.2% of NZ Maori females had a degree compared with 4.3% of males and 4.0% of female Pasifika people had a degree compared with 3.7% of males. By contrast, 11.6% of NZ European females had a degree compared with 13.0% of males in 2001.

FIGURE 6.1 Percent of NZ Residents aged 15 years or older with a degree qualification by Ethnic Origin 1981 to 2001

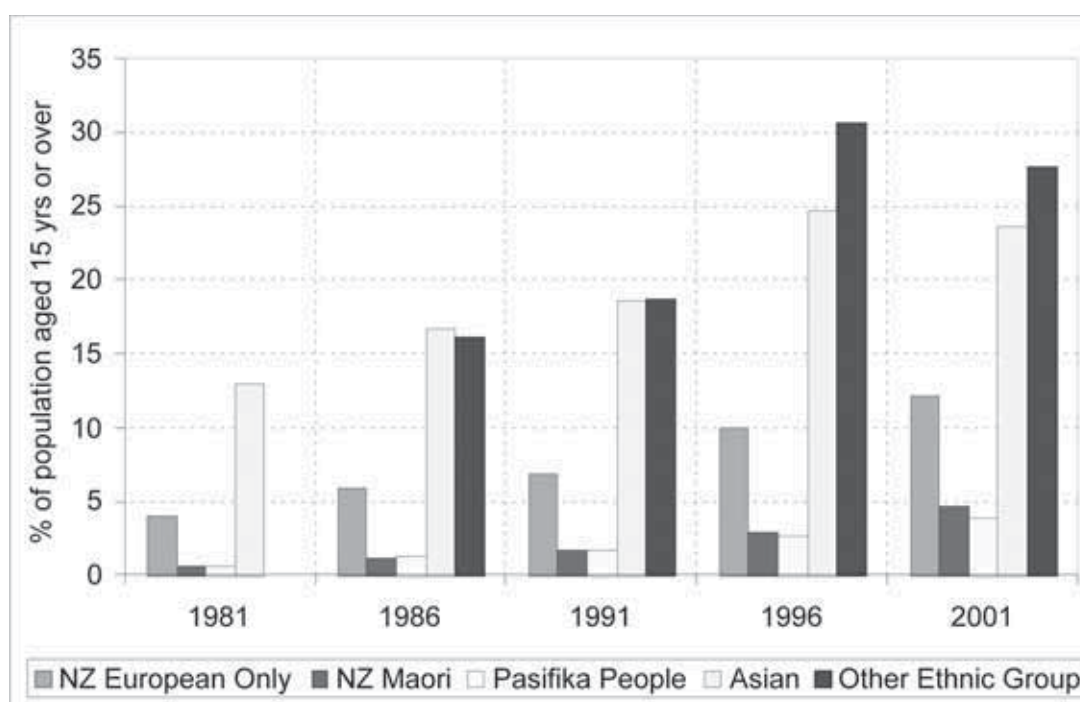


TABLE 6.2 Percent of the usually resident New Zealand population with a degree qualification by Ethnic Group: 1981 - 2001

	1981	1986	1991	1996	2001	Chge 1981-2001
NZ European Only	4.1	5.9	6.9	10.0	12.2	8.2
NZ Maori	0.7	1.2	1.7	3.0	4.8	4.1
Pasifika People	0.6	1.3	1.7	2.7	3.9	3.3
Asian	13.0	16.7	18.6	24.7	23.6	10.6
Other Ethnic Group	-	16.2	18.7	30.7	27.7	22.8
All Ethnic Groups	3.8	5.5	6.5	9.5	11.8	8.0

TABLE 6.3 Percent of the usually resident New Zealand population with a degree qualification by age and ethnic group: 1996 and 2001

Age Group	NZ European Only		NZ Maori		Pasifika People	
	1996	2001	1996	2001	1996	2001
15-19 yrs	0.1	0.1	0.1	0.1	0.1	0.1
20-24 yrs	13.7	17.0	3.9	5.1	3.7	3.8
25-29 yrs	15.6	21.4	4.4	7.8	4.4	7.1
30-34 yrs	13.6	17.4	3.9	6.0	3.6	5.3
35-39 yrs	13.4	15.4	3.6	5.7	3.6	5.0
40-44 yrs	13.2	14.9	3.8	5.6	2.8	5.1
45-49 yrs	11.9	14.5	3.5	5.7	2.5	3.8
50-54 yrs	9.6	12.6	2.8	5.2	2.3	3.4
55-59 yrs	7.5	10.0	2.4	4.2	1.5	2.0
60-64 yrs	5.8	7.7	1.8	3.5	1.0	1.0
15 yrs plus	10.0	12.2	3.0	4.8	2.7	3.9

TABLE 6.4 Intercensal change in the percent with a degree qualification for each usually resident New Zealand population age cohort by ethnic group: 1986-1991 and 1996-2001

End of Period Age Cohort	NZ European Only		NZ Maori		Pasifika People	
	1986-1991	1996-2001	1986-1991	1996-2001	1986-1991	1996-2001
15-19 yrs	0.2	0.1	0.2	0.1	0.3	0.1
20-24 yrs	8.3	16.9	1.8	5.0	2.1	3.8
25-29 yrs	3.7	7.6	1.0	3.9	0.9	3.4
30-34 yrs	1.2	1.7	0.4	1.5	0.3	0.9
35-39 yrs	1.0	1.7	0.6	1.9	0.0	1.4
40-44 yrs	0.7	1.5	0.3	2.0	0.3	1.5
45-49 yrs	0.3	1.3	0.4	1.9	0.0	1.0
50-54 yrs	0.0	0.7	0.4	1.7	0.0	0.9
55-59 yrs	-0.2	0.4	0.2	1.4	-0.1	-0.3
60-64 yrs	-0.2	0.1	0.0	1.1	-0.2	-0.5
15 yrs plus	1.0	2.3	0.5	1.8	0.3	1.2

TABLE 6.5 Percent of the usually resident New Zealand population with a degree qualification by ethnic group and sex: 1981 - 2001

	Sex	1981	1986	1991	1996	2001
NZ European Only	Male	5.5	7.5	8.4	11.6	13.0
	Female	2.7	4.3	5.6	8.4	11.6
NZ Maori	Male	0.9	1.5	2.0	3.2	4.3
	Female	0.4	0.9	1.4	2.8	5.2
Pasifika People	Male	0.8	1.6	1.9	2.9	3.7
	Female	0.4	1.0	1.5	2.4	4.0
Asian	Male	16.8	20.6	21.5	28.2	25.3
	Female	8.8	12.8	15.8	21.5	22.1
All Gps	Male	5.1	6.9	7.8	11.0	12.4
	Female	2.5	4.0	5.2	8.1	11.2

6.2 NON-DEGREE POST SECONDARY QUALIFICATIONS

In 1981, only 5.5% of Pasifika people and 6.8% of Maori aged 15 years or over had reached a non-degree post-secondary qualification level compared with 17.3% of those of NZ European ethnic origin (Table 6.6). By 2001, 16.5% of Maori, 12.9% of Pasifika people compared with 22.4% of NZ European residents aged 15 years or over had a non-degree post-secondary qualification as their highest educational qualification.

The gains in non-degree post-secondary qualification attainment by NZ Maori and Pasifika people compared NZ European between 1981 and 2001 are reflected in the proportion of NZ Maori and Pasifika people gaining a non-degree post-secondary qualification between school leaving and entry to the workforce (Tables 6.7 and 6.8). Between 1996 and 2001, intercensal non-degree post-secondary qualification gains made by Maori and Pasifika people age 15 to 29 years were equal to or larger than those made by NZ European residents.

The transition from male led to female led gains in non-degree post-secondary qualification attainment took place much earlier amongst Pasifika people than NZ Europeans or NZ Maori (Table 6.9) and earlier than similar gains in degree level attainment. By 1991, 20.7% of female Pasifika people had reached non-degree post-secondary qualification attainment (but not a degree) compared with 20.4% of males. In 2001 by contrast, 21.3% of NZ European females had reached non-degree post-secondary qualification attainment (but not a degree) compared with 23.6% of males.

TABLE 6.6 Percent of the usually resident New Zealand population at non-degree post secondary qualification level by Ethnic Group: 1981, 1996 and 2001

	1981	1996	2001	Chge 1981-2001
NZ European Only	17.3	23.3	22.4	5.1
NZ Maori	6.8	13.6	16.5	9.7
Pasifika People	5.5	10.0	12.9	7.5
Asian	10.0	12.0	11.0	1.0
Other Ethnic Group	-	15.7	13.7	0.5
All Ethnic Groups	15.9	21.0	20.5	4.6

TABLE 6.7 Percent of the usually resident New Zealand population with at non-degree post-secondary educational qualification level by age and ethnic group: 1996 and 2001

Age Group	NZ European Only		NZ Maori		Pasifika People	
	1996	2001	1996	2001	1996	2001
15-19 yrs	5.6	6.5	4.8	7.3	3.9	7.2
20-24 yrs	22.8	22.0	15.2	19.8	13.1	19.6
25-29 yrs	26.2	25.4	15.1	19.3	11.7	16.6
30-34 yrs	28.2	25.9	15.9	18.6	11.7	14.1
35-39 yrs	30.9	26.8	17.7	18.8	12.3	13.6
40-44 yrs	30.1	28.7	17.9	19.5	12.0	13.3
45-49 yrs	28.0	27.5	16.8	18.9	10.2	12.6
50-54 yrs	25.8	25.0	13.9	16.8	9.2	10.2
55-59 yrs	24.3	22.9	13.0	14.3	7.7	8.6
60-64 yrs	21.9	21.1	11.5	13.1	5.8	6.2
15 yrs plus	23.1	22.3	13.6	16.4	9.9	12.9

TABLE 6.8 Intercensal change in the percent at non-degree post-secondary qualification level for each usually resident New Zealand population age cohort by ethnic group: 1986-1991 and 1996-2001

End of Period Age Cohort	NZ European Only		NZ Maori		Pasifika People	
	1986-1991	1996-2001	1986-1991	1996-2001	1986-1991	1996-2001
15-19 yrs	13.1	6.4	12.9	7.3	11.1	7.2
20-24 yrs	29.3	16.5	19.8	15.1	19.9	15.8
25-29 yrs	10.2	2.8	9.7	4.4	9.7	3.7
30-34 yrs	6.2	-0.2	7.3	3.6	6.6	2.3
35-39 yrs	5.4	-1.3	7.3	2.9	4.7	1.8
40-44 yrs	4.5	-2.1	5.5	1.8	5.0	0.8
45-49 yrs	3.8	-2.6	4.4	1.0	3.9	0.3
50-54 yrs	3.0	-3.1	4.0	-0.2	2.8	-0.3
55-59 yrs	2.7	-3.3	2.4	0.2	0.3	-0.7
60-64 yrs	1.9	-3.7	1.7	-0.1	1.5	-1.6
15 yrs plus	5.5	-0.9	7.2	2.9	6.2	2.9

TABLE 6.9**Percent of the usually resident New Zealand population at non-degree post-secondary qualification level by ethnic group and sex: 1981 - 2001**

	Sex	1981	1986	1991	1996	2001
NZ European Only	Male	19.4	32.0	37.0	25.5	23.6
	Female	15.4	23.0	29.1	21.2	21.3
NZ Maori	Male	7.7	17.7	23.8	14.2	15.8
	Female	5.8	11.8	20.1	13.0	17.1
Pasifika People	Male	5.3	15.0	20.4	9.7	11.3
	Female	5.7	13.8	20.7	10.2	14.4
Asian	Male	9.6	17.3	26.9	11.9	10.9
	Female	10.5	16.8	24.5	12.1	11.1
All Groups	Male	17.8	29.8	34.7	22.9	21.2
	Female	14.1	21.5	27.7	19.3	19.7

7

TRENDS IN NEW ZEALAND HUMAN RESOURCES IN RESEARCH, SCIENCE AND TECHNOLOGY (HRST)

7.1 HUMAN RESOURCES IN SCIENCE AND TECHNOLOGY CONCEPTS

The last decade has seen major international studies into the “**human capital in research science and technology**” (HRST) workforce. The analysis in this chapter is based on an adaptation of Statistics New Zealand’s (2003) interpretation of the OECD (1995) standards for the measurement of human resources in science and technology (HRST). As summarised in Box 7.1, the concept uses three measures of the science and technology workforce.

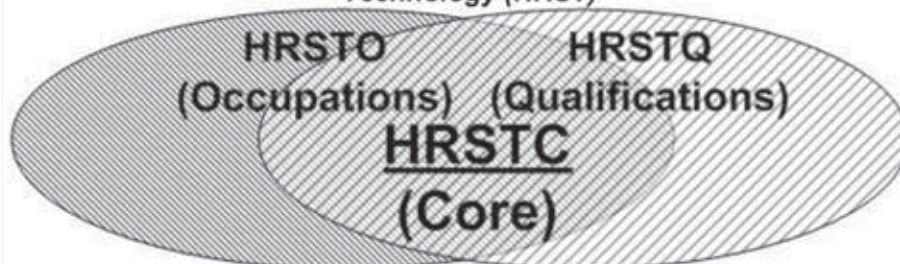
Box 7.1 Human Resources in Research Science and Technology (HRST)

This measurement standard defines the “human resources devoted to science and technology” (HRST) in terms of:

- those who have successfully completed education at the third level in a science and technology field of study (HRSTQ - human resources in science and technology qualifications); or
- are employed in a science and technology occupation where the above qualifications are normally required (whether or not formally qualified) (HRSTO - human resources in science and technology occupations).

This core “human resources devoted to science and technology” (HRSTC) consists of those who are both qualified at degree level (HRSTQ) and are currently engaged in a science and technology occupation (HRSTO) (Figure 7.1).

Figure 7.1: Measurement of Human Resources in Science and Technology (HRST)



Studies into HRST also commonly define HRST Occupations in terms of five subgroups. These are

- Specialised Managers (122)
- Professional Group 1 (Physical, Mathematical and Engineering Science Professionals / Life Science and Health Professionals - 21, 22))
- Professional Group 2 (Teaching and Other Professionals - 231, 232, 233, 234, 24)
- Technical Group 1 (Physical and Engineering Science Associate Professionals / Life Science and Health Associate Professionals - 31, 32)
- Technical Group 2 (Teaching Associate and Other Associate Professionals 235, 33)

HUMAN RESOURCES IN SCIENCE AND TECHNOLOGY CORE (HRSTC)

The HRSTC workforce increased from 3.8% in 1981 to 9.5% in 2001 (Table 7.3), a 230% increase (Tables 7.1 and 7.2). The 1981 to 1986 period had the highest percentage growth rate in HRSTC and the lowest rate of growth took place between 1986 and 1991. There was a 34% growth in HRSTC in each of the 1991 to 1996 and 1996 to 2001 intercensal periods.

The “specialised managers” occupational subgroup of HRSTC had the highest rate of growth 1981-2001 but Professional Group 2 workers (which represents teaching and other professionals) the largest absolute increase of 49,800 (Table 7.4). The proportion of HRST Occupations with a degree increased from 15.5% in 1981 to 30.4% in 2001 (Table 7.5). The “specialised managers”, “technical group 1” and “technical group 2” showed the largest proportionate increase in the ratio of HRSTO workers defined as HRST core between 1981 and 2001 period (Table 7.5).

The proportion of employed persons with a degree working in non-HRST occupations reached 20.5% in 1996 compared with only 13.8% in 1981 (Table 7.3).

TABLE 7.1 1981 to 2001 Trends in Core and Total New Zealand Human Resources in Science and Technology

	HRSTQ not wkg	% HRSTQ not wkg	HRSTQ non HRSTO Occpns.	Total HRSTQ	HRSO	HRSTC	HRST
1981	15,507	19.1	11,190	81,243	351,903	54,546	378,600
1986	23,805	18.8	20,973	126,765	421,767	81,987	466,545
1991	35,784	22.6	23,688	158,517	439,716	99,045	499,188
1996	45,510	20.3	46,038	224,241	499,752	132,693	591,300
2001	56,541	19.4	57,663	292,080	584,445	177,876	698,649

TABLE 7.2 Rates of Intercensal Change (%) in Core and Total New Zealand Human Resources in Science and Technology 1981 to 2001

	HRSTQ not wkg	HRSTQ non HRSTO Occpns	Total HRSTQ	HRSO	HRSTC	HRST
1981-86	53.5	87.4	56.0	19.9	50.3	23.2
1986-91	50.3	12.9	25.0	4.3	20.8	7.0
1991-96	27.2	94.4	41.5	13.7	34.0	18.5
1996-01	24.2	25.3	30.3	16.9	34.1	18.2

TABLE 7.3 1981 to 2001 Trends in Core and Total New Zealand Human Resources in Science and Technology

	HRSTC as % Employed 15 yrs.	HRSTQ Wkg / HRSTQ	HRSTQ Wkg/ HRSTC	HRST as % 15 yrs. +
1981	3.8	80.9	13.8	16.5
1986	5.1	81.2	16.5	18.9
1991	6.3	77.4	14.9	19.3
1996	7.5	79.7	20.5	21.2
2001	9.5	80.6	19.7	24.2

TABLE 7.4 Human Resources in Science and Technology Core (HRSTC) 1981-2001

	1981	1986	1991	1996	2001	1981-2001
Specialised Managers	3,927	8,979	12,570	18,822	27,948	24,021
Prof Gp 1	15,513	22,044	22,914	27,705	40,413	24,900
Prof Gp 2	27,420	35,496	46,713	61,629	77,181	49,761
Tech Gp 1	3,294	6,138	6,054	8,790	11,487	8,193
Tech Gp 2	4,392	9,330	10,794	15,747	20,847	16,455
All HRSTC	54,546	81,987	99,045	132,693	177,876	123,330

TABLE 7.5 Percent of Human Resources in Science and Technology Occupations that is also core (HRSTC) 1981-2001

	1981	1986	1991	1996	2001
Specialised Managers	4.0	7.1	10.4	14.0	17.4
Prof Gp 1	35.0	36.8	34.6	36.0	42.6
Prof Gp 2	34.5	42.2	43.7	50.1	51.4
Tech Gp 1	4.9	8.2	9.8	14.8	19.1
Tech Gp 2	6.9	12.2	12.8	14.9	17.5
All HRSTC	15.5	19.4	22.5	26.6	30.4

7.3 HUMAN RESOURCES IN SCIENCE AND TECHNOLOGY OCCUPATIONS (HRSTO)

Employment in HRST occupations increased by 66% between 1981 and 2001 (Table 7.6). Employment in Professional Group 1 (Physical, Mathematical and Engineering Science Professionals / Life Science and Health Professionals) increased by 114%, almost double the overall rate of growth HRSTO over the period. Employment in Technical Group 1 (Physical and Engineering Science Associate Professionals / Life Science and Health Associate Professionals) decreased by 11% between 1981 and 2001.

TABLE 7.6 Human Resources in Science and Technology Occupations (HRSTO) 1981-2001

	1981	1986	1991	1996	2001	1981-2001	1981-2001
Specialised Managers	97,329	125,931	120,582	134,709	160,338	63,009	65
Prof Gp 1	44,313	59,838	66,228	76,899	94,848	50,535	114
Prof Gp 2	79,365	84,144	106,785	123,024	150,015	70,650	89
Tech Gp 1	67,311	75,129	61,596	59,457	60,105	-7,206	-11
Tech Gp 2	63,585	76,725	84,525	105,663	119,139	55,554	87
All HRSTO	351,903	421,767	439,716	499,752	584,445	232,542	66

7.4

HUMAN RESOURCES IN SCIENCE AND TECHNOLOGY QUALIFICATIONS (HRSTQ)

The number of HRSTQ increased from 81,000 in 1981¹³ to 290,000 in 2001 (Table 7.7). The proportion of persons categorised as in the HRSTQ group not working peaked at 22.6% 1991 and dropped to 19.4% in 2001 (Table 7.3). Engagement in paid work is highest among the 45-49 year age group (Table 7.8) but differs greatly between men and women (Figures 7.2 and 7.3). The proportion of degree qualified women in paid work increased between 1981 and 2001 but decreased for men. The difference between the proportion of 40-44 year old and 30-34 year old women with a degree engaged in paid work was 16% in 1981 and 5% in 2001.

TABLE 7.7 Human Resources in Science and Technology Qualifications (HRSTQ) 1981-2001

Highest Qualification Level	1981	1986	1991	1996	2001
<i>Non-degree Level Post-school Qualifications</i>	343,071	-	-	493,581	507,885
Bachelor Degree	-	78,009	103,191	149,898	199,938
Higher Degree	-	48,756	55,326	74,343	92,142
HRSTQ (Degrees)	81,243	126,765	158,517	224,241	292,080

TABLE 7.8 Percent of Human Resources in Science and Technology Qualified New Zealanders Engaged in Paid Work 1981-2001

	1981	1986	1991	1996	2001
20-24 yrs	76.9	76.0	63.3	80.2	78.4
25-29 yrs	84.7	86.5	81.2	84.6	84.0
30-34 yrs	85.8	84.9	82.0	81.5	82.2
35-39 yrs	89.7	89.2	84.6	84.3	82.7
40-44 yrs	92.5	91.5	88.9	87.5	86.9
45-49 yrs	92.9	93.2	90.6	89.3	88.9
50-54 yrs	91.4	90.2	88.3	90.0	87.8
55-59 yrs	85.4	83.2	79.5	84.3	83.1
60-64 yrs	61.6	54.6	51.4	64.9	68.0
65-69 yrs	37.2	28.7	30.4	41.3	38.0
70-74 yrs	21.4	18.4	18.2	31.0	23.2
75-79 yrs	10.8	8.7	9.4	20.7	12.9
80-84 yrs	12.5	4.3	5.4	16.0	8.4
85 + yrs	3.3	6.5	3.6	10.9	4.4
15 years or over	80.5	79.9	76.4	80.1	78.7

13 As explained in Section 2.2, the 1981 statistics can not be reliably broken down into bachelor and higher degrees.

FIGURE 7.2 Percent of Males with a Degree (HRSTQ) engaged in paid work by age group 1981-2001

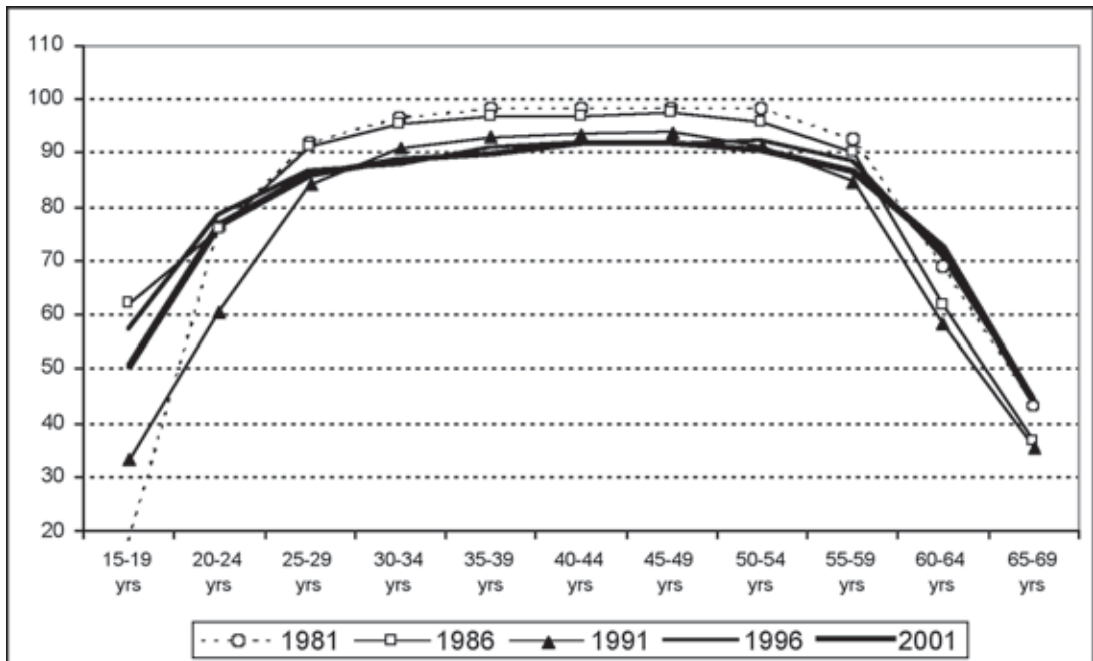
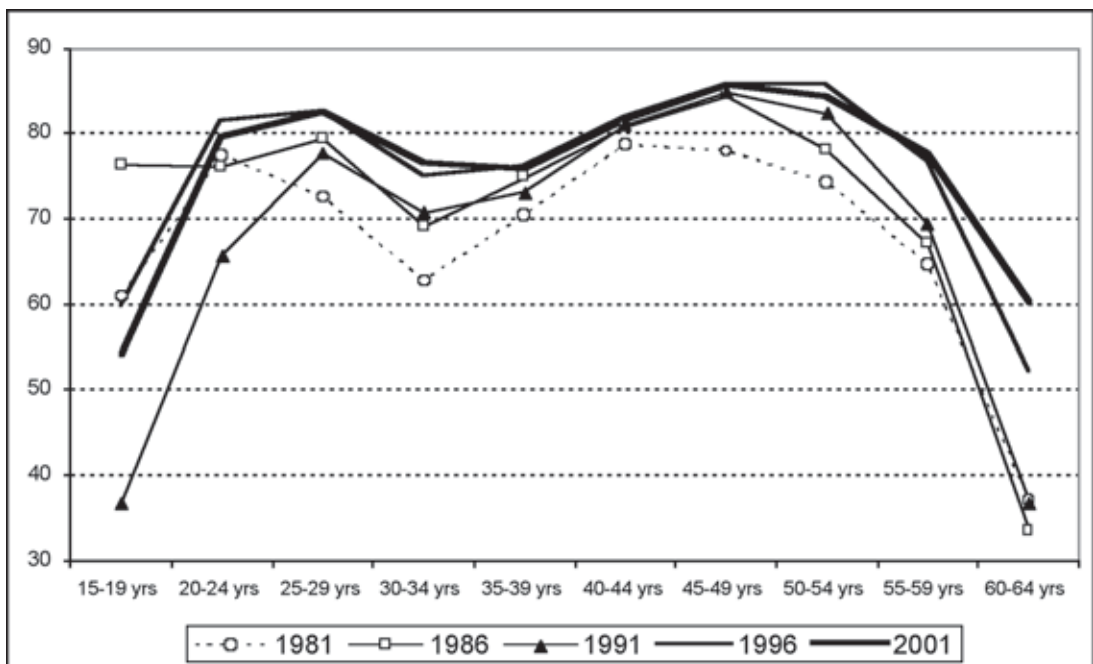


FIGURE 7.3 Percent of Females with a Degree (HRSTQ) engaged in paid work by age group 1981-2001



TRENDS IN EMPLOYMENT IN HUMAN RESOURCES IN SCIENCE AND TECHNOLOGY QUALIFICATIONS (HRSTQ) BY INDUSTRY ECONOMIC SECTOR

In 1981 10.2% of central government employees had a degree but this had tripled to 30% by 2001 (Table 7.9). Between 1981 and 2001, the proportion of those with a degree in local government went up by a factor of four. The proportion with a degree in the private sector increased by a factor of three and a half between 1981 and 2001.

In 1981, 41% of those with a degree were employed in central government and 8.5% in local government, 3.5% in Scientific Research Institutes and only 46.6% in the private sector (Table 7.10). By 2001, the 63.3% of those with a degree were employed in the private sector. Over that same period the proportion of jobs in the private sector increased from 72.1% to 80.2% (Table 7.11).

TABLE 7.9 Percent of workers with a degree by Industry Sector 1981-2001

Sector	1981	1986	1991	1996	2001
Tertiary Education	n/a	44.6	44.8	49.9	55.7
Scientific Research Institutes	32.6	42.7	46.0	55.9	58.7
Central Government	10.2	11.7	16.7	23.0	30.0
Local Government	5.4	6.0	9.1	16.1	20.2
Private Sector	3.1	4.9	6.4	8.6	10.8
Other or Sector Not Specified	2.6	3.4	5.1	4.3	4.6
All Employed Workers	4.7	6.6	8.8	10.9	13.6
Unemployed or not in the Labour Force	1.7	2.4	2.9	3.9	4.9
Population 15 yrs or over	3.5	5.1	6.1	8.0	10.1

TABLE 7.10 Distribution (%) of Degree Qualifications (HRSTQ) by Industry Sector 1981-2001

Sector	1981	1986	1991	1996	2001
Tertiary Education	0.0	6.3	7.2	5.9	5.9
Scientific Research Institutes	3.5	2.6	2.0	1.9	1.5
Central Government	41.0	32.9	31.1	25.6	25.0
Local Government	8.5	2.9	3.1	3.1	2.7
Private Sector	46.6	51.4	56.0	61.0	63.3
Other or Sector Not Specified	0.5	3.9	0.7	2.6	1.6

TABLE 7.11 Distribution (%) of all workers by Industry Sector 1981-2001

Sector	1981	1986	1991	1996	2001
Tertiary Education	-	0.9	1.4	1.3	1.4
Scientific Research Institutes	0.5	0.4	0.4	0.4	0.4
Central Government	19.1	18.7	16.5	12.2	11.4
Local Government	7.5	3.2	3.0	2.1	1.8
Private Sector	72.1	69.1	77.6	77.5	80.2
Other or Sector Not Specified	0.8	7.6	1.2	6.6	4.8

8

COMPONENTS OF CHANGE IN HUMAN EDUCATIONAL CAPITAL AMONGST THE NEW ZEALAND RESIDENT POPULATION

The methods used to estimate components of human educational capital stocks and flows are documented in Appendix E. Historical trends of net changes from migrant flows and onshore educational enrichment are explored in section 8.1. The components of changes over the 1996 to 2001 are analysed in detail in section 8.2. Estimates of these components or close correlates for the 1996 to 2001 intercensal period are made in section 8.3 and longer term trends are discussed in section 8.4. This includes estimates of those not NZ born who are expected to have gained their highest educational qualification onshore as outlined in the Figure E.1.

8.1

CONTRIBUTION TO NEW ZEALAND HUMAN EDUCATIONAL STOCK FROM THE NEW ZEALAND BORN AND NOT NEW ZEALAND BORN

Overall Trends

Intercensal changes in the proportion of overseas born residents at specific higher educational attainment levels increased at a greater rate than the share of the New Zealand resident population born overseas. This reflects the effect of high skill / educational levels as a selection criteria applied to new permanent residential migrants.

The proportion of degree qualified residents that were overseas born increased after 1986 and up to 2001 (Table 8.1).

The proportion of the population 15 years or over born overseas increased from 17.8% to 22.5% between 1981 and 2001 (Table 8.1). The rate of increase in overseas born has accelerated over each intercensal period since 1981. This reflects increasing out migration of New Zealanders, lower return migration flows of residents and high levels of incoming permanent and long term residents (Figures 8.1, 8.2 and 8.3).

TABLE 8.1

Percent of New Zealand residents born overseas by highest educational level 1981 to 2001

	1981	1986	1991	1996	2001
Non-Degree Post School Qual	19.1	20.8	20.3	18.8	19.1
Bachelor Degree	22.8	22.8	25.4	27.5	29.8
Higher Degree	32.0	30.0	32.7	38.6	40.8
Any Degree	25.1	25.6	28.0	31.2	33.3
All Persons 15 yrs or over	17.8	18.0	18.6	20.3	22.5

The proportion born overseas of those with a **degree** increased significantly from 1986 to 2001 but increased fastest from 1991 to 1996. The inflow of overseas educated new migrants is likely to have peaked again over the 2001 to 2006 period - as is shown later using permanent long term residential migrant flow statistics. In 1986, 25.6% of the New Zealand residents with any degree were born

overseas and this rose to 31.2% by 1996 (5.6%). For this same period, the proportion of New Zealand residents aged 15 years or over with a degree increased from 18.0% to 20.3% (2.3%).

The proportion of **higher degree** qualified residents that were overseas born increased sharply over the 1991 to 1996 period. By contrast, as a proportion of all those with a higher degree, there has been little change in the share of those estimated to have gained their qualification overseas; 7.6% in 1981 and 8.6% by 2001.

The proportion of those with a **non-degree post-secondary qualification** born overseas was the same in 2001 as 1981, despite an increase in the proportion of overseas born from 17.8 to 22.5% of the population aged 15 years or over.

Degree Qualification Level Trends

The proportion of those with degree qualifications born and educated overseas is estimated to have increased from 14% of those aged 15 years or over in 1981 to 22% in 2001 (Tables 8.2, 8.3). The proportion of the overseas born estimated to have gained their degree qualification overseas increased from 62% in 1981, to 69% in 1996 and finally to 71% in 2001. There was an estimated 20,000 net gain of overseas degree qualified new settlers between 1996 and 2001.

A detailed breakdown of the numbers and proportion of degree holders born overseas by field of study is provided in Appendices B, C and D. The increase in overseas born degree holders was lowest in the health, education and creative arts fields (Figure 8.2). Persons with degrees in “Engineering and Related Technology” and “Information Technology” were the more likely to have gained that qualification overseas than any other degree field of study in 2001 (36%) and increased by the largest margin between 1981 and 1996. (Table 8.4).

The 35-39 age group had the largest proportion (30.7) of overseas born and educated amongst the degree qualified population in 2001. This is a change from 1981 when overseas born and educated made up the largest proportion (23.1%) of the 45-49 age group in the degree holding population. The increase from 1981 to 2001 in the proportion of New Zealand residents with a degree born and educated overseas was most rapid amongst those aged 35-39 years (Table 8.5).

TABLE 8.2 Estimated number of degree qualifications gained overseas as at 1981, 1996 and 2001

	1981	1996	2001
Undefined Qual Level, Birthplace or Years in NZ	600	3,200	2,200
NZ Born, NZ Degree	60,800	153,200	194,500
Overseas Born, NZ Degree	7,000	19,600	26,200
Overseas Born, Unknown if NZ or Overseas Degree	1,600	4,300	5,500
Overseas Born, Overseas Degree	11,300	43,700	63,700
All Persons with a Degree	81,300	223,900	292,100

TABLE 8.3 Estimated proportion of degree qualifications gained overseas as at 1981, 1996 and 2001

	1981	1996	2001
NZ Born, NZ Degree	75.3	69.4	67.1
Overseas Born, NZ Degree	8.7	8.9	9.0
Overseas Born, Unknown if NZ or Overseas Degree	2.0	2.0	1.9
Overseas Born, Overseas Degree	14.0	19.8	22.0

TABLE 8.4 Estimated proportion of degree qualifications gained overseas by Field of Study Level 1 as at 1981, 1996 and 2001

	1981	1996	2001
Natural and Physical Sciences	15.9	20.1	26.3
Information Technology	11.7	26.7	29.4
Engineering and Related Technologies	13.2	33.6	36.1
Architecture and Building	11.1	19.2	21.6
Agriculture, Environmental and Related Studies	11.0	14.9	17.1
Health	24.0	29.3	26.8
Education	12.2	13.6	15.9
Management and Commerce	7.3	13.2	17.1
Society and Culture	11.9	14.8	17.2
Creative Arts	16.7	20.1	19.4
Food, Hospitality and Personal Services	-	-	-
All Qualification Level 2 Fields	13.9	19.5	21.8

TABLE 8.5 Estimated proportion of degree qualifications gained overseas by age group as at 1981, 1996 and 2001

	1981	1996	2001
23-24 yrs	2.3	2.3	2.9
25-29 yrs	7.2	12.8	11.3
30-34 yrs	14.3	25.0	24.2
35-39 yrs	19.1	25.1	30.7
40-44 yrs	21.3	23.9	28.4
45-49 yrs	23.1	24.4	26.0
50-54 yrs	20.9	23.5	25.5
55-59 yrs	20.2	22.6	25.2
60-64 yrs	21.0	23.4	26.1
65-69 yrs	18.5	20.9	26.8
70-74 yrs	18.1	19.0	24.3
15 yrs or older	13.9	19.5	21.8

Non-Degree Post-Secondary Qualifications Trends

The overseas born and educated made up 12% of non-degree post-secondary compared with 22% of degree holding residents in 2001. The proportion of those at non-degree post-secondary education attainment level born overseas and educated overseas decreased between 1981 and 1996 but then stayed constant between 1996 and 2001 (Tables 8.6, 8.7).

The “natural and physical sciences” field of study had the highest (14.3%) and the “architecture and building” the lowest (7.1%) proportion of overseas born and educated non-degree post-secondary qualified residents in 2001 (Table 8.8). The 70-74 age group had the largest proportion (22.1%) of overseas born and educated amongst the non-degree post-secondary qualified population in 2001. This is a change from 1981 when overseas born and educated made up the largest proportion (23.7%) of the 50-54 age group in the non-degree post-secondary qualified population (Table 8.9).

TABLE 8.6 Estimated number of non-degree qualifications gained overseas as at 1981, 1996 and 2001

	1981	1996	2001
Undefined Qual Level, Birthplace or Years in NZ	2,700	7,200	4,100
NZ Born, NZ Qualification	277,200	397,000	409,400
Overseas Born, NZ Qualification	17,600	29,800	33,000
Overseas Born, Unknown if NZ or Overseas Qualification	0	2,100	2,200
Overseas Born, Overseas Qualification	45,500	57,600	59,300
All Persons with a non-Degree	343,100	493,600	507,900

TABLE 8.7 Estimated proportion of non-degree qualifications gained overseas as at 1981, 1996 and 2001

	1981	1996	2001
NZ Born, NZ Qualification	81.5	81.6	81.3
Overseas Born, NZ Qualification	5.2	6.1	6.6
Overseas Born, Unknown if NZ or Overseas Qualification	0.0	0.4	0.4
Overseas Born, Overseas Qualification	13.4	11.8	11.8

TABLE 8.8 Estimated proportion of non-degree qualifications gained overseas by Field of Study Level 2 as at 1981, 1996 and 2001

	1981	1996	2001
Natural and Physical Sciences	13.0	14.3	14.3
Information Technology	10.7	12.9	11.0
Engineering and Related Technologies	14.9	12.1	11.5
Architecture and Building	12.9	9.4	7.1
Agriculture, Environmental and Related Studies	10.8	7.1	7.9
Health	12.7	11.4	13.0
Education	10.6	9.0	10.4
Management and Commerce	12.3	12.9	12.9
Society and Culture	19.2	12.4	11.6
Creative Arts	16.6	10.1	9.3
Food, Hospitality and Personal Services	14.4	10.9	8.5
All Qualification Level 2 Fields	13.3	11.7	11.7

TABLE 8.9 Estimated proportion of non-degree qualifications gained overseas by age group as at 1981, 1996 and 2001

	1981	1996	2001
23-24 yrs	2.7	2.7	4.0
25-29 yrs	5.8	5.6	6.7
30-34 yrs	11.1	8.6	10.2
35-39 yrs	15.8	9.0	11.7
40-44 yrs	19.2	10.8	11.0
45-49 yrs	22.7	14.1	12.0
50-54 yrs	23.7	17.0	14.0
55-59 yrs	22.3	20.0	16.3
60-64 yrs	19.0	22.7	19.5
65-69 yrs	19.5	23.9	21.8
70-74 yrs	22.5	23.4	22.1
15 yrs or older	13.3	11.7	11.7

8.2 SUMMARY OF TRENDS IN INTERNATIONAL RESIDENTIAL MIGRATION FLOWS

Introduction

The previous section presented statistics on educational capital stock trends for the overseas and New Zealand born subpopulations. This section discusses the characteristics of migration flows as a preliminary to section 8.3 which takes a more in depth look at the components of intercensal change in human educational capital stocks over the 1996 to 2001 period.

Two means are available for estimating these cross border flows. The first is the census of population and dwellings and derived population and migration accounting models. MERA's successive census based regional migration modelling work is used here and is based on triangulation between census statistics, births and deaths data. The second source is the permanent or long term external residential migration arrival and departure statistics assembled from arrival and departure cards.

Examination and comparison of census based and external arrival and departure based estimates of migration flows sets the scene for using those estimates in the 1996 to 2001 intercensal educational capital flows model estimates in section 8.3 and longer term estimates of educational capital accounts in section 8.4.

The census can provide detailed information on inward flows but can only support estimates of the demographic characteristics of outward flows. On the plus side, the census includes information on educational attainment levels and indications of new migrants and returning residents. The census estimates here do not as yet provide estimates by birthplace or ethnic group whereas the PLT statistics offer a useful breakdown by citizenship. They also provide a "real time" picture up till some months ago.

The trends in international migration provide indications of components of changes in educational capital. They correlate with variation over time in net migration losses of NZ educated residents and net migration gains from new residential arrivals educated offshore.

Census Based Estimates

Estimated arrival and departure migration flows differ in age composition (Figures 8.1 and 8.2). Out migration has a strong peak at 25 years of age and in migration has a maxima at ages 18-19 years and 30-31 years (where these are the age of persons at the end of the intercensal period). The 18-19 year of age peak represents overseas students arrivals which grew rapidly over the 1991-2001 period. The strong out migration peak at 25 years of age represents the large outward migration flows of young adults outward bound for overseas experience and/or permanent settlement. The 30-31 year of age peak represents in part the return of New Zealander's from "overseas experience".

The most striking aspect of the net effect of migration gains and losses is the very large and persistent loss of young New Zealanders (Figure 8.3) with what educational capital they have assimilated prior to departure. There is a clear long term trend of increased mobility of young New Zealanders reflecting increasingly open international labour markets for educated workers and decreasing costs of international travel. This is a feature of OECD countries rather than an aberration of New Zealand society, a reflection of growing international demand and low barriers for the movement of skilled workers and increasing interconnectedness between different economies. The effect of new permanent long term migrant arrivals is not easy to separate out without looking at other attributes such as birth place or ethnic origin, neither of which is absolutely adequate in itself.

FIGURE 8.1

Estimated Intercensal (Census Based) International Out Migration Flow Estimates (%) by Age Group 1981-2001

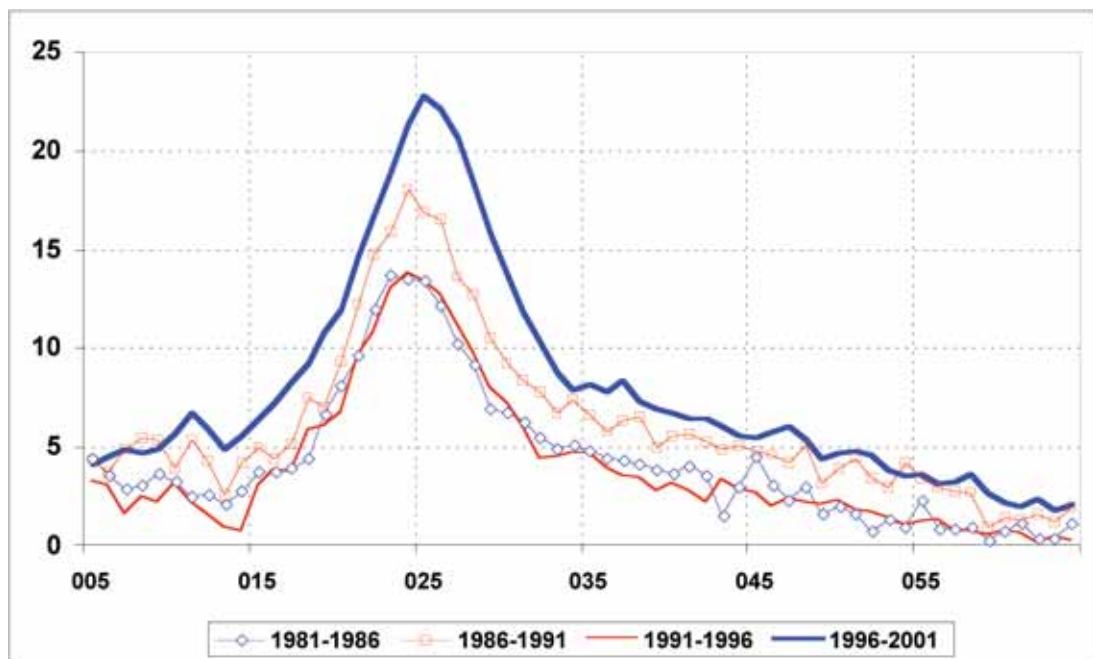


FIGURE 8.2 Estimated Intercensal (Census Based) International In Migration Flows (%) by Age Group 1981-2001

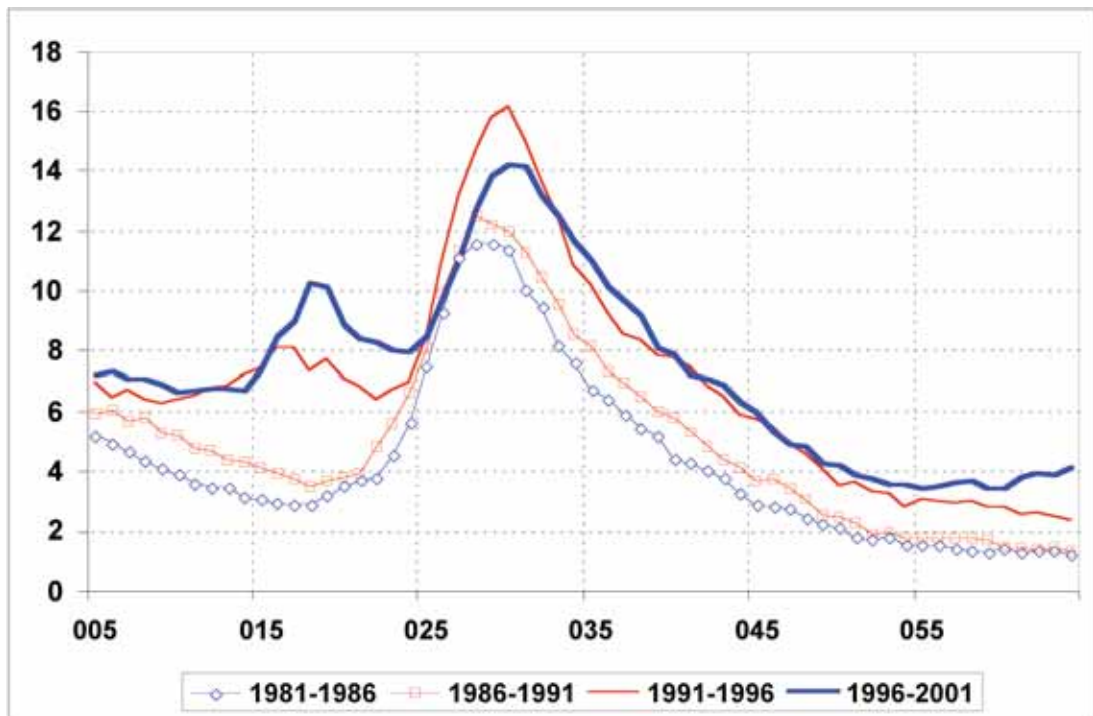
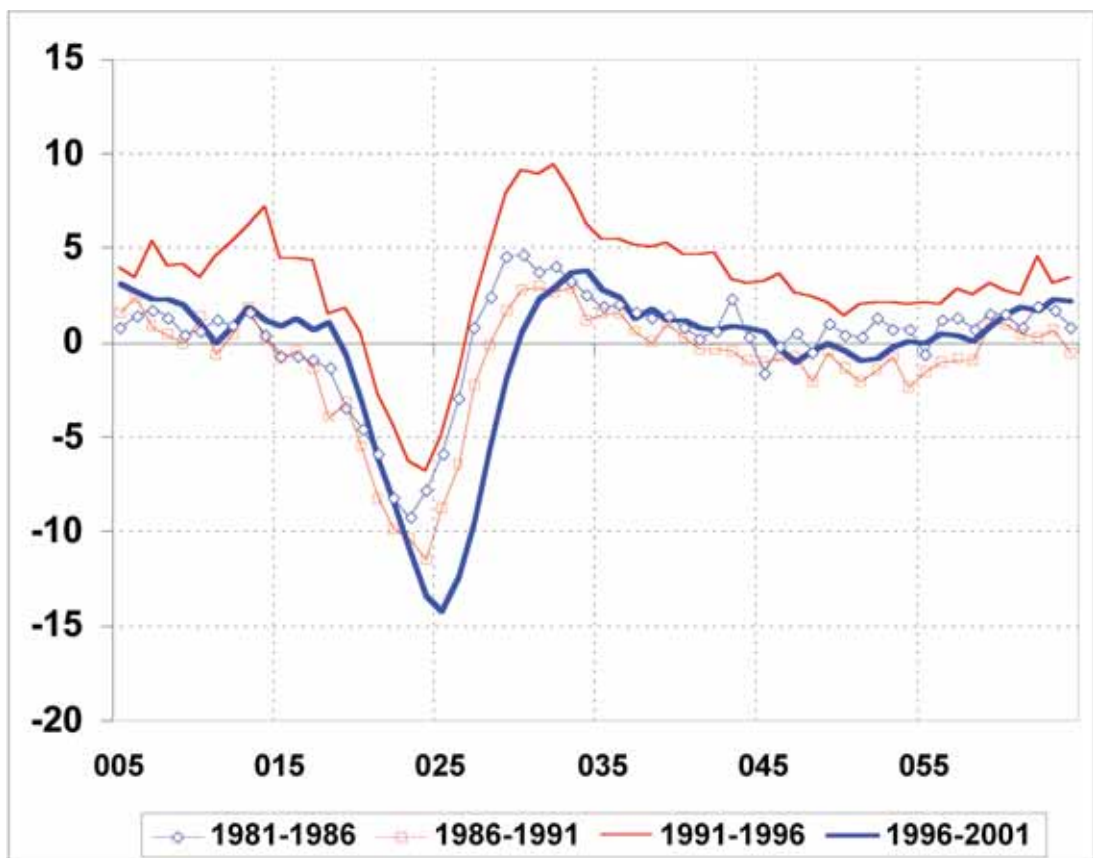


FIGURE 8.3 Estimated Intercensal (Census Based) Net International Migration (%) by Age Group 1981-2001



Permanent Long Term (PLT) Residential Migration Arrival and Departure Based Estimates

The census estimates of net migration and PLT residence arrival and departure statistics are compared in Tables 8.11 and 8.12.

The estimates from the two sources (Tables 8.11 and 8.12) are similar and show similar relative differences between intercensal periods. One of the main differences is the estimate of a net migration loss of 44,000 15 to 29 year olds from the census but a net loss of only 23,500 for the corresponding group using the PLT residential migration data. That result is explained by the increase in the apparent census undercount between the 1996 and 2001 census - which is estimated to have undercounted the 2001 population by about 25,000 compared with the undercount level at the 1996 census.

Permanent or long term external residential migration arrival and departure estimates by citizenship provide a means of distinguishing movements of NZ educated residents and new permanent migrants educated offshore. There are large differences in intercensal flows by citizenship. The cross-boarder PLT residential movements of NZ citizens contrast sharply with those of citizens of other countries (Tables 8.10, Figure 8.4). In general, there are large net losses of NZ citizens and large net gains of others.

Net migration gains of non-NZ citizens increased unevenly but consistently from 1978 up to the current intercensal peak of 193,900 for the period between beginning of March 2001 and the end of September 2005. The movements of non-NZ citizens since the late 1990s include a large cohort of (primarily) young people coming here to study. Between 2001 and 2005 net gains of non-NZ citizens aged 15 to 29 were more than double those for the earlier 1996 to 2001 period (Table 8.11). The spike of residential migration due of international student flows is illustrated by the contrast between the age structure of non-NZ citizen migrants by age in Figure 8.5. The “double peak” of migration flows by age evident for 1996 to 2001 is replaced by a “single peak” for the 2001 to 2005 period.

This single peak reflects the international student market for the 2002 and 2003 June years who can be expected to yield little gain in offshore sourced human educational capital but may enrich society if they remain to become permanent residents. These arrivals are classified as PLT residential migrants but are in the main temporary / short term migrants who are staying for longer than the 12 months maximum stay which defines a short term residential migrant.

From census data, there was a net gain of about 20,000 overseas educated migrants over the 1996 to 2001 period (Table 8.6). This would imply that the gains for 2001 to 2006 are likely to be of the order of 25,000 and those for the 1991 to 1996 were probably only slightly lower but gains for the 1986 to 1991 period were probably about 10,000. This estimate is based on the relative size of net non-NZ citizen PLT external residential migrant gains.

The net international migration loss of NZ citizens has fluctuated wildly in a cycle of alternating high and lower intercensal losses. This is illustrated in Tables 8.11, 8.12 and by age group in Figure 8.6. The age profile of net migration of NZ citizens for 2001 to 2005 is closest to that of 1991 to 1996 and 1981 to 1986. The estimated net loss of 89,000 NZ citizens for the most recent 2001 to 2005 period is midway between the extremely high net loss of 144,000 estimated for the 1996 to 2001 period and the historically low net loss of 50,000 between 1991 and 1996. The volatility in the net migration flows of NZ citizens arises disproportionately from variation in international outflows and to a much lesser extent in variation in the inflows. The variation in the net outflows of implies corresponding variation in the net losses of educational capital.

Overall, the 2001 to 2005 period is expected to be the most “buoyant” on record when measured in terms of net international residential PLT migration gains (Figure 8.7). The reality is that this net migration flow includes some short term residential migrants in New Zealand for the duration of their studies.

These statistics on cross border migration flows and related gains or losses contribute to a more complete human educational capital stocks and flows model in the next section.

TABLE 8.10 PLT (Permanent or Long Term) Residential Arrival / Departure Net Flows by Citizenship for intercensal periods from 1978 to 2005

Period	Non NZ Citizens	NZ Citizens	Net Change
1978-81	4,500	-100,000	-95,400
1981-86	40,300	-72,400	-32,100
1986-91	66,800	-116,600	-49,800
1991-96	127,500	-50,300	77,200
1996-01	138,500	-144,300	-5,800
2001-05	192,900	-89,200	103,600

TABLE 8.11 Alternative Estimates of Net Residential Migrant Flows of those aged 15 to 29 years at period end for “intercensal” periods from 1978 to 2005

Period	PLT External			Census Migration Model
	NZ Citizens	Non-NZ Citizens	All	
1978-81	-56,500	4,500	-52,500	
1981-86	-53,500	14,500	-39,500	-28,000
1986-91	-69,500	21,500	-48,000	-42,000
1991-96	-36,500	41,000	4,500	0
1996-01	-70,500	47,000	-23,500	-44,000
2001-05	-49,500	81,500	32,000	

TABLE 8.12 Alternative Estimates of Net Residential Migrant Flows of those aged 30 years or over at period end for “intercensal” periods from 1978 to 2005

Period	PLT External			Census Migration Model
	NZ Citizens	non NZ Citizens	All	
1978-81	-21,000	-4,500	-25,500	
1981-86	-7,500	12,500	5,000	15,000
1986-91	-31,500	28,000	-3,500	2,000
1991-96	-7,000	57,000	50,000	66,000
1996-01	-50,500	64,500	14,500	18,000
2001-05	-26,500	81,000	54,500	

FIGURE 8.4

Permanent or Long Term Residential Migration Flows by Citizenship for intercensal periods from 1978 to 2005

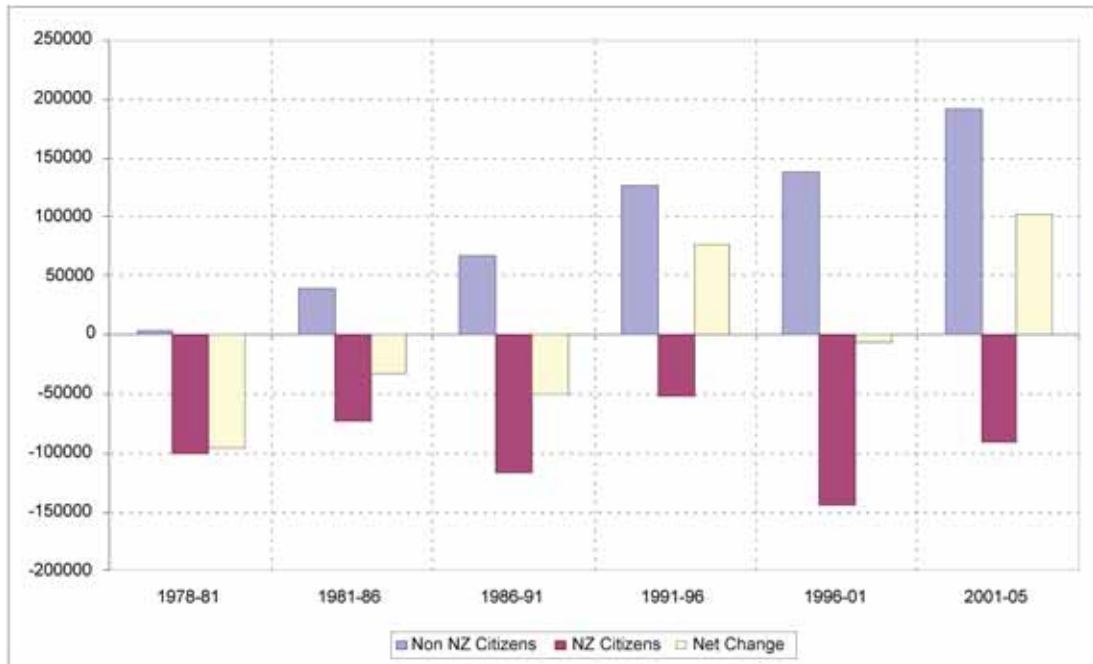


FIGURE 8.5

Estimated Intercensal Net External Permanent Long Term Residential Migration of non-NZ Citizens by Age Group 1978-2005

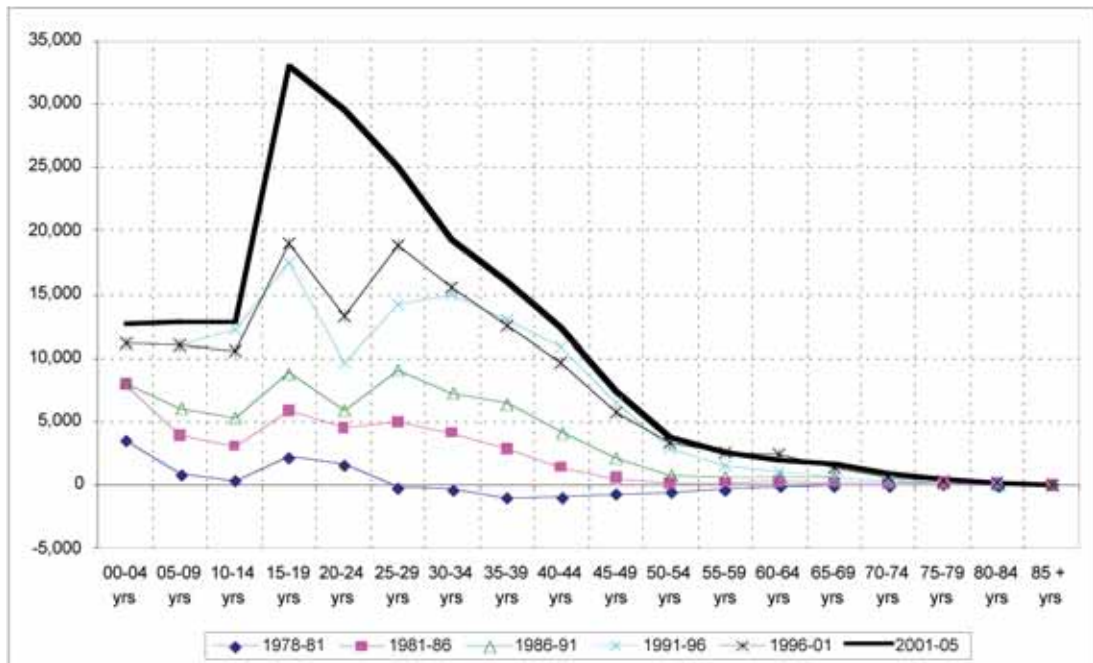


FIGURE 8.6

Estimated Intercensal Net External Permanent Long Term Residential Migration of NZ Citizens by Age Group 1978-2005

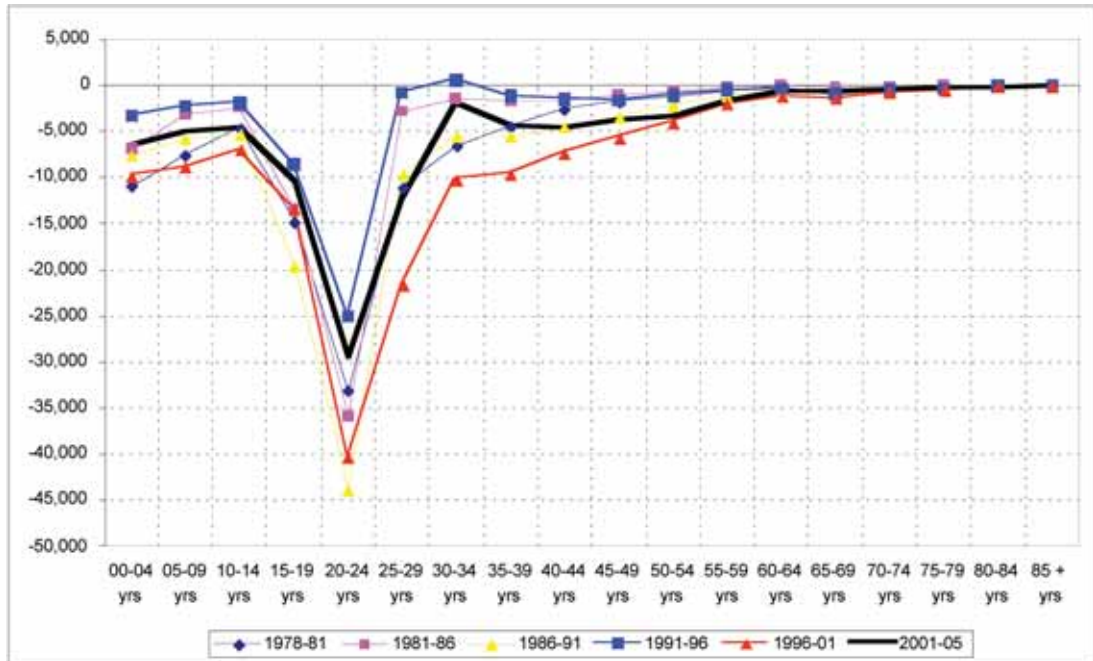
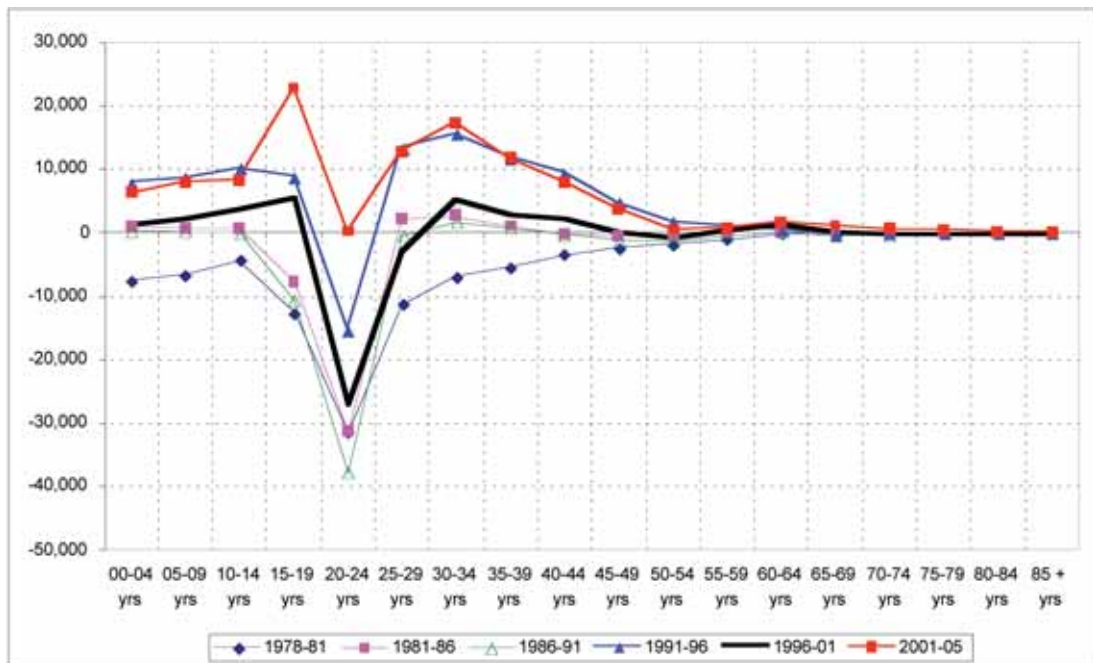


FIGURE 8.7

Estimated Intercensal Net External Permanent Long Term Residential Migration by Age Group 1978-2005



ESTIMATION OF CHANGE IN NEW ZEALAND HUMAN EDUCATIONAL CAPITAL – A CASE STUDY OF THE 1996 TO 2001 PERIOD

This section looks more closely at the stock and flow components of 1996 to 2001 changes in educational capital amongst New Zealand residents. It makes use of more detailed estimates of the contribution of international migration flows to those changes in stocks.

The 1996 to 2001 intercensal period is the most recent one for which census data is available at the time of writing. Education completions data is also available for that period but incomplete for earlier periods.

Components of an intercensal national educational capital flows model and lettering used are outlined in Appendix E. The model estimated is based on a set of accounts with two categories, those with and those without a university degree. The net intercensal change in stocks (f) for each age cohort is simply the difference between the number of persons with a degree at the end of the period (B+C) and the number of persons in the corresponding birth year age range who held a degree at the start of the period (E+F). Knowing the change in stocks (f) and the number of onshore completions of New Zealand residents (c) it is possible to estimate the inferred net gain or loss from international migration (N). This is the net intercensal change in stocks (f) minus the number of offshore completions by New Zealand residents (c). Intercensal deaths are also a factor but are negligible for the 20 to 59 year age range analysed by comparison with the educational capital components that are being estimated.

A Two Part - Degree / non-Degree Model

Onshore **degree completions** are an essential component of educational capital accounts. Degree completions by permanent New Zealand citizens by age for the 2000 to 2004 period by age group are shown in Table 8.13. One completion only is recorded for each person. Post-graduate completions are excluded as this involves a change in status within the degree holder category rather than a gain in the degree holder category. This means that the number of completions may be slightly underestimated resulting in a slight underestimate of net migration losses.

The results suggest a net international migration loss of about 23,000 degree holders between 1996 and 2001 (Table 8.13). Much of this net educational capital loss is estimated to have been of those aged 20 to 29 years of age as at March 2001. Inferred net migration of those with a non-degree post-secondary qualification may be as high as 100,000 (Table 8.14), although that upper estimate includes double counting of those who up-skilled to a degree in the intercensal period. The number of degree completions for older age groups is small relative to estimated net migration losses over the 1996 to 2001 period. Adjusting for the double counting might reduce estimates of net migration losses by 30-40%. They would still remain much higher than net migration losses of degree holders as a proportion of stocks.

The net migration gain of overseas educated degree holders can be estimated for the 1996 to 2001 period from NZ census data. Those estimates have been arrived at by taking into account the years since arrival, the birth place, the educational attainment level and the age of each person in the census to make a judgement as to whether the person was likely to have gained their highest qualification offshore or onshore. Subtracting the gains from onshore educated arrivals it is possible to estimate the net losses of those educated in NZ. Those estimates are shown in Tables 8.13 and 8.14.

To get an indication of the significance of the net international migration gains or losses, it is useful to express it as a percentage of the beginning period “stocks plus the completions that occurred between 1996 and 2001. This is shown in the final column of Tables 8.13 and 8.14 and Figure 8.10.

Net 1996 to 2001 migration losses of degree holders are estimated to be the equivalent of one in five of degree holders for the 20 to 24 and 25 to 29 year age ranges. Net losses of older age groups are an order of magnitude less. Net migration loss of New Zealand educated degree holders component aged 20 to 24 was in order of one in four and those aged 25 to 29 in the order of one in four.

Overall, the 1996 to 2001 period saw significant net human educational capital loss through international migration but probably more loss of non-degree type trade and technical educated persons especially at older age groups. Net migration loss of degree holders was significant at ages 20 to 29 but not large for other age groups.

These human educational capital flow estimates for the 1996 to 2001 period are consistent with estimates of international outward, inward and net migration flows by age group as discussed extensively in Section 8.2. They indicate the high international mobility of the New Zealand population.

TABLE 8.13 Net change between 1996-2001 in the number of the usually resident New Zealand population at degree post secondary educational qualification level by age group

Age Group	Start of Period Stock (B+C)	End of Period Stock (E+F)	Comple-tions (c)	Net Change in Stocks (f)	Inferred Net Migration (N)	Est. Net Migration Gain of not NZ Educated (e-d)	Est. Net Migration Gain of NZ Educated (b-a)	Net Migr as % Stock N/(B+C+c)
20-24 yrs	200	33,500	41,600	33,300	-8,300	4,500	-12,800	-19.9
25-29 yrs	30,900	47,200	26,800	16,300	-10,600	1,500	-12,100	-18.3
30-34 yrs	38,400	45,900	8,700	7,500	-1,200	-100	-1,200	-2.6
35-39 yrs	39,000	45,600	6,800	6,600	-200	200	-400	-0.5
40-44 yrs	36,600	41,600	5,700	4,900	-800	200	-1,000	-1.9
45-49 yrs	32,000	35,300	4,100	3,300	-800	200	-1,000	-2.1
50-54 yrs	27,200	29,000	2,600	1,800	-800	100	-900	-2.7
55-59 yrs	16,800	17,700	1,000	900	-100	0	-100	-0.7
SubTotal	221,100	295,800	97,400	74,700	-22,800	6,700	-29,500	-7.2

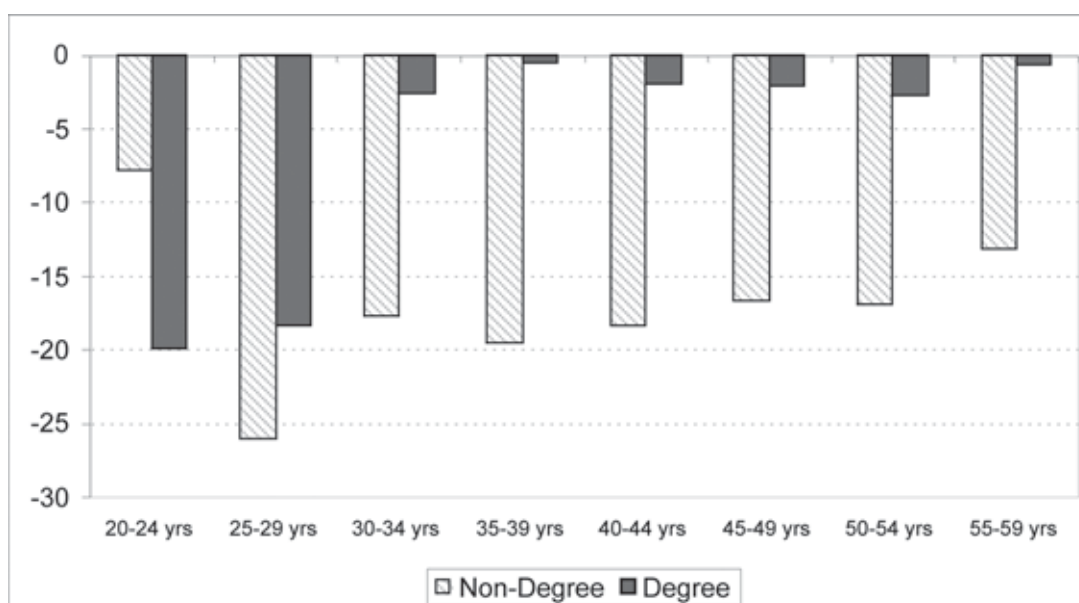
A Three Part - Degree / Other non-degree Post-Secondary Qual / Neither Model

The approach is stretched to accommodate an indicative estimate of the non-degree post-secondary educational capital stocks in Table 8.14. The sub-degree post-secondary education stock and flow estimates do not allow for up-skilling from sub-degree to degree level. This means that the out migration flow estimates of sub-degree holders will be inflated but some indications of the sensitivity to that uncertainty can be gained from estimates of the number of degree completions for older age groups.

TABLE 8.14 Net change between 1996-2001 in the number of the usually resident New Zealand population at non-degree post secondary educational qualification level by age group

Age Group	Start of Period Stock (B+C)	End of Period Stock (E+F)	Comple-tions (c)	Net Change in Stocks (f)	Inferred Net Migration (N)	Est. Net Migration Gain of not NZ Educated (e-d)	Est. Net Migration Gain of NZ Educated (b-a)	Net Migr as % Stock N/ (B+C+c)
20-24 yrs	16,800	53,000	40,700	36,200	-4,500	2,500	-7,000	-7.8
25-29 yrs	49,300	52,100	21,200	2,800	-18,400	400	-18,800	-26.0
30-34 yrs	56,900	60,300	16,300	3,300	-13,000	1,000	-14,000	-17.7
35-39 yrs	65,000	65,200	16,100	200	-15,800	1,000	-16,800	-19.5
40-44 yrs	71,300	68,300	12,400	-3,000	-15,300	1,400	-16,800	-18.3
45-49 yrs	73,900	68,900	8,800	-5,000	-13,700	2,100	-15,800	-16.6
50-54 yrs	63,100	56,800	5,200	-6,300	-11,600	1,400	-13,000	-16.9
55-59 yrs	54,900	49,800	2,500	-5,100	-7,500	800	-8,400	-13.1
SubTotal	451,100	474,400	123,000	23,300	-99,800	10,700	-110,500	-17.4

FIGURE 8.8 Estimated Percent Net International Migration gain or loss of degree and non-degree post-secondary qualified residents by age group 1996-2001



Gender Differences in Educational Capital Accumulation Trends

A breakdown of results from the 1996 to 2001 educational capital stock and flow model by sex is summarised in Appendix F. New Zealand permanent resident onshore degree and non-degree post-secondary qualification completions by females aged under 30 for the period were estimated to have been 40,500 compared with 28,000 males, 45% more female than male completions (Table 8.15). This implies a slightly higher net migration loss of female than male degree qualified residents over the 1996 to 2001 period (Table 8.16).

TABLE 8.15 1996-2001 New Zealand Permanent Resident Education Completions by age group and Sex

Age Group	Degree		Non-Degree Post-Secondary	
	Male	Female	Male	Female
20-24 yrs	16,000	25,700	18,200	22,500
25-29 yrs	12,000	14,800	8,900	12,300
30-34 yrs	3,600	5,100	6,500	9,800
35-39 yrs	2,400	4,400	5,800	10,200
40-44 yrs	1,600	4,100	4,100	8,300
45-49 yrs	1,000	3,100	2,800	6,000
50-54 yrs	700	1,900	1,700	3,500
55-59 yrs	300	700	900	1,600
SubTotal	37,600	59,800	48,900	74,200

TABLE 8.16 Estimated 1996-2001 Degree Level Migration Gains and Losses by age group and Sex

Age Group	Inferred Net Migration (N)	
	Male	Female
20-24 yrs	-4,400	-7,500
25-29 yrs	-5,700	-5,400
30-34 yrs	-1,200	200
35-39 yrs	0	100
40-44 yrs	-100	-500
45-49 yrs	-200	-600
50-54 yrs	-700	-500
55-59 yrs	-400	-200
SubTotal	-12,700	-14,400

8.4 INDICATIVE CONTRIBUTORS TO 1976 TO 2005 CHANGES IN NEW ZEALAND EDUCATIONAL CAPITAL

Using the results of the previous section and a range of other information it is possible to make indicative estimates of the components of intercensal changes in NZ educational capital stocks of degree holding residents from 1976 to 2005 (Table 8.17). These results are only preliminary estimates.

NZ completions have been estimated by using the annual counts of the number of students in tertiary education 1972 to 2003 scaled in relation to the 1996 to 2001 estimates as a proxy for completions. The 2001 to 2006 degree NZ permanent resident completions are assumed to be of the same order as those for 1996 to 2001.

The overseas educated migrant gains are assumed to be proportional to the gains in overseas born residents using the 1996 to 2001 intercensal gains as a reference point. NZ educated gains and losses are assumed to be proportional to the net losses of NZ citizens for intercensal periods with allowance for changes in educational levels using trends in the proportion of those aged 25 to 29 with a degree.

The net migration gain or loss is the product of NZ educated losses and overseas educated gains. The net intercensal gain in human educational capital of degree holding residents is the net of estimated NZ completions and net migration gains or losses.

TABLE 8.17 Indicative Estimates of changes in educational capital flows (degree holding residents only) for the intercensal periods from 1976 to 2006

Cens Period	NZ Completions	Overseas Educated Migrant Gains	NZ Educated Losses	Net Migrant Gains / Losses	Net Intercensal Gains
1976-81	40,000	1,000	10,000	-9,000	31,000
1981-86	45,000	2,000	11,000	-9,000	36,000
1986-91	52,000	3,500	19,000	-15,500	36,500
1991-96	80,000	7,000	10,000	-3,000	77,000
1996-01	100,000	7,000	30,000	-23,000	77,000
2001-06	100,000	12,000	20,000	-8,000	92,000

Glass and Choy (2001) in their paper “Brain Drain or Brain Exchange” argue that the international migration flows are best described as a “brain exchange”. Their analysis is mainly based on comparisons of the occupational composition of PLT residential migration flows and takes a very long term view of the trends. Their analysis compares the share of outflows and inflows in the NZSCO level 1 occupational groups 1 to 3 which are made up of “legislators, administrators and managers”, “professionals” and “technicians and associate professionals”.

A flaw in that approach is that 50 to 70% of arrivals and 50 to 65% of departing migrants do not record their occupation. These includes some occupational subgroups with low proportions of degree holders. The reliability of the occupational data recorded is also unknown and untested. The skill gains and losses of trade workers were not taken into account in Glass and Choy as these are not part of the “professional” occupations included in their definition of “brain drain” but are significant for the NZ labour market. This has been recognised through skill shortages in building and construction industries and escalating costs associated with those shortages over the last few years.

Rather than using ratios, Figure 8.9 shows arrival and departures and net gains and losses of those who recorded their occupation as NZSCO level 1 categories 1 to 3 “high skill”. This would suggest net gains of high skilled professional workers over the 1992 to 1997 and 2001 to 2005 periods and net losses over the 1997 to 2001 period. A similar history is indicated for “trades workers” in Figure 8.10. The results from those estimates are consistent with the indicative component flow estimates of degree holders in Table 8.15.

The analysis of 1991 to 2005 PLT occupational flows appear to corroborate the estimates in Table 8.17.

The long term picture revealed by these estimates is that overseas migrants make increasing incremental gains to educational capital stock as measured by the number of persons with a degree over a 30 year period (Table 8.17). Net migration has at times resulted in a net loss and at other times a net loss of educational capital. The 1996 to 2001 period studied in the previous section would appear to have experienced the highest net migration loss of degree holding residents only partially buffered by gains of degree holding new settlers.

The last decade has seen New Zealanders become extremely mobile internationally as labour markets internationally open up to skilled workers from some “safe” countries such as New Zealand. This increased brain drain has been buffered by significantly increased net migration gains of skilled new settlers, a brain exchange as referred to Glass and Choy (2001). There are qualitative differences in the in and out flows including younger NZ educated migrant losses than new settler migrant gains.

It is not clear that the field of the skills of the new migrants are equivalent to those lost by those leaving. The flows are to different countries with Australia dominating the inflows but not the outflows.

There also appears to have been a major loss of skilled trades and related non-degree technical skilled workers that may be less buffered by gains from new settlers.

Extension of the model used here to field of study and better integration with supply and demand trends by occupation would enable a better understanding of the implications of this “brain exchange” for supply of New Zealand labour market needs.

FIGURE 8.9 International flows of PLT migrants listing their occupation in the NZSCO level 1 groups 1 to 3 (high skills) by June year 1992-2005

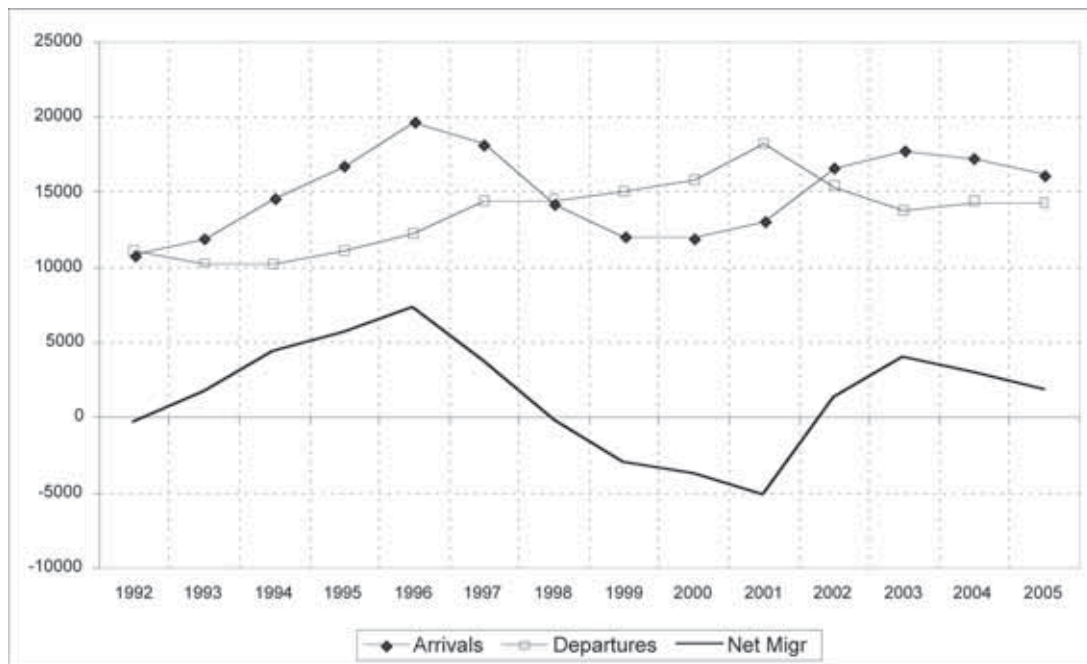


FIGURE 8.10 International flows of PLT migrants listing their occupation in the NZSCO level 1 groups 7 (trades workers) by June year 1992-2005





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APPENDICES

APPENDIX A

COMPARISONS WITH SELECTED PUBLISHED HIGHEST EDUCATIONAL QUALIFICATION LEVEL STATISTICS

TABLE A.1 Statistics NZ (2003) and MERA estimates of “Highest Educational Qualification Level Counts” for 1986 and 1991

Highest Qualification Level	1986			1991		
	This study	Statistics NZ 2003	Diff.	This study	Statistics NZ 2003	Diff.
Qualification Not Stated	147,543	181,236	-33,693	154,098	154,098	0
No Qualification	946,497	967,548	-21,051	849,339	849,339	0
Other School Qualifications	15,339	13,080	2,259	95,172	95,172	0
Fifth Form Qualification	353,718	324,930	28,788	303,948	303,948	0
Sixth Form Qualification	211,653	194,091	17,562	179,361	179,364	-3
Higher School Qualification	72,810	66,681	6,129	91,266	91,269	-3
Other Post-school Qualifications	593,973	593,973	0	758,574	758,580	-6
Bachelor Degree	78,009	78,009	0	103,191	103,191	0
Higher Degree	48,756	48,753	3	55,326	55,326	0
Usually Resident NZ Population Aged 15 years or over	2,468,301	2,468,301	0	2,590,287	2,590,290	-3

TABLE A.2 Statistics NZ (2003) and MERA estimates of “Highest Educational Qualification Level Counts” for 1996 and 2001

Highest Qualification Level	1996			2001		
	This study	Statistics NZ 2003	Diff.	This study	Statistics NZ 2003	Diff.
Qualification Not Stated	435,396	432,906	2,490	407,445	407,439	6
No Qualification	895,209	897,699	-2,490	686,220	686,223	-3
Other School Qualifications	59,169	59,172	-3	166,176	166,176	0
Fifth Form Qualification	310,215	310,215	0	389,256	389,259	-3
Sixth Form Qualification	236,859	236,859	0	283,479	283,482	-3
Higher School Qualification	131,550	131,550	0	156,975	156,981	-6
Other Post-school Qualifications	493,581	493,584	-3	507,885	507,891	-6
Bachelor Degree	149,898	149,898	0	199,938	199,932	6
Higher Degree	74,343	74,343	0	92,142	92,151	-9
Usually Resident NZ Population Aged 15 years or over	2,786,223	2,786,220	3	2,889,543	2,889,537	6

1981, 1996 AND 2001 STATISTICS ON NZ HIGHEST POST-SECONDARY QUALIFICATION BY FIELD OF STUDY AND ATTAINMENT LEVEL

TABLE B.1 Field of Study Estimates for Degree and Non-Degree Highest Qualification in “Natural and Physical Sciences” for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
0100 Natural and Physical Sciences not further defined	144	30	2,889	1,071	42	10,167	1,425	75	13,542
0101 Mathematical Sciences	117	309	516	3,183	5,265	5,445	3,468	5,745	6,594
0103 Physics and Astronomy	150	156	147	1,077	2,418	2,427	1,227	2,652	2,685
0105 Chemical Sciences	747	1,137	1,104	2,850	5,421	5,178	3,582	6,771	6,549
0107 Earth Sciences	144	138	135	768	2,274	2,550	909	2,493	2,871
0109 Biological Sciences	588	906	1,038	4,584	12,006	12,036	5,226	13,074	13,641
0199 Other Natural and Physical Sciences	2,328	2,331	2,433	2,682	795	1,974	5,037	3,402	4,686
Natural and Physical Sciences	4,218	5,007	8,262	16,215	28,221	39,777	20,874	34,212	50,568

TABLE B.2 Field of Study Estimates for Degree and Non-degree Highest Qualification in “Information Technology” for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
0200 Information Technology not further defined	0	3	408	0	6	459	0	21	972
0201 Computer Science	417	6,717	10,437	321	4,434	4,242	738	12,450	16,497
0203 Information Systems	30	0	4,128	63	0	2,178	108	0	6,489
0299 Other Information Technology	0	0	6	27	0	6	33	0	63
Information Technology	447	6,720	14,979	411	4,440	6,885	879	12,471	24,021

TABLE B.3

Field of Study Estimates for Degree and Non-Degree Highest Qualification in “Engineering and Related Technologies” for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
0300 Engineering and Related Technologies not further defined	42	7,674	8,220	468	1,155	2,955	1,758	10,560	14,673
0301 Manufacturing, Engineering and Technology	6,804	12,654	9,051	0	420	351	6,855	18,714	12,837
0303 Process and Resources Engineering	1,209	7,665	1,884	276	1,416	1,590	1,503	9,873	4,002
0305 Automotive Engineering and Technology	20,373	33,273	29,310	0	48	138	20,331	38,373	32,394
0307 Mechanical and Industrial Engineering and Technology	21,456	22,590	18,174	939	2,919	3,330	22,419	32,028	26,295
0309 Civil Engineering	2,520	2,568	3,117	2,013	3,849	4,179	7,680	6,774	7,782
0311 Geomatic Engineering	1,941	1,245	1,419	129	507	660	2,049	1,905	2,214
0313 Electrical and Electronic Engineering and Technology	23,715	32,286	27,645	1,353	3,360	4,125	25,554	39,024	34,314
0315 Aerospace Engineering and Technology	3,657	5,157	4,197	0	123	225	3,639	5,946	5,364
0317 Maritime Engineering and Technology	4,587	4,854	4,764	0	87	99	4,593	6,066	5,814
0399 Other Engineering and Related Technologies	6,174	2,253	1,083	411	888	1,893	6,591	3,978	3,681
Engineering and Related Technologies	92,478	132,219	108,864	5,589	14,772	19,545	102,972	173,241	149,370

TABLE B.4

Field of Study Estimates for Degree and Non-Degree Highest Qualification in “Architecture and Building” for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
0400 Architecture and Building not further defined	0	0	3	9	0	24	12	0	30
0401 Architecture and Urban Environment	1,596	3,324	4,296	993	2,835	3,942	2,955	6,786	8,796
0403 Building	28,818	38,169	32,391	48	615	606	28,866	49,680	40,662
Architecture and Building	30,414	41,493	36,690	1,050	3,450	4,572	31,833	56,466	49,488

TABLE B.5

Field of Study Estimates for Degree and Non-Degree Highest Qualification in "Agriculture, Environmental and Related Studies" for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
0500 Agriculture, Environmental and Related Studies not further defined	0	6	3	198	6	6	198	18	27
0501 Agriculture	8,769	13,899	10,071	2,469	3,804	3,426	13,377	19,635	15,792
0503 Horticulture and Viticulture	2,151	6,762	8,043	252	1,452	1,287	2,409	9,012	10,752
0505 Forestry Studies	99	1,644	2,115	249	612	750	354	3,039	4,062
0507 Fisheries Studies	0	306	354	0	12	18	0	432	651
0509 Environmental Studies	186	258	411	24	1,125	507	210	1,419	930
0599 Other Agriculture, Environmental and Related Studies	324	177	126	39	6	3	360	324	252
Agriculture, Environmental and Related Studies	11,529	23,052	21,123	3,231	7,017	5,997	16,908	33,879	32,466

TABLE B.6

Field of Study Estimates for Degree and Non-Degree Highest Qualification in "Health" for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
0600 Health not further defined	0	696	831	0	192	525	0	1,020	1,488
0601 Medical Studies	444	1,596	1,035	5,397	10,386	11,247	5,811	12,654	12,939
0603 Nursing	51,498	61,275	54,933	33	2,034	9,183	51,540	67,263	67,821
0605 Pharmacy	3,156	2,601	2,442	228	1,506	2,127	3,399	5,298	5,475
0607 Dental Studies	5,445	5,898	5,097	1,095	1,821	1,953	6,549	7,905	7,359
0609 Optical Science	303	252	258	0	186	303	312	513	651
0611 Veterinary Studies	498	375	1,320	777	1,593	1,590	1,275	2,283	3,141
0613 Public Health	3	111	669	3	168	600	12	342	1,506
0615 Radiography	1,332	48	1,275	0	57	441	1,335	123	1,848
0617 Rehabilitation Therapies	2,658	3,312	4,128	27	1,056	2,574	2,709	5,067	7,392
0619 Complementary Therapies	0	1,056	942	0	33	105	0	1,365	1,230
0699 Other Health	942	1,275	1,992	108	1,458	1,494	2,883	2,979	4,317
Health Studies	66,279	78,495	74,922	7,668	20,490	32,142	75,825	106,812	115,167

TABLE B.7 Field of Study Estimates for Degree and Non-Degree Highest Qualification in “Education” for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
0700 Education not further defined	738	1,899	36	3,690	12,669	660	7,107	14,637	792
0701 Teacher Education	65,370	58,155	55,158	0	4,251	10,149	65,343	65,010	68,745
0703 Curriculum and Education Studies	24	0	2,430	1,032	0	15,147	1,059	0	17,994
0799 Other Education	861	564	1,506	105	255	51	954	855	1,653
Education Studies	66,993	60,618	59,130	4,827	17,175	26,007	74,463	80,502	89,184

TABLE B.8 Field of Study Estimates for Degree and Non-Degree Highest Qualification in “Management and Commerce” for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
0800 Management and Commerce not further defined	0	0	7,635	132	0	12,027	126	0	22,365
0801 Accountancy	6,750	3,243	3,615	4,191	18,951	18,777	10,944	24,258	24,246
0803 Business and Management	2,469	17,349	21,570	561	15,714	14,274	5,949	36,234	37,800
0805 Sales and Marketing	3,651	6,423	10,158	213	4,566	5,139	3,864	12,717	17,718
0807 Tourism	81	8,313	10,167	0	795	465	90	11,931	12,201
0809 Office Studies	19,632	26,799	21,255	0	3	93	19,644	37,290	28,953
0811 Banking, Finance and Related Fields	1,668	2,979	2,691	0	1,074	1,905	1,665	4,692	5,559
0899 Other Management and Commerce	5,112	3,414	831	1,140	3	843	6,261	4,047	1,857
Management and Commerce	39,363	68,520	77,922	6,237	41,106	53,523	48,543	131,169	150,699

TABLE B.9

Field of Study Estimates for Degree and Non-Degree Highest Qualification in "Society and Culture" for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
0900 Society and Culture not further defined	0	216	228	0	765	1,641	0	987	1,917
0901 Political Science and Policy Studies	0	3	42	951	3,033	3,786	969	3,066	3,957
0903 Studies in Human Society	84	420	1,362	10,908	18,075	19,869	11,079	18,678	22,161
0905 Human Welfare Studies and Services	1,884	8,736	13,395	576	1,512	2,496	2,463	12,303	18,168
0907 Behavioural Science	231	459	837	3,030	7,629	8,664	3,288	8,259	9,768
0909 Law	102	123	255	5,151	495	11,700	5,400	768	12,354
0911 Justice and Law Enforcement	1,164	2,097	3,036	114	9,237	72	1,278	11,976	3,687
0913 Librarianship, Information Management and Curatorial Studies	1,125	1,671	2,007	27	159	573	1,155	2,004	2,805
0915 Language and Literature	33	1,914	2,457	8,481	18,936	16,632	8,505	21,693	20,133
0917 Philosophy and Religious Studies	1,140	2,937	2,529	1,407	3,513	5,235	2,547	7,047	8,349
0919 Economics and Econometrics	9	150	189	2,196	5,382	5,718	2,208	5,700	6,126
0921 Sport and Recreation	111	1,848	5,127	15	249	2,106	135	2,406	8,037
0999 Other Society and Culture	48	813	3,615	6	483	759	66	1,338	5,019
Society and Culture	5,931	21,387	35,079	32,862	69,468	79,251	39,093	96,225	122,481

TABLE B.10

Field of Study Estimates for Degree and Non-Degree Highest Qualification in “Creative Arts” for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
1000 Creative Arts not further defined	0	0	36	0	0	63	0	0	162
1001 Performing Arts	921	4,887	2,889	852	3,345	2,874	1,767	12,015	10,071
1003 Visual Arts and Crafts	1,032	2,325	4,515	435	1,278	2,256	4,578	4,176	7,728
1005 Graphic and Design Studies	2,625	3,555	5,982	0	327	1,986	2,634	4,566	8,793
1007 Communication and Media Studies	486	2,583	3,609	21	810	2,145	492	3,966	6,546
1099 Other Creative Arts	0	0	18	0	0	3	0	0	54
Creative Arts	5,064	13,350	17,049	1,308	5,760	9,327	9,471	24,723	33,354

TABLE B.11

Field of Study Estimates for Degree and Non-Degree Highest Qualification in “Food, Hospitality and Personal Services” for 1981, 1996 and 2001

NZSCED Code	Non-Degree Post School Qualification Level			Degree Qualification Level			Field of Study All Levels		
	1981	1996	2001	1981	1996	2001	1981	1996	2001
1100 Food, Hospitality and Personal Services not further defined	192	0	3	0	0	0	183	0	15
1101 Food and Hospitality	6,768	7,581	14,271	0	9	57	7,278	13,335	22,134
1103 Personal Services	4,365	9,654	9,531	18	0	33	4,389	15,408	14,301
Food, Hospitality and Personal Services	11,325	17,235	23,805	18	9	90	11,850	28,743	36,450

1981, 1996 AND 2001 ESTIMATED PERCENT OF THOSE AT DEGREE EDUCATIONAL ATTAINMENT LEVEL WHO QUALIFIED OVERSEAS BY NZSCED96 FIELD OF STUDY LEVEL 3

Field of Study Level 3	Percent Overseas Born and Educated			Number Overseas Born and Educated		
	1981	1996	2001	1981	1996	2001
0100 Natural and Physical Sciences not further defined	30.3	64.3	36.2	320	30	3,680
0101 Mathematical Sciences	14.5	22.5	25.5	460	1,190	1,390
0103 Physics and Astronomy	17.3	29.0	32.4	190	700	790
0105 Chemical Sciences	13.9	21.7	26.4	400	1,180	1,370
0107 Earth Sciences	11.7	21.0	21.9	90	480	560
0109 Biological Sciences	8.7	15.9	18.0	400	1,910	2,170
0199 Other Natural and Physical Sciences	27.2	24.9	27.1	730	200	530
0200 Information Technology not further defined	0.0	0.0	27.5	0	0	130
0201 Computer Science	11.2	26.7	33.0	40	1,190	1,400
0203 Information Systems	14.3	0.0	22.6	10	0	490
0299 Other Information Technology	11.1	0.0	50.0	0	0	0
0300 Engineering and Related Technologies not further defined	40.4	39.2	44.6	190	450	1,320
0301 Manufacturing, Engineering and Technology	0.0	43.6	36.8	0	180	130
0303 Process and Resources Engineering	9.8	37.9	40.8	30	540	650
0305 Automotive Engineering and Technology	0.0	56.3	54.3	0	30	80
0307 Mechanical and Industrial Engineering and Technology	16.9	39.5	41.0	160	1,150	1,370
0309 Civil Engineering	6.6	24.6	30.0	130	950	1,250
0311 Geomatic Engineering	7.0	11.2	14.5	10	60	100
0313 Electrical and Electronic Engineering and Technology	9.5	34.9	40.9	130	1,170	1,690
0315 Aerospace Engineering and Technology	0.0	39.0	38.7	0	50	90
0317 Maritime Engineering and Technology	0.0	75.9	84.8	0	70	80
0399 Other Engineering and Related Technologies	22.6	35.5	16.6	90	320	320
0400 Architecture and Building not further defined	33.3	0.0	25.0	0	0	10
0401 Architecture and Urban Environment	11.2	18.7	19.6	110	530	770
0403 Building	6.3	21.5	34.2	0	130	210

Field of Study Level 3	Percent Overseas Born and Educated			Number Overseas Born and Educated		
	1981	1996	2001	1981	1996	2001
0500 Agriculture, Environmental and Related Studies not further defined	28.8	100.0	100.0	60	10	10
0501 Agriculture	9.7	14.7	19.1	240	560	650
0503 Horticulture and Viticulture	3.6	9.9	13.3	10	140	170
0505 Forestry Studies	15.7	24.0	20.0	40	150	150
0507 Fisheries Studies	0.0	25.0	100.0	0	0	20
0509 Environmental Studies	12.5	16.8	4.1	0	190	20
0599 Other Agriculture, Environmental and Related Studies	23.1	0.0	100.0	10	0	0

0600 Health not further defined	0.0	21.9	22.3	0	40	120
0601 Medical Studies	28.3	37.3	40.0	1,530	3,880	4,500
0603 Nursing	27.3	20.1	14.9	10	410	1,370
0605 Pharmacy	25.0	22.7	23.3	60	340	500
0607 Dental Studies	7.1	18.1	22.7	80	330	440
0609 Optical Science	0.0	19.4	26.7	0	40	80
0611 Veterinary Studies	16.6	24.7	25.1	130	390	400
0613 Public Health	0.0	17.9	26.5	0	30	160
0615 Radiography	0.0	42.1	32.7	0	20	140
0617 Rehabilitation Therapies	33.3	24.7	22.1	10	260	570
0619 Complementary Therapies	0.0	36.4	65.7	0	10	70
0699 Other Health	27.8	17.1	17.7	30	250	260

0700 Education not further defined	9.8	13.6	21.4	360	1,720	140
0701 Teacher Education	0.0	12.7	13.1	0	540	1,330
0703 Curriculum and Education Studies	18.0	0.0	17.4	190	0	2,640
0799 Other Education	37.1	29.4	29.4	40	80	20

0800 Management and Commerce not further defined	4.5	0.0	21.8	10	0	2,620
0801 Accountancy	3.4	10.8	14.8	140	2,040	2,780
0803 Business and Management	30.5	18.2	19.7	170	2,860	2,810
0805 Sales and Marketing	5.6	6.8	8.8	10	310	450
0807 Tourism	0.0	6.0	12.3	0	50	60
0809 Office Studies	0.0	100.0	29.0	0	0	30
0811 Banking, Finance and Related Fields	0.0	15.4	19.1	0	170	360
0899 Other Management and Commerce	10.5	0.0	4.6	120	0	40

Field of Study Level 3	Percent Overseas Born and Educated			Number Overseas Born and Educated		
	1981	1996	2001	1981	1996	2001
0900 Society and Culture not further defined	0.0	17.6	17.0	0	140	280
0901 Political Science and Policy Studies	9.8	13.1	16.2	90	400	610
0903 Studies in Human Society	11.4	10.9	12.3	1,250	1,970	2,450
0905 Human Welfare Studies and Services	21.4	14.5	19.2	120	220	480
0907 Behavioural Science	22.6	12.3	15.0	680	940	1,300
0909 Law	4.4	18.2	10.6	230	90	1,240
0911 Justice and Law Enforcement	28.9	7.6	37.5	30	700	30
0913 Librarianship, Information Management and Curatorial Studies	77.8	45.3	19.9	20	70	110
0915 Language and Literature	10.6	17.1	21.1	900	3,230	3,500
0917 Philosophy and Religious Studies	17.7	22.3	23.7	250	780	1,240
0919 Economics and Econometrics	15.6	29.3	33.2	340	1,580	1,900
0921 Sport and Recreation	0.0	12.0	13.7	0	30	290
0999 Other Society and Culture	50.0	23.6	30.0	0	110	230
1000 Creative Arts not further defined	0.0	0.0	19.0	0	0	10
1001 Performing Arts	8.5	20.4	19.6	70	680	560
1003 Visual Arts and Crafts	32.4	12.4	20.2	140	160	460
1005 Graphic and Design Studies	0.0	40.4	20.4	0	130	410
1007 Communication and Media Studies	28.6	23.0	17.3	10	190	370
1099 Other Creative Arts	0.0	0.0	100.0	0	0	0
1101 Food and Hospitality	0.0	66.7	52.6	0	10	30
1103 Personal Services	0.0	0.0	54.5	0	0	20
TTTT All Qualification Level 3 Fields	13.9	19.5	21.8	11,270	43,690	63,710

**1981, 1996 AND 2001 ESTIMATED PERCENT OF PERSONS AT
NON-DEGREE POST-SECONDARY QUALIFICATION LEVEL WHO GAINED
THEIR TRAINING OVERSEAS BY NZSCED96 FIELD OF STUDY LEVEL 3**

Field of Study Level 3	Percent Overseas Born and Educated			Number Overseas Born and Educated		
	1981	1996	2001	1981	1996	2001
0100 Natural and Physical Sciences not further defined	43.8	40.0	12.0	60	10	350
0101 Mathematical Sciences	25.6	37.9	26.7	30	120	140
0103 Physics and Astronomy	22.0	23.1	28.6	30	40	40
0105 Chemical Sciences	12.0	16.1	16.3	90	180	180
0107 Earth Sciences	25.0	10.9	17.8	40	20	20
0109 Biological Sciences	5.1	7.9	10.1	30	70	110
0199 Other Natural and Physical Sciences	11.5	12.1	14.1	270	280	340
0200 Information Technology not further defined	0.0	0.0	17.6	0	0	70
0201 Computer Science	9.4	12.9	11.7	40	860	1,220
0203 Information Systems	30.0	0.0	8.4	10	0	350
0300 Engineering and Related Technologies not further defined	57.1	13.1	17.8	20	1,010	1,460
0301 Manufacturing, Engineering and Technology	16.8	11.4	10.4	1,140	1,440	940
0303 Process and Resources Engineering	32.5	7.4	9.2	390	570	170
0305 Automotive Engineering and Technology	7.6	6.8	5.9	1,540	2,270	1,740
0307 Mechanical and Industrial Engineering and Technology	16.9	15.8	13.3	3,640	3,580	2,410
0309 Civil Engineering	12.4	10.9	11.8	310	280	370
0311 Geomatic Engineering	11.6	10.6	10.1	230	130	140
0313 Electrical and Electronic Engineering and Technology	13.8	12.8	12.0	3,280	4,130	3,310
0315 Aerospace Engineering and Technology	15.3	12.5	9.4	560	650	400
0317 Maritime Engineering and Technology	34.7	32.8	30.5	1,590	1,590	1,450
0399 Other Engineering and Related Technologies	17.5	16.8	12.2	1,080	380	130
0400 Architecture and Building not further defined	0.0	0.0	100.0	0	0	0
0401 Architecture and Urban Environment	14.3	11.5	11.0	230	380	470
0403 Building	12.8	9.2	6.5	3,700	3,520	2,110
0501 Agriculture	10.6	7.4	9.4	930	1,030	950
0503 Horticulture and Viticulture	12.7	6.4	7.0	270	430	560
0505 Forestry Studies	9.1	6.0	4.8	10	100	100
0507 Fisheries Studies	0.0	9.8	6.8	0	30	20
0509 Environmental Studies	12.9	16.3	4.4	20	40	20
0599 Other Agriculture, Environmental and Related Studies	2.8	3.4	4.8	10	10	10

Field of Study Level 3	Percent Overseas Born and Educated			Number Overseas Born and Educated		
	1981	1996	2001	1981	1996	2001
0600 Health not further defined	0.0	4.7	13.4	0	30	110
0601 Medical Studies	12.8	15.4	22.6	60	250	230
0603 Nursing	13.7	12.0	14.1	7,040	7,370	7,750
0605 Pharmacy	7.4	5.0	6.0	230	130	150
0607 Dental Studies	2.8	4.4	5.8	150	260	290
0609 Optical Science	15.8	21.4	22.1	50	50	60
0611 Veterinary Studies	14.5	11.2	4.8	70	40	60
0613 Public Health	100.0	8.1	19.7	0	10	130
0615 Radiography	18.0	12.5	14.4	240	10	180
0617 Rehabilitation Therapies	17.3	11.7	12.6	460	390	520
0619 Complementary Therapies	0.0	13.9	14.0	0	150	130
0699 Other Health	13.7	17.6	6.2	130	230	120
0700 Education not further defined	27.2	32.1	25.0	200	610	10
0701 Teacher Education	10.3	8.2	9.3	6,760	4,750	5,140
0703 Curriculum and Education Studies	0.0	0.0	33.0	0	0	800
0799 Other Education	18.1	19.7	11.6	160	110	170
0800 Management and Commerce not further defined	0.0	0.0	12.9	0	0	980
0801 Accountancy	11.1	20.9	28.0	750	680	1,010
0803 Business and Management	15.3	13.5	13.5	380	2,340	2,910
0805 Sales and Marketing	10.1	9.8	9.1	370	630	930
0807 Tourism	14.8	9.9	7.6	10	830	770
0809 Office Studies	10.7	13.3	13.5	2,110	3,580	2,860
0811 Banking, Finance and Related Fields	19.2	17.2	18.3	320	510	490
0899 Other Management and Commerce	18.0	7.8	7.9	920	270	70
0900 Society and Culture not further defined	0.0	19.4	17.1	0	40	40
0901 Political Science and Policy Studies	0.0	200.0	71.4	0	10	30
0903 Studies in Human Society	46.4	15.7	9.0	40	70	120
0905 Human Welfare Studies and Services	23.1	9.4	8.6	440	820	1,150
0907 Behavioural Science	32.5	20.3	15.4	80	90	130
0909 Law	26.5	22.0	36.5	30	30	90
0911 Justice and Law Enforcement	12.4	11.4	5.4	140	240	170
0913 Librarianship, Information Management and Curatorial Studies	11.7	8.4	9.0	130	140	180
0915 Language and Literature	63.6	29.3	38.0	20	560	930
0917 Philosophy and Religious Studies	20.5	12.5	15.7	230	370	400
0919 Economics and Econometrics	33.3	60.0	54.0	0	90	100
0921 Sport and Recreation	18.9	4.1	7.3	20	80	370
0999 Other Society and Culture	12.5	14.0	9.7	10	110	350
1000 Creative Arts not further defined	0.0	0.0	25.0	0	0	10
1001 Performing Arts	12.1	10.6	9.0	110	520	260
1003 Visual Arts and Crafts	19.2	12.3	8.3	200	290	380
1005 Graphic and Design Studies	18.5	11.1	12.9	490	400	770
1007 Communication and Media Studies	9.3	5.9	4.7	50	150	170
1099 Other Creative Arts	0.0	0.0	16.7	0	0	0

Field of Study Level 3	Percent Overseas Born and Educated			Number Overseas Born and Educated		
	1981	1996	2001	1981	1996	2001
1100 Food, Hospitality and Personal Services not further defined	21.9	0.0	0.0	40	0	0
1101 Food and Hospitality	15.6	15.0	9.8	1,050	1,140	1,400
1103 Personal Services	12.2	7.7	6.6	530	750	630
TTTT All Qualification Level 3 Fields	13.3	11.7	11.7	45,550	57,590	59,290

ESTIMATION OF CHANGES IN HUMAN EDUCATIONAL CAPITAL STOCKS

The census provides estimates of New Zealand resident population human educational capital stocks by age and sex for defined subpopulations. The census does not provide all the necessary information to measure individual components of intercensal change. The census lacks information on:

- where the educational qualifications of residents were obtained
- the number of persons who have left the country since the last census and their (educational or other) characteristics.

Those born in New Zealand are most likely to have gained their highest educational qualification here. The number of New Zealand born residents who gained their highest post secondary educational qualification offshore is assumed to be small.

The 1981, 1986, 1996 and 2001 censuses also record the number of years since arrival of New Zealand migrants. When “years since arrival” is cross-correlated with age and highest educational level, it is possible to start to improve on the rough picture shown by birthplace alone. A first order estimate can be made of the number of overseas born individuals likely to have gained their highest educational qualification before arrival.

Further insights can be obtained by factoring in intercensal educational attainment completions recorded by the Ministry of Education. These counts exclude double counts for any individual. This allows an estimate of net intercensal international migration gain/loss by age cohort to be made. The completions data does include those individuals who already held a degree at the start of the intercensal period and gained a second or higher degree over the period.

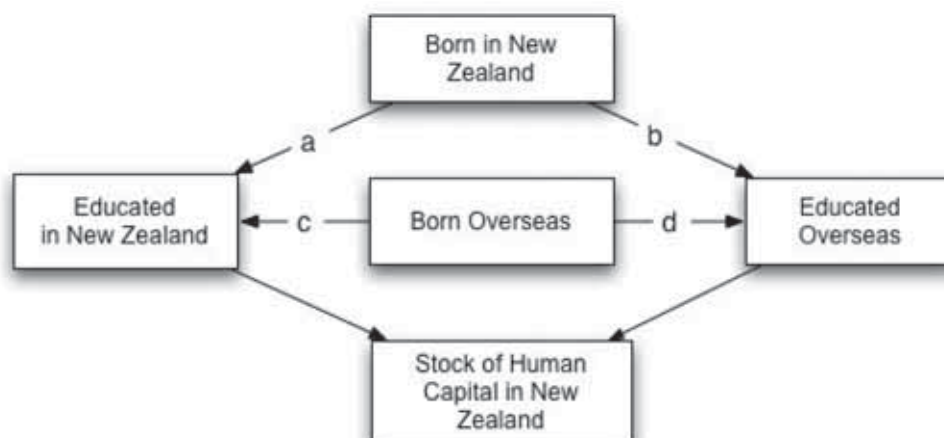
Measuring the net educational capital gains from permanent long term migrant flows

One component of the changes in stocks is the contribution to human educational capital arising from international migration flows. This is made up of the contribution arising from net flows of NZ educated residents and those due to net gain of those who gained their highest educational qualification offshore.

The stock of educational capital amongst New Zealand residents (e.g. Figure 8.1) can be represented by:

- those born in New Zealand and educated here;
- those born here but educated overseas;
- those born overseas but educated here; and
- those born overseas and educated overseas.

FIGURE E.1 Static Representation of Components of the educational capital of New Zealand residents



Estimates can be made of the human educational capital changes arising from net intercensal gains of those who attained their highest educational qualification overseas. This can be estimated using the length of time people have been in New Zealand, their current age, and what is their highest educational attainment level.

The net intercensal change in human educational capital held by any age group and identifiable subpopulation is the difference between its “stock” at the census beginning the period and the corresponding aged¹⁴ cohort of the subpopulation derived the following census. Statistics on this are presented in Section 8.2.

Measuring the source of intercensal change in educational capital amongst New Zealand residents

The inter-censal change in educational qualification attainment level of New Zealand residents is the net result of three main factors for each age cohort and identifiable subpopulation. These are:

- new qualifications gained within New Zealand;
- outward and return flows of New Zealand residents and their educational “capital”; and
- gains from the educational “capital” brought by new long term settlers educated outside New Zealand.

Figure 8.2 illustrates the manner in which educational capital flows result in changes in human educational capital stocks between any two census periods for any age cohort and identifiable subpopulation. The beginning period stocks are for age group n and the end period stocks are measured as those for age group n+5 to represent the changes for a specific birth cohort.

First, it is useful to define the short hand for some key terms in a human educational capital stock and intercensal flows accounting model. These are as follows :

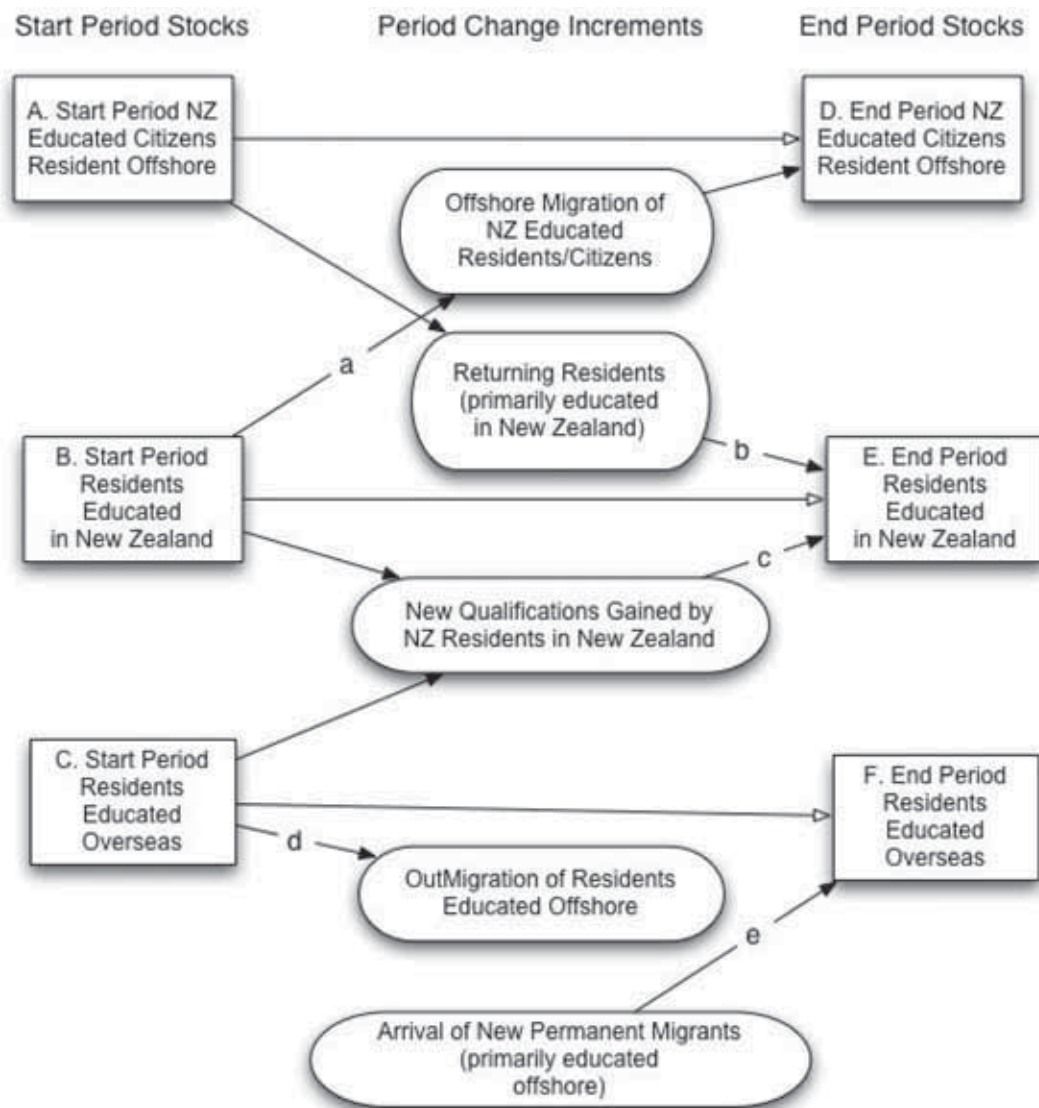
- B is start of intercensal period NZ residents educated in New Zealand;
- C is start of intercensal period NZ residents educated overseas;
- E is end of intercensal period NZ residents educated in New Zealand;
- F is end of intercensal period NZ residents educated overseas;
 - a is loss due to offshore migration of onshore educated residents;
 - b is gain due to return migration of New Zealand educated residents;
 - c is gain due to New Zealand residents gaining a degree qualification in New Zealand;
 - d is loss due to offshore migration of offshore educated residents;

14 The end of period cohort for comparison will be that five years older than the corresponding start of period age group.

- e is gain due to arrival of new permanent migrants educated offshore.
 - f is the net change in educational capital stocks in the resident population.
 - g is the loss of educational capital stocks through deaths of the resident population.
- N is the net migration gain or loss of human educational capital.

To work within the robust elements of estimates of human educational capital stocks the analysis will be on those with a degree at any level and those without, although some estimates can be made in a three part model using degree / other post-secondary qualification/no post-secondary qualification. Some interesting work could also be done with higher degree as a level in the accounting model but has not been attempted here.

FIGURE E.2 Representation of Intercensal Stocks and Flows of the educational capital of New Zealand residents



Deaths (g) are a contributor to changes in educational capital for older age groups but can be considered negligible by comparison with other components for those under 60. Deaths are left out of the partial equations explored here. At ages over 60, death rates for those with / without a degree would need to take account of likely associations between educational attainment level, socio-economic status and mortality rates. For the purposes of this analysis a focus on those under 60 is more than adequate.

The change in human educational capital stocks from one census to the next can be estimated as
 $f=(E+F)-(B+C)$

The net migration gain or loss of human educational capital (N) can be estimated as
 $N=f-c+g$

By definition, net migration gain or loss of human educational capital (N) is determined as
 $N=(b-a)+(e-d)$

An estimate of the net gain or loss of overseas educated residents enables estimation of the net gain or loss of New Zealand educated residents (b-a) as
 $(b-a)=N-(e-d)$

This is on the basis of comparing the cohort aged n at one census with those aged (n+5) at the subsequent five yearly census.

Estimates of these components or close correlates for the 1996 to 2001 intercensal period are made in section 8.3 and longer term trends are discussed in section 8.4.

GENDER BREAKDOWN OF THE RESULTS OF THE 1996 TO 2001 INTERCENSAL EDUCATIONAL CAPITAL STOCKS AND FLOWS MODEL

TABLE F.1 Net change between 1996-2001 in the number of the usually resident New Zealand male population at degree educational qualification level by age group

Age Group	Start of Period Stock (B+C)	End of Period Stock (E+F)	Comple-tions (c)	Net Change in Stocks (f)	Inferred Net Migration (N)	Est. Net Migration Gain of not NZ Educated (e-d)	Est. Net Migration Gain of NZ Educated (b-a)	Net Migr as % Stock N/ (B+C+c)
20-24 yrs	100	11,700	16,000	11,600	-4,400	1,800	-6,200	-27.3
25-29 yrs	11,700	18,000	12,000	6,300	-5,700	700	-6,400	-24.0
30-34 yrs	16,700	19,000	3,600	2,400	-1,200	-100	-1,100	-5.8
35-39 yrs	17,800	20,200	2,400	2,400	0	0	0	-0.1
40-44 yrs	17,800	19,300	1,600	1,600	-100	0	-100	-0.4
45-49 yrs	16,000	16,800	1,000	800	-200	0	-200	-1.2
50-54 yrs	14,700	14,700	700	0	-700	0	-700	-4.4
55-59 yrs	9,300	9,200	300	-100	-400	0	-400	-4.3
SubTotal	104,100	129,000	37,600	24,900	-12,700	2,500	-15,200	-8.9

TABLE F.2 Net change between 1996-2001 in the number of the usually resident New Zealand female population at degree educational qualification level by age group

Age Group	Start of Period Stock (B+C)	End of Period Stock (E+F)	Comple-tions (c)	Net Change in Stocks (f)	Inferred Net Migration (N)	Est. Net Migration Gain of not NZ Educated (e-d)	Est. Net Migration Gain of NZ Educated (b-a)	Net Migr as % Stock N/ (B+C+c)
20-24 yrs	100	18,300	25,700	18,200	-7,500	2,700	-10,100	-28.9
25-29 yrs	15,000	24,400	14,800	9,400	-5,400	800	-6,200	-18.2
30-34 yrs	16,900	22,200	5,100	5,300	200	0	200	0.9
35-39 yrs	16,500	21,000	4,400	4,500	100	200	-100	0.6
40-44 yrs	14,500	18,100	4,100	3,600	-500	200	-700	-2.7
45-49 yrs	12,200	14,600	3,100	2,400	-600	200	-800	-4.1
50-54 yrs	9,200	10,500	1,900	1,300	-500	100	-600	-4.9
55-59 yrs	5,200	5,700	700	500	-200	0	-200	-3.3
SubTotal	89,500	134,900	59,800	45,400	-14,400	4,200	-18,600	-9.7

TABLE F.3

Net change between 1996-2001 in the number of the usually resident New Zealand male population at non-degree post secondary educational qualification level by age group

Age Group	Start of Period Stock (B+C)	End of Period Stock (E+F)	Comple-tions (c)	Net Change in Stocks (f)	Inferred Net Migration (N)	Est. Net Migration Gain of not NZ Educated (e-d)	Est. Net Migration Gain of NZ Educated (b-a)	Net Migr as % Stock N/ (B+C+c)
20-24 yrs	4,600	20,000	18,200	15,400	-2,800	1,500	-4,200	-12.1
25-29 yrs	21,700	24,300	8,900	2,600	-6,300	100	-6,400	-20.5
30-34 yrs	28,300	29,800	6,500	1,500	-5,000	100	-5,100	-14.4
35-39 yrs	33,300	33,300	5,800	0	-5,800	-100	-5,800	-14.9
40-44 yrs	35,600	33,700	4,100	-1,900	-6,000	0	-5,900	-15.1
45-49 yrs	31,300	28,500	2,800	-2,800	-5,500	-200	-5,400	-16.3
50-54 yrs	28,600	24,700	1,700	-3,900	-5,600	-200	-5,500	-18.5
55-59 yrs	20,800	17,300	900	-3,400	-4,300	-100	-4,200	-20.0
SubTotal	204,200	211,700	48,900	7,500	-41,400	1,100	-42,500	-16.4

TABLE F.4

Net change between 1996-2001 in the number of the usually resident New Zealand female population at non-degree post secondary educational qualification level by age group

Age Group	Start of Period Stock (B+C)	End of Period Stock (E+F)	Comple-tions (c)	Net Change in Stocks (f)	Inferred Net Migration (N)	Est. Net Migration Gain of not NZ Educated (e-d)	Est. Net Migration Gain of NZ Educated (b-a)	Net Migr as % Stock N/ (B+C+c)
20-24 yrs	7,000	24,000	22,500	17,000	-5,400	1,800	-7,200	-18.5
25-29 yrs	25,200	26,900	12,300	1,700	-10,600	0	-10,600	-28.2
30-34 yrs	25,500	28,600	9,800	3,100	-6,700	100	-6,700	-18.9
35-39 yrs	29,200	31,100	10,200	2,000	-8,300	100	-8,300	-21.0
40-44 yrs	32,200	32,900	8,300	700	-7,600	0	-7,600	-18.7
45-49 yrs	28,600	27,600	6,000	-1,000	-7,000	-100	-6,900	-20.2
50-54 yrs	25,000	23,000	3,500	-2,000	-5,500	-100	-5,400	-19.3
55-59 yrs	17,300	15,500	1,600	-1,800	-3,400	-100	-3,300	-17.8
SubTotal	190,000	209,800	74,200	19,800	-54,400	1,700	-56,100	-20.6

