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Income Mobility in New Zealand 2007–2020: Combining Household Survey and Census Data[1,2]

John Creedy and Quy Ta

Victoria University of Wellington and NZ Productivity Commission

Abstract

This paper describes income mobility patterns in New Zealand over the short to medium term. It uses a special dataset which tracks Household Labour Force Surveys over the period from 2007 to 2020, using 2013 census data. The measure of income is total family taxable income per adult equivalent person. The income unit is the individual. Over the period 2007-2020, around half of the New Zealand working-age population stayed in the same income quintile over four years, and 40% over seven to eight years. Of those initially in the bottom quintile, 57% remained in that quintile over four years, while 68% of those initially in the top quintile remained in that quintile four years later. Of those who initially had incomes less than 50% of the median income per adult equivalent person, about half remained in that category after six to seven years. Income mobility for working-age New Zealanders is broadly similar to other OECD countries.

JEL Code: D31, D33, D63

Keywords: Income dynamics; Income distribution; Low Income; Mobility.

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[2] We are grateful to Geoff Lewis, Carolyn O'Fallon, Jo Smith, and Philip Stevens, from the New Zealand Productivity Commission, for their helpful comments.

1 Introduction

This paper examines the nature of relative income changes for individuals in New Zealand. The analysis is based on a special dataset, constructed by linking individuals in various Household Labour Force Surveys (HLFSs) with those in the 2013 census. The paper examines income mobility over the short- to medium-term (up to eight years), over the period 2007 to 2020.

In any study of incomes, three crucial decisions have to be made, concerning 'what' (the welfare metric), 'whose' (the unit of analysis) and 'when' (the accounting period).[3] These choices are inevitably constrained by the nature of the data available. Inland Revenue administrative data are used to calculate annual total gross taxable income. This includes wages and salaries, self-employment income, investment income (such as dividends, interests, and rental income), pensions, and some benefits (such as jobseeker support, sole parent support, and young parent payment). It does not include non-taxable sources of income, such as most capital gains and non-taxable benefits. Hence, in what follows, the term 'low income' cannot be construed in terms of poverty.

The welfare metric is defined as total annual family taxable income per adult equivalent person. This allows for the fact that many individuals who are not taxpayers (such as, for example, dependent children and partners with no taxable income) benefit from the incomes of taxpayers through some form of income sharing. A fundamental problem is that information is not available about its precise nature. This would require details of expenditure, and knowledge of who has discretion over such expenditure.[4] It is also not known how widely the income is shared. Hence, an artificial welfare metric, assuming equal sharing, is usually constructed. This allows for the differing size and composition, via the use of adult equivalent scales, of the group of those over whom sharing is assumed to take place.

In considering the definition of the relevant group, difficulties arise when discussing households or families, since there are no ideal or universal definitions of these terms. The question of how a family is defined has to depend on the context. Many single adults who live alone (or with other adults in the same household) are likely to consider themselves as members of a family (or indeed several families), defined in terms of various relationships, which may be genetic or social. There is probably a large extent of within-family income transfers that take place among those who live in different households, and this is likely to vary over the life cycle. Such money flows may include intergenerational transfers, and transfers between siblings.

[3] On the range of alternatives, see Creedy (2017).

[4] Furthermore, some goods that are considered to be 'private goods' may be 'public goods' within the household or family.

Faced with this difficulty, the approach taken here is that the artificial welfare metric is based on the assumption that sharing is most important within families, rather than within households, and furthermore, within family groups who are living together at the same address. Given this choice, the welfare metric is the resulting total taxable income per adult equivalent person in that family group, and this measure is assigned equally to each member.[5] This ensures that the 'income unit' is always the individual.[6] Between two years, individuals may move between family units, so that their welfare metric depends on both their individual income and the family unit to which they belong.[7] There is no pretence that this particular choice of income-sharing assumption is in any sense correct or ideal, and indeed there is much that is purely pragmatic about it. However, it is argued here that its use is warranted in view of the lack of analyses of income dynamics in NZ that allow for income sharing and the movement of individuals between such family units.[8]

In constructing the datasets used here, the challenge is to trace the movements, where relevant, of individuals between family units as defined above. Hence, the longitudinal database contains the same number of individuals in each year, but the number of family units varies between time periods. For example, a dependent child in one period who becomes an adult in the second period is treated as a new one-adult family, even though that individual may be living in the same household (at the same address).

Section 2 briefly describes the dataset and adult equivalent scales used. Section 3 examines relative income mobility in New Zealand, in terms of inter-decile and inter-quintile movements of individuals over time. Section 4 provides some international comparisons. The emphasis of Section 5 is on the mobility characteristics of low-income groups, defined as those with income per adult equivalent person of less than half the median value. For all tables and figures reported here, the results are based on the authors' calculations using the special dataset described, except where explicitly-described comparisons with earlier literature are made. Section 6 concludes.

2 The Data and Income Concept

[5] It may be thought that a sharing assumption could be based on the equivalence scales used, but these (as below) typically involve an assumption of economies of scale and would not capture the public good nature of much of the family expenditure.

[6] Some studies, while using a welfare metric based on a measure of income per adult equivalent person (for a specified sharing unit such as the household), nevertheless use the household as the 'income unit' in distributional analyses. Hence, their reported decile groups contain equal numbers of households but unequal numbers of individuals.

[7] This feature lies behind the apparent paradox, pointed out by Glewwe (1991) and Shorrocks (2004), who showed that where the individual is the unit of analysis, the standard association of Lorenz orderings with the Principle of Transfers does not hold; see also Creedy and Scutella (2005), and for NZ comparisons using different units, see Creedy and Sleeman (2005) and Creedy and Eedrah (2016).

[8] Studies of mobility in NZ have generally been concerned with individual taxpayers: for recent studies see Creedy *et al*. (2021) and Alinaghi *et al*. (2022a, 2022b, 2022c, 2022d).

Subsection 2.1 briefly describes the datasets used. Subsection 2.2 then describes the adult equivalent scales used for the construction of the income measure for each individual. This is based on total family taxable income per adult equivalent person. The family is regarded as consisting of an adult, or adult partners, and dependent children who live at the same address. Adult children in the same household are treated as separate adult family units. Following the widely-used assumption of equal sharing within the family, the total income per adult equivalent person is assigned to each person in the family. Hence in all the analyses reported here, the 'unit of analysis' is the individual: the 'weight' attached to each income measure is the number of individuals in the family.[9] Information about incomes is obtained from Inland Revenue administrative data, so the income measure used throughout is gross taxable income.[10] All figures in this paper refer to the whole sample of all individuals, unless otherwise stated.

2.1 The Data

The income and demographic data were obtained from New Zealand Household Labour Force Surveys (HLFSs) for the years 2007 to 2020.[11] Sample calibration weights, produced by Statistics New Zealand, are used to ensure that grossed-up values match a range of population characteristics. The HLFS follows participants for eight consecutive quarters on a rotating basis and asks about income only in the June quarter, providing a maximum of two data points over two consecutive years. Therefore, people from each HLFS wave are matched with their records in the 2013 Census, in order to examine income mobility beyond two consecutive years. As the census is, by construction, the whole population at a point in time, there is a high degree of overlap. The HLFS is matched to the census by individuals' unique identifiers. The absence of a match can arise because of international migration, births and deaths, or data problems such as measurement errors.

This process generates a series of pairings between the census and HLFSs, from 2007 to 2020, which are between two and seven years apart. This makes it possible to trace individual movements within or between families over time. The resulting datasets are outlined in Figure 1. Effectively, there is a pairing for each different HLFS sample, linked to the 2013 census, so that they differ according to the relevant time intervals. For analyses of income mobility and low-income transitions from one

[9] An alternative would be to use the number of equivalent persons as weight; on the implications for welfare comparisons, see Shorrocks (2004).

[10] Carter and Gunasekara (2012) used gross taxable household income while Carter *et al*. (2014) used disposable household. However, both studies found similar results regarding income mobility. The former study found that 58.7 per cent of people remained in the same quintile from one wave to the next (short-term mobility), and 40 per cent remained in the same quintile from wave 1 to wave 7. The second study found 57.3 per cent of the people remained in the same quintile from one wave to the next and 38 per cent remained in the same quintile from wave 1 to wave 8.

[11] The datasets were initially constructed by Chris Ball. Further details can be obtained here: https://github.com/Ball-Christopher/linked_hlfs_census.

year to another, there are therefore two points in time for each panel, and in most cases the years are not consecutive.

Figure 1 The Datasets: HLFS Data Linked to Census 2013

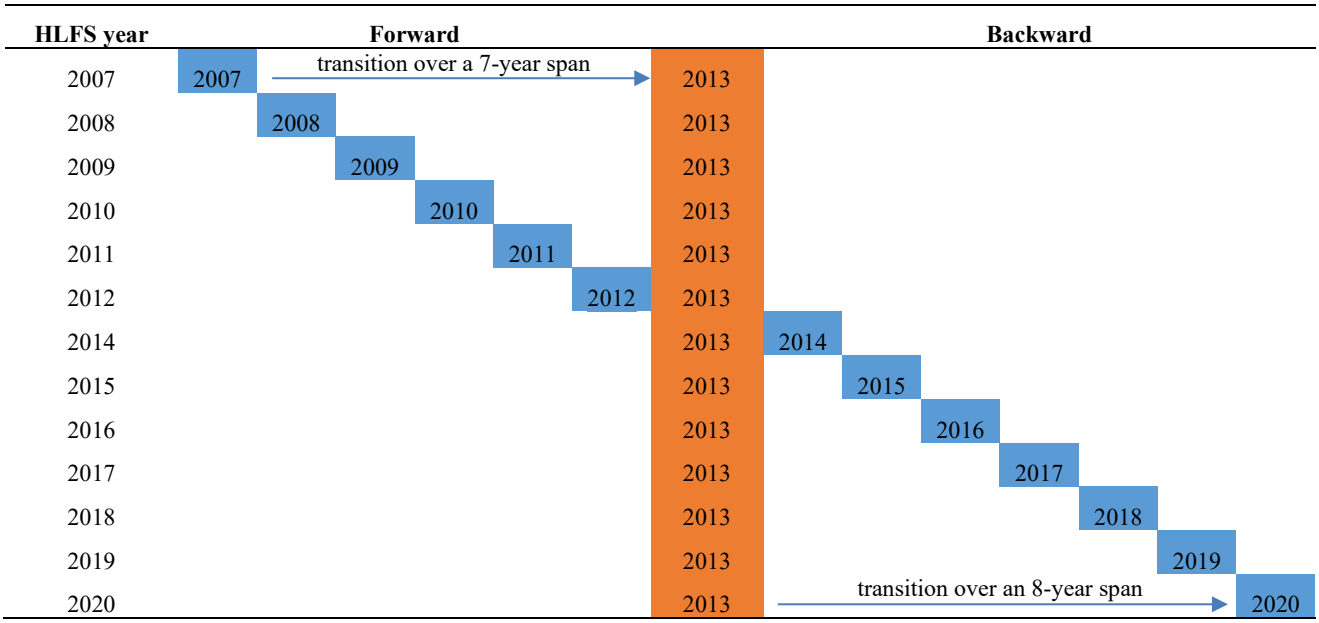


Table 1 HLFS Samples over Different Time Spans

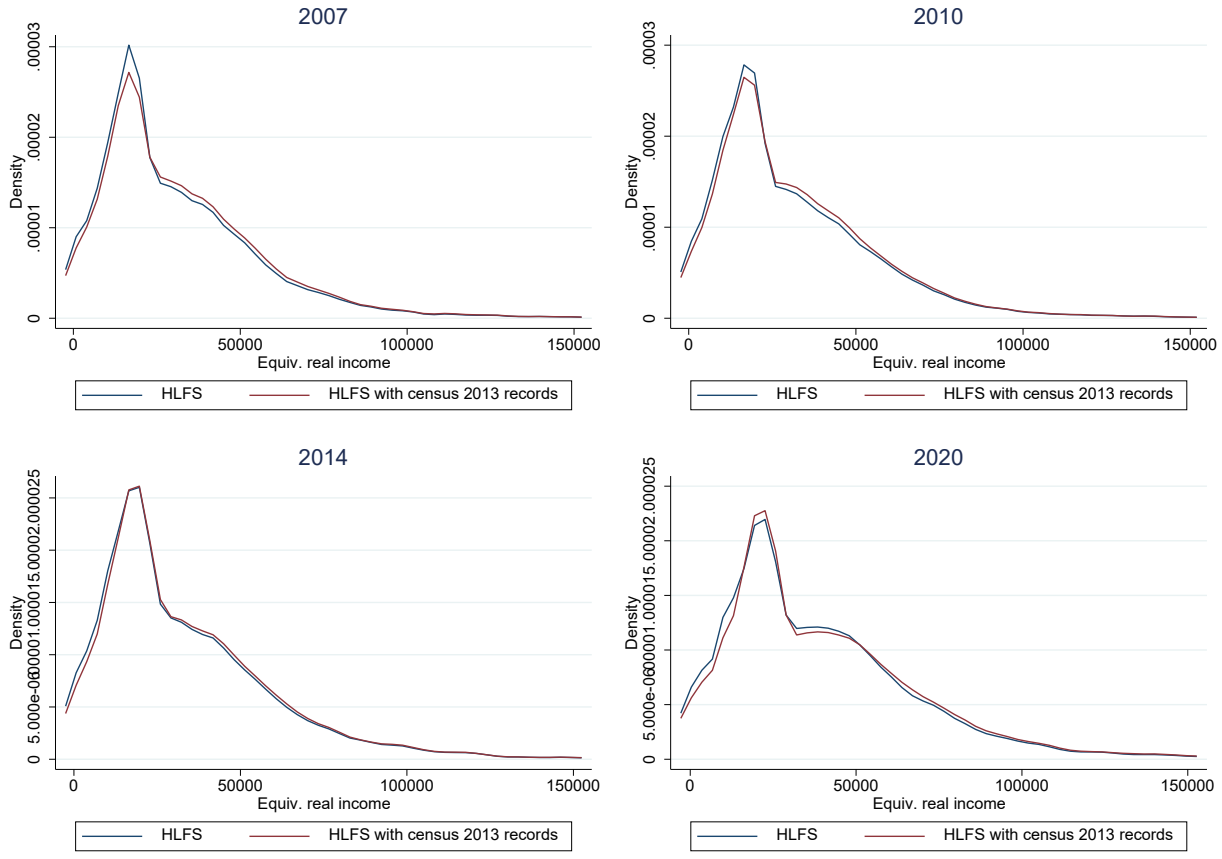
Span of years	Year 1	Year 2	Adults	Children	Total	Retention rate %
7	**2007**	2013	19,152	7,038	26,190	78.5
6	**2008**	2013	19,671	6,981	26,652	79.6
5	**2009**	2013	21,435	7,689	29,124	81.0
4	**2010**	2013	22,242	7,935	30,177	82.9
3	**2011**	2013	22,335	7,803	30,138	84.9
2	**2012**	2013	23,022	7,989	31,011	87.3
2	2013	**2014**	24,339	8,208	32,547	90.9
3	2013	**2015**	22,884	7,563	30,447	88.4
4	2013	**2016**	21,795	7,353	29,148	85.9
5	2013	**2017**	21,267	7,134	28,401	82.9
6	2013	**2018**	21,090	6,939	28,029	80.3
7	2013	**2019**	20,994	7,044	28,038	78.0
8	2013	**2020**	18,900	6,348	25,248	75.2

Note: Each panel includes only two points in time. HLFS years are in bold. Counts refer to the number of individuals used in the analysis.

The size of each sample is shown in Table 1. As mentioned above, it is not possible to link all families included in any HLFS sample with information contained in the 2013 census, and of course there are inevitably exits and entrants to the population. The individual retention rates are shown in the final column of Table 1. Although these rates are high, there is a nevertheless a possible sample selection bias, if those individuals and families who can be identified in both the respective HLFS and the census are not representative of all individuals and families in the population. To check for such a

possibility, the income distributions were compared with the full HLFS samples for relevant years. Some examples of kernel density plots are presented in Figure 2, for all individuals in several years.[12] The distributions are of individual incomes per adult equivalent person.[13] These, and further plots for different years and family types, reported in Appendix Figure 2, demonstrate that the differences in the density functions are minor. Appendix Tables 2 and 3 provide a detailed description of the HLFS sample in 2020, by ethnicity and income quintile respectively.

Figure 2 Distributions of Income Per Adult Equivalent Person: Individual as Income Unit



2.2 Adult Equivalent Scales

All inequality and poverty measures have been designed on the assumption that there are no relevant non-income differences between income units. But there is considerable heterogeneity regarding the size and compositions of families, and this is regarded as a major non-income characteristic when making welfare comparisons. Most studies therefore construct an artificial income measure, using

[12] Here, and in subsequent analyses, negative incomes (accounting for about a quarter of one per cent in each sample) were converted to zeros. In addition, 0.25 per cent of incomes at the top end of the income distributions were set to a maximum at 99.75 per cent. Further sensitivity checks were carried out by truncating just over three per cent of the families in the bottom of the income distribution (retaining those with log-equivalised income of 6 and above), and by not using the sample weights. The results were found to be consistent with the baseline.

[13] For comparison purposes across different years, these plots use real incomes adjusted by CPI, where CPI in 2013Q1 equals 100.

adult equivalent scales. The approach taken here is to use a two-parameter expression for the adult equivalent size of a family, based simply on the number of children and the number of adults. This allows sensitivity analyses to be carried out easily. Furthermore, the parametric scales have been found to give close approximations to many alternatives, and often more complex scales; see Creedy and Sleeman (2005).[14]

The following formula is used to derive the adult equivalence size, m, of a family:

$$m = (n_a + \beta n_c)^{\delta} \quad (1)$$

Here, n_a is the number of adults, and n_c is the number of children. Benchmark parameters of $\beta = 0.6$ and $\delta = 0.8$ are used in all cases reported below.[15] A child is classified as a dependent if that person is under 18 years of age. Total family income per adult equivalent person is thus total gross taxable income divided by the adult equivalent size of the family unit. As stressed above, the income unit is the individual, so that each individual in the family is assigned the income per adult-equivalent person.

Figure 3 Mean and Median Income Per Adult Equivalent Person 2007 to 2020

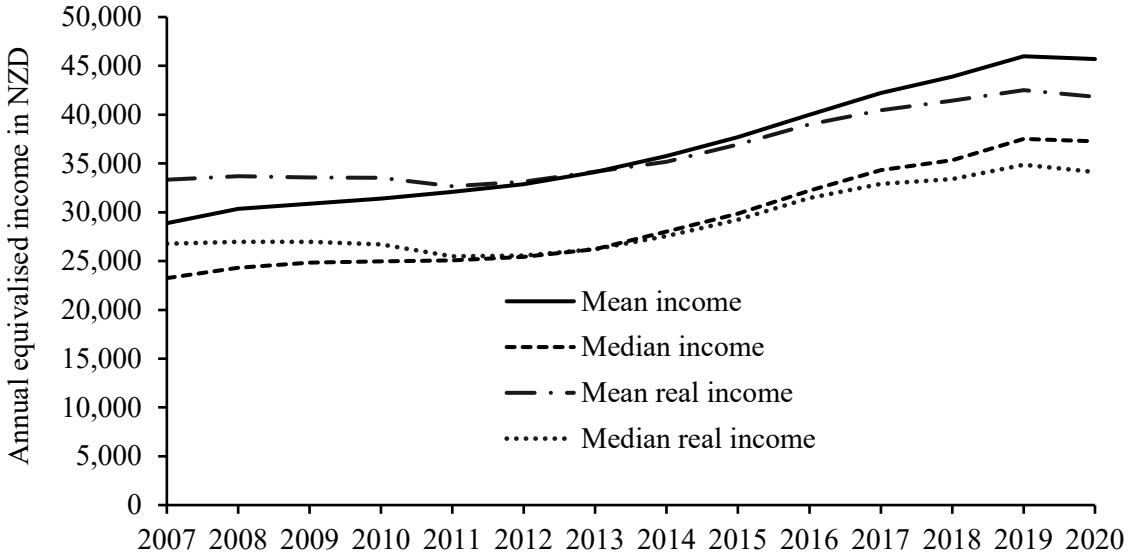


Figure 3 shows the variation over time in the mean and median values of individual income per adult equivalent person, both in nominal and real terms after adjusting using the Consumer Price Index (where CPI in 2013Q1 equals 100). Real incomes were relatively stable over the period 2007 to 2012, followed by gradual increases until 2019.

[14] On the earlier use of these scales, see Jenkins and Cowell (1994).

[15] These give scales close to those by Michelini (1999), estimated using New Zealand data.

3 Relative Income Changes

In considering income mobility, a distinction can be drawn between mobility viewed as differential income growth, and mobility in terms of positional, or rank-order, changes within the population.[16] A convenient non-parametric summary of relative income mobility is obtained using the transition matrix, showing movements between deciles or quintiles. Subsection 3.1 reports results using a series of such transition matrices.[17] Movements over different time periods are examined in Subsection 3.2.

3.1 Transition Matrices

The transition matrix summarises movements between specified proportions of the distribution between years t_o and t_1. Transition probabilities, $p_{i,j}$, are obtained as the percentage of those who are in income group i at time, t_0, and move to group j at time, t_1: movement is thus from rows to columns of the matrix. As the datasets consist of constant population groups of individuals, and as decile income groups are used rather than absolute incomes, all row and column sums add to 100 per cent.[18]

Table 3 shows transition matrices for movements between deciles from 2007 to 2013, and from 2013 to 2019, for all individuals combined. This demonstrates substantial mobility over time, in terms of differential income growth. However, just over half of people in the bottom decile in 2007 were still in the lowest two deciles in 2013. Of those initially in the top income decile, 64 per cent were in the highest two deciles in 2013. Over the period 2013-2019, where economic conditions were more stable than in the previous period, mobility was somewhat greater for the bottom decile: 46.3 per cent of those in the bottom decile in 2013 remained either there or in the second-lowest decile in 2019. Furthermore, 67.1 per cent of those in the top decile in 2013 remained either there or in the second-highest decile in 2019. For each matrix, the final column is the percentage of individuals who in the second year remained in the same decile, or the decile immediately above or below their decile in the first year. The decile values for each of the years are shown in Appendix Table 4.

[16] For an analysis of positional (rank order) changes in NZ, for individual taxpayers, see Alinaghi *et al*. (2022d).

[17] Transition matrices could of course be constructed for movements among absolute income classes (using equal income class widths, or equal log-income class widths). However, the emphasis here is relative movements within the distribution. Transition matrices for individual taxpayers are examined in Alinaghi *et al*. (2022a). On NZ relative income changes of individual taxpayers using a parametric model, see Creedy *et al.* (2021).

[18] In the matrices reported here, the use of rounding to one decimal place means that the values do not sum to exactly 100.

Table 2 Inter-Decile Transition Matrices

A. Period 2007-2013

		Decile in 2013										± 1
		Bottom	2	3	4	5	6	7	8	9	Top	decile
Decile in 2007	Bottom	**32.6**	19.8	9.0	6.6	9.9	6.3	4.4	4.5	3.6	3.2	52.4
	2	15.9	**26.0**	14.7	11.4	10.0	7.3	5.3	4.3	2.7	2.2	56.6
	3	6.5	11.5	**37.5**	17.2	9.2	6.1	4.4	3.1	1.9	1.1	66.2
	4	7.4	10.7	10.8	**31.1**	14.4	11.3	6.8	4.5	3.3	1.6	56.3
	5	7.9	9.3	8.6	9.3	**17.3**	17.4	15.1	7.7	5.8	1.8	44.0
	6	6.6	7.1	6.4	6.9	12.8	**15.9**	17.5	14.6	8.6	3.6	46.2
	7	6.6	4.9	4.0	5.4	9.8	12.7	**19.8**	18.4	12.7	5.9	50.9
	8	5.3	4.5	4.2	5.3	7.3	10.1	13.1	**20.0**	19.9	10.5	53.0
	9	4.0	3.9	2.4	4.8	5.7	8.0	8.6	15.1	**25.9**	21.9	62.9
	Top	7.3	2.3	2.6	2.1	3.8	4.9	5.2	7.8	15.7	**48.3**	64.0

B. Period 2013-2019

		Decile in 2019										± 1
		Bottom	2	3	4	5	6	7	8	9	Top	decile
Decile in 2013	Bottom	**31.9**	14.4	8.1	8.3	8.4	8.2	6.7	5.9	4.8	3.6	46.3
	2	19.8	**26.1**	11.2	11.6	10.0	6.3	5.5	4.9	2.7	1.9	57.1
	3	7.7	18.2	**32.0**	14.4	9.3	6.5	4.6	3.0	3.2	1.2	64.6
	4	8.1	10.1	15.7	**28.1**	12.7	10.3	6.0	4.1	3.4	1.6	56.5
	5	7.7	7.8	9.3	13.1	**18.1**	18.4	11.4	7.8	4.1	2.3	49.6
	6	4.9	7.2	6.4	7.9	15.4	**17.2**	17.1	13.0	8.2	2.8	49.7
	7	5.4	5.7	4.4	6.5	10.6	14.7	**19.1**	15.9	13.0	4.9	49.7
	8	4.8	4.4	4.9	4.3	7.7	8.9	16.1	**20.9**	18.5	9.5	55.5
	9	5.2	3.2	2.8	4.5	4.7	6.5	8.4	17.3	**26.3**	21.2	64.8
	Top	4.5	2.2	3.6	2.9	3.5	3.7	5.2	7.35	15.8	**51.3**	67.1

Note: The final column is the percentage of individuals who in 2019 remained in the same decile or the decile immediately above or below their decile in 2013.

Further summary information about these transition matrices is given in Figure 4, which shows the overall proportion of individuals (starting in any of the deciles) who moved by two or more deciles over the relevant periods. Separate results are shown for the years 2007 to 2013 (where data are linked 'moving forward' to the census) and 2013 to 2020 (where the individuals are linked by 'moving backward' to the census from a later HLFS). Not surprisingly, the number moving by two or more deciles increases as the time interval increases. Around 20 per cent changed by at least two deciles after a year. Over eight years, 47 per cent changed by two deciles or more. The results are similar for periods 2007 to 2013 and 2013 to 2020.

Figure 4 People Moving at Least Two Deciles From Their Initial Decile

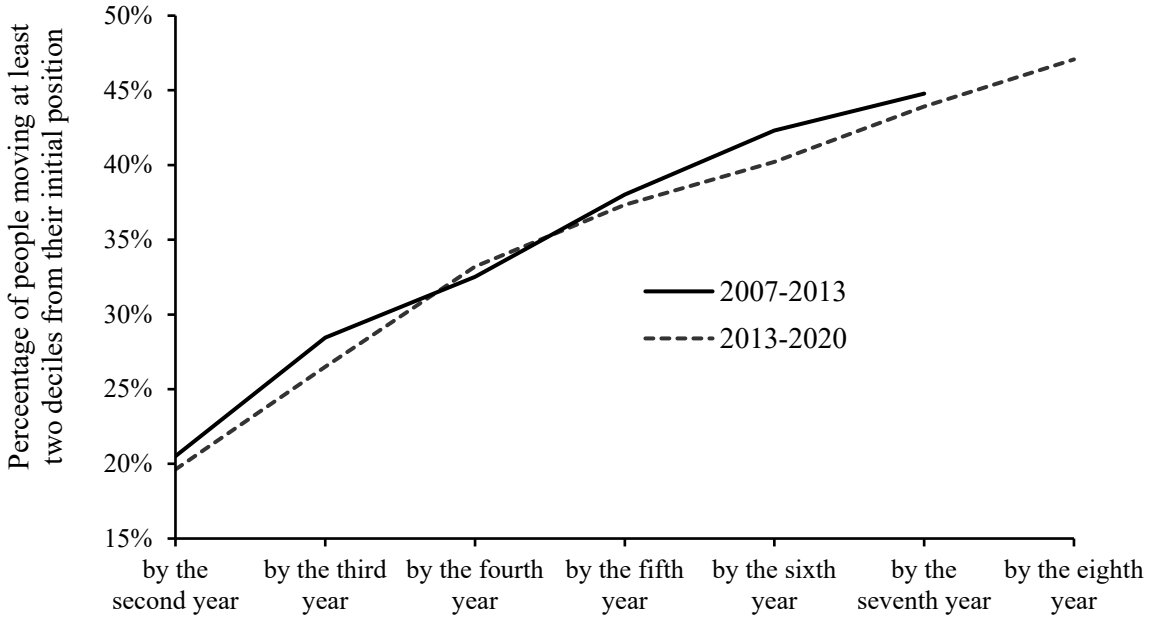
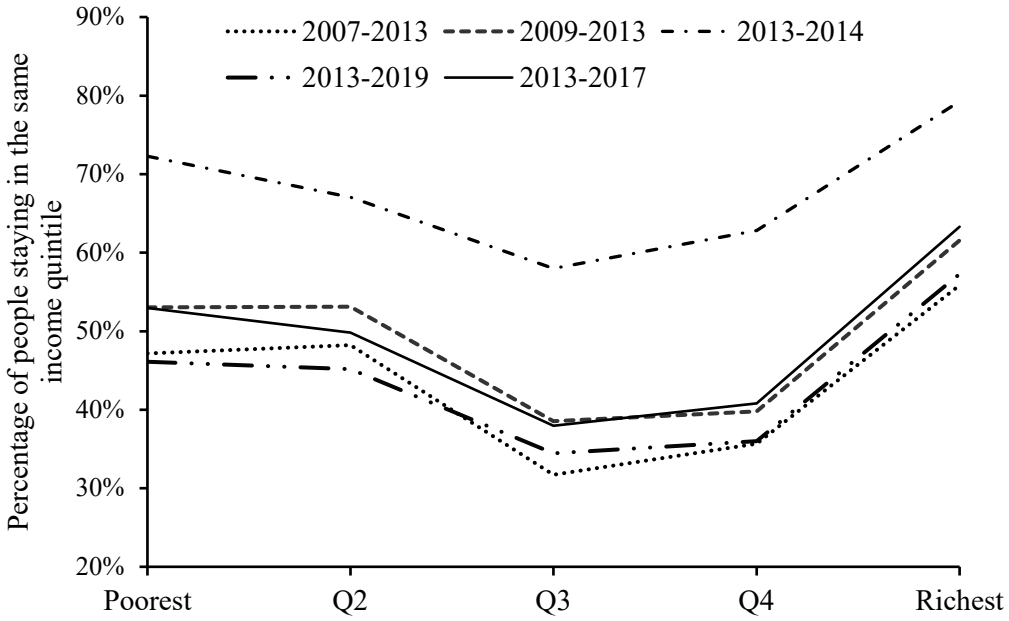


Figure 5 People Staying in the Same Income Quintile over Different Time Intervals



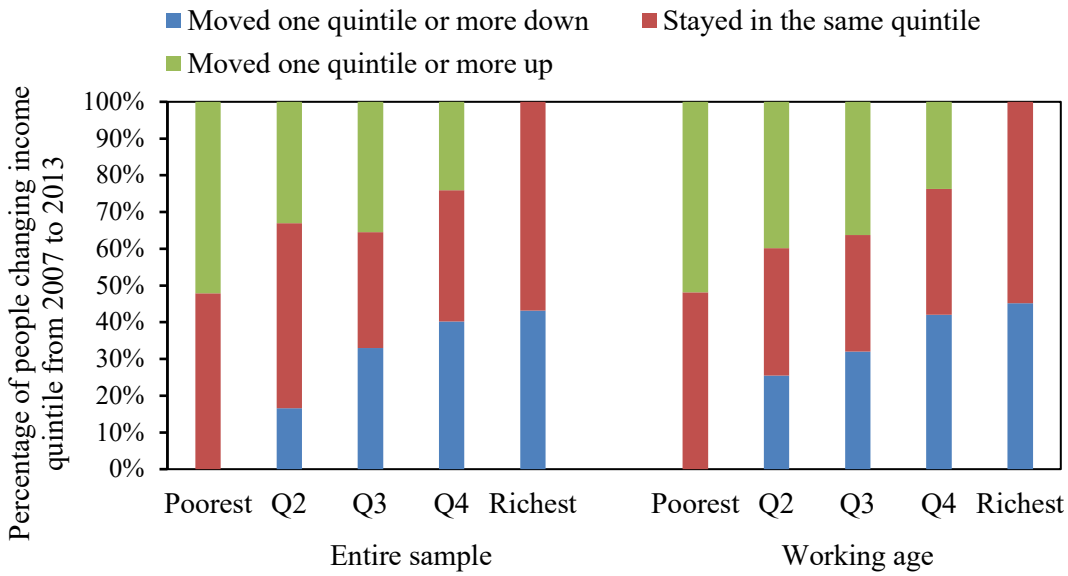
To simplify the presentation, and enable comparison with other studies, Figure 5 reports the proportion of individuals who stayed in the same quintile, for each quintile group, and for a number of time intervals. These profiles show that there is more stability for people at the two bottom quintiles and even more for those at the top quintile. After 2013, medium-term mobility was slightly greater for those in the second-bottom quintile, compared with the pre-2013 periods.

Results relating to quintile movements for different population groups are shown in Figure 6. There are almost no differences between groups for the top and bottom quintiles. However, there is

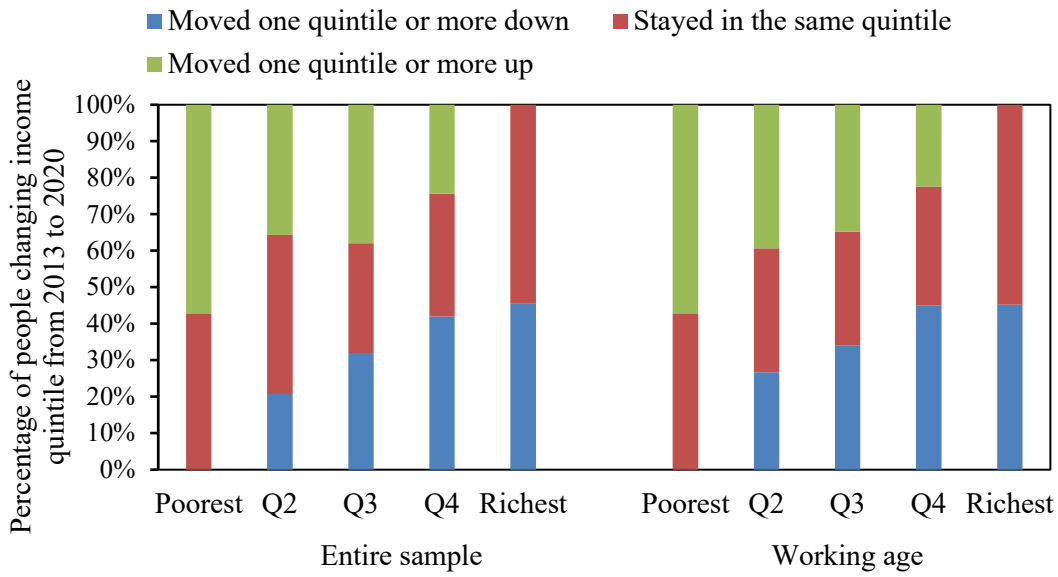
somewhat greater mobility for the working-age people in the second-bottom quintile when compared to the entire population. This reflects the importance of retired people, who typically are in the second-bottom quintile: that is, about 60 per cent of those in that quintile in 2020 are aged 65 or over; and 70 per cent of them were not in the labour force: see Appendix Table 3. Regarding the income quintile changes for the entire population, almost 43 per cent of those in the bottom income quintile in 2013 remained there in 2020, while 55 per cent of those in the top quintile stayed there after seven years. Income mobility is higher for those in the middle group: 30 per cent of those who stayed in the middle quintile in 2013 remained there and 38 per cent moved up at least one quintile in 2020.

Figure 6 Quintile Movements over The Medium Term by Initial Income Quintile

A. 2007 to 2013

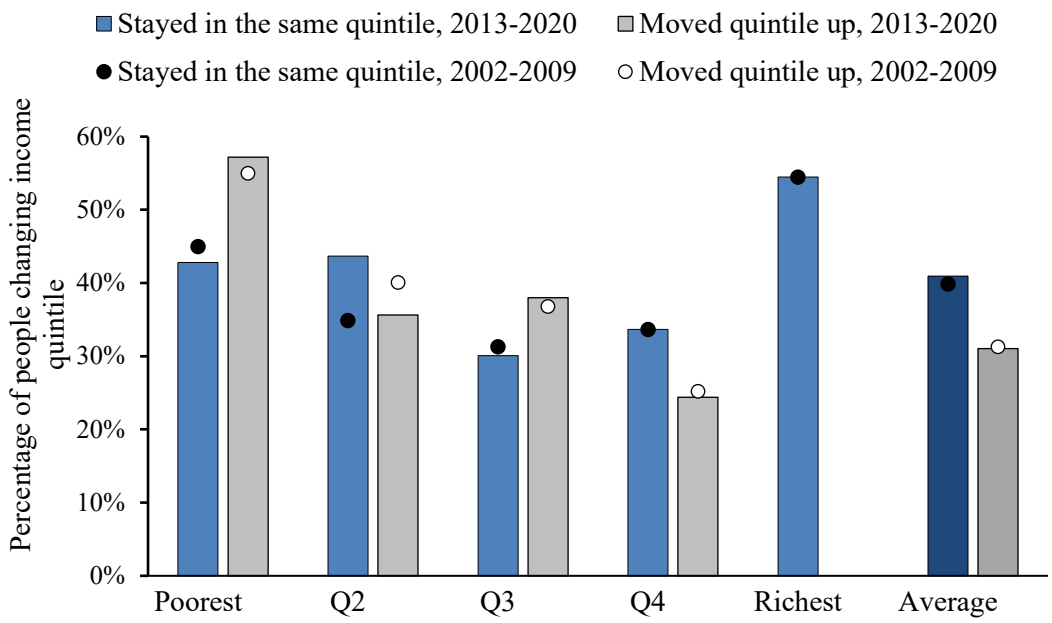


B. 2013 to 2020



Figures 7 and 8 report further details of movements between income quintiles, and real income changes, over an eight-year span. The results are compared with those obtained by Carter and Gunasekara (2012): circles are used to indicate their results. Although the results are difficult to compare perfectly because of the use of different adult equivalent scales and income units, there are no large differences in income mobility patterns between the two periods, 2013-2020 and 2002-2009, except for those in the second bottom quintile, who were more likely to be affected by the presence of large numbers of retired individuals.[19]

Figure 7 Trends in Relative Income Mobility by Initial Quintile



Regarding income quintile movements over the period 2013 to 2020, Figure 7 illustrates information contained in Panel B of Figure 6 (the entire population) in a different way. It looks at the proportion in each quintile in 2013 who stayed in the same quintile or had moved up by 2020. It also shows the results from a similar exercise by Carter and Gunasekara (2012), using the SOFIE dataset. On average, 41 per cent of the population remained in the same quintile while 31 per cent moved quintiles up over the period. The results are similar to Carter and Gunasekara's (2012) analysis, with the exception of quintile 2.

[19] They used the 1988 Revised Jensen Scale to compute nominal income per adult equivalent person, based on gross taxable household income, and their income unit was the household.

Figure 8 Trends in Upward and Downward Income Mobility by Initial Quintile over Eight Years

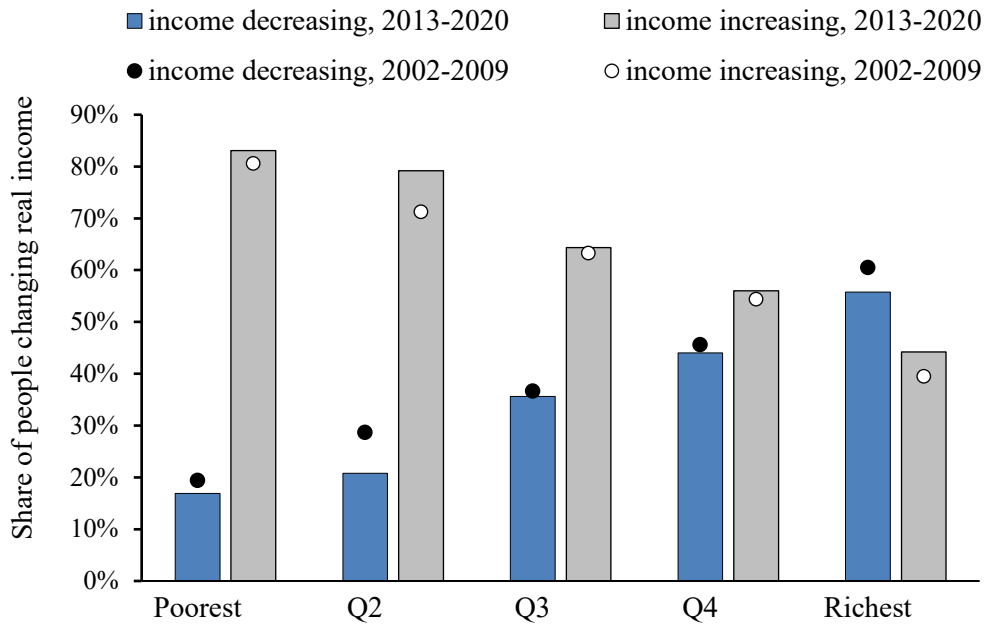


Figure 8 shows that people who stayed in lower income quintiles were more likely to experience real income increases over time, compared to those in higher quintiles. This may partly be due to income transitions over the life cycle.[20] For instance, students and young people before their prime working are more likely to experience income increases over the medium term compared to the average population. Equivalently, individuals who started in low-income families were less likely to experience real income decreases over time compared to those from high-income families. Again, these estimates are not adjusted for age or any other demographic factors. Of those in the bottom quintile in 2013, 83 per cent experienced an increase or no changes in real income in 2020 while about 56 per cent of the richest quintile increased their real income or remained in the previous real income levels.

3.2 Transitions for Working-Age Individuals

This subsection concentrates on the income mobility of working-age individuals, defined as those between the ages of 18 and 65. Figure 9 reports the share of the working-age population remaining in the same quintile over different time spans. Not surprisingly, the number staying in the same quintile, regardless of their initial quintile, decreases as the time interval increases. For movements between consecutive years, around two-thirds of the working-age population remained in their initial income quintile. Over eight years, 39 per cent remained in their initial positions.

[20] On the changing distribution of individual incomes with age in New Zealand, see Alinaghi *et al*. (2022e).

Figure 9 Working-Age Population Staying in Same Quintile over Different Time Intervals

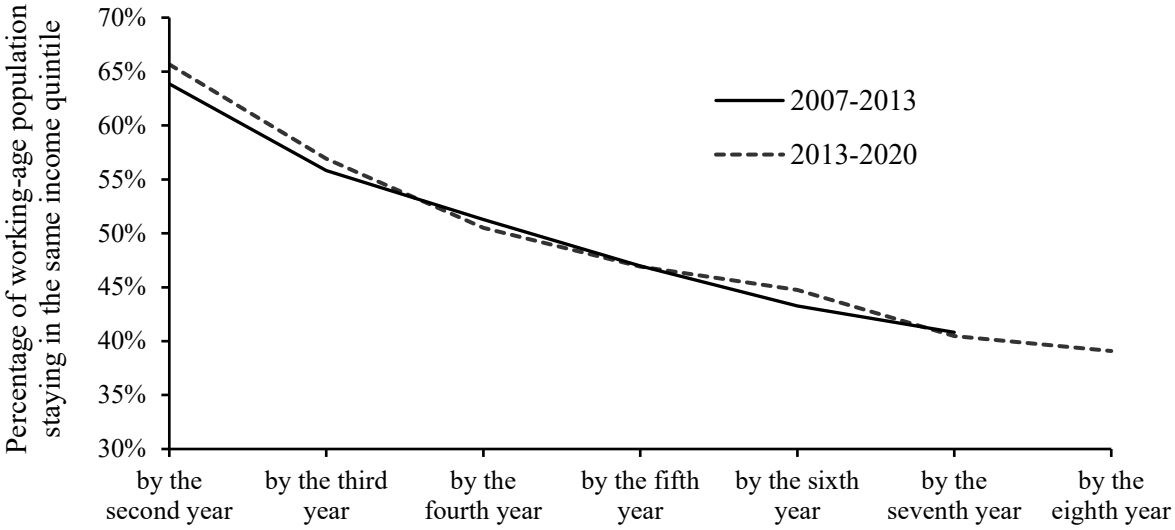


Figure 10 Percentage of Working-Age Population Staying in Same Quintile over Different Time Intervals

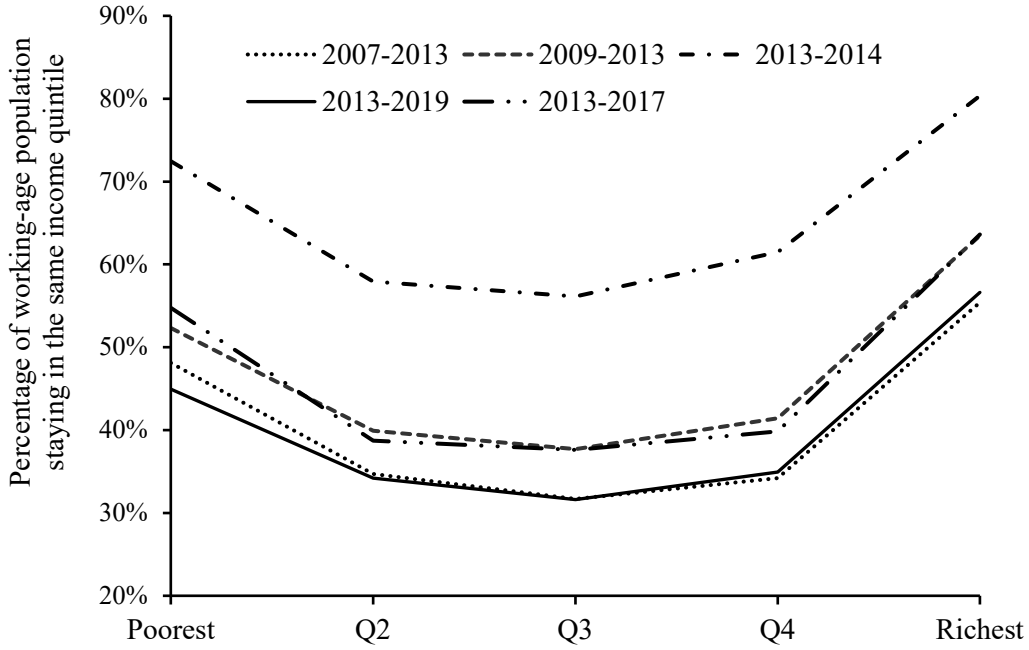


Figure 10 reports the proportion of working-age individuals who stayed in the same quintile, for each quintile group and for a number of time intervals. These profiles show that income mobility is lower for people at the bottom quintile, compared with middle-income groups, and even lower for those at the top quintile. Of those starting in the bottom quintile, more than half remained in the same quintile four years later, and over 45 per cent remained seven years later. Nevertheless, as seen in Figure 8, a majority of those in the poorest quintile experienced a real income increase over eight years, although these increases were insufficient to allow many of them to move to higher quintiles. Regarding the richest quintile, almost two thirds of them remained there over the medium term (four years), and

around 57 per cent remained seven years later. Again, there was little difference in medium-term mobility between the two timespans, 2007 to 2013, and 2013 to 2019.

4 Some International Comparisons

This section compares results with those reported in OECD (2018). International comparisons are always fraught with difficulties regarding comparability of data and methods. OECD (2018) examining the income changes of the working-age (18-65) population over the medium term (four years) and longer term (up to nine years).[21] Disposable household income per adult equivalent person, using the modified OECD scale, were used in almost all countries in the OECD sample.[22]

Figure 11 provides comparisons of quintile movements over the period 2011 to 2014 for all countries except New Zealand, Australia, Germany, Ireland, Switzerland, Turkey and the United Kingdom (which use years 2010 to 2013), Canada (2007 to 2010) and Chile (2006 to 2009). Figure 12 reports values for 2007 to 2013 for New Zealand, 2007 to 2014 for France, 2005 to 2013 for Australia, Germany, Korea, and Switzerland, and 2004 to 2012 for the United States. In each figure, reading from left to right, the degree of income mobility, in terms of the proportion of people remaining in the same quintile over the relevant period, decreases.

Overall, income mobility of the working-age population in New Zealand is close to the OECD average. On average across OECD countries, almost half of working-age individuals stayed in the same income quintile over four years, and almost 40 per cent over nine years: this is similar to results for New Zealand. Figure 11 shows that, over four years, there was more movement between quintiles for adults in New Zealand than in France, Canada, or Germany, and somewhat less than in Australia or Norway, and significantly less than in the United Kingdom or emerging market economies. The patterns observed over longer term appeared to be similar, as see in Figure 12.

[21] Data for China refer to the age 25-55 population.

[22] For the United States, disposable family income was used to derive income per adult equivalent person. For Israel, data refer to gross household income before taxes.

Figure 11 Income Quintile Changes Over Four Years: 2011 to 2014.

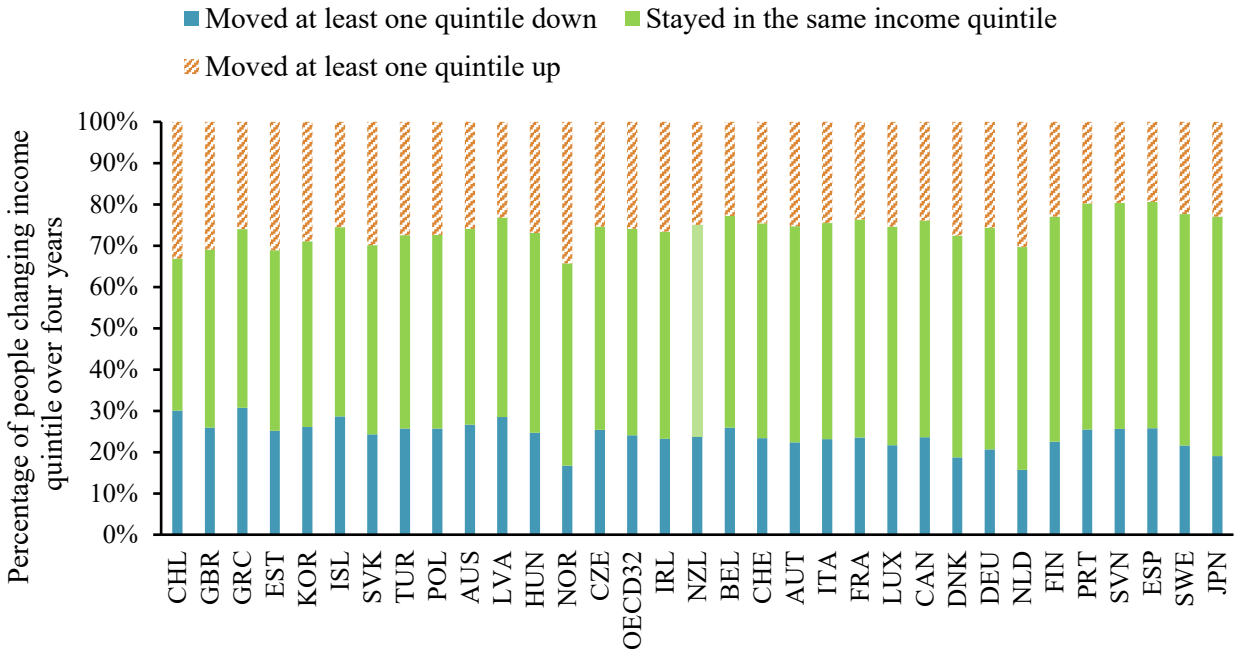


Figure 12 Income Quintile Movements Over Periods of Up to Nine Years

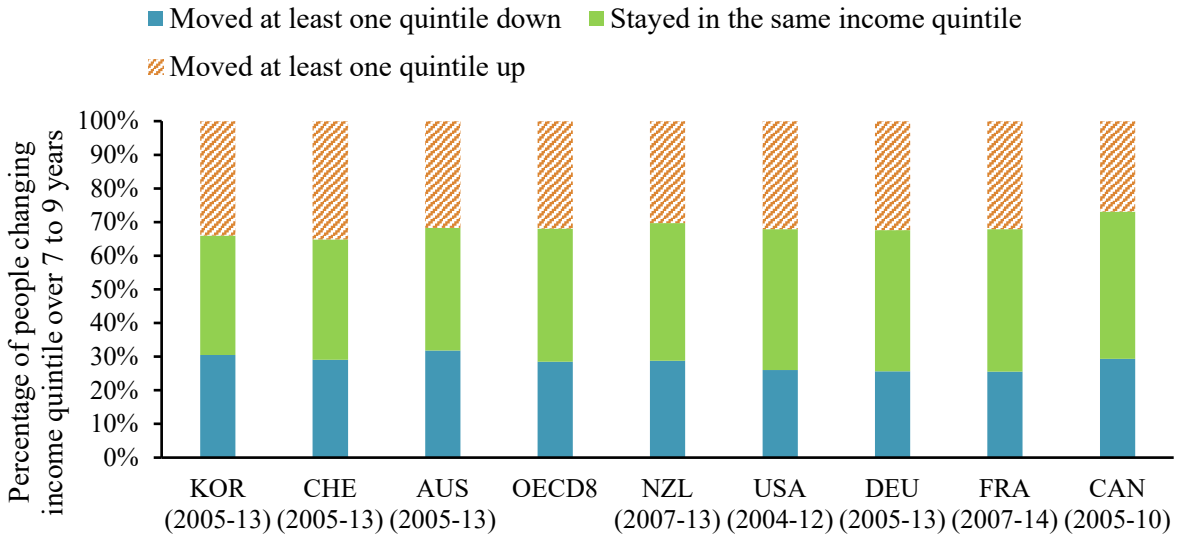


Figure 13 compares income quintile movements for the working-age population over four years, by initial position. Just over half of the New Zealand population stayed in the same income quintile over the medium term (four years). Compared with OECD countries, mobility in New Zealand is similar for the top and bottom quintiles, with somewhat less mobility for the middle quintiles. The obvious similarity is such that there is less inter-quintile mobility at both ends of the distribution. Income mobility (measured in terms of transition proportions) is lower at the bottom of the income distribution (57 per cent over four years) and even lower at the top (68 per cent).

Figure 13 Quintile Movements over Four Years by Initial Quintile

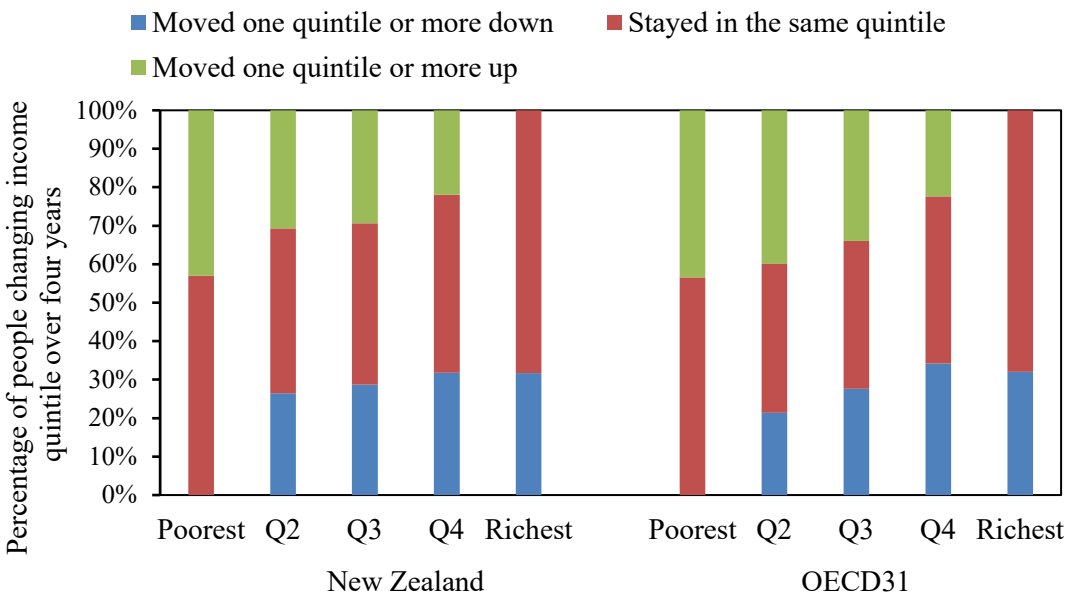


Figure 14 Movements for the Third Quintile over Four Years

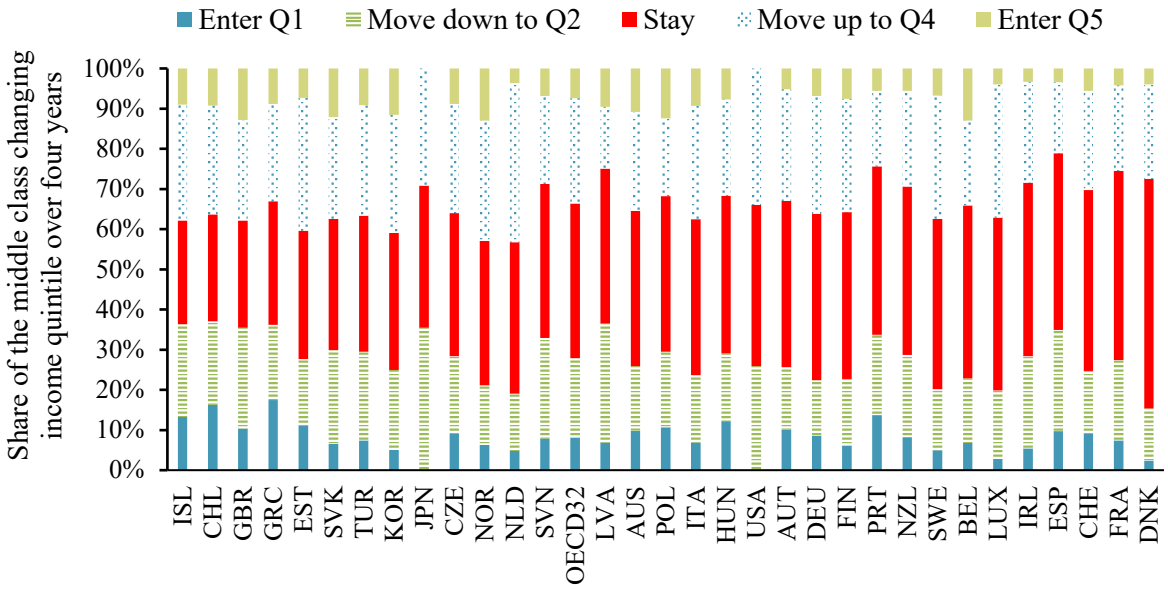


Figure 14 represents further cross-country comparisons in the income movements for the working-age individuals who started in the middle (third) quintile. Forty-two per cent of working-age New Zealanders who started in the third quintile remained in the same quintile after four years. For these people, a small real income change can lead to a change in their income quintile. The OECD average proportion moving from the third quintile over four years was somewhat higher than in New Zealand (38 per cent versus 42 per cent remaining in the same quintile).

Figure 15 Percentages Remaining in Bottom and Top Quintiles over Four Years

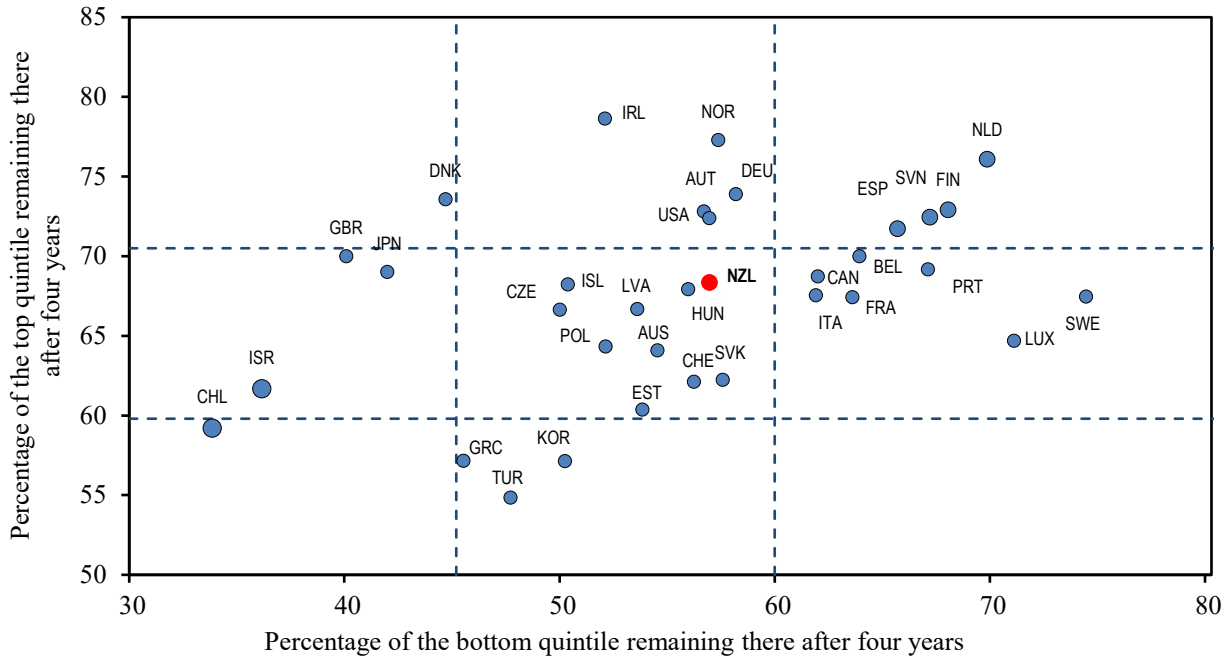


Figure 15 compares mobility across countries regarding the share of working-age individuals in the lowest and highest income quintile staying in the same income quintile after four years. Data refer to the period 2011 to 2014 for all countries except Switzerland (2009-2012), New Zealand, Germany, Ireland, Japan and the United Kingdom (2010-2013), Turkey (2008-2011), Canada (2007-2010) and Chile (2006-2009). For the United States, where data are collected on a biannual basis, the result is based on the average between results for 3-year and 5-year panels. Among OECD countries, there were several different patterns combining the mobility for those in the bottom and top quintiles over four years. For example, the United Kingdom, Denmark and Japan belong to the group where there were larger transition proportions for those in the bottom, but lower proportions for those in the top quintile. Norway, Germany, Austria, the United States and Ireland were in the group with low mobility at the top of the income distribution with average transition proportions at the bottom. New Zealand is at the average level of the OECD countries, and in the same group with Australia, Hungary, and Switzerland: these showed average levels of mobility for those either in the bottom or top quintile.

5 Low Incomes and Mobility

This section concentrates on the income changes of 'low income' individuals, defined as those below a threshold value set in relation to median income per adult equivalent person. The analysis uses a class of poverty measures introduced by Foster *et al.* (1976). While these measures are applied in the present context, care must be taken to avoid referring to them as 'poverty' measures, given the use of a gross taxable income 'welfare metric'. The summary measures are defined in Subsection 5.1.

Subsection 5.2 describes a decomposition of these measures into short-period and longer-period components. Low-income dynamics are summarised in Subsection 5.3.

5.1 The Foster-Greer-Thorbeck (FGT) Measures

Let y_i denote the income of person i (i= 1, 2, …, n), and y_p is a low-income threshold. The subset of low-income people is denoted, A. Following Foster *et al.* (1976), the FGT measures, LT_α, for a specified value of the parameter, α, are given by:

$$LT_\alpha = \frac{1}{n}\sum_{i \text{ in } A}\left(\frac{y_p - y_i}{y_p}\right)^\alpha \qquad (2)$$

The most interesting cases are for values of α of 0, 1 and 2. For α = 0, expression (2) is simply the proportion of people below the low-income threshold, and hence measures the *incidence* (conventionally referred to as the 'headcount' measure). For α = 1, equation (2) depends on LT_0 and the average normalised low-income gap, which depends on average income among those below the low-income threshold, and reflects *intensity.* For α = 2, LT_2 depends on the average squared normalised low-income gap, which is related to the standard deviation of low incomes, reflecting *inequality* among the low-income group.

5.2 Short and Longer-Term Low Incomes

In this subsection, the measures, LT_α, are used to measure the incidence, intensity and inequality of individuals who are below a specified income threshold in a given year. The approach follows Borooah and Creedy (1998), who decompose the two-period LT_α measures into temporary and longer-term components.[23] Suppose individuals can be observed over two periods, t = 1, 2, and a summary measure from the FGT class, say LT_t, is obtained for each period. The low-income threshold can differ between periods, if required. Define LT as the arithmetic mean low-income measure over the two periods, so that:

$$LT = \frac{1}{2}\sum_{t=1}^{2} LT_t \qquad (3)$$

A property of the FGT class of measures, defined in terms of the sum of powers of proportional low-income gaps, is that it is possible to decompose the expression in (3) into two components. One component relates to those individuals who are below the threshold in one period only, and the other component relates to those who are below the threshold in both periods.

[23] Alternatively, longitudinal data could be used to construct measures of 'persistence' based on the number of consecutive periods an individual is below the threshold, or the number of periods spent below the threshold within a specified length of time. For example, EU persistent at-risk-of-poverty indicator considers a person who was poor in a given year and in at least two of the three preceding years to be persistently poor. OECD (2008) defines people with low income in three years over a three-year period as the persistently poor. Similarly, it is possible to calculate the probability that an individual is below the low-income threshold in one period, conditional on being below the threshold in the previous period: for example, see Cappellari and Jenkins (2014) who used British panel data for the 1990s.

Let the superscripts, *T* and *L*, refer to temporary (or short-term) and longer-term low income, and the low-income threshold in period, *t*, is $y_{p,t}$. Using the FGT class, where *n* is the (constant) population size, *LT* in year *t* is given by:

$$LT_t = \frac{1}{n}\sum_{j \text{ in } A}\left(\frac{y_{p,t}-y_{j,t}}{y_{p,t}}\right)^{\alpha} + \frac{1}{n}\sum_{j \text{ in } B}\left(\frac{y_{p,t}-y_{j,t}}{y_{p,t}}\right)^{\alpha} \quad (4)$$

Here, A is the set of individuals in *t* who are below the threshold only in that year, while B is the set of individuals who are below the relevant threshold in both years. Write:

$$LT_t = LT_t^T + LT_t^L \quad (5)$$

The average low income in (3), using equal weights for the two components, becomes:[24]

$$LT = \frac{1}{2}\sum_{t=1}^{2} LT_t^T + \frac{1}{2}\sum_{t=1}^{2} LT_t^L \quad (6)$$

This may be written as:

$$\boldsymbol{LT = LT^T + LT^L} \quad (7)$$

The *temporary component* of the low-income measure (or short-term component), LT^T, captures the contribution of those individuals whose incomes are below the threshold in one year only. *The longer-term component*, LT^L, captures the contribution of those individuals whose incomes are below the threshold in both years. In reporting these components for NZ, the low-income threshold was set at 50 per cent of median income. This is of course a completely arbitrary setting, but it also allows comparisons to be made with other countries.

5.3 Low Income Dynamics

This subsection describes low-income dynamics between two years, where the low-income threshold in each year is defined as 50 per cent of the median family income per adult equivalent person. In most cases, years are not consecutive. Data refer to all individuals in any HLFS sample linked with the records in the census 2013. Demographic characteristics are those observed in the initial year.[25] For details of the variable definitions, see Appendix Table 1. Caution is needed in interpreting the results for small groups, such as sole-parent males, MELAA (Middle Eastern, Latin American, and African), and 'other' (unidentified) ethnic groups.

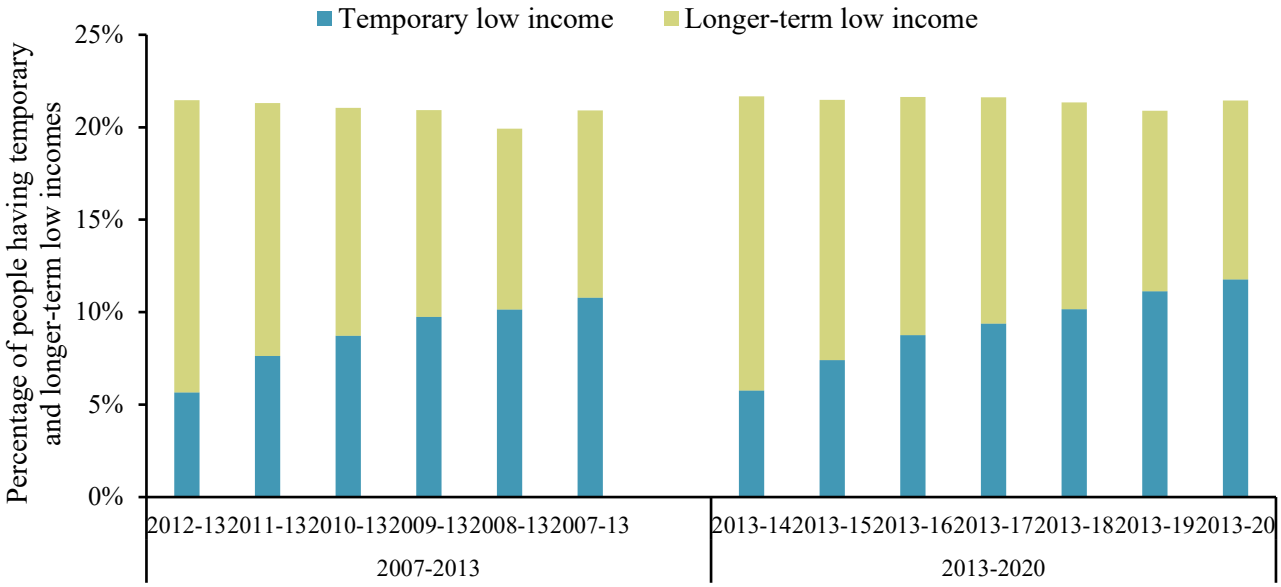
Figure 16 presents the low-income prevalence of different HLFS samples, in terms of the proportion of people having incomes less than 50 per cent of the median income per adult equivalent person over two years. Average low-income measures, *LT*, are reflected by the height of the bars, which are two-year average levels. The blue bars reflect the temporary component, LT^T, or proportion of people with

[24] Clearly, different weights could be used, depending on value judgements.

[25] When using demographic characteristics in the destination years to classify people, the results are almost unchanged.

low income in either year. The light green bars show the longer-term component, LT^L, or proportion of people with low income in both years, as defined in equation (7). Given the dataset used here, consecutive years are not used in most cases.

Figure 16 NZ Low-income FGT Measures Decomposed: incidence measure ($\alpha = 0$)



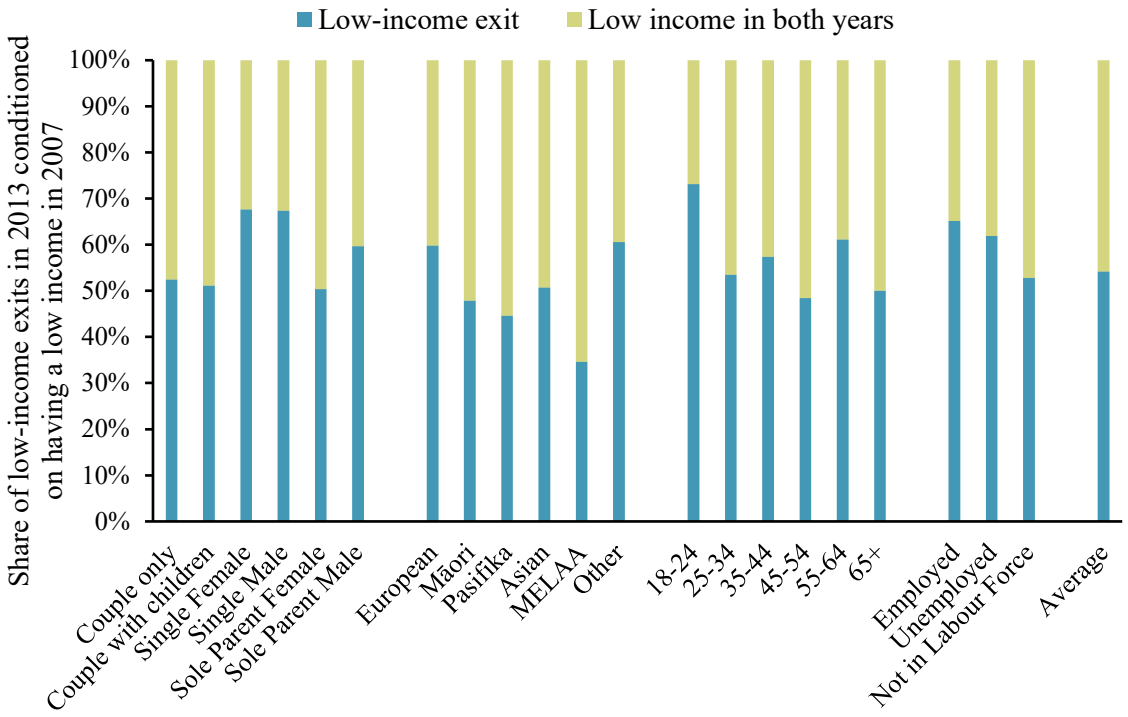
The average low-income measures, LT, seem to be stable over different time intervals. On average, just over a fifth of the New Zealand population had income (per adult equivalent person) below 50 per cent of the median family income per adult equivalent person. For decompositions between two consecutive years, around 6 per cent of the population had low income in either 2012 or 2013, and 16 per cent had low income in both years. As the interval of time expands, the temporary components, LT^T, increase while the longer-term components, LT^L, decrease. Over a longer period of time, there are more low-income entries and exits. As a result, the share of people with longer-term low-income decreases. For decompositions between two non-consecutive years, one in ten New Zealanders had low income in either 2007 or 2013, and the same rate for those who had low income in both years. The two sets of results for two periods before and after 2013 are similar.

Figure 17 shows low-income exits over the medium term for the entire population, and by demographic groups observed in the initial years (computed as the proportion of people who exited low income in the second period, conditioned on having a low income in the first period over the total number of people with low income initially). For New Zealanders as a whole, of those who were below y_p initially, just under half were below or had returned to being below the relevant threshold after six to seven years. There was a similar pattern in Australia over the period from 2000/2001 to 2015/2016, where nearly half of those with income less than half of disposable household equivalised

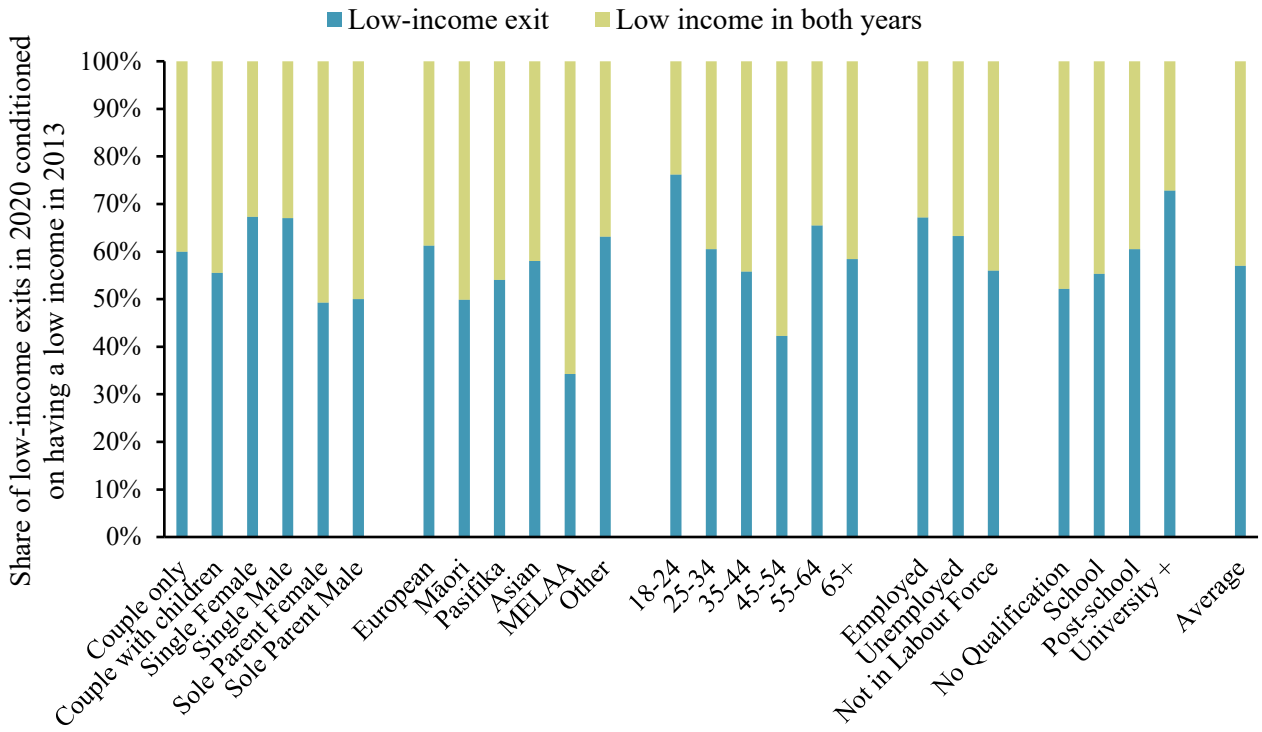
income in one year were also in, or had returned to, below the threshold five years later; see Australian Productivity Commission (2018, p. 127).

Figure 17 Percentage of Low-Income Exits, Conditioned on Initially Having a Low Income

A. 2007 to 2013



B. 2013 to 2020



New Zealanders aged 18 to 24, and single people, were more likely to move above the low-income threshold over the medium term, compared to the entire population. In particular, three quarters of young people, who initially had low incomes, exited after six to seven years: the rate was two thirds for single people. These groups were more likely to transition from study to work and thus more likely to move above the threshold over the medium term compared with the overall sample. For instance, for the transition from 2013 to 2020, 26 per cent of those aged 18 to 24 studied in 2013 while just 6 per cent of those aged 25 or above studied. Similarly, workers and people with university education were more able to rise above the low-income threshold over the medium term, as these groups were more likely achieve labour market success.

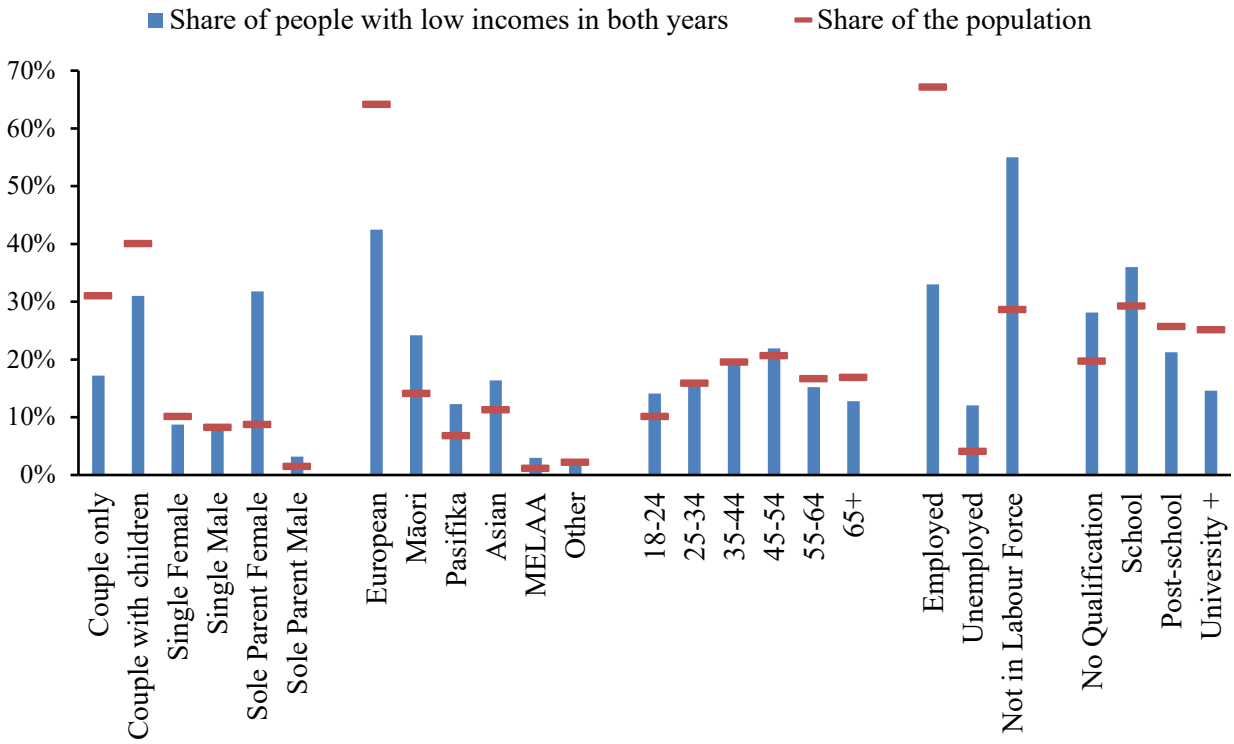
Figure 18 displays the characteristics of people who experienced longer-term low income, by using different samples, defined earlier as those who had low income in both years in a two-year panel. In particular, the height of the blue bar represents the proportion of people with that characteristic who have a longer-term low income. Many Europeans have longer-term low incomes as they account for the majority of the population.

The red horizontal bars show where the bar would reach if people with that characteristic were to match the average for the whole population. That is, the red bars represent the share of each demograhic group in the entire population. Where the blue column is significantly higher than the red horizontal bar, a person with that characteristic is more likely to have a longer-term low income than the population as a whole; these include sole parents, people not working, and those without qualifications. A simple way to distinguish a group being over-represented in the longer-term low-income population is to derive the ratio of the longer-term component to the share of the population: this is the relative long-term ratio. Where the proportion is greater than one, the corresponding group has a higher prevalence of longer-term low income, compared to the entire population. The higher the proportion, the more likely to be over-represented in the longer-term low-income population.

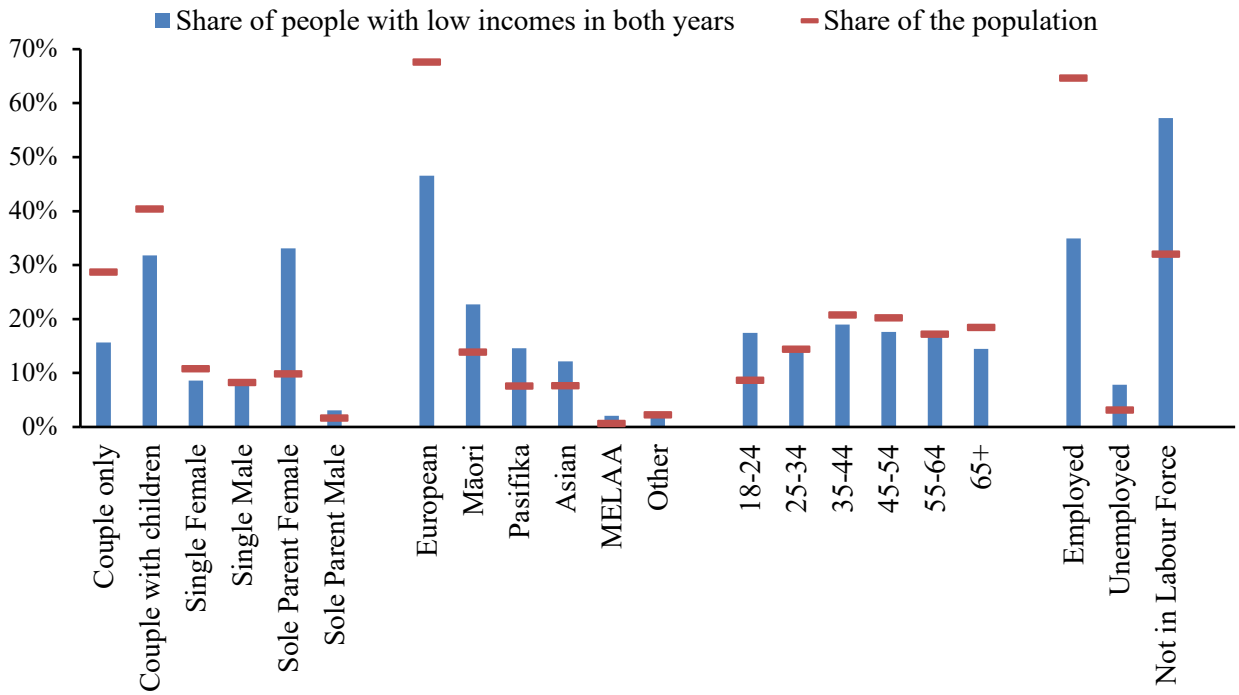
Figure 18 Characteristics of People With Low Incomes in Both years: Incidence Measure (α=0)

A. Sample 2007-2013

B. Sample 2013-2020



C. **Sample 2009-2013**



D. **Sample 2013-2015**

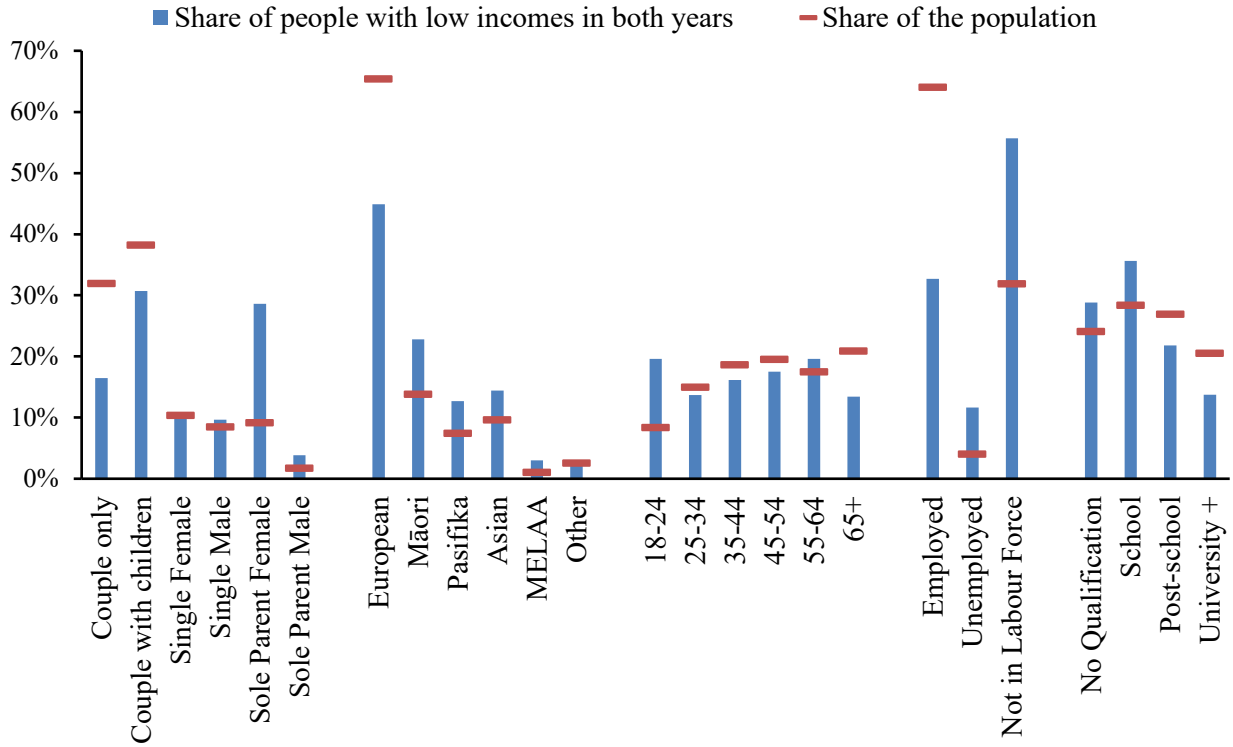


Table 3 Characteristics of Individuals More Likely to Have a Longer-Term Low Income: HLFS Sample in 2020 Compared With Census 2013

Characteristic	Share of population, (percentage) (1)	Share of the longer-term population (percentage) (2)	Ratio (2)/(1)
Sole parent female	8.8	32	3.61
Unemployed	4.1	12	2.92
MELAA	1.2	2.9	2.43
Sole parent male	1.5	3.2	2.09
Not in labour force	28.7	55	1.92
Pasifika	6.8	12.3	1.79
Māori	14.2	24.2	1.70
Asian	11.3	16.4	1.44
No qualifications	19.8	28.1	1.42
School graduates	29.3	36	1.23

Consider, for example, the low-income people in 2020 who were also in low income in 2013: see the panel B of Figure 18). Table 3 summarises the characteristics of individuals who were more likely to have a longer-term low income than the average population (that is, who had a ratio greater than one).

To further explore the characteristics of those who were likely to have a longer-term low income, the analysis in Figure 18 was replicated for different cohort groups over different time intervals: there were essentially indistinguishable patterns across samples, with the exception of some differences for young people as they transitioned from study to work.

Figure 19 provides an alternative way to identify people who are more likely to have a longer-term low income, applied for three FGT low-income measures. For instance, regarding the incidence measure, each number represents the proportion of people with certain characteristic having a longer-term low income, compared with the corresponding population. The average measures (derived for the entire population) are used as the benchmark to identify those with significantly higher longer-term low-income measures than the average values: these include, for example, sole parents, indigenous people, and those who are not-working.

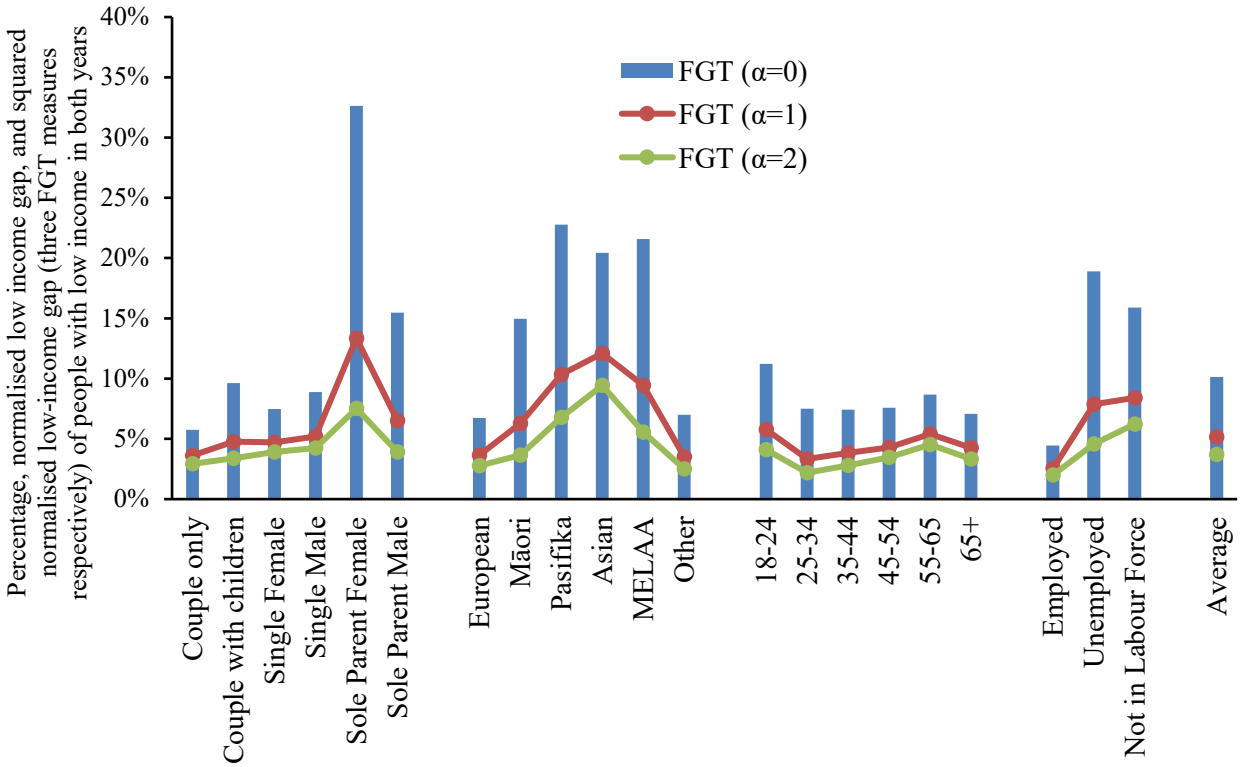
Consider low-income people in 2020 who were also below the relevant low-income threshold in 2013 (shown in panel B of Figure 19). The following characteristics were found to be associated with a higher likelihood of having a longer-term low income than the average population. For the incidence measure: sole parent female, unemployed people, MELAA, sole parent male, Pasifika, Māori, Asian,

people not in the labour force, and those without qualifications. For example, among all sole parent female families in 2013, 32 per cent had low income in both 2013 and 2020.

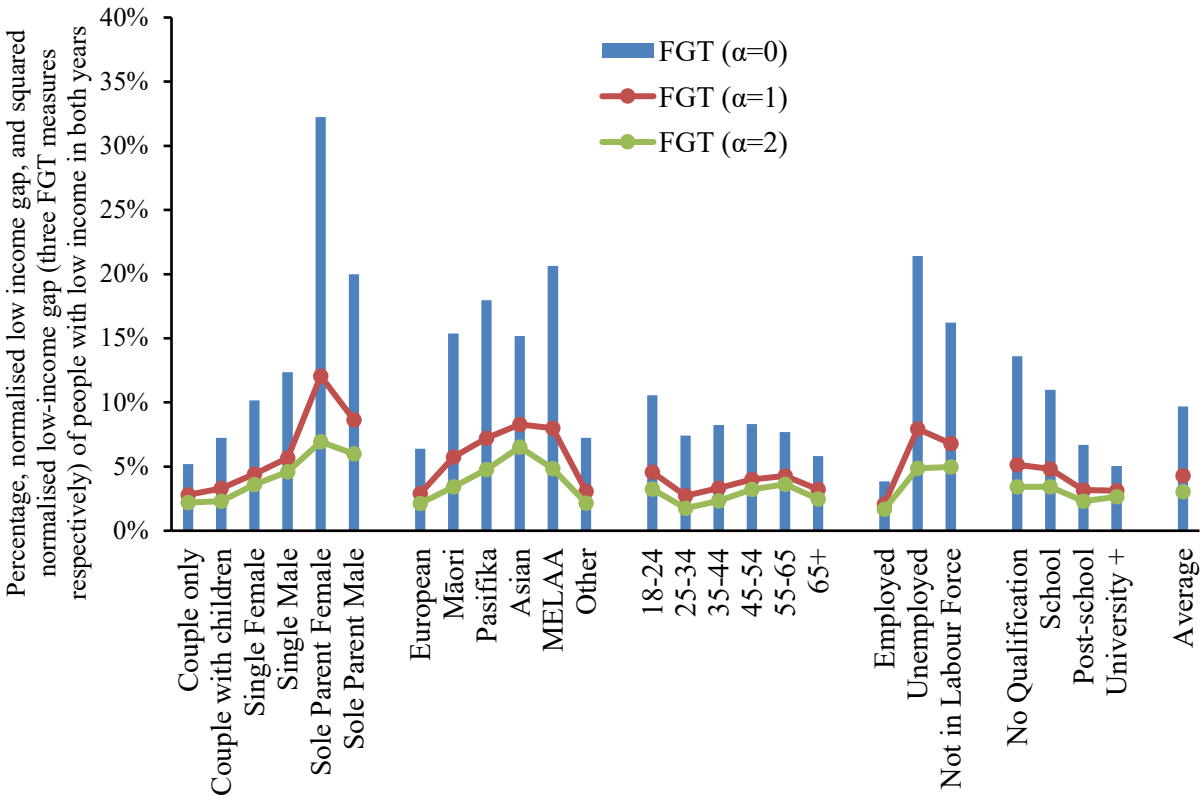
For the intensity measure: sole parent female, sole parent male, unemployed people, Asian, MELAA, Pasifika, people not in the labour force, Māori, and those without qualifications. Asians were found to have slightly higher longer-term low-income rates than Māori or Pacific people, according to this intensity measure. The latter populations were younger, had a higher proportion of sole-parent families, and lower qualifications than the average population, while the Asian respondents had a higher share of couple parent families: see Appendix Table 2.

Figure 19 Longer-term measures of low income

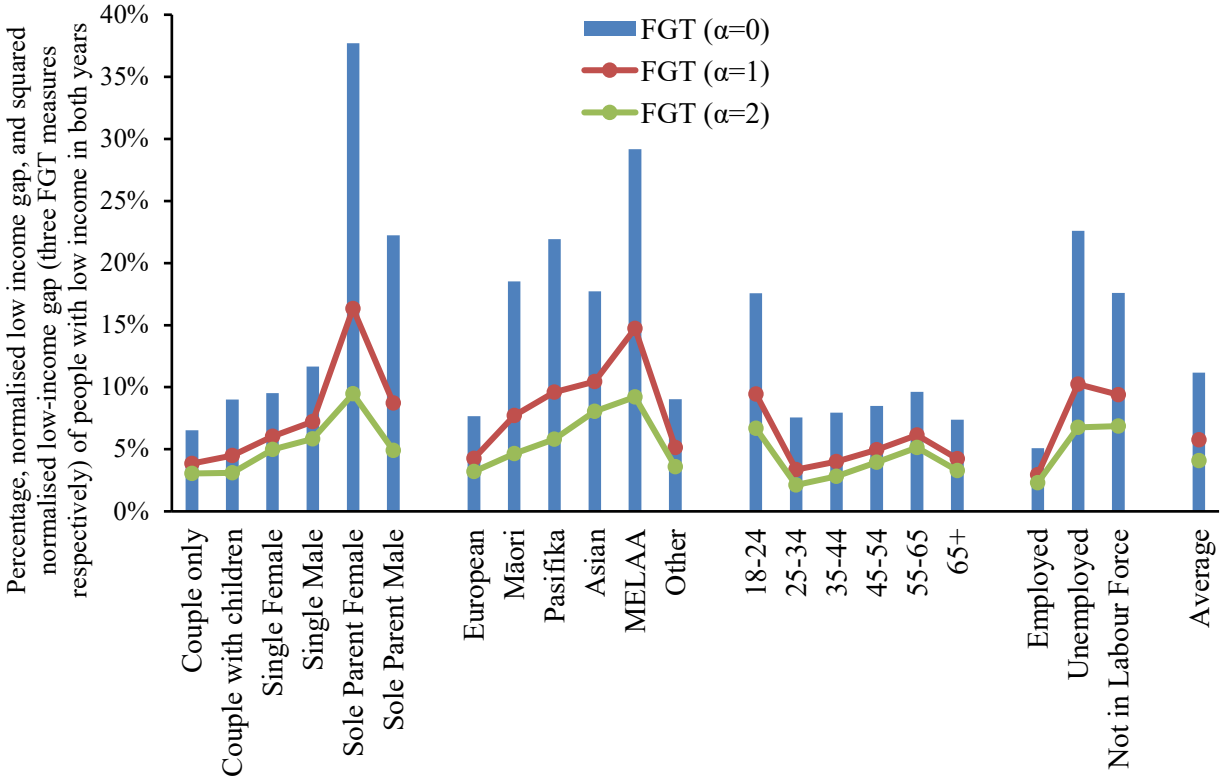
A. Sample 2007-2013



B. Sample 2013-2020



C. Sample 2009-2013



D. Sample 2013-2017

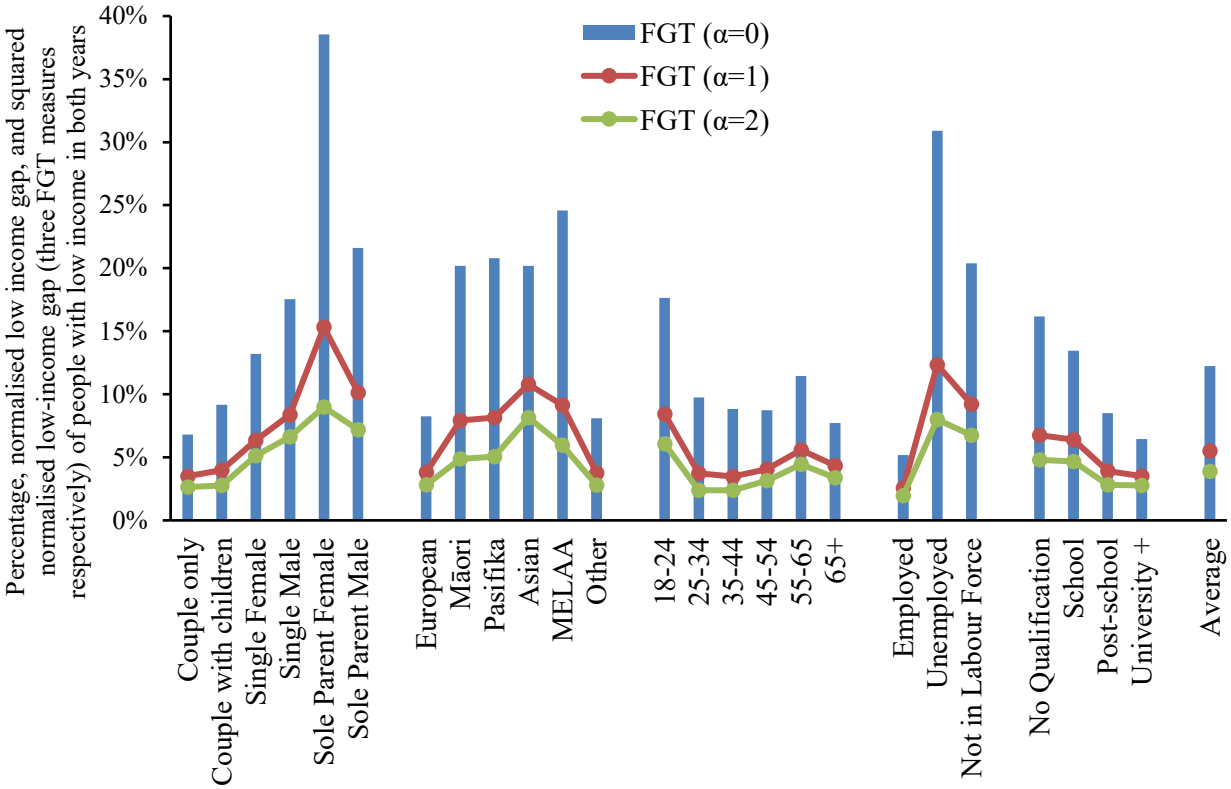


Figure 20 Temporary and Longer-Term Low-Income Incidence: 2013 and 2020

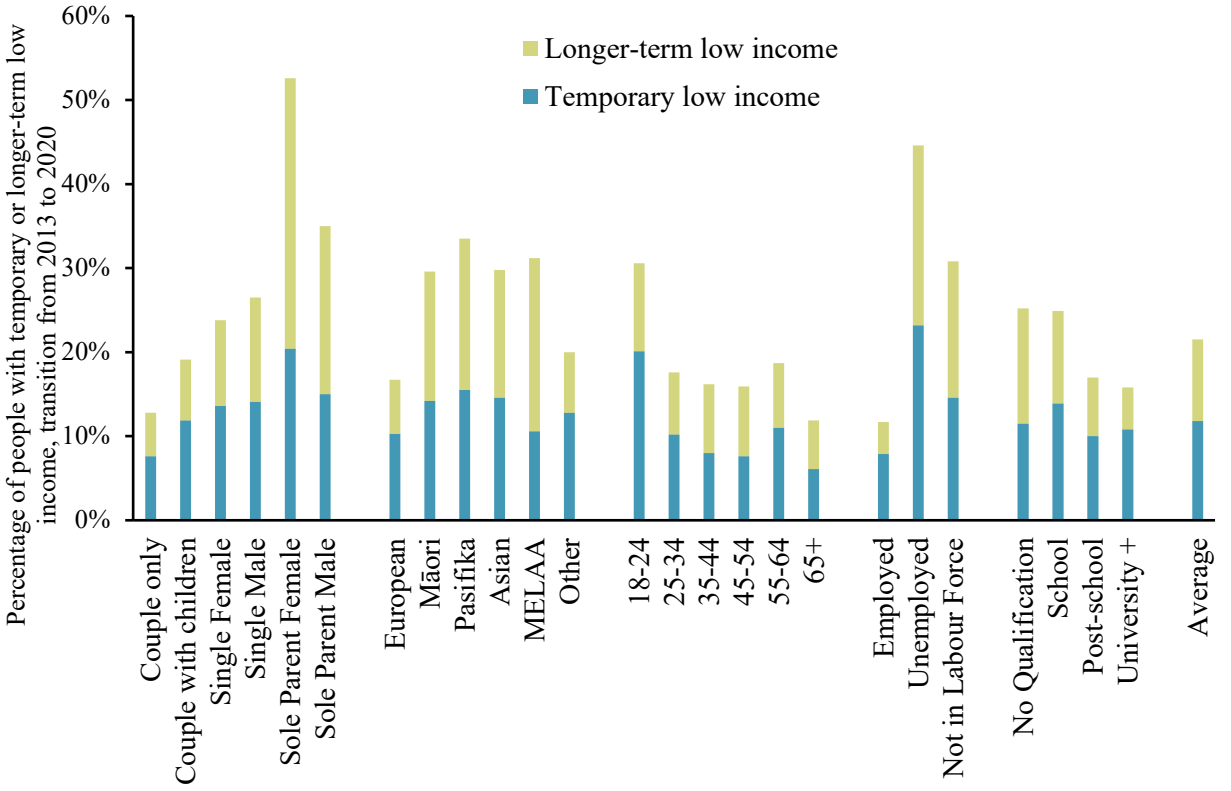
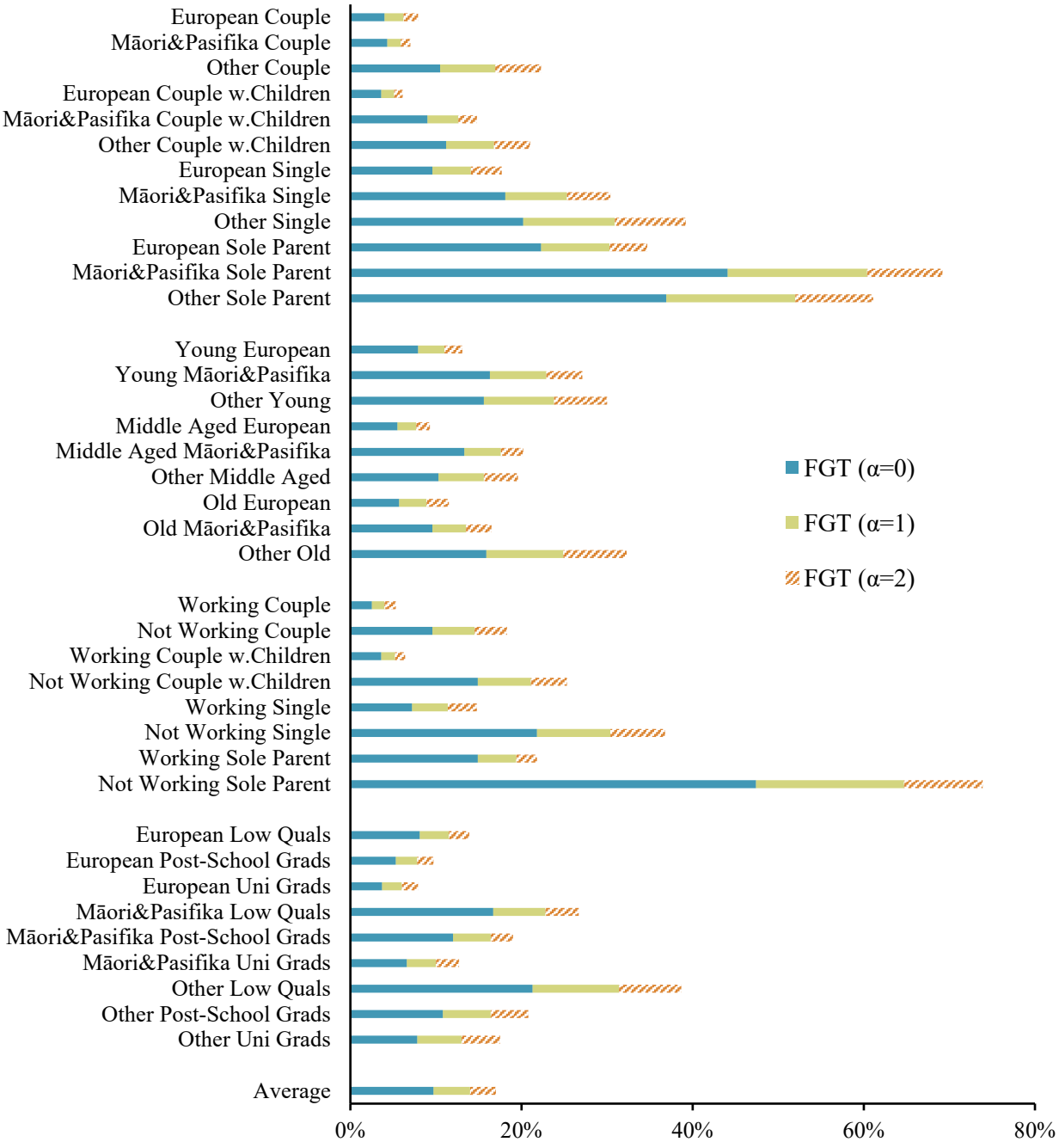


Figure 20 depicts decompositions of temporary versus longer-term low-income incidence across demographic groups, for the HLFS sample in 2020 who were traced back to the 2013 census. For those with low incomes at one point in time, the probability of having a longer-term low income increases. An exception is those aged 18-24 as they transfer from study to work. Again, not all people who were below the low-income threshold in one period also had low income in both periods, as there were substantial differences between the longer-term components and average low-income measures.

Figure 21 illustrates the longer-term measures of low income, applied to three FGT measures, decomposed by two characteristics for the HLFS sample in 2020. These decompositions help to identify the characteristics of people who were likely to experience a longer-term low income than the average population, including non-European sole parents and not-working sole parent families (whose low-income measures are far higher than the averages of the entire population).

Figure 21 Longer-Term Components of Low-Income Measures: 2013 and 2020



Percentage, normalised low-income gap, and squared normalised low-income gap (three FGT measures respectively) of people with low income in both years

6 Conclusions

This paper has used a special dataset to examine income mobility in New Zealand. The data were obtained by linking a number of Housing and Labour Force Surveys with the New Zealand census for 2013, in order to obtain information about families and individuals in two different years. The income or 'welfare metric' used was total family taxable income per adult equivalent person, where the family is restricted to one or more adults and, where relevant, dependents who are living at the same address at the time of the survey. The income unit was in all cases the individual, so that the income per adult equivalent person is allocated to each person in the family. Hence, in comparing incomes in two different years, the 'welfare metric' depends on the family to which the person belongs, and this may differ between years. The adult equivalent scales were based on a two-parameter specification which allows for differences between adults and children, as well as allowing for economies of scale within the family. Although it is not possible, because of exits and entries and other data problems, to link all individuals, the income distributions in each year were found to be similar to those for the full HLFS samples.

In examining relative income mobility, attention was restricted to transition matrices for inter-decile and inter-quintile movements. Hence, income changes which do not move the individual into a different decile or quartile are not recorded. Typically, over all quintiles and population groups, about half the individuals moved into another quintile over a four-year period, with about forty per cent remaining in the same decile over a period of seven years. However, more stability was found for those initially observed in lower and upper quintiles. Difference among various demographic groups were also examined. Although international comparisons raise difficulties caused by the use of different income measures, the findings are similar to those previously observed for a range of OECD countries, placing New Zealand roughly in the middle of the group.

The paper also examined the characteristics of individuals observed to be below a low-income relative threshold, set at fifty per cent of the median income per adult equivalent person in each relevant year. Adopting a class of three poverty measures, which reflect the incidence, the intensity and inequality among those with low incomes, differences among demographic groups were examined. The samples are large enough to allow for numerous categories. Furthermore, a decomposition of the poverty measures was used, in which two separate groups were identified. These are, the people who are below the threshold in just one year, and those below the threshold in two years (although, because the years are generally not consecutive, it is not known how many individuals rose above, and then fell back into, the low-income threshold). The present paper therefore provides an initial exploratory analysis of a new rich dataset, using descriptive measures to explore differences between demographic groups in their mobility and low-income characteristics.

Appendix: Further Data

Appendix Table 1. Variable Descriptions

Variable	Description
Adult	Individuals aged 18 or above.
Children	Individuals aged under 18.
Family type	Couple only; couple with children; single female; single male; sole parent female; sole parent male.
Age group	18-24; 25-34; 35-44; 45-54; 55-64; 65 and over.
Ethnicity	One of the following ethnic groups prioritised by Māori; Pasifika; Asian; European; MELAA (Middle Eastern, American, and African); and Other (unidentified).
Working status	Employed; unemployed; not in the labour force.
Highest education	No Qualification; School (NCEA levels 1 – 3); Post-School (NCEA levels 4 – 6); University+ (NCEA level 7 or higher). Data for education are available from 2013 onwards.
Occupation	managers; professionals; technicians and trades; community and personal services; clerical and administrative; sales; machinery operators and drivers; labourers. Data for occupation are available from 2009 onwards.
Two-way decomposition: To generate two-way decomposition outputs, we need to recategorize the following variables of interest into fewer subgroups based on their counts and similarities; particularly:	Family types: Couple Only; Couple with Children; Single; and Sole Parent
	Ethnic groups: European; Maori & Pasifika; and Other (Asian, MELAA, and other ethnics).
	Age groups: Young (aged <35); Middle-Aged (aged 35-54); and Old (aged 55+)
	Working status: Working (Employed); and Not Working (Unemployed and Not in Labour Force)
	Highest qualification: Low Qualification (No Qualification & School); Post-School Graduates; and University Graduates (Uni Grads and Postgrads).

Note: Characteristics were observed in the first year of each two-year panel.

Appendix Table 2. Characteristics of the HLFS Sample in 2020 by Ethnicity

	% by column	European	Māori	Pasifika	Asian	MELAA	Other
Couple Only	32.5	37.5	19.9	17.9	28.7	19.9	39.2
Couple with Children	32.7	29.5	34.5	37.7	44.6	50.0	30.3
Single Female	14.4	15.1	14.3	14.8	11.5	13.4	10.6
Single Male	11.3	11.4	11.7	12.7	9.7	8.5	11.5
Sole parent	9.0	6.5	19.6	16.9	5.6	8.2	8.3
Total	100	100	100	100	100	100	100
0-17	17.2	13.7	26.9	27.7	18.5	20.9	17.2
18-24	8.0	6.6	10.6	14.8	8.4	10.5	6.2
25-34	11.0	9.6	13.5	14.0	13.9	13.4	11.2
35-44	12.4	11.1	12.3	11.6	19.7	21.9	10.3
45-54	15.3	15.8	13.7	11.8	16.5	16.7	16.3
55-64	15.1	16.8	11.7	9.9	12.4	9.8	21.8
65+	21.0	26.5	11.4	10.2	10.6	6.9	17.0
Total	100	100	100	100	100	100	100
Employed	64.7	64.4	64.3	58.7	68.3	66.0	73.1
Unemployed	2.8	2.0	4.8	5.7	3.7	4.7	2.4
Not in Labour Force	32.5	33.7	31.0	35.5	28.0	29.3	24.4
Total	100	100	100	100	100	100	100
No Qualification	19.8	19.0	27.5	31.4	11.1	10.3	17.5
School	29.3	27.7	32.3	40.7	30.0	28.5	28.0
Post-School	25.7	28.4	23.8	17.5	16.8	22.1	24.8
University+	25.2	25.0	16.4	10.4	42.1	39.1	29.7
Total	100	100	100	100	100	100	100

Note: All numbers are in percentages. Unreported counts in blue are smaller than 50 individuals.

Appendix Table 3. Characteristics of the HLFS Sample in 2020 by Income Quintile

	% by column	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Couple Only	32.5	17.1	40.2	24.9	33.2	47.0
Couple with Children	32.7	23.3	17.9	46.4	44.7	33.1
Single Female	14.4	18.2	23.4	10.4	9.7	9.3
Single Male	11.3	17.4	11.5	9.9	9.3	8.4
Sole Parent Female	7.5	21.1	6.0	6.3	2.3	1.5
Sole Parent Male	1.5	2.9	1.0	2.1	0.8	0.7
Total	100	100	100	100	100	100
0-17	17.2	22.9	10.7	21.8	17.9	13.4
18-24	8.0	18.9	5.1	9.7	5.1	0.8
25-34	11.0	10.0	5.3	14.2	14.4	11.7
35-44	12.4	10.6	6.5	15.0	15.8	15.0
45-54	15.3	11.8	5.6	13.9	20.3	26.5
55-64	15.1	15.8	5.8	13.1	17.8	24.4
65+	21.0	9.9	61.1	12.3	8.8	8.3
Total	100	100	100	100	100	100
European	64.3	52.0	70.7	60.7	63.9	73.8
Māori	14.2	20.5	11.6	15.2	13.8	9.8
Pasifika	6.8	9.6	6.9	9.1	5.6	2.8
Asian	11.3	13.9	8.3	11.9	12.5	10.4
MELAA	1.2	1.8	0.8	1.1	1.3	1.1
Other	2.2	2.2	1.8	2.2	2.8	2.1
Total	100	100	100	100	100	100
Employed	64.7	41.7	28.3	79.4	88.7	90.9
Unemployed	2.8	8.4	1.9	2.0	1.2	1.0
Not in Labour Force	32.5	49.9	69.8	18.6	10.1	8.2
Total	100	100	100	100	100	100
No Qualification	19.8	23.5	32.3	18.0	14.7	8.4
School	29.3	38.8	26.9	32.7	26.8	22.6
Post-School	25.7	21.3	25.8	28.3	28.3	24.7
University+	25.2	16.5	15.0	21.0	30.2	44.2
Total	100	100	100	100	100	100

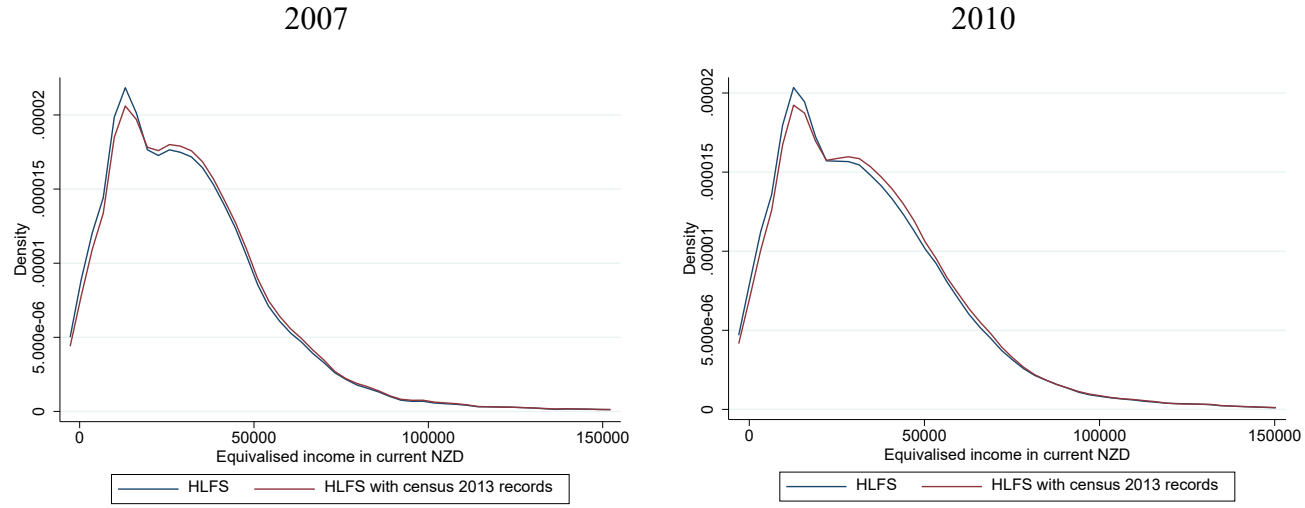
Note: All numbers are in percentages.

Appendix Table 4. Means and Medians of Equivalised Income by Income Decile

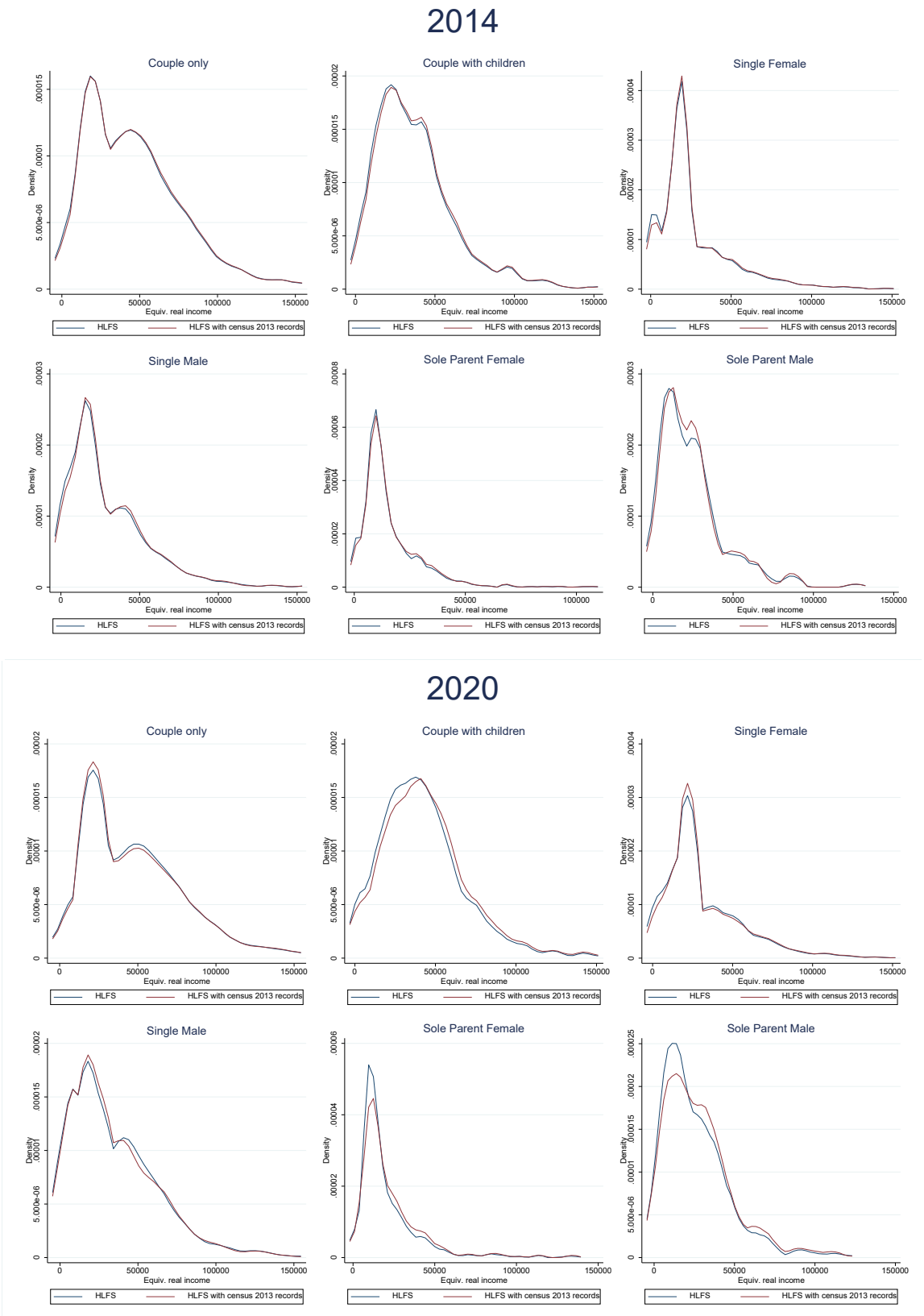
	2007-2013 sample				2013-2019 sample			
	2007		2013		2013		2019	
Decile	mean	median	mean	median	mean	median	mean	median
bottom	2494.5	1900.3	3086.3	2693.0	3119.7	2799.0	4781.1	5261.4
2	8808.1	8751.9	10191.4	10019.5	10220.2	10168.1	14122.2	14342.2
3	13228.7	13581.0	15136.3	14955.0	15168.3	14955.0	20546.7	20933.9
4	15901.8	16016.6	19281.4	19102.0	19261.9	19102.0	24512.8	24058.0
5	18952.6	18959.1	23005.9	22958.0	22994.3	22947.9	31943.1	32095.6
6	24272.8	24363.6	29265.4	29359.4	29272.1	29359.0	40281.8	40305.9
7	30482.3	30491.6	36930.4	36961.5	36951.6	36977.5	48866.6	48820.5
8	37524.8	37379.2	45383.0	45307.2	45419.1	45381.1	59157.6	58951.3
9	47343.6	46892.9	57786.7	57288.5	57789.5	57304.3	74179.8	73723.6
top	77808.2	68382.8	95357.1	84046.0	95405.7	84129.0	124121.7	106115.1

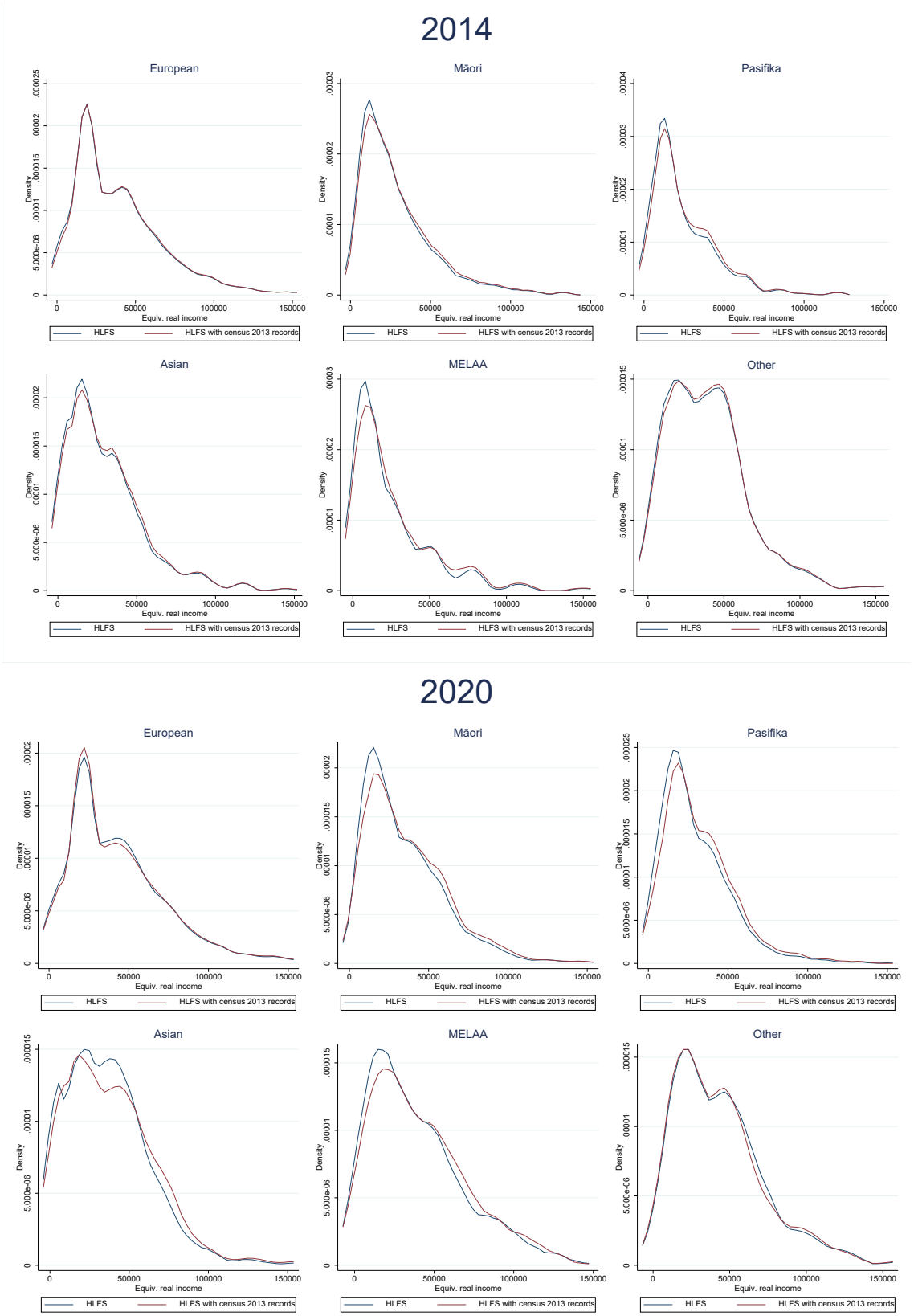
Note: Incomes are in current NZ dollars.

Appendix Figure 1. Equivalised Real Income Distributions: Working-Age Population 18-65



Appendix Figure 2. Equivalised Real Income Distributions by Family Type and Ethnicity




2014
European
Māori
Pasifika
Asian
MELAA
Other
Density
Equiv. real income
HLFS
HLFS with census 2013 records
2020
European
Māori
Pasifika
Asian
MELAA
Other
Density
Equiv. real income
HLFS
HLFS with census 2013 records

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