

## Exploring trends in income inequality in New Zealand (2007–2023)

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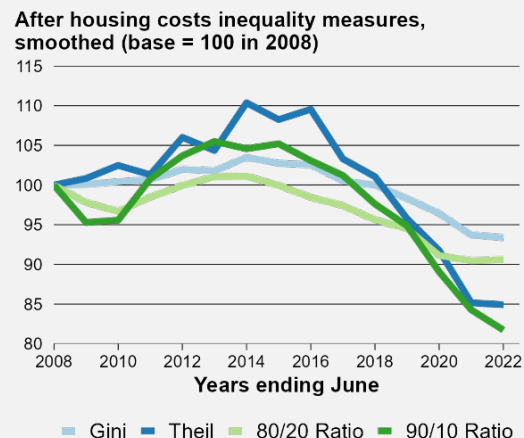
A technical report containing additional plots and the underlying data is available here: <https://treasury-analytics-and-insights.github.io/analytical-note-24-10-income-inequality-trends/analytical-note-24-10-income-inequality-trends.html>

### Key insights

This report investigates changes to income inequality in New Zealand over the period from 2007 to 2023. We find that income inequality increased to approximately 2013, and then declined, with lower inequality at the end of the period than at the start.

In this analytical note, we focus on the Theil index and exploit its decomposability to investigate how changes to incomes within and between different household types contributed to changes in overall inequality. We find that:

- Income gaps are narrowing between multi-adult households with and without children.
- Overall inequality decreased largely due to reduced income gaps between household types, and more similar incomes among multi-adult households, both with and without children.
- The contribution of single households without children to overall inequality is small, despite the higher level of inequality among these households. This is a result of these households being only a small segment of the total population.



We also explore how senior working patterns and living arrangements are changing, and what impact this is having on senior inequality. We find that:

- Seniors are increasingly working past the age of superannuation eligibility and sharing accommodation with adults other than their partners.
- Inequality among households with non-working seniors is decreasing, both for those living alone and with adults other than their partners.
- While overall inequality decreased for senior households, there is increasing inequality between seniors in different household types categorised by working and living arrangements.

By decomposing population level income inequality, we gain insights into why common perceptions about movements in income inequality are sometimes contradictory to the decreases we have observed in income inequality measurements over recent years.

## Introduction

Income inequality is a key policy concern in New Zealand. While national-level inequality data is regularly reported, understanding its changes requires examining trends within and between different population subgroups. To help fill data gaps on inequality in New Zealand, this analysis explores income inequality patterns from 2007 to 2023, focusing on variations across different household types.<sup>1</sup>

### Income definition and inequality measures

Incomes can be compared across individuals using household equivalised disposable income (HEDI), where equivalisation<sup>2</sup> allows for comparisons of income across different household sizes and compositions. Disposable income is the income received by a household after taxes and government transfers and can be considered either before or after deducting housing costs. Income sources include wages, salaries, self-employment, interest, dividends, government benefits, and other transfers. They do not include income that is not taxed or realised, meaning some returns from capital are not included. To measure inequality over all individuals in the population, we assign the HEDI calculated for a household to each member of the household. This accounts for different household sizes and compositions.

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<sup>1</sup> See Stephens (2023) and Symes (2021) for recent Treasury Analytical Notes on income and wealth inequality, respectively.

<sup>2</sup> We calculate the HEDI using modified-OECD equivalisation (Hagenaars *et al.*, 1994).

In this note, we focus on the Theil index measure of inequality and exploit the way it can be decomposed. However, there are a range of measures that can be used to assess income inequality. To test the sensitivity of the levels and trends in income inequality to the choice of measure, we compare the Theil index to some common inequality measures.

Gini coefficient <sup>3</sup>	The Gini coefficient measures income inequality by comparing cumulative shares of the population to the cumulative share of income they receive. A higher coefficient indicates greater inequality.
90/10 and 80/20 income ratios	The 90/10 ratio is the ratio of the 90 <sup>th</sup> percentile of incomes over the 10 <sup>th</sup> percentile. The 80/20 ratio is the 80 <sup>th</sup> percentile of incomes over the 20 <sup>th</sup> percentile. Higher ratios indicate greater income inequality. These ratios offer a perspective on the extremes of the income distribution.
Theil index <sup>4</sup>	<p>The Theil index measures inequality by comparing incomes in a population to the average income. A higher value of the Theil index indicates more inequality. As with other inequality measures, we can calculate the Theil index for a group in a population in the same way that we calculate it for the population. However, the Theil index is also decomposable. This means we can use it to determine how inequality within and between different groups in the population contribute to the Theil index of the whole population.</p> <ul style="list-style-type: none"> <li>• Within-group inequality refers to the contribution of inequality within a group to the level of inequality in the population. It is determined by calculating the Theil index of the group independently to determine the level of inequality within the group, and then weighting this inequality by the group’s total income. Holding income shares constant, a group with a more unequal income distribution will have a larger contribution to the population Theil index. Holding inequality within groups constant, a group with a higher share of total income will have a larger contribution to the population Theil index.</li> <li>• Between-group inequality refers to the contribution of inequality between different groups to the level of inequality in the population. It is determined by comparing the average incomes of groups to the average income of the population. The greater the differences between group incomes and the population average, the larger the contribution of between-group inequality to the population Theil index. Between-group inequality is also weighted, so that groups with larger shares of the population income contribute more to the population Theil index.</li> <li>• The population Theil index is the sum of all the within-group contributions and the between-group contribution.</li> </ul>

<sup>3</sup> Description adapted from Stats NZ (2024a).

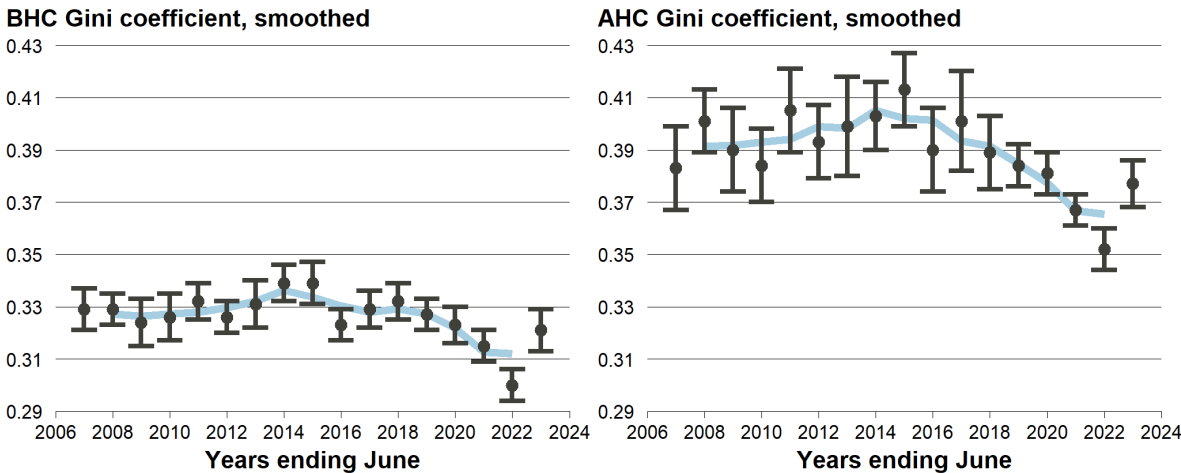
<sup>4</sup> Described in Theil (1967). See the appendix of this note for detailed formulae. See Conceicao & Ferreira (2000) for an intuitive explanation of the Theil index starting with the two-group case.

## Trends in inequality

In Figure 1, we show point estimates of the Gini coefficient for New Zealand over the period from 2007 to 2023. We present these estimates along with a smoothed trendline, which we obtain by taking a three-year rolling average over the point estimates.<sup>5</sup> These trendlines suggest that income inequality in New Zealand increased from 2008 to the mid-2010s and then decreased, with inequality lower in 2022 than in 2008.

Figure 1 suggests that income inequality, both before and after deducting housing costs, was lower in the year ending June 2022 than in all other years of the period studied. However, as noted by Stats NZ (2024a), estimates of the Gini coefficient made using the 2022 Household Economic Survey (HES) are likely to be biased due to COVID-19 related survey collection disruptions.<sup>6</sup> When we exclude estimates for 2022 and analyse the trends, we find evidence supporting a rising and falling pattern for income inequality, both before and after deducting housing costs. We find that income inequality peaks between 2012 and 2013 and falls to lower levels in 2023 than in 2007. More details on the statistical significance of these and subsequent results are provided in the appendix.

**Figure 1: Gini coefficient for New Zealand, before housing costs (BHC) and after housing costs (AHC)**

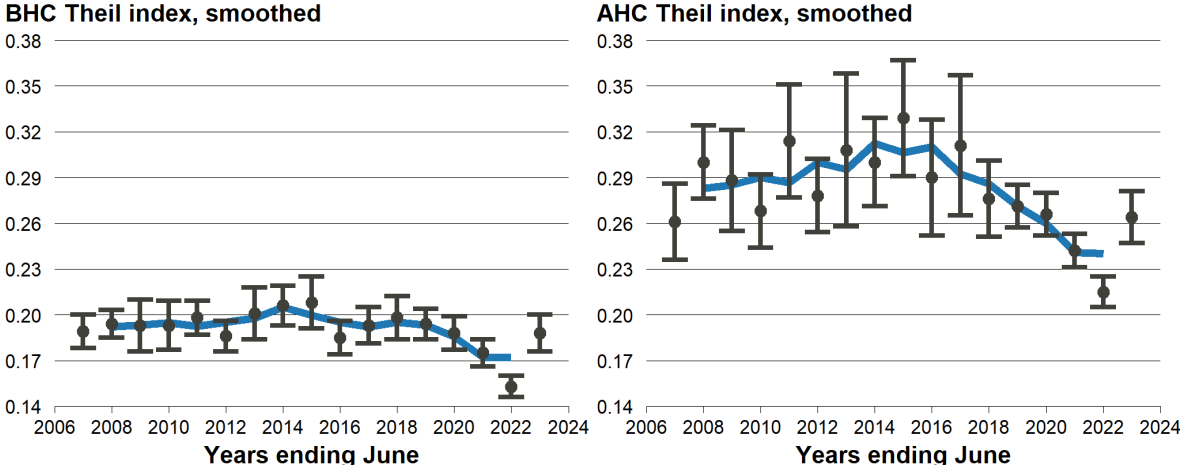


In Figure 2, we show point estimates of the national Theil index for the New Zealand population, along with a smoothed trendline. Over the period from 2007 to 2023, we find that the rising and falling pattern is only significant after housing costs are deducted. In this case, income inequality peaks between 2012 and 2013, and falls to a lower level in 2023 than in 2007.

<sup>5</sup> Because smoothing requires three adjacent point estimates, trendlines are only estimated from 2008 to 2022. Smoothed trendlines in this note are taken over all estimates from 2007 to 2023.

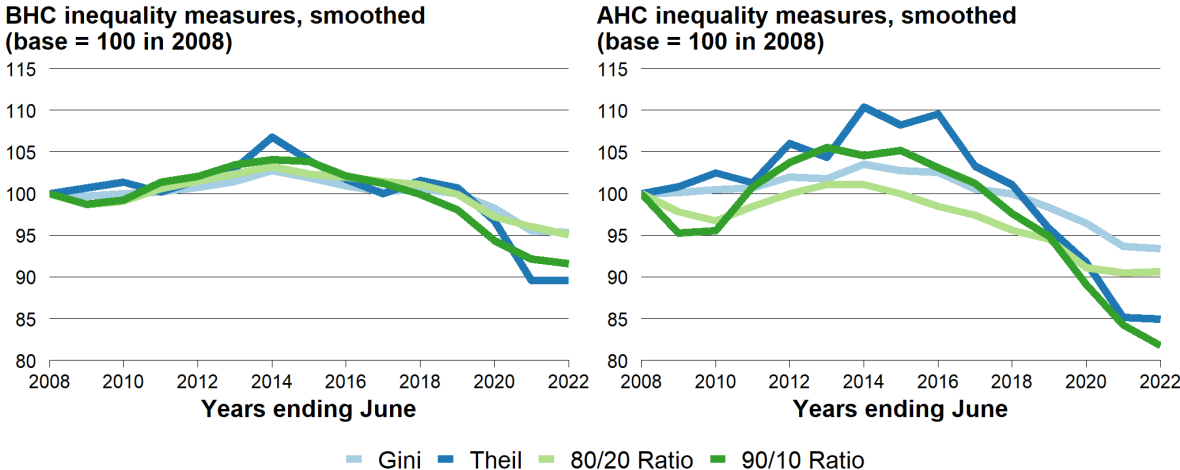
<sup>6</sup> See Stats NZ (2023) for a description of the COVID-19 related collection issues with HES 2022.

**Figure 2: Theil index for New Zealand**



Figures 1 and 2 suggest that income inequality was higher after deducting housing costs throughout this period. Meanwhile, Figure 3 demonstrates that after housing costs inequality has decreased by a proportionately greater amount over the period of interest. This may suggest that, while housing costs have a disequalising effect on incomes, the strength of this disequalising effect has decreased over the period studied.<sup>7</sup>

**Figure 3: Trends in income inequality measures**



Finally, Figure 3 demonstrates that observed movements in the Theil index are similar to those in other commonly used inequality measures over the period. This consistency between measures gives us confidence in the Theil index, which we will use to decompose inequality. This will allow us to identify how changes to income inequality within and between individuals in different household groups contributed to the changes in income inequality observed in New Zealand.

<sup>7</sup> However, because these inequality measures are nonlinear, interpreting the relative change between before and after housing cost inequality may be less straightforward.

# Inequality by household composition

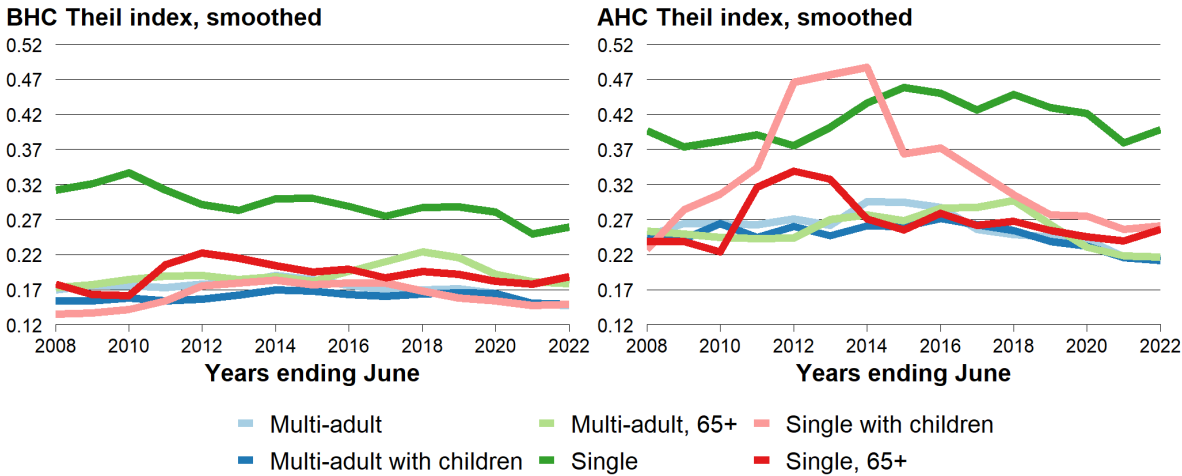
We start by disaggregating the population of New Zealand into the following groups based on household composition:<sup>8</sup>

	Adults	Children (0-17)	Seniors (65+)
Multi-adult	2 or more		
Multi-adult with children	2 or more	✓	*
Multi-adult, 65+	2 or more		✓
Single	1		
Single with children	1	✓	*
Single, 65+	1		✓

\* These households may include seniors though most do not

In this section, we seek to show how the inequality of incomes between individuals from the same household type (ie, within-group Theil inequality), and the inequality of incomes between individuals residing in different household types (ie, between-group Theil inequality), contribute to the national Theil index inequality for New Zealand as presented in Figure 2.

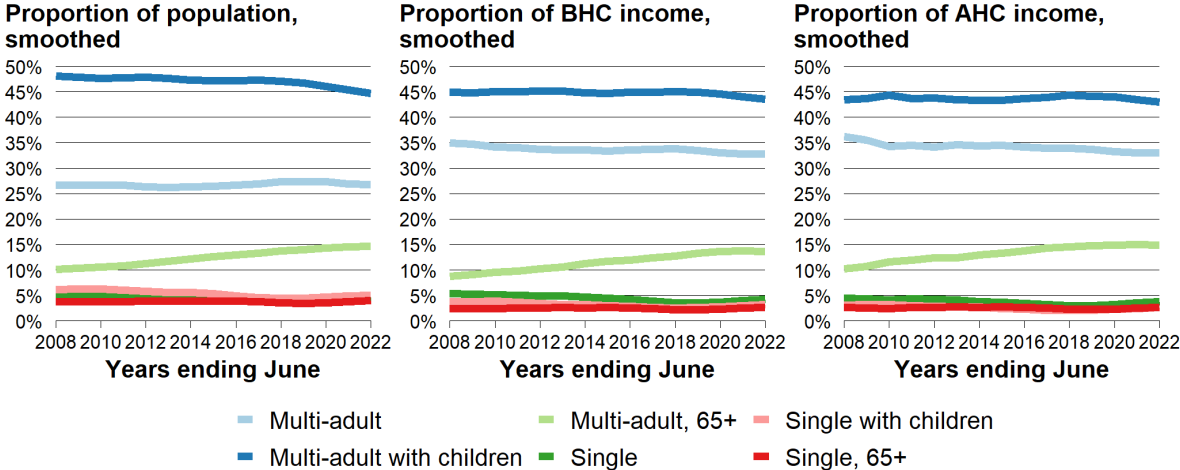
**Figure 4: Theil index of household types**



The within-group contribution of each group to the national Theil index depends on both the level of inequality within a group, and the share of the population’s total income that the group receives. In Figure 4, we apply the Theil index separately to each household group. This figure suggests there are some differences in the income inequality levels of different household types. Before housing costs inequality is higher among people in single adult households than for those in other household types over this period. Income inequality levels can differ between household types for many reasons, including differences in the spread of demographic factors within household types. For example, the age profile of single households without children is likely more varied than that of other household types.

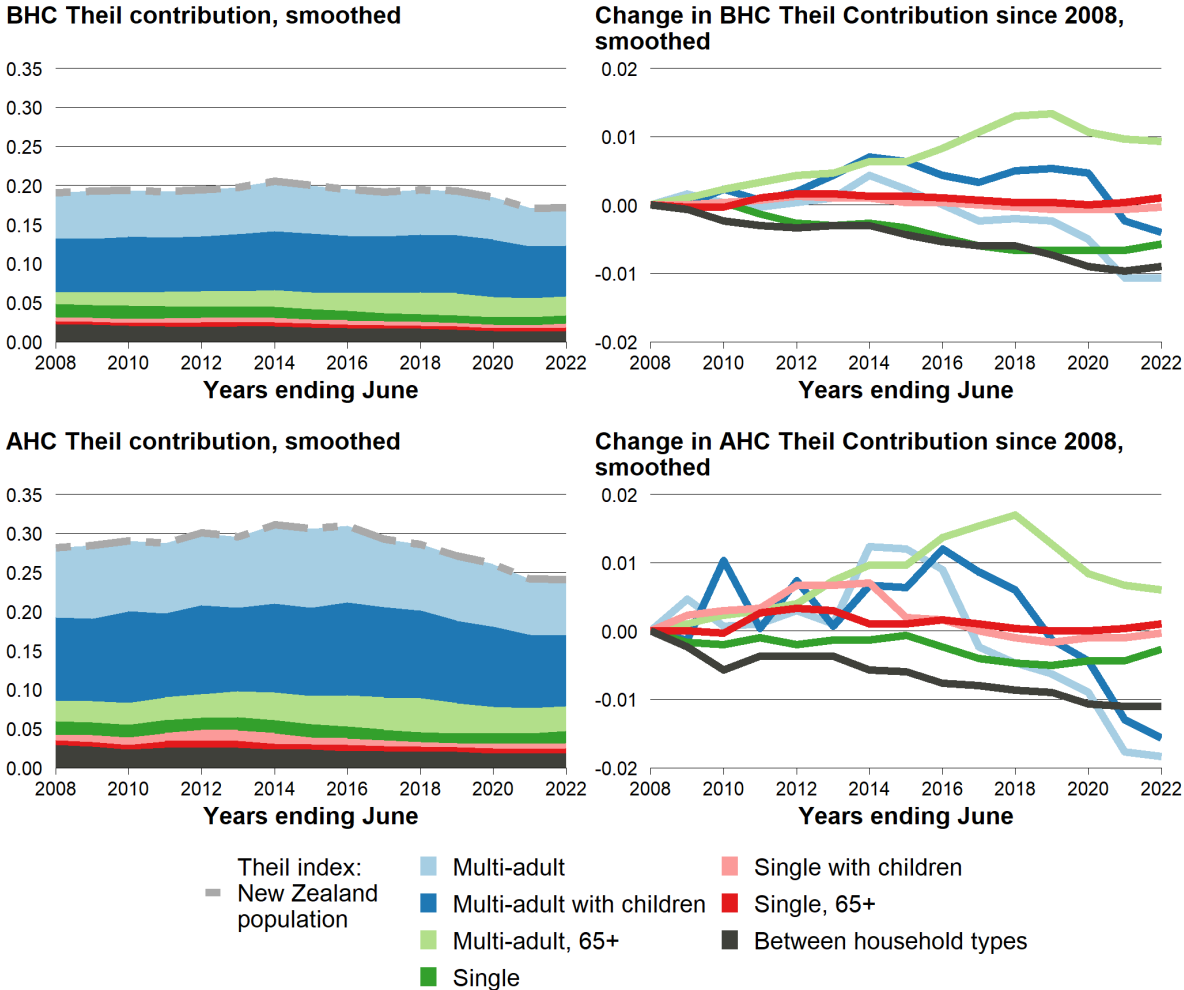
<sup>8</sup> These groups are mutually exclusive. All households that include children are either single with children households or multi-adult with children households, even if they include people aged 65 or over.

**Figure 5: Population and income shares of household types**



The contribution of between-group inequality to the national Theil index depends on how different average incomes are between groups. In Figure 5, we show the population shares of the different household types, as well as the share of total equivalised income received by individuals in each household type. Average incomes differ between groups when the population share of each group is different from the share of income received by the group. Figure 5 illustrates that individuals in multi-adult without children households have a much higher share of total income than their share of the population, indicating above average incomes for this group. Meanwhile, individuals in multi-adult with children households have a slightly lower share of income than their share of the population across the period studied, indicating slightly below average incomes. This figure shows that there is some level of income inequality between household groups.

**Figure 6: Contribution of inequality within and between household types to the New Zealand Theil index**



In Figure 6, we illustrate how these within- and between-group income inequalities combine to give the national Theil index inequality. The left-hand side panels in Figure 6 illustrate that national inequality, before and after housing costs, is dominated by within-group inequality among individuals in multi-adult households both with, and without, children. This reflects that, as Figure 5 shows, these groups receive the largest shares of the population’s income. While Figure 4 showed that there was higher before housing costs inequality among people in single without children households, the small income share of this group means that it makes only a small contribution to the national Theil index. Figure 6 shows that inequality between different household types is only a moderate contributor to national inequality.

The right-hand side panels of Figure 6 illustrate how contributions to the national Theil index have changed since 2008. These panels suggest that inequality between household types decreased steadily between 2008 and 2022. We can see that decreased between-group inequality is consistent with Figure 5, which shows that income shares have been converging towards population shares over time. Although it is difficult to see from Figure 5, the average incomes of individuals in multi-adult without children households have grown slower than those of people in multi-adult with children households, decreasing the differences in average incomes, and thus inequality, between these groups over time.



The contributions of within-group inequality from individuals in multi-adult households both with and without children appear to follow similar rising and falling patterns to the national Theil index. Figure 6 shows that the contribution of individuals in multi-adult households with seniors to before housing costs inequality increased over this period, while the contribution of individuals in this group to after housing costs inequality appears to have had a rising and falling pattern.

Decomposing the Theil index for New Zealand by household groups demonstrates how the various changes to within-group and between-group inequality resulted in the rising and falling pattern observed in inequality at the national level. This decomposition also shows that decreased national inequality by the end of the period, both before and after deducting housing costs, was primarily a result of decreased inequality between individuals in different household types, and among individuals in multi-adult households with children and in multi-adult households without children. The decrease in inequality among individuals in single without children households was also a large contributor to the decrease in before housing costs inequality. Decreasing inequality was offset through much of the period by trends in multi-adult with senior households. These households had an increased contribution to inequality largely due to their increasing income share, visible in Figure 5, rather than due to changes to inequality within the group. The relatively small contribution of inequality between household types to overall income inequality in New Zealand suggests that other factors, such as employment, education, or geography, may be more substantial contributors to overall income inequality than household structure.

Decomposing the Theil index allows us to speculate about some of the potential causes of decreased inequality in New Zealand. As we have seen, decreased within-group and between-group inequality by the end of the period is largely a result of changes to incomes among individuals in multi-adult households, both with and without children, and between these household types. Multi-adult with children household incomes have increased relative to other household types, while inequality within this group decreased. This may be a result of increases to Working for Families tax credits and benefit levels towards the end of this period. Meanwhile, multi-adult without children household incomes have decreased relative to other household types, while inequality within this group decreased. While explanations for this change are not obvious in our data, factors like fiscal drag, changes to usual hours in work, or changes to skills and earnings potentials, are possible areas for further research.

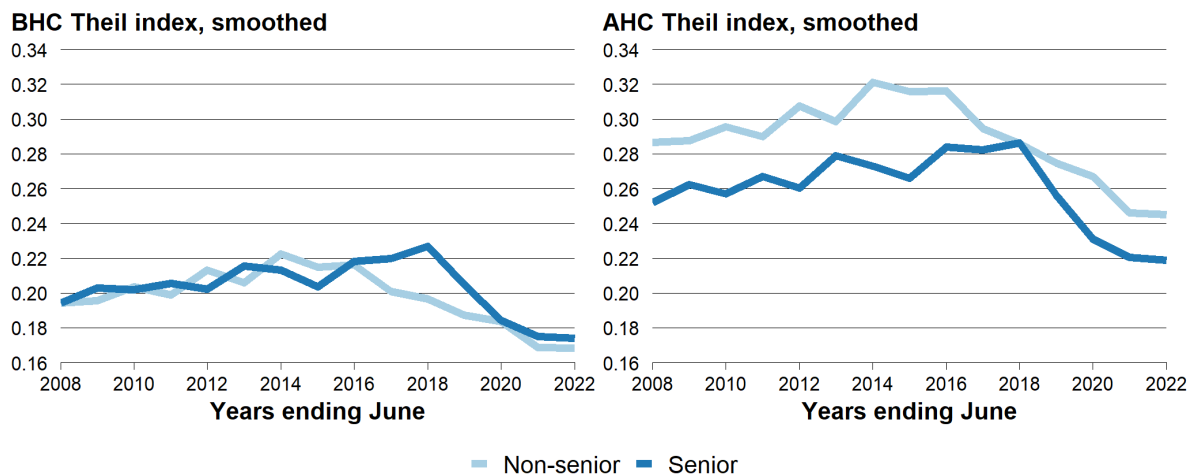
## Senior inequality by working and living arrangements

Over the period from 2007 to 2023, there was both a substantial increase in the proportion of people at or above the age of superannuation eligibility,<sup>9,10</sup> and in the labour force participation rate of people in this age group.<sup>11</sup> In this section, we investigate the senior population to understand what effect demographic changes have had on income inequality for seniors. First, we disaggregate the New Zealand population into the following age-based groups:<sup>12,13</sup>

- Non-senior: Household with no members aged 65 or over.
- Senior: Household with at least one member aged 65 or over.

Figure 7 suggests that inequality for individuals in both senior and non-senior households followed similar rising and falling patterns as seen in Figure 2 for the national Theil index.

**Figure 7: Theil index of senior and non-senior households**



Our analysis suggests that the share of the population living in senior households has increased steadily over the period studied. Further, the share of income that goes to individuals in each of the two household types is very close to their respective shares of the population. As a result, inequality between individuals in senior and non-senior households makes almost no contribution to the national Theil index for New Zealand, with national inequality instead dominated by within-group inequality. Figures supporting these findings are provided in the technical report.

<sup>9</sup> Stats NZ (2024b) report that the 65+ population increased from 12.4% of the total population in the year ending June 2007 to 16.5% in 2023.

<sup>10</sup> The age of superannuation eligibility is 65 years old throughout the period. Some seniors are ineligible due to factors like residency requirements, which have become more stringent over time.

<sup>11</sup> Stats NZ (2024c) estimate that the labour force participation rate for the 65+ population increased from 13.7% in the year ending June 2007 to 25.9% in 2023.

<sup>12</sup> These groups are mutually exclusive. Households in either group may contain children.

<sup>13</sup> A limitation to consider when using the HES to study seniors is that it targets the usually resident individuals of private dwellings. It does not include people who live in homes for the aged. Stats NZ (2024d) estimate that, in 2023, 91,480 people lived in non-private dwellings. Moore *et al.* (2024) report that around 32,000 New Zealanders live in Aged Residential Care facilities. These figures should be compared to an estimated 65+ population in 2023 of 868,700 (Stats NZ, 2022), and a 2023 population of 1,159,000 people living in households that contain people 65+ in our data.

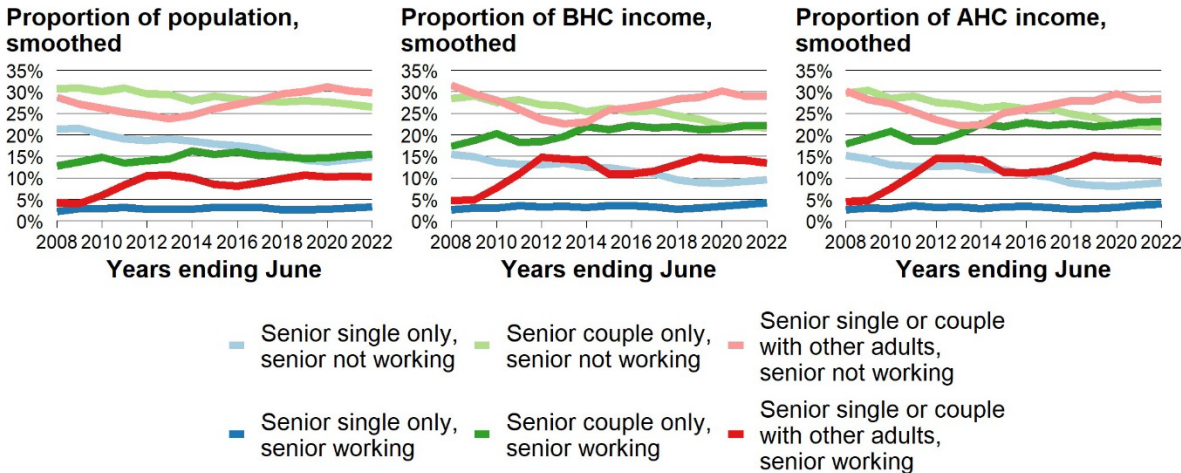
In the following section, we restrict the population of interest to individuals in senior households only. The equivalent of the national Theil index in the previous section is now the senior Theil index, which is presented as the senior line in each panel of Figure 7. Upcoming Theil decompositions show how inequality within and between different senior household types contributed to these observed senior Theil indices.

We disaggregate the population of individuals living in households with seniors into groups based on senior working and living arrangements:<sup>14, 15</sup>

	Senior Single	Senior Couple <sup>16</sup>	Sharing with other adults	Working senior(s)
Senior single only, not working	✓			
Senior single, working	✓			✓
Senior couple only, not working		✓		
Senior couple only, working		✓		✓
Senior single or couple with other adults, senior not working	✓		✓	
Senior single or couple with other adults, senior working	✓		✓	✓

As income inequality levels are similar for different senior household types across the period studied, we do not include a figure of the Theil indices for these different household types.

**Figure 8: Population and income shares of senior household types**



<sup>14</sup> Non-working seniors are seniors who are retired or otherwise not in the labour force, unemployed, or who did not respond to the labour force participation question in the HES survey.  
<sup>15</sup> Adults are people aged 18 years and older, while seniors are people aged 65 years and older. All household types listed may include children.  
<sup>16</sup> A senior couple is a couple where at least one member is 65+.

In Figure 8 we show that the proportion of people living in households with working seniors has increased over this period. Further, this figure shows that the proportion of people living in households where seniors live with adults other than their partners has also increased.<sup>17</sup> Together, these changes may suggest that seniors are increasingly less likely to live alone or not work. However, these changes may be the result of a change in the age distribution of seniors, or changes to the compositions of different senior household types. Seniors may be living with their adult children, so an increased incidence of seniors living with people who are not their partners could reflect changes to the circumstances of these family members. The observed changes may also reflect the increased longevity of older New Zealanders.

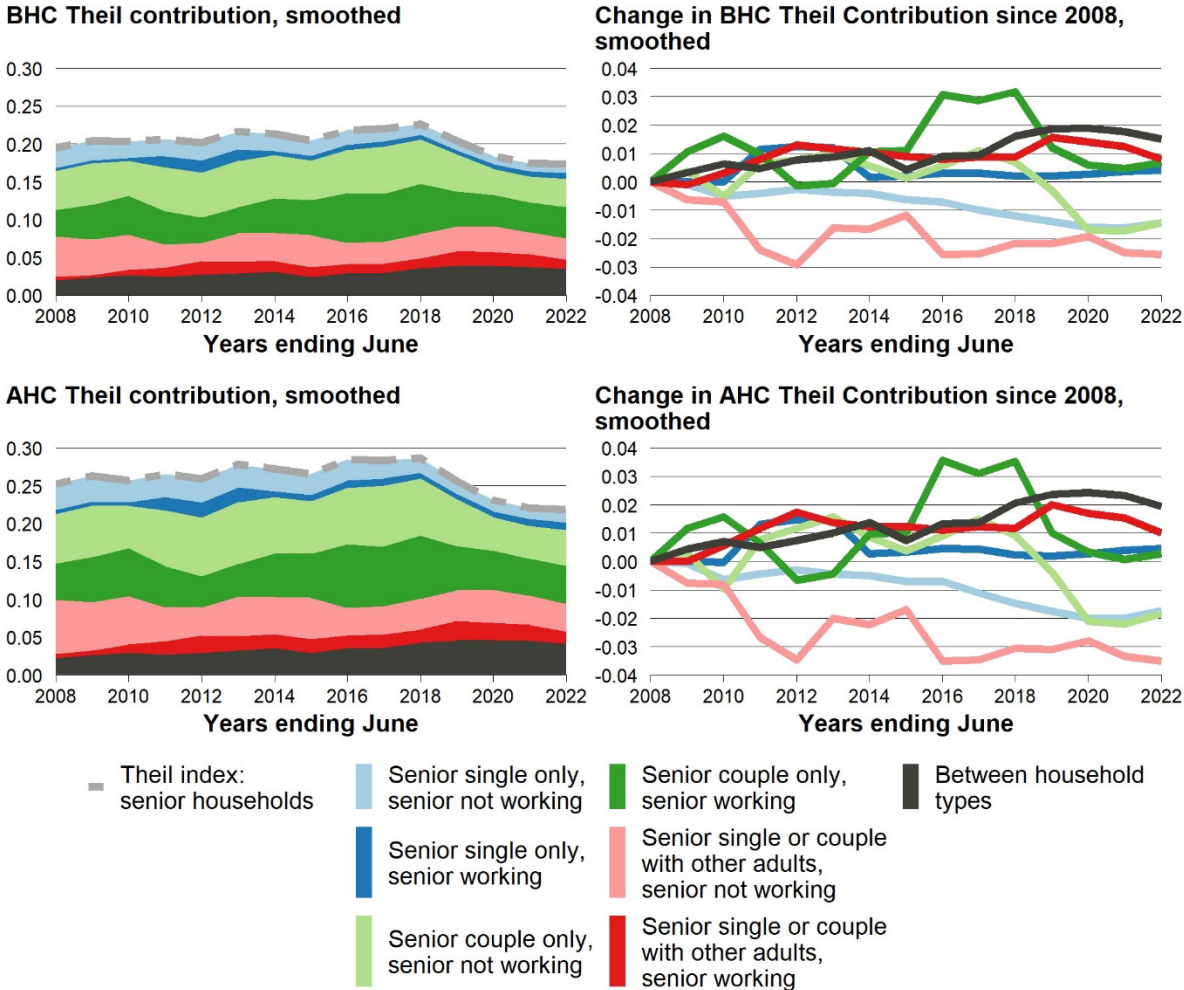
An interesting observation from Figure 8 is that the population share of households with single seniors living alone and working has been stable, despite decreases to the population share of households with seniors living alone and not working. While compositional changes may be at play, this may also suggest that single seniors have increasingly shared housing with other adults, as opposed to working while living alone. The same is not seen for couples, with the population share of households with couples living alone and working increasing while the population share of households with couples living alone and not working decreased. This may suggest that working and living alone as a couple has been more viable, or otherwise attractive, than working and living alone as a single senior.

From Figure 8 we can infer that individuals in households with working seniors tend to have above average incomes, while those in households with non-working seniors tend to have below average incomes. However, both working single senior households and households with non-working seniors who live with adults other than their partners have income shares similar to their population shares, and have incomes near the average for senior households.

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<sup>17</sup> As outlined in footnote 13, our sample does not include people living in rest homes or other aged care facilities, so this increase is unlikely to reflect changes in how many seniors live in rest homes.

**Figure 9: Contribution of inequality within and between senior household types to the senior Theil index**



The decomposition of the senior Theil index by household type, presented in Figure 9, suggests there are opposing trends in the movements of senior inequality, with income inequality between household types increasing, while the contribution of inequality from within some groups decreased. Although it is difficult to see in Figure 8, increasing between-group inequality results from average incomes rising faster for individuals in working senior household types over this period than for those in households with non-working seniors. Figure 9 suggests that the decrease in inequality for senior households by the end of the period is a result of the decrease in the contribution of within-group inequality from all non-working senior household types. The inequality contribution of households with working seniors living with adults other than their partners appears to have increased over the period studied.

We can speculate on some potential causes of decreased income inequality for non-working seniors. It may be the case that non-superannuation incomes, such as returns from saving and investment, have become more similar across seniors. For example, as interest rates decreased over the period we consider, these returns would be expected to fall, making

remaining incomes more similar and thus decreasing income inequality.<sup>18</sup> For seniors living with adults other than their partners, it may also be the case that the incomes of these other adults have become more similar across senior households, decreasing inequality.

This decomposition of the senior household Theil index has thus enabled us to identify that, although overall senior inequality increased and then decreased across the period studied in a similar way to overall inequality in New Zealand, there has been a persistent increase in inequality between different senior household types based on working and living arrangements. As the diversity of senior living and working arrangements continues to increase, this identifies a potential driver of future increases in senior income inequality. However, this analysis does not account for factors such as savings that seniors may draw down to support their standard of living, and which may influence seniors' working and living arrangements. Further, since our data does not contain income that is not taxed or realised, our analysis does not include all returns from capital. Because wealth, and therefore returns from capital, are more concentrated among seniors, these omitted income sources likely have greater impact on inequality among seniors than for other age groups.<sup>19</sup> The way that capital income and wealth disparities interact with, and potentially explain, senior income inequality is an area for further investigation.

## Conclusion

In this analytical note, we have shown that income inequality in New Zealand increased over the period from 2007 to approximately 2013, and then declined, ultimately falling to a lower level in 2023 than in 2007. Using the decomposability property of the Theil index, we have shown how this rising and then falling movement in inequality reflects changes to inequality within and between individuals in different types of households. Our results show that lower inequality by the end of the studied period was largely a result of decreased inequality between household types, as well as decreased inequality among multi-adult households with and without children. When we focused on the incomes of individuals in senior households we found that, while inequality has decreased for senior households overall, there is an increasing diversity among seniors in terms of both their working and living arrangements. This increased diversity in arrangements is accompanied by increased income inequality between individuals in senior households based on whether or not they work or share accommodation. If this between-group income inequality continues to increase, it may drive future increases in overall income inequality for seniors in New Zealand.

## Acknowledgements

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<sup>18</sup> These movements in interest rate, however, would have different effects on sources of senior income that are not included in our measure of income, such as components of capital income.

<sup>19</sup> See Symes (2021) for details on the distribution of wealth by age. See Ching *et al.* (2023) for analysis of how this wealth concentration flows through to untaxed income and Effective Average Tax Rates (EATR).

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# Appendix

## Data

The unit record data used in this analysis were provided by Stats NZ and cover the period from the year ending June 2007 to the year ending June 2023. This is the same dataset that is used by Stats NZ to create child poverty and household income statistics. For June years 2019-2023, the data are derived from the Household Economic Survey (HES) linked to administrative income data in the Integrated Data Infrastructure (IDI). These surveys have a target sample size of 20,000 households. For years prior to 2019, the HES was a much smaller survey of around 3,500-5,000 households. Thus, where possible, the data comprise the HES combined with the Household Labour Force Survey (HLFS), linked to administrative data in the IDI, to create a larger sample size. Where the required survey responses are not available in the HLFS records, we use a sample that only consists of the HES linked to administrative data. Because housing costs and senior relationship information are not available in the HLFS records, our results for all after housing costs measures and senior decompositions are derived from the HES linked to administrative data only.

## Method

In our survey weighted sample the Theil index for a population is defined

$$T = \frac{1}{N} \sum_{i=1}^S \left[ w_i \left( \frac{x_i}{\mu} \right) \ln \left( \frac{x_i}{\mu} \right) \right], \quad (1)$$

where

- $w_i$  is the weight of individual  $i$
- $x_i$  is the income of individual  $i$
- $N = \sum_{i=1}^S w_i$  is the total population of individuals
- $\mu = \frac{1}{N} \sum_{i=1}^S w_i x_i$  is the mean income of the population
- and  $S$  is the sample size, the number of individuals in the sample belonging to the population.

The Theil index can thus be decomposed

$$T = \sum_{g=1}^G T_{within,g} + \sum_{g=1}^G T_{between,g}, \quad (2)$$

where

$$T_{within,g} = \frac{X_g}{X} T_g \quad (3)$$

and

$$T_{between,g} = \frac{X_g}{X} \ln \left( \frac{X_g N}{X N_g} \right). \quad (4)$$



In these expressions

- $X = \sum_{i=1}^S w_i x_i$  is the total income of the population
- $X_g = \sum_{i=1}^K w_i x_i$  is the total income of the group  $g$
- $N = \sum_{i=1}^S w_i$  is the total population of individuals
- $N_g = \sum_{i=1}^K w_i$  is the population of individuals in group  $g$
- $T_g$  is the Theil index of group  $g$  calculated as in equation 1, but with the sums (including for  $N$  and  $\mu$ ) taken only over the  $K$  individuals in group  $g$
- $S$  is the sample size, the number of individuals in the sample belonging to the population
- $G$  is the number of groups that the population has been split into
- $K$  is the number of individuals in the sample belonging to each group  $g$ .

## Significance Testing

This section presents the statistical significance testing of our income inequality analysis. Complete results are available in the technical report. Below we present our key findings across the different figures presented in this analytical note.

### Figure 1

Figure 1 appears to show that Gini income inequality increased, and then decreased, over the period studied. The confidence intervals on the points estimated in this figure suggest that income inequality, both before and after deducting housing costs, was statistically significantly lower in 2022 than in all other years of the period studied. However, as outlined previously, estimates of income inequality for the year ending June 2022 are likely to be biased due to pandemic related sampling challenges. To determine whether the apparent rising and falling patterns reflect real movements in income inequality, we fit weighted least squares quadratic regressions on the point estimates from 2007 to 2023 and their associated sampling errors, excluding the estimates for 2022. These regressions, both before and after deducting housing costs, show statistically significant rising and falling patterns for income inequality, with inequality in both cases peaking between 2012 and 2013, and falling to lower levels in 2023 than in 2007. Here, statistical significance is determined by an F-test of the overall significance of the coefficients of the regression with  $p < 0.05$ .

### Figure 2

Similar to Figure 1, this figure appears to show a rising and falling pattern in Theil index income inequality. Over the period studied, we find that a quadratic rising and falling trend in the after housing costs Theil index for New Zealand is statistically significant. We do not, however, find evidence of a quadratic rising and falling pattern in the before housing costs Theil index. In both cases, and in all subsequent tests of statistical significance for Theil related metrics, we exclude the estimates for 2022 when testing the trends. This is because Theil index measures of inequality are likely to exhibit a similar bias to the Gini coefficient in this year.

## Figure 6

The right-hand panels of this figure suggest that inequality between household types decreased steadily between 2008 and 2022. After testing for trends, we find that decreasing linear trends in between household type inequality are statistically significant, both before and after housing costs. Note that here, and subsequently, ordinary least squares regression is used to test for trends in between-group inequality.

This figure further suggests that the contributions of within-group inequality from individuals in multi-adult households, both with and without children, follow similar rising and falling patterns to the national Theil index. These quadratic patterns are found to be at least weakly statistically significant for both household types, both before and after deducting housing costs. Here, weak statistical significances implies  $p < 0.1$  in an F-test of the overall significance of the coefficients of the regression. The contribution of these groups to inequality tended to peak at some point between 2010 and 2014 and fall to lower levels in 2023 than 2007. The exception to this was for multi-adult with children households before housing costs, which had income inequality peak later in around 2017.

Finally, Figure 6 suggests that the contribution of individuals in multi-adult households with seniors to before housing costs inequality increased over this period. We find an increasing linear trend over time to be statistically significant. Meanwhile, the contribution of individuals in this group to after housing costs inequality appears to have a rising and falling pattern. We find a quadratic trend is statistically significant, though, as compared to the other multi-adult groups, the contribution to inequality of multi-adult households with seniors peaked later, between 2017 and 2018, and remained higher in 2023 than in 2007.

## Figure 7

This figure suggests that inequality for individuals in both senior and non-senior households followed similar rising and falling patterns to that seen in Figure 2 for the national Theil index. Testing quadratic trends over the period from 2007 to 2021, we find these patterns to be at least weakly statistically significant, with income inequality resting lower in 2021 than in 2007. While it appears in this figure that before and after housing costs income inequality peaked earlier for non-seniors than for seniors, the fitted regressions all have peaks between 2013 and 2015.

## Figure 9

This figure suggests there are opposing trends in the movements of contributions to senior inequality, with income inequality between household types increasing, while the contribution of inequality from within some groups decreased. We find that linear increasing trends are statistically significant for inequality between senior household types, both before and after housing costs. Figure 9 suggests that the decrease in inequality for senior households by the end of the period results from the decreased contribution of within-group inequality from among all non-working senior household types. Among these groups, however, only linear decreasing trends in the contribution from non-working single seniors living alone is found to be statistically significant, both before and after housing costs. We find that linear increasing trends in the inequality contribution of households with working seniors that live with other adults are statistically significant, both before and after housing costs. We also find that linear increasing trends in the inequality contributions from households with working single seniors are statistically significant, both before and after housing costs.

## IDI Disclaimer

These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI please visit <https://www.stats.govt.nz/integrated-data/>.

The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.