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Estimating the distribution of wealth in New Zealand

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TE TAI ŌHANGA
THE TREASURY

Estimating the Distribution of Wealth in New Zealand

Benjamin Ching, Tayla Forward and Oscar Parkyn

New Zealand Treasury Working Paper 23/01

April 2023

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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.

**NZ TREASURY
WORKING PAPER 23/01**

Estimating the Distribution of Wealth in New Zealand

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Abstract

This paper discusses alternative methods to estimate the distribution of wealth in New Zealand. It develops a taxable income capitalisation method for estimating the distribution of wealth in New Zealand that is based on the approach of Saez and Zucman (2016; 2022) and adapted for New Zealand data sources, which we term “the New Zealand capitalisation method”. Internationally, taxable income capitalisation has been found to be a high-performing method for estimating asset holdings that generate taxable income flows, particularly towards the top of the wealth distribution where household surveys often undercount wealth. The New Zealand capitalisation method combines Inland Revenue taxable income administration data with Stats NZ’s Household Balance Sheet to give new estimates of the distribution of New Zealand individuals’ wealth. We present results for 2010, 2015, and 2018, and compare these distributions with those recorded by the Household Economic Survey (HES) 2018. Our method also allows for wealth estimates of smaller groups than can be reliably obtained through HES, including estimates of the wealth held by the top 0.1% of the wealth distribution. The New Zealand capitalisation method suggests more wealth at the top of the distribution than estimated by HES, which is consistent with similar work internationally. Results also show that wealth shares at the top of the distribution fell between 2010 and 2018, while at the same time the greatest increase in average wealth went to the top of the distribution.

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Executive Summary

This paper discusses issues relating to the measurement of the distribution of wealth in New Zealand. It finds that official statistics, such as New Zealand’s Household Economic Survey (HES), are likely to underestimate top wealth shares.¹ We present new estimates of the wealth distribution in New Zealand using a taxable income capitalisation method.

Survey data, such as HES, are generally regarded as problematic when attempting to accurately capture the top tail of the wealth distribution. International literature recognises that the wealthy are likely to be under-sampled, and differential non-response and under-reporting biases are also documented internationally (Balestra & Tonkin, 2018; Vermeulen, 2018; Lustig, 2020). We find evidence that suggests that HES may undercount top wealth in New Zealand, including a significant gap between the wealthiest 2018 HES respondent and the lowest wealth individuals in media-run surveys, such as the New Zealand National Business Review’s (NBR) Rich List. We also find that HES significantly undercounts total net worth when compared to the Stats NZ Household Balance Sheet, although a gap would remain even if there was no underestimation of the top wealth shares (Stats NZ, 2022b).

This paper provides a new set of estimates for the wealth distribution in New Zealand. We arrive at these new estimates by adapting the taxable income capitalisation method developed by Saez and Zucman (2016) to use data sources available in New Zealand. Capitalised wealth is estimated by multiplying personal taxable income data recorded by Inland Revenue to match Stats NZ’s Household Balance Sheet aggregates. This capitalised wealth is supplemented with HES data for assets and liabilities that do not generate taxable income flows, including owner-occupied housing, durables, student loans, and consumer loans. The combination of these datasets provides us with a novel way to construct the cross-sectional wealth distribution in New Zealand, using an individual unit of analysis. We refer to this as the “New Zealand capitalisation method”.

We compare our new estimates of the wealth distribution in New Zealand with the official statistics recorded by HES 2018. Importantly, the New Zealand capitalisation method uses an individual taxpayer unit of analysis, which differs from the household measures typically used for distributional analysis. Studying individual units tends to indicate greater inequality than family or household units because wealth is shared between individuals for these wider groups. For example, the top 1% wealth share estimate for HES 2018 using an individual unit is 20.1%, whereas using a household unit it is 16.8%.

Table 1 shows that the New Zealand capitalisation method estimates higher top decile and top percentile wealth shares in 2018 when compared with HES. It also estimated lower wealth shares for the bottom 90% of the population. We find that individuals in the top decile held approximately 67.2% of individual net wealth, which is significantly higher than the upper range for the 95% confidence interval for HES 2018 (63.1%). We also find that in 2018 individuals in the top percentile held approximately 26.1% of individual net wealth, which is near the upper range for the 95% confidence interval for HES 2018 (26.0%). The New Zealand capitalisation method uses the full taxpayer population, so can also provide wealth estimates for smaller groupings than can be reliably obtained through HES, including the top 0.1%.

¹ The HES net worth distribution is an official statistic under the Official Statistics System described here: <https://www.stats.govt.nz/about-us/legislation-policies-and-guidelines#tier-1-stats>

Table 1 – Top quantile wealth shares according to the New Zealand capitalisation method and HES in 2018 (individual units)

	Top 10%	Top 1%	Top 0.1%
Individual New Zealand Capitalisation Method	67.2%	26.1%	8.3%
Individual HES wealth shares	59.3% (55.5% - 63.1%)	20.1% (14.2% - 26.0%)	Not available

Note: Brackets include the 95% confidence interval range for HES estimates. A confidence interval is not available for the New Zealand capitalisation method because it is not based on a sample, instead using full population income data to estimate wealth.

We present results for the individual capitalised wealth distribution in 2010, 2015, and 2018. The New Zealand capitalisation method suggests that wealth shares at the top of the distribution fell between 2010 and 2018. At the same time, the greatest increase in average wealth went to the top of the distribution. For example, we find that the top percentile’s wealth share fell by 2.8 percentage points between 2010 and 2018, but their average individual wealth increased by \$2.3 million (Q2, 2022 inflation adjusted dollars). By contrast, we find that the wealth share for decile 5 increased by 0.2 percentage points over the same period, while their average individual wealth increased by only \$18,000 (Q2, 2022 inflation adjusted dollars). This apparent contradiction can be explained by the difference between relative and absolute measures of inequality. If aggregate household wealth grows sufficiently, a fall in wealth share can still correspond to a significant increase in absolute wealth. This finding is consistent with similar evidence from the United Kingdom (Broome & Leslie, 2022).

The New Zealand capitalisation method provides significant new insights into New Zealand’s wealth distribution but has some limitations. One of the method’s key limitations is that while it allows for different rates of return between assets (ie, certain assets have a larger return than others), it assumes a fixed rate of return *within* each asset class. An emerging body of international work has shown that heterogeneity in returns and correlation of returns with wealth within asset classes are indeed a significant feature of the data. The presence of heterogenous returns to wealth within New Zealand asset classes would imply a bias in the New Zealand capitalised wealth distributions. The direction and scale of that bias is an empirical question.

Using HES data, we also present preliminary investigations that suggest that dividend rates of return decline with equity holdings. This finding is consistent with Lundberg and Waldenström (2018) and with the tax-favoured status of capital gains in New Zealand, which both suggest that higher-wealth individuals are likely to favour undistributed and untaxed capital gains over dividend income. A finding that dividend returns decline with equity holdings implies that the current New Zealand capitalisation method underestimates the share of incorporated equity held at the very top of the distribution. However, this preliminary finding should be considered in the context of other aspects of the method which might be leading to an overestimation of the top tail’s net worth share, including other asset classes where heterogeneous rates of return may be detected before we can be sure that the total effect of biases in the current method produces underestimated top shares.

One area where we expect that our fixed rate of return assumption could generate an overestimation of top wealth relates to cash or bank deposits. The New Zealand capitalisation method will not detect any deposits held in non-interest-bearing accounts. If these non-interest-bearing deposits represent a greater proportion of wealth towards the bottom of the distribution, then the method will also underestimate wealth at the bottom of the distribution. However, sensitivity testing indicates that the scale of this issue is small. Accordingly, we do not think that this would significantly reduce our estimates of top wealth shares.

At this stage we cannot say definitively whether our fixed rate of return capitalisation method over- or underestimates wealth held at the top of the distribution. In the future the New Zealand capitalisation method could be adapted to incorporate heterogeneous returns. Alternatively, new data sources or improved sampling methods could make official wealth data sources more reliable at the top of the distribution. Until then, our fixed rate of return capitalisation method is a useful contribution towards an improved understanding of the wealth distribution in New Zealand.

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Estimating the distribution of wealth in New Zealand

1 Introduction

The distribution of wealth is important for understanding the economy and measuring inequality. Accessible, reliable, and transparent distributional data are a public good essential for informed public debate in a democratic society. They can also be relevant for macroeconomic forecasts and economic policy analysis. Further, the distribution of wealth is increasingly being recognised as an important component for understanding the distribution of wellbeing. The Public Finance (Wellbeing) Amendment Act 2020 now requires the Treasury to report on the state of wellbeing in New Zealand at least once every four years.

There is now an established body of literature that examines international trends in wealth and income inequality (Piketty & Saez, 2003; Kopczuk & Saez, 2004; Boserup, Kopczuk, & Kreiner, 2016; Saez & Zucman, 2016, 2020, 2022; Fagereng, Guiso, Malacrino, & Pistaferri, 2016; Alvardeo, Atkinson, & Morelli, 2018; Lundberg & Waldenström, 2018; Garbinti, Goupille-Lebret, & Piketty, 2021; Smith, Zidar, & Zwick, 2023). The seminal works of Piketty (2014; 2020) demonstrated a rise in income and wealth inequality since the 1980s that is not uniform across countries, suggesting that country specific policies and institutions can shape the distribution of wealth.

Information on wealth is also important for understanding economic income, and by extension the distributional properties of tax and transfer systems and of other economic and social policy. The Haig-Simons definition of economic income is annual consumption plus (or minus) annual wealth gained (or lost), which can be estimated only with knowledge of the wealth distribution and how it changes over time.

There is growing evidence internationally that official statistics derived from household surveys underestimate top wealth shares (Balestra & Tonkin, 2018; Vermeulen, 2018; Lustig, 2019). In response, several alternative methods have been developed to estimate the wealth distribution, often making use of supplementary datasets, such as Rich Lists (Vermeulen, 2018) or tax data (Saez & Zucman, 2016, 2022; Smith, Zidar, & Zwick, 2023), to correct for top wealth underestimation. This paper sits within this body of literature on estimating the distribution and evolution of wealth.

This paper provides a new set of estimates for the wealth distribution of New Zealand. We arrive at these new estimates by adapting the income tax capitalisation method developed by Saez and Zucman (2016) to use data sources available in New Zealand. Our method capitalises personal taxable income flows recorded by Inland Revenue to match asset totals recorded in Stats NZ's Household Balance Sheet (formerly administered by the Reserve Bank of New Zealand).² Capitalised wealth is supplemented with data from the Household Economic Survey (HES) for assets and liabilities that do not produce a taxable income flow, eg, owner-occupied housing and consumer durables. This means our focus is on privately held physical and financial assets, net of liabilities, as measured by HES and the Household Balance Sheet.³

Results are presented on the annual cross-sectional distribution of the wealth of New Zealanders in 2010, 2015, and 2018, using an individual unit of analysis. The data presented here are annual measures of the cross-sectional wealth distribution. An individual unit of analysis is adopted because this matches the unit for personal taxable income flows. We present relative wealth shares, and measures of absolute wealth inequality, across the population deciles and top percentiles.

We supplement this analysis with a range of sensitivity tests for our key assumptions. In particular, we test for potential biases arising from the presence of returns to human capital (ie, labour income) and the possibility of heterogenous returns within asset classes. We discuss caveats, current limitations, and future directions for refinement of the New Zealand capitalisation method.

² The figures used for capitalisation reflect the Stats NZ Household Balance Sheet (supplementary table 1.5B) for the June 2022 quarter, which was published on 20 October 2022. These are an experimental series and subject to updates by Stats NZ.

³ In aggregate the capitalised wealth totals exceed the net worth recorded in the Stats NZ Household Balance Sheet, because we include household durables and valuables from HES (see discussion in section 2.3).

2 Data sources

2.1 The definition of wealth

Any study of the wealth distribution must have a precise and functional definition of wealth. The System of National Accounts 2008 (SNA) is limited to assets that are “subject to ownership rights and from which economic benefit may be derived by their owners holding them or using them in an economic activity” (United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, & World Bank, 2008, p. 19). This means that the SNA excludes “consumer durables, human capital and natural resources that are not capable of bringing economic benefits to their owners”. These exclusions hint that wealth can be defined more broadly.

In New Zealand, the Treasury’s Living Standards Framework (LSF) captures three additional categories of wealth that sit outside the SNA definitions: the natural environment, human capability, and social cohesion. The most recent iteration of the LSF (The Treasury, 2021b) explains why these are included as aspects of wealth:

Like physical and financial capital, these contribute to economic production processes and so can be at least partly measured by their market or shadow prices. However, we value these aspects of our wealth for more than their contribution to economic production and their full value is not captured by their prices. Because the value of these aspects of our wealth goes beyond their role as factors of production, we have shifted to describing them as wealth, rather than as types of capital as we did in previous versions of the framework.

The LSF (The Treasury, 2021b) also recognises that culture underpins all aspects of wealth. Culture includes knowledge systems, values, and beliefs, and their manifestations in objects, practices, and concepts.

Alongside the LSF’s holistic wealth definitions are four prompts or analytical lenses for analysing wealth. These four prompts are distribution, resilience, productivity and sustainability. The distribution of wealth is explicitly recognised by the LSF as a factor shaping individual and collective wellbeing, as well as the resilience and productivity of organisations. The Treasury (2022) recently assessed the distribution of holistic wealth in its first report on wellbeing in New Zealand.

Instead of attempting to measure a broad or multidimensional concept of wealth, the key innovation of this paper is to improve our understanding of the distribution of physical and financial wealth. We use Stats NZ’s Household Balance Sheet, which was formerly administered by the Reserve Bank of New Zealand (RBNZ), as our measure of net worth, which follows the standardised SNA wealth definition. The advantage of using the Household Balance Sheet is that it provides a readily available and internationally comparable data source. The Household Balance Sheet is compiled from a range of data sources including surveys, administrative data from the RBNZ, Crown Financial Information Systems, and local councils (Stats NZ, 2022b). We will use the terms ‘wealth’ and ‘net worth’ interchangeably throughout this paper. Unless otherwise stated, these terms refer to the Stats NZ Household Balance Sheet definition.

Table 2 shows category totals and percentage shares for the Household Balance Sheet for the years ended December 2021 and March 2018. This shows how household asset composition can change over time, with housing and land values (category Q) growing from 49% of household wealth in 2018 to 54% in 2021. However, some caution is needed when comparing these figures. First, net financial wealth includes housing loans that are used to finance housing and land assets. The wealth share of owner-occupied housing net of housing loans was 38% in March 2018 and 44% in December 2021. Second, the housing and land value figures (category Q) only includes owner-occupied properties. Rental properties are included in category 'F1.3 equity in unincorporated NZ businesses'. The wealth share of rental properties net of housing loans was 12% in March 2018 and 14% in December 2021. This gives a combined owner-occupied and rental housing net worth share of approximately 50% in March 2018 and 58% in December 2021.

The Household Balance Sheet is not the only measure of net worth in New Zealand. The triennial HES net worth survey looks at the distribution of net worth by demographics. HES net worth data are collected at the detailed individual and household level, whereas the Household Balance Sheet is estimated at an aggregated level. Given their different data collection methods, the total estimates have significant discrepancies (Stats NZ, 2022b). We discuss the differences between these two wealth data sources in the next section.

**Table 2 – Stats NZ Household Balance Sheet (supplementary table 1.5b)
breakdown for selected years**

	30 December 2021		31 March 2018	
	NZD millions	Percentage of net worth	NZD millions	Percentage of net worth
A. Total household financial assets (B+C+D+E+F+G)	1,411,339	57%	1,063,963	64%
B. Currency	5,399	0%	3,668	0%
C. Total deposits (C1+C2)	219,379	9%	171,773	10%
C1. Deposits with registered banks	216,679	9%	168,973	10%
C2. Deposits with non-bank deposit takers	2,700	0%	2,800	0%
D. Total debt securities (D1+D2+D3)	3,499	0%	3,686	0%
D1. Central government debt securities	835	0%	475	0%
D2. Local government debt securities	434	0%	287	0%
D3. Other debt securities	2,230	0%	2,924	0%
E. Loans	290	0%	290	0%
F. Total equity and investment fund shares (F1+F2)	1,035,428	42%	785,964	47%
F1. Total equity (F1.1+F1.2+F1.3+F1.4)	905,034	37%	672,678	40%
F1.1. NZ listed shares	168,652	7%	125,638	8%
F1.2. NZ unlisted shares	88,179	4%	53,340	3%
F1.3. Equity in unincorporated NZ businesses	637,283	26%	485,932	29%
F1.4. Overseas listed shares	10,920	0%	7,768	0%
F2. Total investment fund shares (F2.1+F2.2)	130,394	5%	113,286	7%
F2.1. Cash management trusts	10,484	0%	9,127	1%
F2.2. Investment fund shares	119,910	5%	104,159	6%
G. Total insurance technical reserves (G1+G2)	147,344	6%	98,581	6%
G1. Net equity in life insurance and superannuation funds (G1.1+G1.2)	143,389	6%	94,154	6%
G1.1. Net equity in life insurance reserves	9,943	0%	9,175	1%
G1.2. Net equity in superannuation funds	133,446	5%	84,979	5%
G2. Non-life insurance claims	3,955	0%	4,426	0%

	30 December 2021		31 March 2018	
	NZD millions	Percentage of net worth	NZD millions	Percentage of net worth
L. Total household financial liabilities	272,658	11%	211,378	13%
M. Total loans (M1+M2+M3)	272,658	11%	211,378	13%
M1. Total consumer loans (M1.1+M1.2+M1.3)	13,996	1%	16,580	1%
M1.1. Consumer loans with registered banks	7,794	0%	11,186	1%
M1.2. Consumer loans with non-bank lending institutions	6,119	0%	5,308	0%
M1.3. Other consumer loans	83	0%	86	0%
M2. Total housing loans (M2.1+M2.2+M2.3)	242,727	10%	178,843	11%
M2.1. Housing loans with registered banks	237,297	10%	176,194	11%
M2.2. Housing loans with non-bank lending institutions	5,049	0%	2,231	0%
M2.3. Other housing loans	381	0%	418	0%
M3. Student loans	15,935	1%	15,955	1%
P. Net financial wealth (A-L)	1,138,682	46%	852,584	51%
Q. Housing and land value	1,337,227	54%	810,404	49%
R. Net wealth (P+Q)	2,475,908	100%	1,662,988	100%

Note: The figures in the above table reflect the Stats NZ Household Balance Sheet (supplementary table 1.5B) for the June 2022 quarter, which was published on 20 October 2022.

2.2 New Zealand wealth surveys

New Zealand's official statistics on household net worth are derived from the Household Economic Survey (HES), which is considered a high-quality household survey. HES is aligned with international statistical standards, and provides a rich source of data on the distribution of household assets and liabilities.

HES collects income, expenditure, and net worth data on a triennial basis (ie, net worth data are only collected every three years). HES data are collected between 1 July to 30 June the following year. For convenience, we refer to the surveys by their end date: for example, the HES net worth survey collected between 1 July 2014 and 30 June 2015 is labelled simply HES 2015. There are three existing HES net worth datasets: 2015, 2018, and 2021.⁴

⁴ A final HES net worth survey is planned for 2023/24, after which Stats NZ intends to transition to a new Household Expenditure and Wealth Survey, which will include incremental changes to the dataset.

The HES survey population covers those aged 15 years or older and living in a private permanent dwelling.⁵ HES net worth surveys typically sample 8,000 households, with a response rate of approximately 75%, resulting in approximately 6,000 responses. HES net worth 2021 had a reduced sample of 5,500 households and 4,400 responses, as COVID-19 restrictions prevented face-to-face interviews for several months in 2020.

The HES net worth survey asks respondents to report the values of their household assets and liabilities. Business and trust assets use “market values”, which are defined as “the value that could be obtained if assets were sold on the day of the interview” (Stats NZ, 2022c). By contrast, property assets use local government capital values, which are likely to be a more reliable metric than respondents’ subjective assessments of the value of their house. However, when prices are rising, property assets may be undervalued by HES, as local governments only update capital values infrequently.

HES was preceded by two other household wealth surveys: the Household Savings Survey (HSS), and the Survey of Family, Income and Employment (SoFIE). HSS was a one-off net worth survey collected in 2001 and provided the data for Figure 2 (below). SoFIE was an eight-year longitudinal survey that first went into the field in October 2002. It had an initial sample size of 15,000 households, which decreased over time. SoFIE collected net worth data during every second year of the survey, namely 2004, 2006, 2008, and 2010. We use the SoFIE 2010 data to supplement our capitalised wealth distribution for that particular year.

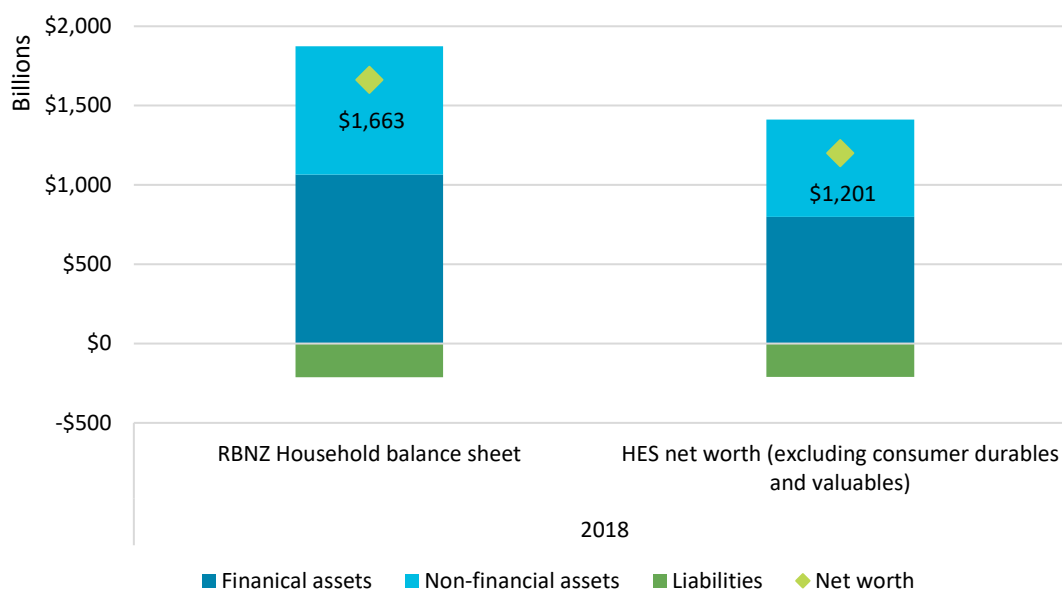
2.3 Comparability with National Accounts

As already indicated, the HES net worth statistics are not directly comparable to Stats NZ’s Household Balance Sheet. Stats NZ advises that the Household Balance Sheet is the best estimate of the total net worth of New Zealanders, whereas HES net worth statistics are used for understanding the distribution of wealth. Importantly, Stats NZ also notes that HES does not target high-net-worth individuals, either by oversampling or by clustering the sample design by high-wealth areas, which means HES net worth estimates could underestimate “true net worth” (Stats NZ, 2022b).

At an aggregate level, a comparison of HES with the Household Balance Sheet suggests HES undercounts wealth. In 2018, the HES net worth estimates summed to \$1.368 trillion, while the Household Balance Sheet indicated aggregate household net worth of \$1.662 trillion. Further, the Household Balance Sheet excludes consumer durables and valuables which, when adjusted for, suggests a shortfall in HES net worth estimates of approximately \$462 billion, or 28% of the Household Balance Sheet net worth total. Figure 1 compares the HES and Household Balance Sheet net worth totals when we subtract consumer durables and valuables from the HES measure to estimate a more comparable net worth figure. The HES net worth total is found to be lower than the Household Balance Sheet total. There are a range of reasons for this shortfall and some of the gap would remain even if there was no underestimation of the top wealth shares (Stats NZ, 2022b).

⁵ This means that HES does not include people living in non-private dwellings, such as hospitals and student hostels.

Figure 1 – Household net worth according to Stats NZ’s Household Balance Sheet and HES for March 2018



The decision about whether to include valuables or consumer durables in the definition of wealth comes down to the dividing line between wealth and consumption goods. Stats NZ explains that in the SNA, dwellings are the only durable type asset owned by households that are regarded as capital, with all other durable goods counted as “final consumption expenditure” (Stats NZ, 2014). They also note that consumer durables are often difficult to value and, being self-reported, are subject to over/undervaluation. However, there is ongoing consideration by Stats NZ about whether to include consumer durables and valuables in the Household Balance Sheet as memorandum items (Stats NZ, 2022b).

The decision to include or exclude consumer durables turns out to have a significant impact on the apparent wealth distribution in New Zealand, and this decision is not clear cut. There are a wide variety of such durables, with some long-lived durables (eg, cars) and other shorter-lived durables (eg, kitchen appliances). For this reason our capitalised wealth distribution will include estimates incorporating consumer durables and valuables, and we provide separate estimates that exclude consumer durables and valuables.

2.4 Personal taxable income data

Individual taxable income data are collected for the administration of the tax system, rather than wealth estimation per se. However, we provide a brief overview of this dataset because the New Zealand capitalisation method uses individual taxable income data for estimating the distribution of wealth.

Taxable income data are derived from the personal tax return (IR3) or personal tax summary (PTS)⁶ where the individual taxpayer was either required to or chose to file one of these. This information is supplemented with third-party information, such as Portfolio Investment Entity (PIE) income and “pay as you earn” (PAYE) income, where appropriate.

In New Zealand the personal taxpayer unit is the individual. This means that the New Zealand capitalisation method estimates wealth at the individual unit level. The 2018 wealth distribution estimates are based on a population of 4.68 million individual taxpayers. This represents the number of people earning taxable income in New Zealand over the year and includes some non-residents such as temporary workers.

Despite capturing some non-residents, the 2018 individual taxpayer population is still less than the 2018 Census usually resident population, which was 4.70 million. This shortfall can be explained by children and young people who are not yet earning taxable income. We do not consider this problematic for the method, as HES is based on a population of residents aged 15 years and over, and any missing youth are likely to have a negligible impact on the wealth distribution.

The individual taxpayer population also differs from the HES population, which represented only 3.81 million individuals in 2018 and is based on resident individuals aged 15 years and over living in permanent private dwellings. This means the HES population does not count those living in non-private dwellings, such as hospitals, and student hostels. To the extent that these groups might be expected to hold relatively low amounts of wealth, these population differences should not result in significant differences in the measured distribution of wealth in New Zealand.

⁶ This paper only examines tax data up to 31 March 2018. From 1 April 2019, income tax obligations of all individuals are subjected to a square-up, either through the IR3 income tax return or an “autocalc” process, which replaces the Personal Tax Summary

3 Conceptual challenges

3.1 Selecting a unit of analysis

The New Zealand capitalisation method uses personal taxable income data to distribute the aggregate net worth recorded in the Household Balance Sheet. This means that our distribution will be based on individual taxpayers, rather than households or any other collective unit of analysis.

There are limitations to using individuals as the unit of analysis. Creedy and Eedrah (2014, p 3) note that analysis based on individual units makes an implicit value judgment that there are no non-income differences that are relevant; the units are assumed to be homogenous. Other units of analysis are better able to account for non-income heterogeneity by making explicit assumptions about the way resources are shared and about economies of scale for units of different size:

- **Households** (people living in the same dwelling) are the international standard for the income sharing unit (Perry, 2019). Certain costs (eg, rent and utilities) are likely to be shared evenly across a household.
- **Families** (single or coupled adults, together with any dependent children) might be a better unit when considering the sharing of wealth. A further justification for using families as the unit of analysis is that in New Zealand benefit rates often differ depending on whether one is single, a couple, or with children.⁷
- **Individuals** equate with taxpayers in New Zealand. However, this is not a conclusive reason for using individual units because different taxpayer units exist internationally, eg, joint filing for couples or families is available in the United States (Inland Revenue Service, 2020).

These three units of analysis are limited in their ability to assess resource sharing at a broader level, for example sharing among whānau or other community groups. However, there are no available data to allow analysis of other groupings.

Focussing on the individual level of wealth distribution will tend to show greater inequality because resources are often shared within household or family units. For example, the Gini coefficient included in the HES 2021 net worth statistics for individuals was 75.8%, whereas the Gini coefficient for households was only 67.8%.⁸ Similarly, Perry (2019, p 53) shows that moving from an individual unit to a household unit lowers the 80:20 income inequality ratio from 5.8 for individual taxable income to 3.6 for household gross taxable income. The higher degree of wealth inequality associated with an individual unit of analysis should be remembered when interpreting the capitalised wealth distribution or when comparing it with alternative wealth measures.

⁷ For example, see the Jobseeker Support rates here: <https://www.workandincome.govt.nz/map/deskfile/main-benefits-cut-out-points/jobseeker-support-cut-out-points-current.html>

⁸ Gini index values range between 0 and 100. Values closer to 0 represent higher equality and values closer to 100 represent higher inequality.

3.2 Interpretation of inequality measures

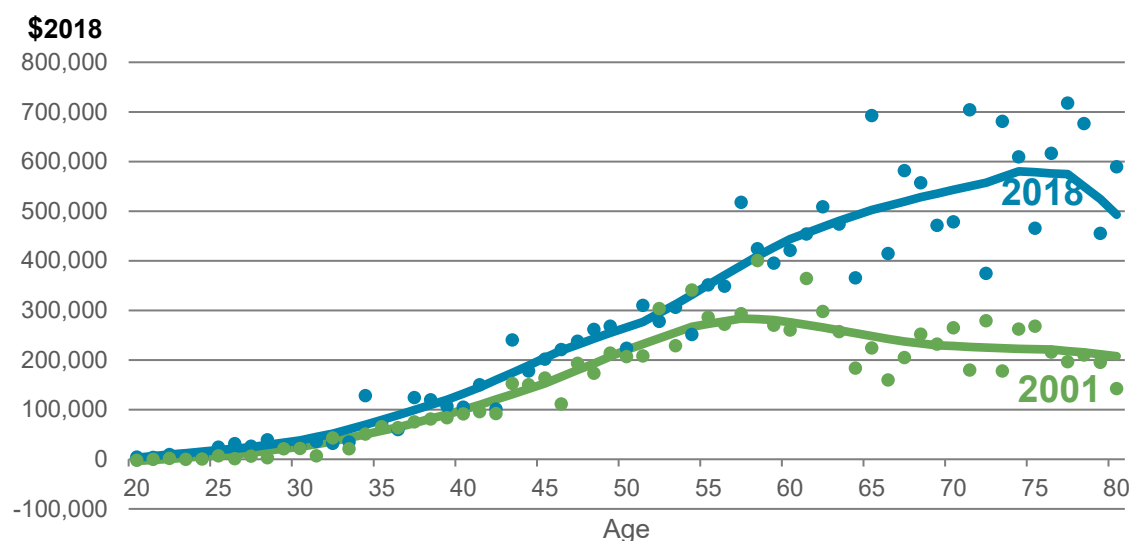
Wealth, income, and consumption have long been understood to follow lifecycle patterns. Fisher (1907, p 106) theorised that consumption and savings followed a “usual course of events” that depended on life stage, foresight, self-control, current income, expected future income, and other personal characteristics. The lifecycle hypothesis of saving was formalised in a series of papers by Modigliani and Brumberg (Modigliani & Brumberg, 1954, 1980; Modigliani, 1986). The key implication of the lifecycle hypothesis for our purposes is that “consumption smoothing leads to a humped-shaped age path of wealth holding” (Modigliani, 1986, p. 300). This standard lifecycle pattern is explained as an accumulation of wealth during the working years followed by dissaving to support consumption in retirement, with any leftover wealth bequeathed after death.

Empirical study of the lifecycle pattern to wealth accumulation in New Zealand would require longitudinal data (following the same cohorts over time). Longitudinal wealth data are not currently collected in New Zealand.⁹ Nevertheless, a hump-shaped income pattern is evident in New Zealand’s administrative and tax datasets (Alinaghi, Creedy, & Gemmell, 2022; Coleman, 2006).

In the absence of longitudinal wealth data for New Zealand, we can get snapshots of the relationship between age and wealth by examining the available cross-sectional wealth data. Figure 2 is reproduced from *He Tirohanga Mokopuna 2021* (the Treasury’s combined Statement on the Long-term Fiscal Position and Long-term Insights Briefing). This shows that the pattern is not static and has shifted significantly over time. Between 2001 and 2018, total wealth increased, with older people gaining more than younger people. The Treasury (2021a) notes that this change will have multiple causes including higher house prices and capital gains accruing more to older cohorts. Greater labour force participation by older people is also likely to be a factor, driven by an increase in the retirement age from 60 to 65 and longer life-expectancies, resulting in people continuing to accumulate wealth much later in life.

⁹ Longitudinal wealth data were briefly collected by the Survey of Family, Income and Employment (SoFIE) between 2004 – 2010. Future extensions of the capitalisation method could be used to better understand lifecycle wealth dynamics by following cohorts across time. However, any attempt to produce longitudinal capitalised wealth data would need to account for possible biases arising from behavioural responses whenever tax settings were changed, which could otherwise bias the data and produce misleading trends.

Figure 2 – Median wealth by age in 2001 and 2018



Source: Household Savings Survey 2001, Household Economic Survey 2018

Note: Solid lines are smooth fits to the points.

The presence of a lifecycle pattern to wealth accumulation means that cross-sectional wealth data must be interpreted with caution. A cross-sectional trend showing greater wealth inequality could have multiple causes, including greater savings by those reaching the age of retirement. Inequality within generations will be difficult to distinguish from inequality between generations. Wealth inequality also differs in quality from consumption inequality, insofar as wealth is durable and will eventually be passed from one generation to the next. Further research to understand the drivers of wealth inequality within and between generations is essential to understand trends in cross-sectional wealth inequality.

Wealth accumulation is linked, but not equivalent, to welfare and wellbeing.¹⁰ Carver and Grimes (2016) find that a consumption measure, which includes some components of wealth, outperforms income in predicting subjective wellbeing. However, not all wealth accumulations necessarily lead to greater consumption and by extension wellbeing. Kaldor (1956, p 42) notes the importance of distinguishing capital gains “which reflect the expectation of higher future earnings of the assets and those which reflect a fall in interest rates.” Where prices adjust upwards purely in response to higher interest rates, this might not affect an individual’s consumption and associated welfare. On the other hand, wealth effects that lead to greater consumption are well documented in macroeconomic literature (de Roiste, Fasianos, Kirkby, & Yao, 2019). Further investigations into the welfare dynamics of asset price movements are currently underway (Fagereng, et al., 2022).

The imperfect link between wealth accrual and welfare and wellbeing must be remembered when interpreting wealth statistics. One promising area for improving our understanding of distributions is by measuring joint distributions of wealth, consumption and income. While beyond the scope of this paper, research in the United States has found increasing inequality when measured through two or three dimensions (Fisher, Johnson, Smeeding, & Thompson, 2022).

¹⁰ For our purposes we treat the concepts of welfare and wellbeing as equivalent, while acknowledging that wellbeing literature generally emphasises a wider set of values than is typical in welfare analysis (The Treasury, 2021b).

3.3 Relative versus absolute measures of wealth inequality

This paper presents results for both relative and absolute measures for the distribution of wealth. Inequality literature tends to focus on changes in relative wealth inequality, such as the change in wealth share held by various quantiles. However, measures of absolute wealth gains or losses can show how a rising or falling wealth share can be translated into consumption possibilities, such as housing affordability (Broome & Leslie, 2022). Focussing purely on relative wealth shares can obscure real gains and losses that result from changes in the wealth base. Provided that aggregate household wealth has increased sufficiently, a fall in wealth share can still correspond to a substantial increase in real wealth.

Differences in the trend of absolute and relative wealth inequality have been documented in inheritance literature (Australian Productivity Commission, 2021). Studies across several countries have found that inheritances can increase absolute wealth inequality, while at the same time leading to falling relative wealth inequality (Boserup, Kopczuk, & Kreiner, 2016; Karaglannaki, 2017; Nekoei & Seim, 2019). This is because wealthy individuals will tend to receive larger inheritances, leading to greater absolute wealth inequality. However, inheritances reduce relative wealth inequality because the inheritances of the wealthy represent a smaller proportion of their existing wealth than for poorer people.

The choice of whether absolute or relative inequality measures are relevant will depend upon the question being asked and value judgements. Drawing on key theories of distributive justice, Thompson (2022) outlines some of the main value judgments that might be applied to the data on wealth inequality. For example, if we assume a maximin principle then we would be most concerned with a measure of the absolute position of those at the bottom of the wealth distribution, rather than their position relative to others. If we instead assume a relational egalitarian principle, and there is evidence that wealth inequality impacts on social relations, then a relative wealth inequality measure may be more relevant.

4 Improving wealth estimates

4.1 The missing rich

Survey data are generally regarded as problematic when attempting to accurately capture the top tail of the wealth distribution (henceforth “top tail”). The wealthy are recognised to be under-sampled, and even deliberate correction via oversampling tends to only partially correct for underestimation of wealth (Balestra & Tonkin, 2018; Vermeulen, 2016, 2018). New Zealand’s HES survey does not attempt to oversample the wealthy and is unlikely to accurately reflect the top tail (Stats NZ, 2022c). In part, missing top tail wealth can be explained by the survey’s limited sample size and the corresponding low probability of selecting wealthy households. However, two non-sampling biases are likely to be more relevant amongst wealthier households:

- **Differential non-response bias:** higher wealth individuals tend to have a higher non-response rate in financial surveys. The existence of this bias is strongly supported by international literature (Kennickell & McManus, 1993; Kennickell & Woodburn, 1999; Vermeulen, 2016, 2018).
- **Differential under-reporting bias:** it is thought that the wealthy may under-report their net worth at a higher rate than the general population. However, there are fewer studies confirming this bias and it is harder to measure (Higgins, Lustig, & Vigorito, 2018; Vermeulen, 2016, 2018).

Further research is needed to establish the extent of differential non-response or under-reporting biases in New Zealand. However, the presence of non-response bias in New Zealand seems likely given the significant international evidence. These biases may partially explain why HES significantly undercounts total net worth in the Household Balance Sheet, although some gap would remain even if there was no underestimation of the top wealth shares (Stats NZ, 2022b).

Beyond the undercounting of aggregate wealth discussed above, comparisons of HES and the NBR Rich List also suggest that HES estimates may be subject to biases related to the “missing rich”. The highest net worth of an individual participating in HES 2018 was \$20 million. By contrast, the 2018 NBR Rich List had a minimum net worth threshold of \$50 million and counted 236 individuals and families in New Zealand whose combined estimated net worth totalled \$80 billion.

There will be a range of reasons for the HES net worth shortfall, such as differences in the valuation methods and timing, especially for the housing stock, and the treatment of non-resident ownership. The limited HES sample size and absence of any attempt to oversample the wealthy may also contribute to the wealth shortfall. Nevertheless, it is plausible that differential non-response and under-reporting biases are also a factor.

Internationally, there are ongoing efforts to correct for the under-sampling and under-reporting of the very wealthy in household surveys. At least six methods have emerged, and we will consider each in turn:

- 1 Adjusting survey design by oversampling wealthier households
- 2 Augmenting survey data using media rich lists
- 3 Augmenting survey data with a modelled top tail (Pareto distribution)
- 4 Administrative wealth registers
- 5 The estate multiplier method, and
- 6 Capitalisation of taxable income.

4.2 Oversampling the wealthy in surveys

Oversampling the wealthiest households in surveys may at least partially address the issue of low sample sizes and response rates. Balestra and Tonkin (2018) document that 18 out of 23 OECD countries use oversampling, such that the wealthiest 10% of households make up more than 10% of the achieved sample (which is then reweighted to recover a representative sample). They find a positive but statistically insignificant relationship between the degree of oversampling and the wealth share of the top decile.

Various oversampling methods have developed internationally, although the choice of method is normally determined by data availability. In descending order of efficiency, oversampling methods have been developed that use wealth tax data, income tax data, or geographical strata frames. Vermeulen (2018, p 383) compares top wealth shares estimated using a Pareto regression (see description under section 4.4) with official survey measures and finds that “the adjustments are largest for countries that either do not oversample or that only use geographic income or geographic information to oversample the wealthy.” By contrast, using tax data to guide the oversampling frame was found to be very effective for top wealth estimation in the US Survey of Consumer Finances (Vermeulen, 2018).

4.3 Augmenting survey data using media rich lists

The missing top tail is sometimes addressed by augmenting survey data with a rich list. A rich list is a ranking of the wealthiest individuals as estimated by a given news media publication. A variety of methods for augmentation exist, from simply adding the aggregated wealth from the published rich list to the survey estimate, to more scientific statistical modelling approaches.

Augmenting survey data using rich lists assumes that the super-wealthy are unlikely to be sampled in the survey population, therefore their addition should not result in double-counting that biases the estimates. Investigations into rich lists suggest this is a reasonable assumption. The wealthiest individuals in household surveys are often found to be many times less wealthy than the least-wealthy rich lister (Vermeulen, 2018). In the United States, the Survey of Consumer Finance (SCF) explicitly excludes members of Forbes 400. This feature makes augmenting survey wealth statistics using rich lists appealing. In some cases, the method has produced estimates that raise top wealth shares by approximately two percentage points compared to the survey data alone (Bricker, Henriques, Krimmel, & Sabelhaus, 2016; Saez & Zucman, 2016).

NBR has been publishing its Rich List of rich individuals and families in NZ since the 1990s. Prior to 2020 the Rich List documented several hundred individuals and families with wealth ranging from \$50 million up to \$10 billion in 2019.¹¹ The richest HES respondent had a net worth of \$20 million in 2018, well below the Rich List's \$50 million threshold. Typically, the HES survey weights are around 300,¹² so one would not necessarily expect any of the top 200 rich-listers to appear in the current survey samples.

The NBR Rich List provides some details about how the dataset was compiled (National Business Review, 2018). All persons on the NBR Rich List were contacted and given the opportunity to comment and contribute, although NBR notes that some rich listers are known to exaggerate or diminish their wealth. Where wealth is held in public equities, market capitalisations are relied upon. Where a private sale of a company occurs, the sale value is taken and then uplifted if it appears the wealth has been conserved, or downscaled if it appears to have been poorly invested. If a private business valuation is not available then estimates are based on any available turnover figures and compared with profit margins from similar businesses. Alternatively, industry after-tax profit margins might be applied to upscale profit into equity values.

Though rich lists are of course subject to inaccuracies, they represent the best publicly available data at this time, and are reasonably accurate for individuals whose fortunes are based on publicly listed companies with disclosed share values. There are several known limitations with using rich list data to uplift survey wealth estimates, including:

- The rich list estimation methods are not fully known or publicly published with full detail. Valuation methods will not always be consistent with those used in surveys. For example, the NBR Rich List may not be able to accurately estimate liabilities, which would lead to overestimates of net wealth.
- The rich list estimation methods do not distinguish tax residents from non-tax residents. Again, this is likely to lead to overestimation of the top of the wealth distribution by including New Zealanders who pay tax in foreign jurisdictions.
- The rich list method may not be consistent over time, limiting its usefulness for constructing time series data.
- The rich list may include a mix of individuals and families, different to the household unit used in surveys.

It is unclear if these issues will result in rich list estimates providing an under- or overestimate of the top tail. The fact that the NBR Rich List often counts groups of individuals (family units) means adjustments must be undertaken to align units of analysis. However, under reporting may bias estimates downwards. It is therefore difficult to assess how accurate the estimates are.

¹¹ In 2021 the Rich List was rebranded as "The List", with a broader focus that is limited to 100 New Zealanders. These changes mean The List will be less useful for wealth data augmentation in the future.

¹² Survey weights are numerical values assigned to survey respondents to adjust for unequal probabilities of selection or non-response, to produce estimates that are representative of the target population.

In 2020 the Treasury reported the results of an experimental method to supplement HES 2018 with Rich List data (Ching, Barker, Parkyn, & Templeton, 2020). This method treated the Rich List like an additional “full coverage” stratum in the survey, differing from the typical HES approach as the stratum was not formally identified and sampled as part of the survey. Such an approach is sometimes used in sampling very skewed populations (Hidioglou, 1986). It assumes that Rich Listers were not surveyed by HES and that their wealth was not double counted. Each rich lister was given a sample weight of “one”. HES survey observations are normally weighted to represent 300 individuals. The lower weighting of the Rich List observations was warranted because they were collected non-randomly. This approach uplifted the top percentile wealth share by 4.6 percentage points compared to a HES top percentile wealth share.

In section 6.3 we explore the effects of augmenting the capitalised wealth distribution with the NBR Rich List, as a correction for heterogenous dividend returns and likely underestimation of top incorporated equity wealth.

4.4 Augmenting survey data with a modelled top tail (Pareto distribution)

Some academic literature fits a modelled top tail using a regression, typically a Pareto distribution. This is a skewed distribution that assumes a high proportion of people have low wealth and a small number have high wealth. Rich lists are often used to calibrate the Pareto modelling parameters (Vermeulen, 2018; Wodrich & Worswick, 2020; Shorrocks, Davies, & Lluberias, 2021).

Pareto distribution estimates require two key parameters: the lower wealth bound w_{min} and the tail index α . Vermeulen (2018) provides a regression method for selecting these parameters. Once these parameters are identified, the Pareto distribution is given by the following complementary cumulative distribution function:

$$P(W > w) = \left(\frac{w_{min}}{w}\right)^\alpha$$

Stats NZ is developing an approach to estimating a Pareto distribution of the top tail in New Zealand using the HES Net Worth data for the year ended June 2018 and has experimentally applied the methodology to survey data combined with additional high-wealth (or rich list) data (Stats NZ, 2022d). These findings could act as a useful cross-check for the capitalised wealth distribution presented in this paper.

4.5 Administrative wealth registers

Distributional wealth data might be collected by tax authorities either for research purposes or to administer wealth taxes. However, wealth registers have become less common as the prevalence of net worth taxes has declined over time (OECD, 2018). For countries that do still have administrative wealth registers, these data can provide a useful check for alternative methods of estimating the wealth distribution (Lundberg & Waldenström, 2018).

In the New Zealand context, Inland Revenue has collected data on high-wealth individuals to assess the fairness of the tax system (Inland Revenue, 2023). They have also used this datasets to improve estimates of the New Zealand distribution of wealth.

4.6 The estate multiplier method

This is the first of two wealth estimation methods that rely upon administrative tax data. As early as the 1920s, estimates of the wealth distribution were attempted using estate tax data in the United States (King, 1927). The method is a statistical approach for estimating the wealth distribution of a population, based on the total value of estates that are subject to estate taxation and applying a multiplier to the reported estate values to account for under-reporting and non-taxable estates. This method normally requires adjustments to be made to the raw data to reflect the overrepresentation of wealthy retirees in estate data.

Estate tax data series can provide very long-lived data series as many countries had estate taxes throughout the past century. In the United States, recent estate tax data estimates have allowed the construction of wealth share estimates spanning 1916 – 2000 (Kopczuk & Saez, 2004). Similarly, estate tax wealth shares have been estimated for the United Kingdom spanning 1895 – 2013 (Alvardeo, Atkinson, & Morelli, 2018).

In New Zealand, Galt (1985) constructed a wealth series based on estate data for the period between 1870 and 1939. Galt noted two key challenges in constructing this wealth series. First the data is biased because it is based on those passing away in a given year, who are disproportionately aged. Second, valuations tended to be conservatively biased to reduce the likelihood of an appeal. Further, estate estimates could be biased due to the exemption that was available for small estates, although a method was developed to adjust average wealth figures for this bias.¹³ Galt (1985, p 14) also applied a method to adjust for the over-representation of the elderly in estate data, by weighting estates by the proportion of their age-group in the total population, for years where age data was available.

The abolition of New Zealand's Estate Duty in 1993 prevents an extension of this wealth estimation method to the present day. Moreover, the legal environment and recognition of property rights under the colonial regime of the day differ significantly between the period measured in Galt's 1985 work and more recent times. Significant work would be required to construct a long-run time series based on an estate multiplier method; a comprehensive treatment would require different wealth concepts reflecting the complexity of shifts in the property rights regime.

¹³ See Galt (1985, p 8): "Those estates under £100 from 1866 to 1920 or £500 from 1921 to 1923, or £1,000 from 1924 onwards did not have to pay any death or succession duties, and as a result did not have to be valued."

4.7 The capitalisation method

The second wealth estimation method that uses tax administration data, and the subject of this paper, is the income capitalisation method. The general idea behind the income capitalisation method is to recover the distribution of wealth from the distribution of capital income flows. Initial attempts to capitalise taxable income were viewed as inferior to estate data estimates because income taxes could not be used to estimate the value of non-income yielding property, not all income types were necessarily taxable and there can be substantial heterogeneity in the returns of different assets (King, 1927; Stewart, 1939). However, advances in tax micro-databases and the ability to supplement capitalised wealth with survey data for non-income yielding property have lowered these obstacles.

Saez and Zucman (2016) reinvigorated interest in the capitalisation methodology by taking advantage of the abundant administrative and survey-based micro-databases available in the United States. They calculated multipliers for eight different capital income sources to infer a taxpayer's wealth.¹⁴ These multipliers are defined as the ratio of aggregate Household Balance Sheet wealth to tax return income, which by construction ensured consistency with the Household Balance Sheet totals. Assets that do not generate taxable income flows, notably owner-occupied houses and pensions, were imputed from the distributions of property taxes and wages respectively. Currency and non-interest deposits were allocated to match the distribution found in the Survey of Consumer Finance (SCF). The wealth distribution was then estimated by combining these various micro- and macro-datasets.

Saez and Zucman's (2016) capitalisation method revealed a U-shaped trend for top wealth shares in the United States: top wealth shares fell from a peak in the 1920s to a trough in the 1980s, and since that time they have been steadily increasing. Saez and Zucman (2016) were also able to show that most of the recent growth in top wealth shares was driven from within the top 0.1%. Since 2016, other economists have developed and tested similar capitalisation methods in Sweden (Lundberg & Waldenström, 2018), Denmark (Jakobsen, Jakobsen, Kleven, & Zucman, 2020), and France (Garbinti, Goupille-Lebret, & Piketty, 2021).

The capitalisation method has also attracted significant and ongoing scrutiny, particularly concerning the assumption that the rate of return is uniform within asset classes. Saez and Zucman (2016, p 540) expressly addressed the possibility of bias arising from idiosyncratic returns to wealth and returns that are correlated with wealth. This assumption does not imply that aggregate rates of return must be constant along the *net* wealth distribution, as returns can rise with wealth because of portfolio composition effects. Instead, it means that rates of return must be roughly constant within each asset class. However, an emerging body of work has shown that heterogeneity in returns and correlation of returns with wealth *within* asset classes are a significant feature of the data.

¹⁴ There are actually nine capital income categories in the United States, but only eight that can be mapped to asset classes: corporate equities excluding S corporations, taxable fixed income claims, tax-exempt bonds, rental housing, mortgages, sole proprietorships, partnerships and S corporations. "Estate and trust income" was the ninth category which did not correspond to an asset class.

Bricker, Henriques, Krimmel, and Sabelhaus (2016) argue that adjusted survey measures of wealth should be preferred to capitalised wealth estimates because of differing units of measurement and data assumptions. In particular, they suggest that Saez and Zucman's (2016) method for deriving a multiplier for fixed income assets results in an implausibly low implied rate of return (approximately 1% for 2013). Bricker, Henriques, Krimmel, and Sabelhaus (2016) find that when assumptions on the return for fixed-income assets is changed to match the 10-year Treasury rate that the trend and level of wealth concentration returns to closely match the SCF distribution.

In a similar vein, Smith, Zidar, and Zwick (2023) present evidence of heterogeneous returns to wealth *within* asset classes. They develop a capitalisation method that can account for such heterogeneity: for fixed income assets they apply different multipliers to different parts of the fixed income distribution, for public equity they adjust returns to account for capital gains, and for private equity they implement industry-specific multipliers that can also account for the role of human capital. These adjustments result in a halving of the growth of the top 0.1% wealth share for the United States when compared to Saez and Zucman (2016), although they still find that wealth is highly concentrated at the top of the distribution and has been trending upwards.¹⁵

In response to these critiques, Saez and Zucman (2020; 2022) argue that their wealth estimates are more consistent with complementary datasets, such as publicly available SEC shareholding data and the Forbes 400 rich list. With reference to publicly available securities data, Saez and Zucman (2022) are able to demonstrate that Smith, Zidar, and Zwick (2023) underestimate many top billionaire equities holdings. The reason for different estimates of top equities wealth appears to hinge on the treatment of capital gains data, which we will explore further in section 6.3. For now we note that public data sources can provide a useful data source to calibrate and reconcile variants of the capitalisation method.

¹⁵ Not all attempts to incorporate heterogeneous rates of return necessarily result in lower top wealth share estimates. Lundberg and Waldenström (2018) find a negative relationship between dividend yields and corporate stock wealth. They suggest this might be due to higher wealth investors preferring low-dividend, high capital gain growth stocks. In section 6.3.1 we identify evidence of declining dividend yields for higher equity holdings in New Zealand HES data.

5 Capitalisation in New Zealand

5.1 The fixed rate of return model

The capitalisation method has emerged as a leading method for improving the measurement of national wealth distributions. We have developed the first New Zealand capitalisation method. While we follow the general approach taken by Saez and Zucman (2016), significant innovation was required to develop a method for New Zealand’s data sources. We use taxable income data sourced from the Inland Revenue to recover distributions for assets that generate taxable income flows. For those asset categories that do not generate taxable capital income flows, we supplement the income capitalisation method with imputations from HES (and for 2010, from SoFIE). The result is a “mixed method”, to use terminology initially introduced by Atkinson and Harrison (1978).

Table 3 shows how the New Zealand capitalisation method maps four capital income flows to four asset classes in the Stats NZ Household Balance Sheet.

Table 3 – Mapping between IR3 taxable income flows and Household Balance Sheet net worth

IR3 individual tax returns data	Household Balance Sheet categories
<p>Interest income: Box 13B on the IR3. This should include any interest received from banks, Inland Revenue, building societies, credit unions, securities, partnerships, look-through companies, estates, trusts, or loans made by the individual taxpayer.</p>	<p>Deposits: B Currency + C1 Deposits with registered banks + C2 Deposits with Non-Bank Deposit Takers + D1 Central government debt securities, + D2 Local government debt securities + D2 Other debt securities + E Loans</p>
<p>New Zealand dividend income: Box 14B on the IR3. This should include dividends from NZ companies, unit trusts distributions, and dividends from NZ partnerships, estates or trusts, and any shares received instead of dividends.</p>	<p>Equities: F1.1 NZ listed shares + F1.2 NZ unlisted shares</p>
<p>Income from partnerships, self-employment income, trust income and housing: Sum of IR3 boxes: 23 is self-employment income, 19E is look-through company income, 18B is partnership income, 16B is trust income, 16C is non-complying trust income, box 22 is net rents.</p>	<p>Unincorporated equity: F1.3 Equity in unincorporated NZ businesses (Note: this category includes sole traders, partnerships, trusts, non-corporate farms, and rental properties.)</p>
<p>Income from Portfolio Investment Entities (PIEs): This value is derived from the returns filed by PIEs each year and linked back to individual taxpayers by Inland Revenue.</p>	<p>Investment Funds and Insurance: F1.4 Overseas listed shares F2.1 Cash management trusts + F2.2 Investment fund shares + G1.1 Net equity in life insurance + G1.2 Net equity in superannuation funds + G2 Non-life insurance claims</p>

A separate multiplier is calculated for each of the four classes shown in Table 3. Each multiplier is fixed within these four-asset classes, which implies a fixed rate of return within each asset class. We present preliminary evidence of how heterogeneous rates of returns within each asset class might affect the capitalised wealth distribution (section 6.3). We also conduct sensitivity tests to check for potential bias arising from returns to human capital (section 6.2). Assets and liabilities that do not generate taxable income flows are taken from the HES net worth survey for 2015 and 2018, and the SoFIE net worth survey for 2010.

The capitalisation multipliers are defined as follows:

$$(1) \quad M_n = \frac{W_n}{C_n}$$

Where M_n is the multiplier, W_n the aggregate asset class wealth, and C_n the aggregate taxable capital income, for each asset class n . These multipliers can also be defined as the inverse rate of return for each asset class n . For example, in the 2018 tax year interest income totalled \$4.5 billion and interest-bearing assets were valued at \$179.4 billion, giving a multiplier of 40 and an implied annual rate of return of 2.5%.

We use Inland Revenue's personal taxable income database to estimate wealth for each individual i and asset class n as follows:

$$(2) \quad W_{n,i} = C_{n,i} \times M_n$$

Where $C_{n,i}$ is individual capital income for each asset-class and $W_{n,i}$ is individual wealth for each asset class. For example, an individual with \$1,000 interest income in the 2018 tax year will have capitalised interest-bearing wealth of approximately \$40,000.

Summing all four classes of wealth produces individual capitalised wealth. Individuals are then ranked in order of capitalised wealth and aggregated into quantiles. Assets and liabilities that do not generate a taxable income flow cannot be capitalised and must be obtained from an alternative data source. HES is used for the net worth distribution for owner-occupied property and loans, consumer durables and valuables, consumer debt, and education debt. The HES data is then matched with the capitalised wealth data for each net worth percentile.

The entire capitalisation process was repeated with altered assumptions about the role of human capital to sensitivity test results (see section 6.2), allowing for heterogeneous returns to equities (section 6.3.2), and substitution of top wealth shares with the NBR Rich List (see section 6.3.2). We also compare capitalised wealth distributions both with and without valuables and consumer durables. The inclusion of these categories is found to significantly reduce top wealth shares.

5.2 Data

We estimate capitalised wealth distributions for the tax years ended 31 March 2010, 2015, and 2018. We chose these years because they reflect periods of relative stability in tax settings that also have HES or SoFIE net worth survey data available for supplementing the capitalised wealth distributions. While a HES net worth survey has also been completed for 2021, tax data are expected to be biased by the unusually high dividend pay-outs ahead of the new 39% top tax rate that has applied since 1 April 2021.¹⁶

Indeed, it is quite possible that capitalised wealth distribution trends are driven by taxpayer behaviour rather than the underlying distribution of wealth. We examine this possibility in detail in **Appendix 2** and conclude that taxpayer behaviour was unlikely to have significantly biased capitalised wealth distributions in 2010, 2015, or 2018.

The IR3 dataset represents the entire taxpayer population in New Zealand (see discussion in section 2.4). Table 4 presents the number of taxpayers by various quantile groupings in each year of interest.

Table 4 – Taxpayer population available for capitalisation in 2010, 2015, and 2018

Year	Taxpayer population for various groupings:				
	Total	10%	1%	0.1%	0.01%
2010	4,016,495	401,650	40,165	4,016	402
2015	4,395,328	439,533	43,953	4,395	440
2018	4,682,611	468,261	46,826	4,683	468

As suggested by Table 4, the New Zealand capitalisation method can be used to estimate very small quantiles because it uses the entire taxpayer population. We present wealth estimates for the top 0.1% (approximately 4,000 taxpayers), which is a smaller group than can be reliably achieved with HES. While it is also possible to provide wealth estimates for the top 0.01% (approximately 400 taxpayers), sensitivity tests found that these estimates are highly sensitive to the dividend income of individuals at the top of the distribution. Therefore, we consider our wealth estimates for the top 0.01% to be less reliable and present them tentatively in **Appendix 3**.

The capitalised wealth distribution must be supplemented with survey data to account for wealth that does not generate a taxable income stream. HES 2015 and 2018 and SoFIE 2010 data provide wealth shares for owner-occupied housing (net of owner-occupied housing loans), education loans, consumer loans, and consumer durables and valuables. We combine this data with the capitalised distribution at the percentile level, which requires an assumption that the net worth distributions match for both datasets (see further discussion in section 5.3). Because SoFIE 2010 did not separately account for owner-occupied and rental loans, we adjust SoFIE residential housing loans by the ratio of owner-occupied housing assets to total residential housing assets.

As discussed in section 3, survey data tend to under-report asset totals. In order to ensure comparability between the capitalised wealth totals and the survey wealth totals we scale the survey data up to match the Household Balance Sheet totals for each category. For example, for the year March 2018, the Household Balance Sheet recorded

¹⁶ <https://www.ird.govt.nz/about-us/tax-statistics/revenue-refunds/income-distribution>

net owner-occupied housing worth \$632 billion, while HES owner-occupied housing (including houses held in trusts) totalled only \$510 billion. Therefore, we multiplied all net owner-occupied housing values by a factor of 1.24 so that HES totals match the Household Balance Sheet totals. This assumes that under-reporting is uniform across the wealth distribution. This method will potentially result in an underestimation of top wealth shares for these survey assets, given the likelihood of differential under-reporting (see section 4.1).

Finally, HES and SoFIE household-level data must be converted into individual-level data to match the taxpayer unit used for capitalisation. Stats NZ publishes HES data that are converted into individual units.

5.3 Caveats

The capitalised wealth distribution requires assumptions and faces limitations that must be borne in mind when interpreting the results. Many of these caveats point to areas where further research would be fruitful. Nevertheless, our initial estimates remain a useful first approach for estimating the capitalised wealth distribution in New Zealand.

Individual taxpayer is the unit of analysis: Section 2.2 discussed how the individual taxpayer unit used in New Zealand differs from the household or family unit that is more typically analysed in surveys. Individual units will tend to indicate greater inequality than when using family or household units because wealth is shared between individuals for these wider groups. For example, the top 1% wealth share estimate for HES 2018 using an individual unit was 20.1%, whereas using a household unit it was 16.8%.

Additionally, the slightly different HES target population may not perfectly match the New Zealand tax resident population. As discussed in section 2.4, HES is weighted using population benchmarks, whereas some segments of the population (eg, those not engaged with the tax system) may be missing from the administrative tax data. This segment is more likely to be composed of those near the bottom end of the wealth distribution.

Reliance upon dividends for company wealth: the New Zealand capitalisation method infers company wealth from dividends, which will only imperfectly reveal the distribution of the underlying company wealth where income is retained in the company or realised as untaxable capital gains. In section 6.3 we explore evidence for how this might bias our fixed rate of return capitalisation estimates.

Income can be retained in companies rather than paid out as a dividend. This might be done so that the income can be reinvested in the company or to delay (or avoid) payment to a shareholder facing a high personal marginal tax rate. Indeed, where a company is eventually sold for an untaxed capital gain it is possible that no taxable income may ever be detected at the individual level. Tax case law has highlighted the strong incentives that top income earners face to minimise their personal incomes.¹⁷ Such tax planning or avoidance behaviour is likely to be greatest for those with high personal income, who are facing high personal tax rates, which could downward bias our top capitalised wealth shares.

¹⁷ For example, see *Commissioner of Inland Revenue v Penny and Hooper* [2011] NZSC 95 SC 62/2010

However, even in countries that have realisation-based capital gains taxes, there is disagreement in the literature about how these data should be incorporated into capitalisation methods. Saez and Zucman (2016, p 534) acknowledged that realised gains could provide useful information about the distribution of stock ownership, however, they could also exaggerate the concentration of wealth because capital gains are “lumpy”. For example, a business owner might sell her stock once prior to retirement, which would exaggerate her stock equity if capitalised. For this reason, Saez and Zucman decide to rely solely upon dividends for ranking individuals into wealth groups, but use both capital gains and dividends to compute wealth shares. They find that this method smooths realised capital gains.

Smith, Zidar, and Zwick (2023) critique the approach taken by Saez and Zucman (2016), instead using an approach that scales dividends and capital gains by a parameter α_i for each wealth group i :

$$(4) \quad C_{i,t}(\alpha_i) = \beta_{i,t}^C(\alpha_i) \times (\alpha_i y_{i,t}^D + (1 - \alpha_i) y_{i,t}^G)$$

Where $C_{i,t}$ is corporation equity wealth in group i in year t and $(\alpha_i y_{i,t}^D + (1 - \alpha_i) y_{i,t}^G)$ is an α_i -weighted average for group i dividend income $y_{i,t}^D$ and capital gains $y_{i,t}^G$. The parameter α_i is set to minimise the distance between their capitalisation approach and equity wealth reported in the Survey of Consumer Finance. They estimate the appropriate weight for all groups to be 0.9 and reject the approach taken by Saez and Zucman (2016) which implied $\alpha_i = 0.5$. They further support this approach with an OLS regression analysis that estimates α_i for each group in a range between 0.98 and 0.94. Therefore, both approaches strongly support placing much more weight on dividends than capital gains.

New Zealand’s notable absence of a comprehensive capital gains tax means that we have no option other than to rely solely on dividends. This implies an approach of setting $\alpha_i = 1$. While this approach is reasonably similar to that taken by Smith, Zidar, and Zwick (2023) it does mean that our approach will miss some potentially useful information available in countries that do have realisation-based capital gains tax data available for capitalisation. Based on the findings of Smith, Zidar, and Zwick (2023) and Saez and Zucman (2022), relying solely on dividends is likely to downward bias top wealth share estimates compared to a method that can also utilise realised capital gains data.

A wealth estimation bias may also exist for companies that do not pay dividends but have accrued capital gains. Smith, Zidar, and Zwick (2023) observe that for some of the wealthiest Americans the majority of capital gains are typically unrealised (ie, accrued), and if these companies do not pay taxable dividends then capitalisation will miss some of this corporation wealth. They address this potential bias by including a supplementary series that replaces their 400 wealthiest taxpayers with the Forbes 400 rich list, although they caution that this may be less accurate at estimating private business wealth. Saez and Zucman (2020; 2022) argue that the approach taken by Smith, Zidar, and Zwick (2023) significantly underestimates top wealth shares when compared to their method, which places a higher weight on realised capital gains. In New Zealand, Ching (2023) observed that accrued capital gains can present a very significant economic income stream, sometimes coming close to matching aggregate taxable income in magnitude. Clearly, such a large unmeasured flow of income presents a serious limitation to accurate wealth capitalisation and we investigate this further in section 6.3.

Reliance upon beneficiary income for trusts: trust wealth is inferred from beneficiary income declared in the IR3. Beneficiary income is any income that is allocated directly to beneficiaries to be taxed at their personal marginal tax rate.

Relying on the beneficiary income distribution might bias the capitalised wealth distribution because trusts can also allocate income as “trustee income”. Trustees pay the final tax on any trustee income, which can then be retained or transferred without the need for any further reporting. The New Zealand capitalisation method will be biased insofar as the distribution of beneficiary income differs from the distribution of the final recipients of trustee income. Were such a bias proven, it could be significant because of the high concentration of national wealth held in trusts. HES 2018 suggests that approximately \$343 billion net worth was held in trusts or 21% of the Stats NZ Household Balance Sheet total net worth in March 2018 (\$1,662 billion).

The final distribution of trustee income is not recorded in any administrative sources, preventing the direct measurement of this potential bias. However, evidence of this potential bias could be collected by measuring the split between trustee and beneficiary income for trusts that make distributions to individuals in the capitalised wealth distribution. A higher trustee income share for high wealth individuals would indicate greater wealth at the top of the distribution.

A further issue concerning the capitalisation of income from business entities is that such flows can contain a mixture of labour and capital income that cannot be easily distinguished. We conduct a sensitivity test to address this potential bias in section 6.2 and find that it is unlikely that the mixing of labour income is biasing our capitalised wealth distribution.

Reliance upon accurate income reporting: estimates depend on information reported to the IRD, but under-reported income for closely-held businesses is found to be substantial in international studies (Mazur & Plumley, 2007; Auten & Splinter, 2019; Guyton, Langetieg, Reck, Risch, & Zucman, 2020) and in New Zealand studies (Cabral, Gemmill, & Alinaghi, 2021).

Some assets without a taxable income stream are taken from HES: owner-occupied property and consumer durables and valuables do not have taxable income streams that can be capitalised. As described in section 5.1, this means we must revert to relying on HES for including the distribution of these assets. The combined value of owner-occupied housing and consumer durables and valuables represents approximately half of Household Balance Sheet net worth, making this a very significant limitation of the New Zealand capitalisation method. Countries that have property taxes levied at the national level are instead able to use these to capitalise property wealth and thereby avoid reliance on surveys (Saez & Zucman, 2016; Smith, Zidar, & Zwick, 2023).

We are particularly reliant on HES data for estimating wealth at the bottom of the distribution, where assets tend to be concentrated in assets that do not generate taxable income streams (see **Appendix 2**). In 2018, the bottom 30% were found to have near zero capital income that could be used for wealth estimation, which means that any wealth we report for these groups is derived solely from the supplementary wealth categories taken from HES.¹⁸

¹⁸ HES is used for the net worth distribution for owner-occupied property and loans, consumer durables and valuables, consumer debt and education debt.

When combining the selected HES assets with the capitalised data, we must assume that the capitalised wealth ranking matches the HES net worth ranking. This means top capitalised wealth percentiles are matched with top HES net worth percentiles, and vice-versa. However, the ranking of individuals in the HES net worth dataset and capitalised wealth dataset are unlikely to perfectly match because capitalised wealth is a subset of total household net worth. This imperfect matching method could lead to an upward bias for top wealth shares. On the other hand, HES is likely to underestimate top wealth, and so these asset totals are likely to be underestimated at the top of the distribution. Therefore, the net effect from relying upon HES for these selected assets is ambiguous. Refinements to our methodology could look to link capitalised data with HES data in the IDI to more precisely match individuals with these supplementary wealth categories.

Reliance upon interest payments for deposits: the New Zealand capitalisation method does not account for cash-holdings or bank deposits held in accounts that do not generate interest. Cash-holdings only represented 0.2% of Household Balance Sheet net worth in 2018, but deposits represented 10% (see Table 2 above). It can be expected that zero-interest accounts represent a larger proportion of wealth for individuals towards the bottom of the distribution. Were this found to be correct, the New Zealand capitalisation method will have underestimated bottom deposits wealth and overestimated top tail deposits wealth. However, based on a simple sensitivity test we think it is unlikely that this bias would be material.

We conduct a simple sensitivity test of this potential bias by assigning the HES 2018 median “currency and deposit” amount (\$3000, with a 8.3% relative sampling error) to everyone in the bottom half of the wealth distribution. This amount is probably much higher than can be expected for the bottom deciles. We then scale this up to account for the HES wealth undercount for currency and deposits compared to the Household Balance Sheet multiplying up this deposit and currency wealth by 1.7. This scenario only adds 0.7 percentage points of wealth to the bottom half of the distribution, which suggests that missing deposit wealth for the lower deciles is unlikely to mean that our top wealth estimates are significantly overestimated.

Nevertheless, the absence of zero-interest deposits can likely explain why the New Zealand capitalisation method’s bottom decile wealth shares appear particularly low (see results under section 6.1). Future research could look to blend capitalised wealth with additional HES wealth categories to address this likely bias.

Imperfect mapping between taxable income and balance sheet categories: the New Zealand capitalisation method maps four groups of assets from the Household Balance Sheet to associated taxable income streams from the IR3 personal tax return (see Table 3 above). These different datasets do not perfectly align, requiring some aggregation of assets and income streams. Saez and Zucman (2016) were able to split their assets and income streams into nine groups, which probably allows for more precise estimates. The Stats NZ Household Balance Sheet does not decompose the different types of unincorporated business equity (F1.3), which means we must combine several different income sources from the IR3, including income from self-employment, look-through companies, partnerships, trusts, and rental properties.¹⁹ These categories can differ significantly in substance, and it would be preferable to capitalise each income stream to more disaggregated wealth categories.²⁰

Incomplete data on assets held overseas: the Household Balance Sheet includes a category for overseas listed shares, although this only represents 0.5% of household net worth. As shown in Table 3 (above) we capitalise PIE income flows to match a series of assets that includes overseas listed shares. This assumes that most overseas shares held by New Zealanders are held via PIEs rather than held directly. This assumption is unlikely to be significant given the very small proportion of overseas listed shares in the Household Balance Sheet.

The Household Balance Sheet excludes any other property or deposits held overseas by New Zealanders, whereas these are included in HES (Stats NZ, 2022b). Were the Household Balance Sheet to be expanded in the future to capture these overseas assets, these could be capitalised using the overseas income flows recorded in the IR3.

Rates of return assumed to be uniform within each asset class: riskier assets can generate higher measured returns owing to a risk premium. While the New Zealand capitalisation method allows for different rates of return between the four different asset categories, it is assumed that rates of returns are uniform within these asset classes. For example, high-wealth individuals receive the same interest rate as low-wealth individuals on their deposits. In section 6.3 we present evidence that rates of return are heterogeneous with asset classes, potentially biasing our results.

Interpreting negative incomes: we only capitalise positive income streams for each capital income component, which means any taxable income losses are set to represent zero wealth. This approach is consistent with Saez and Zucman (2016, p 553). However, Smith, Zidar, and Zwick (2023, p 4) take a different position and note that “17% of total pass-through business wealth accrues to those with losses in terms of pass-through income”. They find that tax rules may allow individuals to report large losses for tax purposes but do not necessarily represent negative equity or no wealth. For this reason they capitalise pass-through business wealth using a combination of different data sources, including business assets and business sales figures. The New Zealand capitalisation method may have underestimated top wealth shares to the extent that high-wealth New Zealanders are masked by losses in any given asset category.

¹⁹ Arguably look-through company income should be capitalised against company wealth since it is derived from company wealth.

²⁰ Stats NZ advises that ongoing refinements to the Household Balance Sheet are unlikely to more closely align with income tax categories owing to data availability.

5.3.1 Implications from caveats

Table 5 summarises the direction of potential biases arising from the limitations discussed above. Although there appear to be more potential biases suggesting the New Zealand capitalisation method may still underestimate top wealth shares, we cannot be sure of the overall impact of these potential biases at this time. These potential biases highlight possible directions for future research. Alternatively, new data sources may eventually neutralise some of these limitations. Nevertheless, our capitalisation method is a useful innovation for wealth estimation in New Zealand.

Table 5 – Direction of potential biases in the New Zealand capitalisation method

Potential biases suggesting underestimation of top wealth	Ambiguous effect on wealth distribution	Potential biases suggesting overestimation of top wealth
<ul style="list-style-type: none"> + reliance on dividends for company wealth + reliance upon beneficiary income for the distribution of trust wealth + tax losses may mask some top wealth 	<ul style="list-style-type: none"> ? Some assets without a taxable income stream are taken from HES ? assumed uniform rate of return within each asset class (see section 6.3) 	<ul style="list-style-type: none"> - reliance on interest income for deposits wealth

6 Results

This section presents the capitalised wealth distribution for 2010, 2015 and 2018. In section 6.1 we present capitalised wealth results based on an assumption that rates of return within our four asset classes are fixed across the wealth distribution. The focus on this section is to examine how the New Zealand capitalisation method estimates a higher concentration of top wealth than the survey-based HES estimates. Section 6.2 tests the sensitivity of these estimates against an assumption that some self-employment and partnership income is derived from labour income. In section 6.3 we find evidence suggesting that rates of return within asset classes are heterogenous across the wealth distribution. This means that the fixed rate of return assumption may still underestimate top wealth shares. We show how substituting top capitalised wealth shares with the NBR Rich List can lead to further increases in top wealth estimates. While our research indicates a significantly higher concentration of top wealth, our estimates are premised on some strong assumptions and will remain experimental.

6.1 Fixed rate of return results

Figure 3 shows wealth shares by wealth deciles using the New Zealand capitalisation method for 2010, 2015 and 2018, when assuming a fixed rate of return within our four asset classes. We also include the HES 2018 net worth percentiles for comparison (orange bars). The top decile wealth shares are significantly higher for capitalisation in 2010 (71.1%), 2015 (64.6%) and 2018 (67.2%) than for HES 2018 (95% confidence interval: 55.5% - 63.1%), which is consistent with the observation in the literature that survey measures inadequately capture top wealth shares due to differential under-reporting and non-response. With a higher wealth share for decile 10, the capitalised wealth shares for all other deciles appear lower than suggested by HES 2018. All estimates for net worth decile 1 are negative, indicating that liabilities exceed assets at the bottom of the wealth distribution.

Figure 3 – Wealth shares by wealth decile (New Zealand capitalisation method in 2010, 2015 and 2018 versus HES 2018)

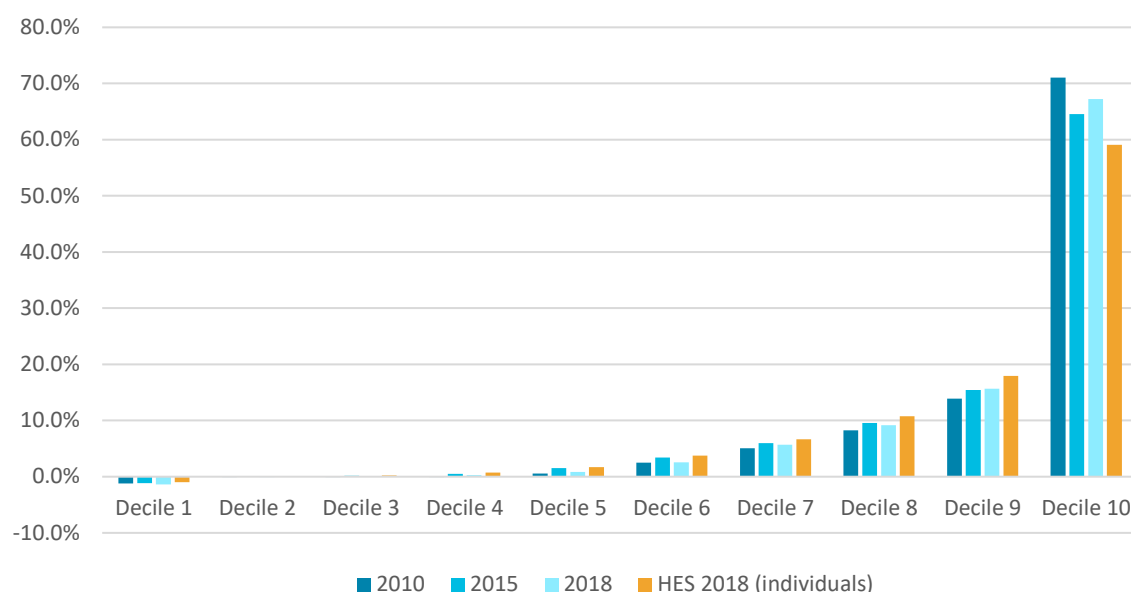
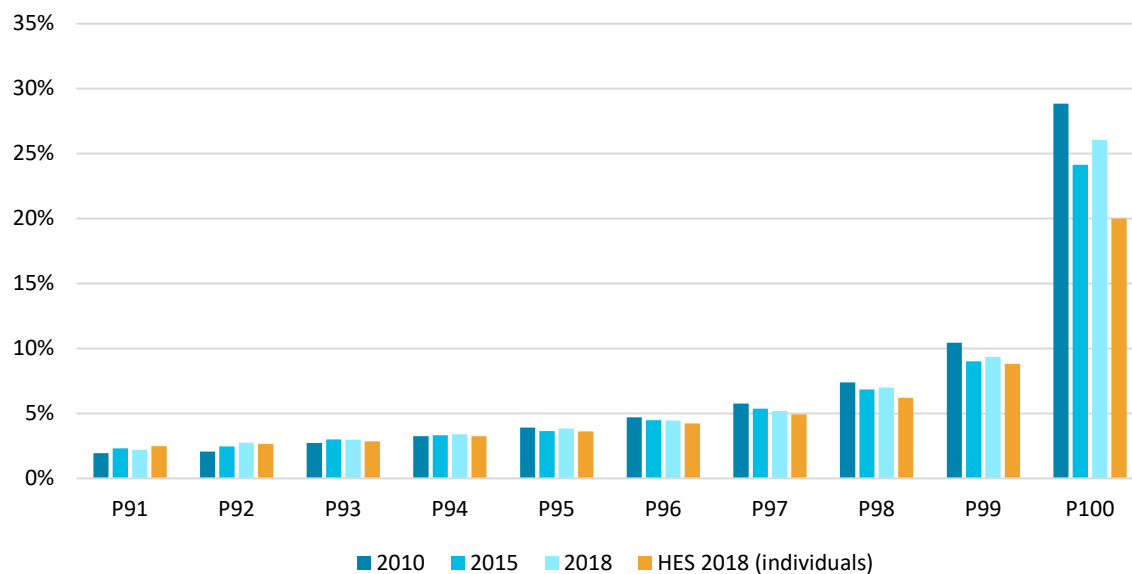


Figure 4 shows the top 10 net worth percentiles (the distribution within decile 10) using the New Zealand capitalisation method in 2010, 2015 and 2018. Again, we include the HES 2018 net worth percentiles for comparison. And again, the top percentile wealth shares are higher for capitalisation in 2010 (28.8%), 2015 (24.2%) and 2018 (26.1%) than for HES 2018 (95% confidence interval: 14.2% - 26.0%). The other top percentile wealth shares (p91 – p99) appear reasonably stable and comparable to the HES estimates.

Figure 4 – Wealth shares of top 10 net worth percentiles (New Zealand capitalisation method in 2010, 2015 and 2018 versus HES 2018)



The New Zealand capitalisation method we have developed aims as best as possible for international comparability. Our method aligns closely with those championed by the World Inequality Lab, meaning estimates presented here can be soundly compared with those produced by mixed income capitalisation methods developed for other contexts - bearing the limitations and caveats discussed in section 5.3 in mind. The estimates for top 1% and 10% wealth shares presented here place New Zealand's top wealth shares above those estimated for the UK and below those estimated for the US.

The results in Figures 3 and 4 include consumer durables and valuables. As already discussed, it can be argued that durables and valuables should be excluded from net worth estimates because they are defined as part of final consumption expenditure in the SNA. In the HES survey these categories can be as varied as cars, boats, furniture, electronics, home appliances, artworks, antiques or jewellery. Some items, such as jewellery or vehicles, might be expected to retain value over a long period of time and so might best be defined as wealth. Other items, such as household appliances, may have relatively short useful lives and so are better considered consumption expenditure.

We have included consumer durables and valuables in Figure 3 and 4 to present wealth estimates that are consistent with the HES and SoFIE net worth surveys. Figure 5 presents top percentile net worth share estimates with and without durables and valuables. Excluding durables and valuables results in a significant uplift of top net worth estimates because these goods are relatively less important for the wealthy.

Figure 5 – Top percentile wealth shares, with and without consumer durables and valuables (New Zealand capitalisation method for 2010, 2015 and 2018)

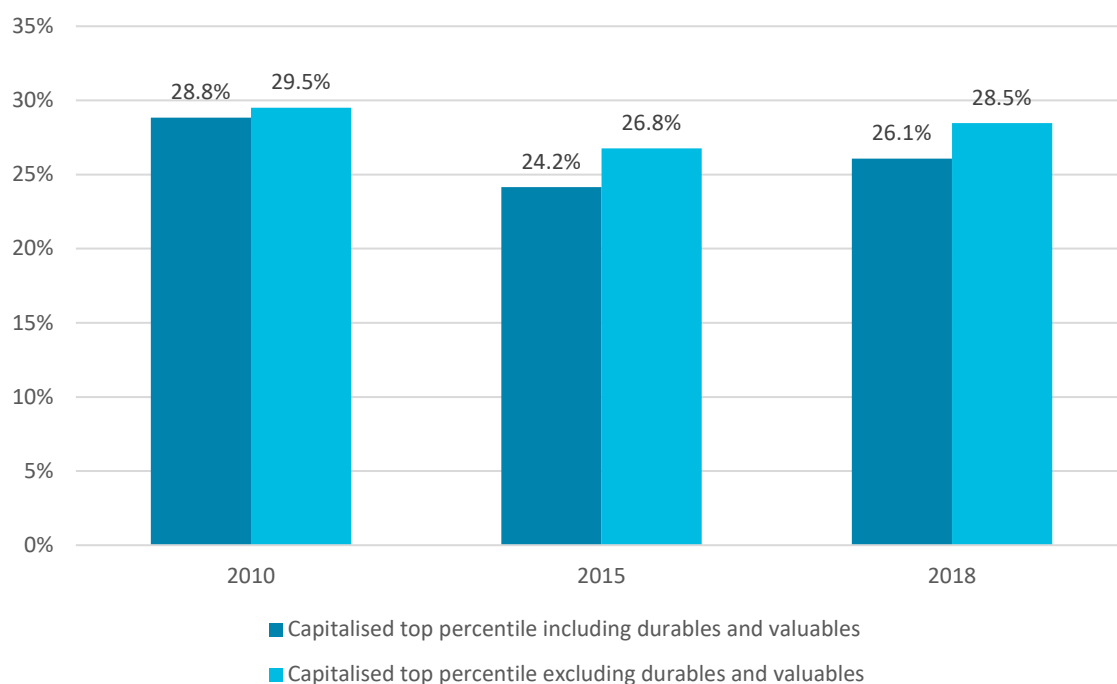
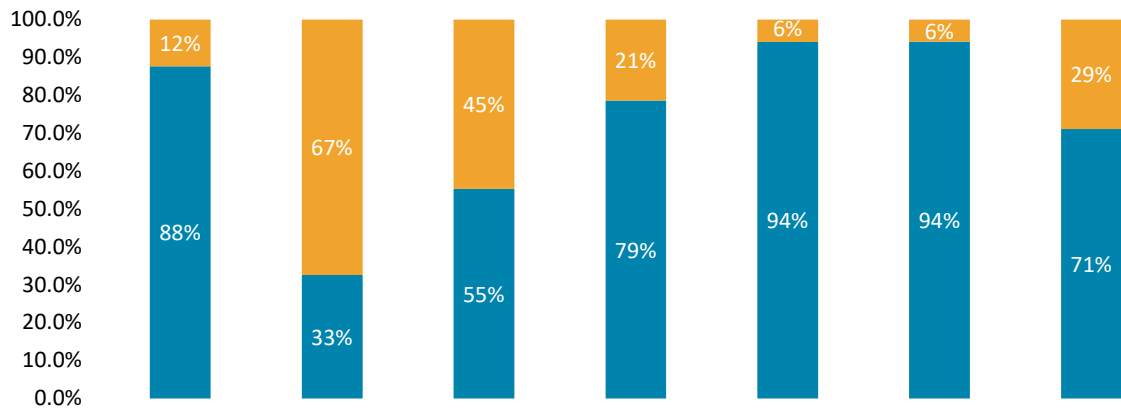


Figure 6 presents the top percentile’s net worth shares for the four capitalised asset classes, the two asset classes from HES and overall net worth. Average top percentile wealth exceeds average wealth for all asset categories. Wealth held in companies stands out as the most skewed asset class, with the top percentile holding approximately 70% of all company net worth in 2010, 2015 and 2018. This means that average company wealth for the top percentile is approximately 70 times higher than the average company wealth for the full population. Consumer durables and valuables are the asset class with the lowest concentration held by the top percentile (6% in 2010 and 3% in 2015 and 2018). However, it can be argued that consumer durables and valuables better represent final consumption expenditure, as is consistent with definitions in the SNA (see section 2.3 above). The asset class with the next lowest concentration held by the top percentile is owner-occupied housing, which may not be particularly surprising given that an individual can only occupy a single dwelling.²¹ Nevertheless, the top percentile still held a significant portion of owner-occupied housing wealth in 2010 (6%), 2015 (5%) and 2018 (11%). Further distributions are presented in **Appendix Three**.

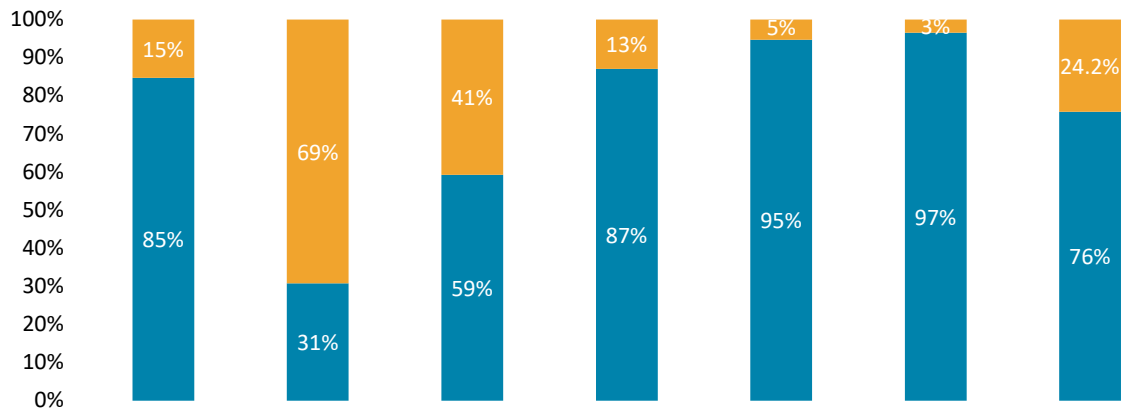
²¹ Holiday homes and other non-investment residential real estate are separately catalogued in HES.

**Figure 6 – Wealth shares for the top percentile by main asset categories
(New Zealand capitalisation method for 2010, 2015 and 2018)**

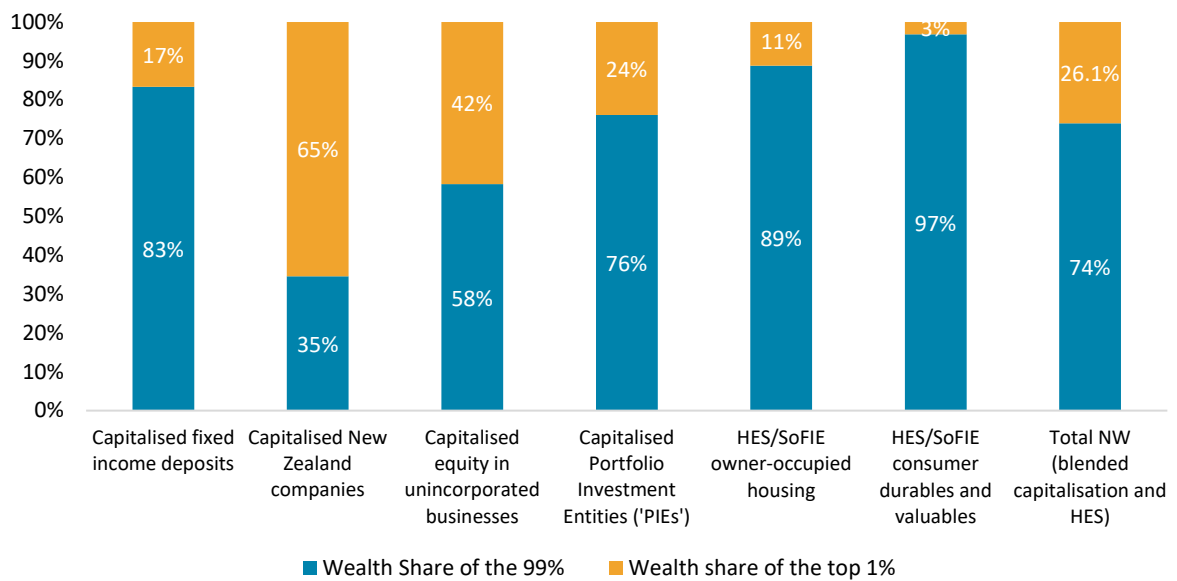
Panel A: 2010



Panel B: 2015



Panel C: 2018

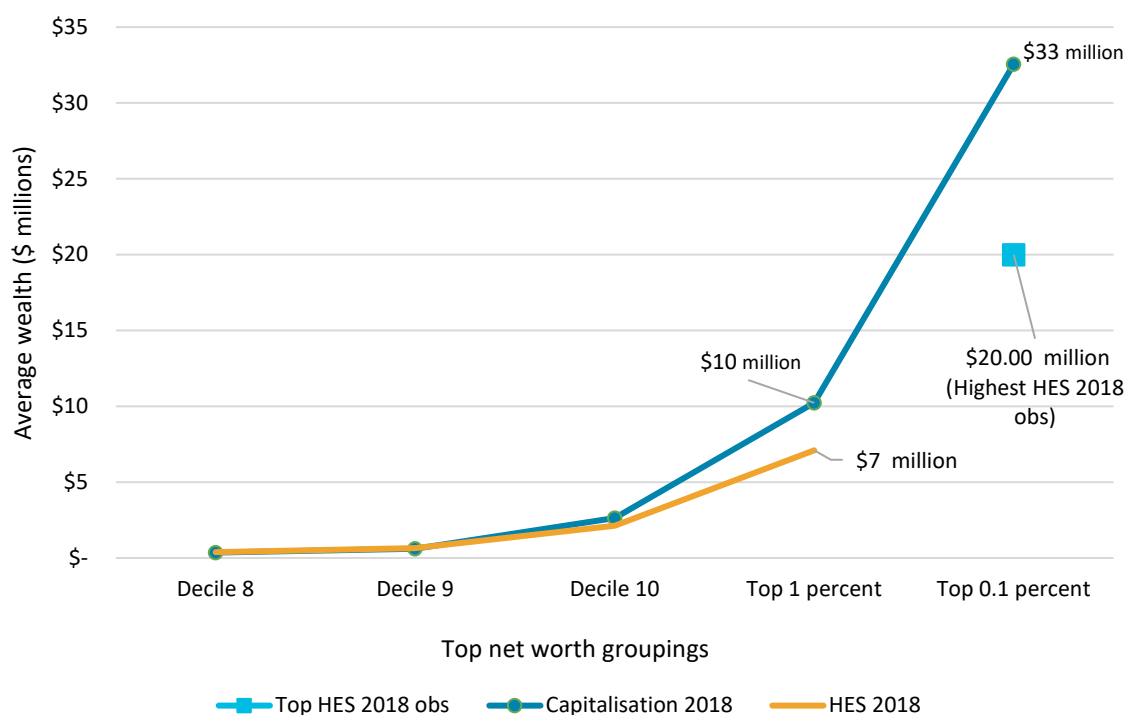


As discussed in section 5.2, the capitalisation method can be used to estimate smaller groupings than can be reliably achieved with survey data because it uses the entire taxpayer population. Accordingly, we estimate the wealth for the top 0.1% (approximately 4,000 taxpayers). We also provide tentative estimates for the top 0.01% (approximately 400 taxpayers) in **Appendix 3**, although we have lower confidence in these estimates because they are overly sensitive to the dividend income of individuals at the top of the wealth distribution.

We still must rely upon HES for the distribution of non-income generating assets.²² To include these assets we extrapolate values from the top percentile by simply dividing the top percentile value by 10 for the top 0.1% wealth share of these assets. This simple extrapolation can be considered to provide a lower bound estimate of the top 0.1% wealth share of non-income generating assets, since it assumes that these assets are evenly distributed within the top percentile. The real distribution of these assets is likely to be heavily skewed towards the top, as we observe within the top decile.

Figure 7 shows the average wealth held by several top net worth quantiles in 2018 according to HES and the New Zealand capitalisation method. This shows that wealth is highly concentrated at the top of the distribution. The highest wealth individual in HES 2018 had a net worth of approximately \$20 million, which is well below the capitalisation method's top 0.1% average wealth estimate of \$33 million.

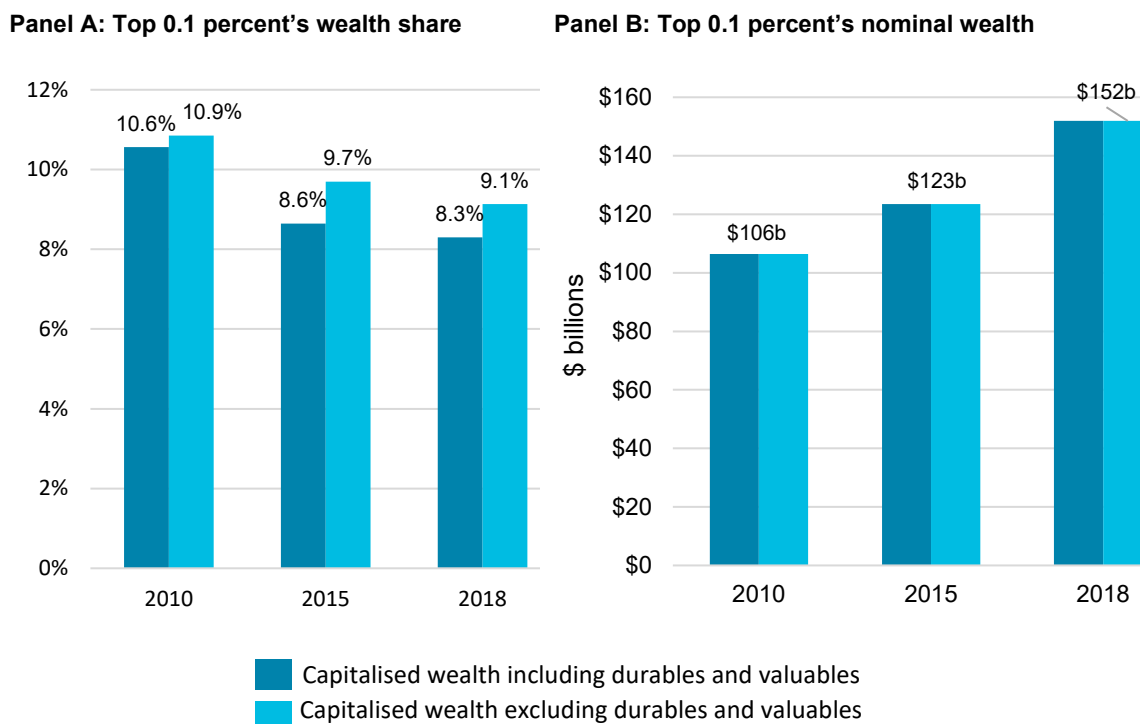
Figure 7 – Comparison of average wealth holdings according to HES 2018 and New Zealand capitalisation method 2018



²² Percentile-level data from HES are used for the net worth distribution for owner-occupied property and loans, consumer durables and valuables, consumer debt, and education debt.

Figure 8, Panel A shows that the top 0.1% wealth share has fallen from 10.6% (10.9% excluding durables) in 2010 to 8.3% (9.1% excluding durables) in 2018. By contrast, Panel B shows that the nominal net worth of the top 0.1% has increased from approximately \$106 billion in 2010 to \$152 billion by 2018.

Figure 8 – Top 0.1% wealth, with and without consumer durables and valuables (New Zealand capitalisation method for 2010, 2015 and 2018)



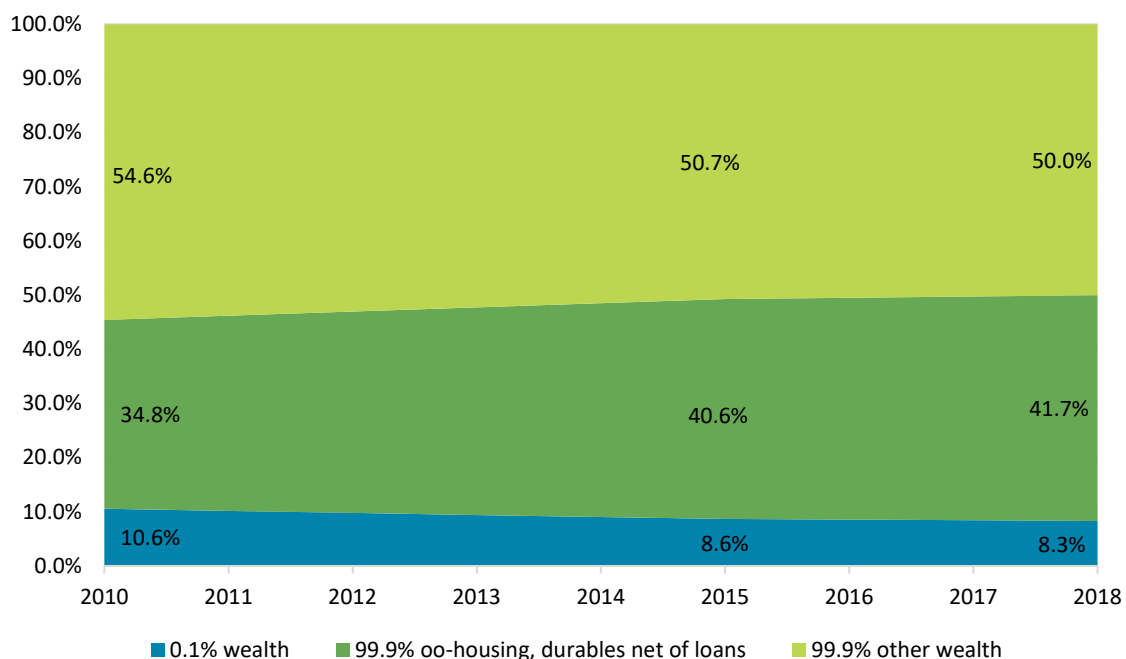
Nominal wealth figures appear identical with and without durables for the top 0.1% in Figure 8, which demonstrates how insignificant these assets are for the wealthy, while they are relatively more significant down the wealth distribution. The steady increase in nominal wealth figures for the top 0.1%, together with their falling wealth share, implies that the net worth of the bottom 99.9% must have increased at a relatively faster rate between 2010 and 2018.

A decomposition of wealth shares can help to explain the relative decline in the wealth share held by the top 0.1%. Figure 9 shows the split between housing and durables (dark green) and other wealth (light green) for the bottom 99.9%, and the total wealth share for the top 0.1% (blue) between 2010 and 2018.²³ This shows that the net worth share of owner-occupied housing and consumer durables for the bottom 99.9% grew from 34.8% of household net worth in 2010 to 41.7% by 2018, crowding out the net worth shares held in other forms of wealth for both groups.²⁴ **Appendix 2** contains a more detailed decomposition of wealth for across the distribution.

²³ We include a straight linear interpolation of wealth shares for the years between our capitalised estimates.

²⁴ The top 0.1% net worth share of owner-occupied housing and consumer durables is so small (0.4% of national wealth in 2018) that it would not be visible in Figure 9, so we only show the total 0.1% wealth share.

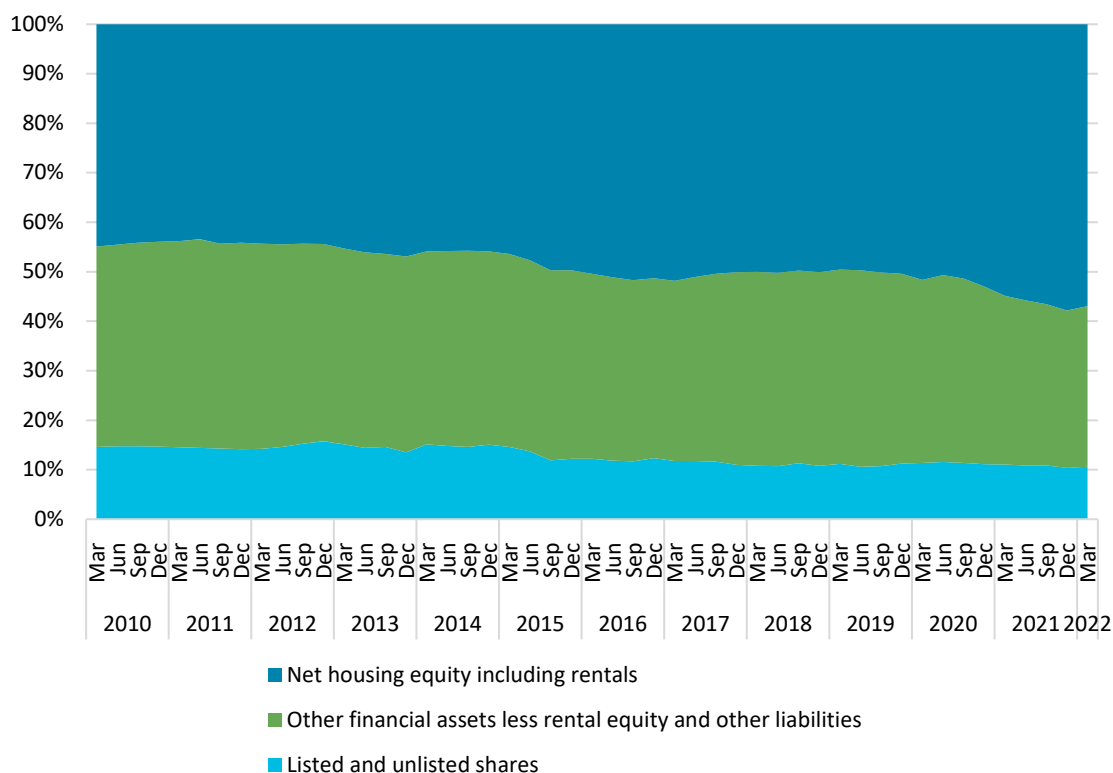
Figure 9 – Top 0.1% wealth share compared to the decomposed wealth share for the bottom 99.9% between 2010 – 2018 (New Zealand capitalisation method)



The relative decline in the wealth share of business asset categories reflects a broader trend that can be seen in the Household Balance Sheet. Between 2010 and 2018, and continuing to the present day; the share of national wealth held in financial assets has declined relative to wealth held in housing. Figure 10 shows that between March 2010 and March 2018 Household Balance Sheet net worth held in housing equity increased from 45% to 50%, while net worth held in listed and unlisted shares fell from 15% to 11%, and net worth held in other financial assets fell from 40% to 39%. This highlights how the growth in house prices has compressed the relative wealth at the top of the distribution – a finding previously explored by Symes (2021). As discussed by Symes (2021) a focus on the relative decline of top wealth shares can obscure the widening gap between home-owners and non-owners at the bottom of the distribution.

Figure 10 also shows that this trend continued, accelerating in 2020, with household wealth held in housing assets peaking at 58% in December 2021. The March 2022 data shows that this trend has now started to reverse, which might also be expected to have results in a reverse to the trends for top wealth shares described above.

Figure 10 – Household Balance Sheet wealth composition between March 2010 and March 2022

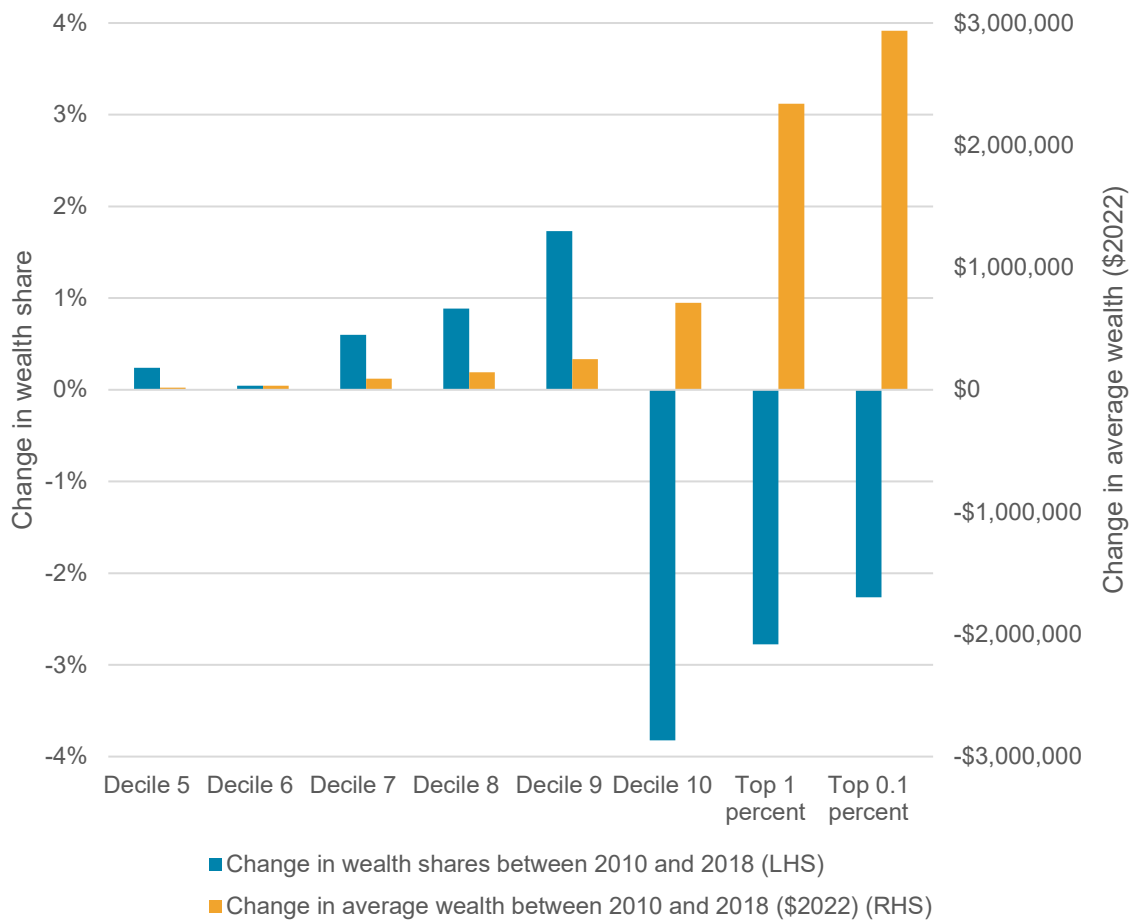


As discussed in section 2.4, focussing purely on relative wealth shares can obscure real gains and losses that result from changes in the wealth base. Provided that aggregate household wealth has increased sufficiently, a fall in wealth share can still correspond to a substantial increase in real wealth. In turn, measures of absolute wealth gains or losses can show how a rising or falling wealth share can be translated into consumption possibilities, such as housing affordability (Broome & Leslie, 2022).

Were the relative wealth shares for the top tail to continue falling, we would expect real wealth gaps to also fall eventually. However, for real wealth gaps to close, these short-term trends would need to persist well into the future. Trend persistence seems unlikely, at least to the extent that the recent fall in top wealth shares has been driven by short term growth in house prices, which are now falling (see Figures 9 and 10).

Figure 11 compares changes in wealth shares with changes in average wealth for deciles 5 and above between 2010 and 2018. Average wealth figures are adjusted according to the Consumer Price Index (CPI) to reflect prices in Q2, 2022. While wealth shares fell for the top 10%, 1%, and 0.1%, these same groups had the largest increases in average wealth. Real wealth gains were greatest for the top 0.1%, with average wealth increasing by \$2.9 million between 2010 and 2018 according to the New Zealand capitalisation method. By contrast, average wealth for decile 5 increased by only \$18,000 over the same period.²⁵

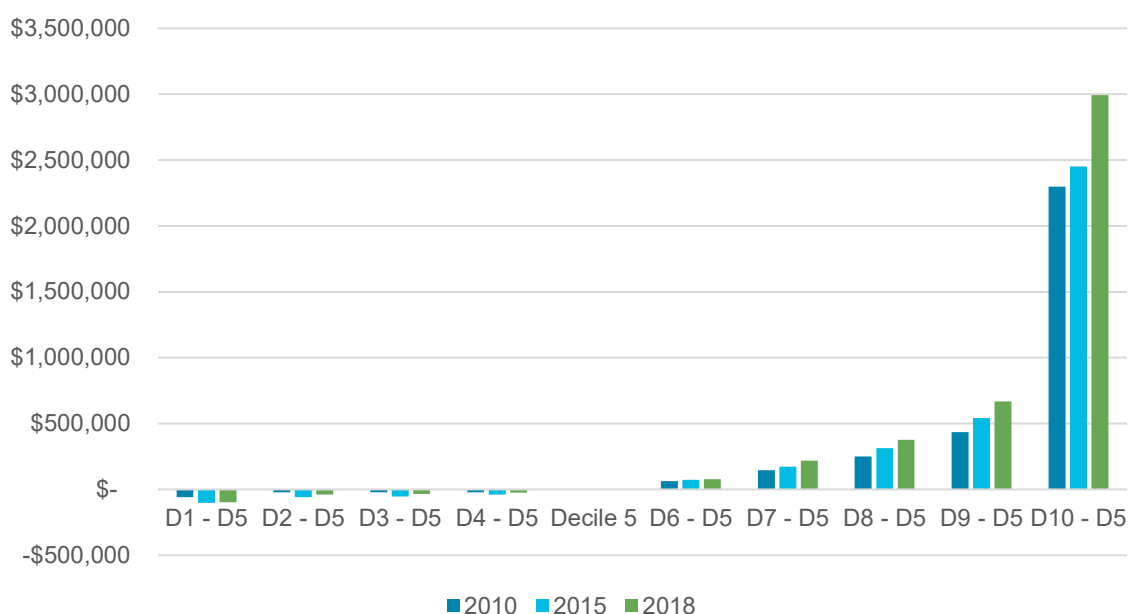
Figure 11 – Change in wealth shares and average capitalised wealth between 2010 and 2018 (2022 dollars)



²⁵ Changes in average wealth are not shown for deciles 1 – 4. All these groups appear to increase their average wealth, except for decile 1 where average wealth appears to have fallen. However, this result should be interpreted cautiously because the capitalisation method cannot reliably estimate bottom decile wealth, where there is very little taxable capital income. The fall in average wealth for decile 1 average wealth is derived entirely from the values for SoFIE and HES owner-occupied housing and associated loans, durables, valuables, consumer loans and education loans (see section 5.3).

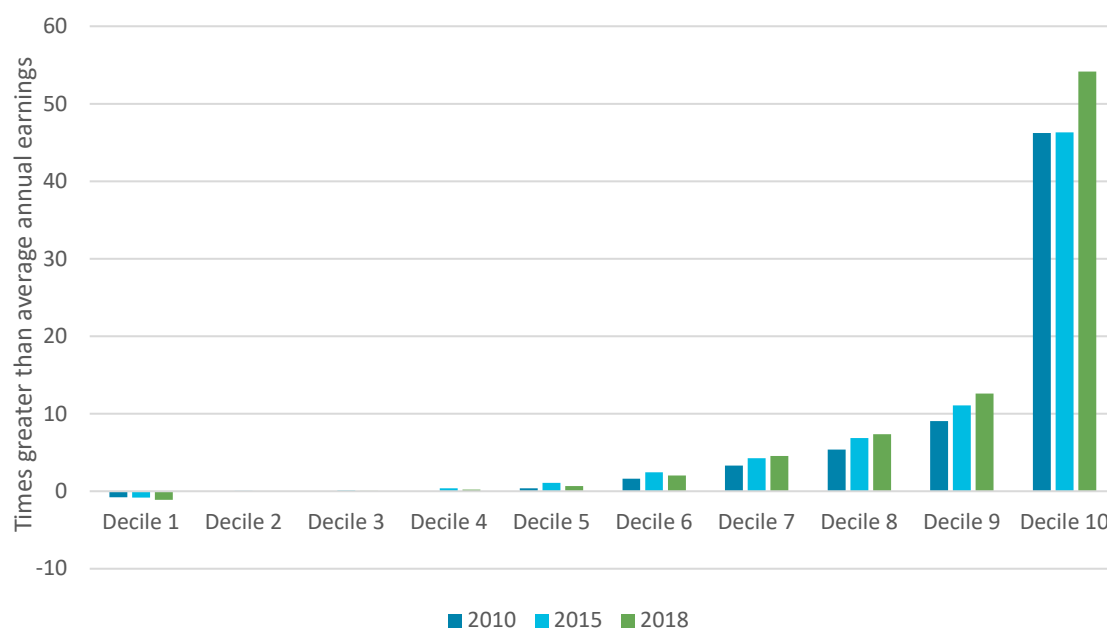
Higher real gains at the top of the distribution also means that there is now a larger average wealth gap between middle and top deciles. Figure 12 shows the average wealth gap between decile 5 and every other decile for 2010, 2015 and 2018 according to the New Zealand capitalisation method, expressed in 2022 dollars. Between 2010 and 2018 the average wealth gap increased between decile 5 and all higher deciles (6 – 10). The largest real average wealth gap was largest for decile 10, which increased from \$2.3 million higher than decile 5 in 2010 to \$3.0 million higher than decile 5 in 2018. Again, it is important to remember that these are cross-sectional data and changes in average decile wealth do not account for wealth mobility as people may move between quantile groupings over time.

Figure 12 – Average wealth gap relative to decile 5 (2022 dollars)



A similar trend can be seen when we compare average decile wealth to average ordinary earnings. Figure 13 shows wealth as a multiple of average ordinary time annual earnings (net of tax and ACC levy). Here we see that the ratio of annual average ordinary earnings to average wealth increased for deciles 7 to 10 between 2010 and 2018. This increasing gap means that between 2010 and 2018 it became harder for the average earner to reach the higher wealth deciles through ordinary earnings alone.

Figure 13 – Wealth as a multiple of average ordinary time annual earnings (net of tax and ACC levy)



6.2 Sensitivity test for human capital

Our capitalised wealth distribution assumes self-employment and partnership income is derived from capital. In reality, a significant portion of this income is likely derived from labour or returns to human capital. Smith, Yagan, Zidar, and Zwick (2019) critique the Saez and Zucman (2016) income estimates as incorrectly attributing partnership and S-corporation²⁶ income to underlying physical capital. They suggest that in the United States approximately 75% of income accruing to S-corporations is derived from human capital. For example, some returns in professional services companies (eg, partners in accountancy or law firms) will reflect human knowledge and skills rather than the physical capital held in their office or equipment. In a subsequent paper, Smith, Zidar, and Zwick (2023) suggest that accounting for these returns to human capital can result in a significant reduction in capitalised top wealth shares.

We tested the sensitivity of our capitalised results to changing this assumption by re-estimating our modelled wealth shares using 45% of the income from partnership, self-employment, and look-through companies. This sensitivity test assumes that 45% of the income from these entities is derived from physical capital, with the remaining 55% derived from labour and therefore discarded. This alternative ratio was based on a Productivity Commission estimate (Fraser, 2018) that the labour income share in New Zealand is approximately 55%.

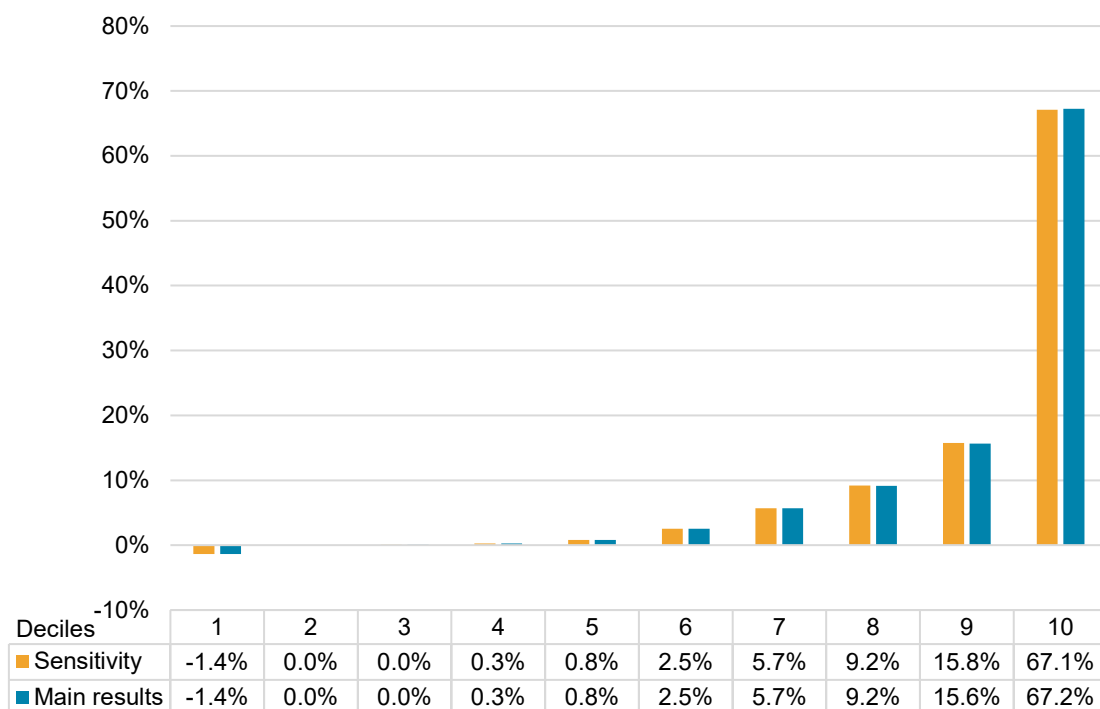
²⁶ Look-through companies are the New Zealand equivalent to S-corporations, but they are less commonly used due to the presence of imputation credits in New Zealand.

Figure 14 compares our main capitalised wealth shares with the sensitivity test results for 2018. Most wealth share estimates are the same or within 0.3 percentage points when rounded to one decimal place. This suggests that our main results are not being significantly biased by returns to human capital that might constitute part of partnership, self-employment or look-through company income. Similar results are found for 2015 and 2010 and are included in **Appendix Four**.

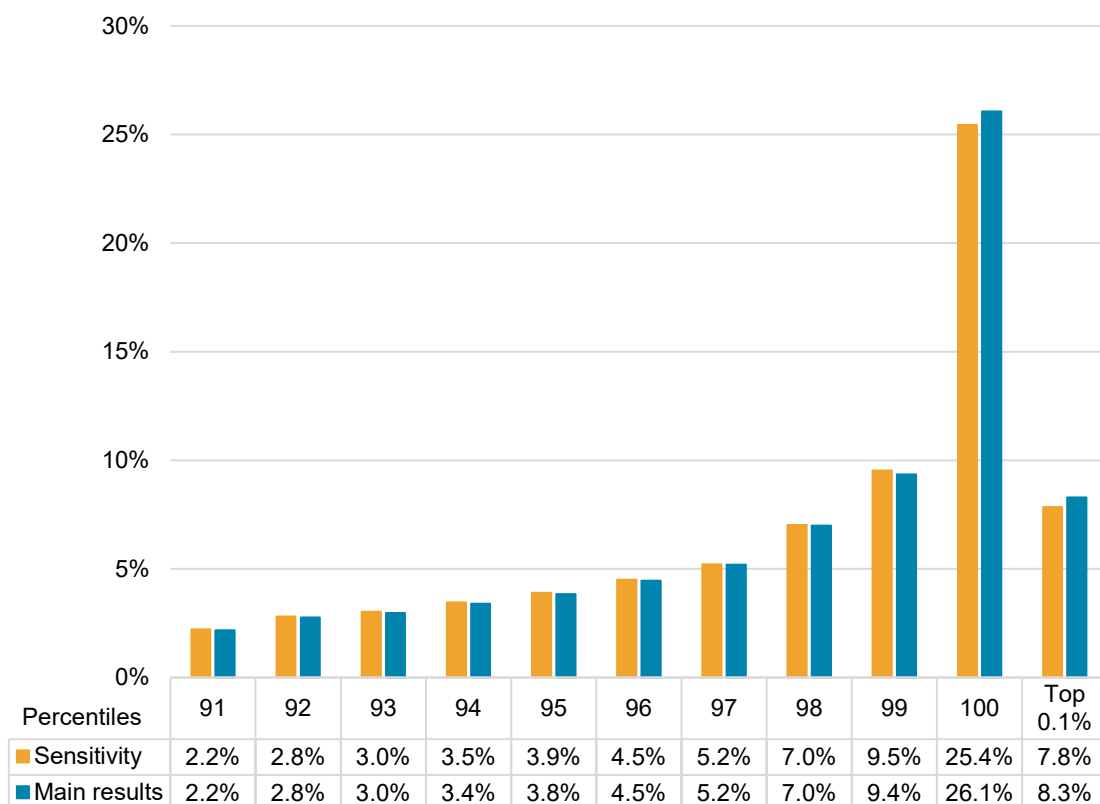
Smith, Yagan, Zidar, and Zwick (2019) and the sensitivity test we have conducted here focus on the human capital aspect of pass-through entities. It is still possible that some bias might be found from returns to human capital if returns on human capital are derived through ordinary companies. The presence of imputation credits, which prevent the double-taxation of income received as dividends in New Zealand, probably raises the likelihood that owner-operators may realise some returns to human capital as dividends. Given the high concentration of company wealth held by the top tail (see Figure 6 above), the mixing of human capital returns in dividends may distort our capitalised wealth distribution. Smith, Zidar, and Zwick (2023) present a method for reducing this bias by basing S-corporation wealth estimates upon an equal-weighted average of company sales, assets and modified earnings. In the New Zealand context such an approach would need to be adapted for application to unlisted equities rather than S-corporations.

Figure 14 – Sensitivity test compared against main results for 2018

Panel A: Deciles



Panel B: Top 10 percentiles



6.3 Heterogenous returns to wealth

A key assumption of the New Zealand capitalisation method is that the rate of return is uniform within each asset class. As discussed in detail in Saez and Zucman (2016), this assumption may be violated if asset-specific returns are correlated with wealth. In this section we discuss how evidence of heterogeneous returns to wealth is generating ongoing debate about how the capitalisation method should be adapted to reflect this dynamic (Saez & Zucman, 2020, 2022; Smith, Zidar, & Zwick, 2023). The presence of heterogenous returns to wealth within New Zealand asset classes would imply a bias in the New Zealand capitalised wealth distributions. The direction and scale of that bias is an empirical question.

There is a well-established body of evidence of heterogeneous returns to wealth internationally. Piketty (2014, p 447) identified that returns on endowment funds increased with their size. In Norway, returns to net worth have been found to be highly variable, with a standard deviation of 22.1% and an 18 percentage point difference in the average return between the 90th and 10th percentiles (Fagereng, Guiso, Malacrino, & Pistaferri, 2020). Heterogeneous returns to wealth have also been detected using Swedish administrative microdata (Lundberg & Waldenström, 2018; Bach, Calvet, & Sodini, 2020). In the United States, heterogenous returns to wealth have been detected using survey data (Saez & Zucman, 2020; Smith, Zidar, & Zwick, 2023).

Persistent heterogeneity in rates of return is also likely to be an important driver of wealth inequality through time. Benhabib, Bisin, and Zhu (2011) use an overlapping generation economy model to find that returns on capital income and persistence of that return, rather than returns to labour income, determines the concentration of top tail wealth. Garbinti, Goupille-Lebret, and Piketty (2021) find that a simple simulation model, that allows for unequal savings rates and heterogenous returns to wealth, can explain the change in wealth-inequality observed in France since the 1980s. It remains to be seen if such mechanisms can explain trends in wealth inequality for New Zealand.

Some of the differences in returns to net wealth are due to portfolio composition effects. Portfolio composition differs markedly across the net wealth distribution (see **Appendix 2**) and may influence wealth inequality. The New Zealand capitalisation method controls for differential returns to net worth that are caused by portfolio composition differences by having asset-specific multipliers (see section 5.1). However, our method does not account for differential rates of return *within* asset classes, where it assumes a fixed rate of return.

There are several reasons why we might expect heterogenous returns to wealth within asset classes. Fagereng, Guiso, Malacrino, and Pistaferri (2020) find that observable factors in Norwegian wealth datasets, such as scale and risk exposure, cannot fully account for heterogenous returns to wealth. They suggest that persistent traits of investors, such as investment ability and talent, are required to fully explain the heterogeneity. Bach, Calvet, and Sodini (2020) also find persistent heterogeneity of returns to wealth using Swedish administrative data, although they conclude that this heterogeneity can be explained solely by differences in risk exposure. These opposing conclusions are a result of different methods for measuring investment performance.²⁷ Nevertheless, both studies indicate the presence of heterogenous returns to wealth.

6.3.1 Evidence of heterogenous returns in New Zealand equities

We have undertaken preliminary investigations into heterogeneity in returns to wealth for New Zealand equity in listed and unlisted corporations. The presence of heterogenous dividend rates of returns could indicate a systematic bias in our fixed return capitalisation method and support the use of alternative methods.

There are some specific features of incorporated equity returns that would seem to raise the likelihood of detecting heterogenous returns. Most importantly, dividends do not represent the total economic return on incorporated equities. Both listed and unlisted incorporated equity provide a source of income in the form of dividends and increases in wealth in the form of capital gains.

²⁷ Fagereng, Guiso, Malacrino and Pistaferri (2020) rely upon average historical returns, whereas Bach, Calvet and Sodini (2020) use asset pricing models to estimate expected returns for each asset class.

As discussed in **section 5.3**, international methods have used both reported dividend income and reported capital gains as income flows for capitalising listed and unlisted equity wealth. Mapping between income and wealth is found to be more accurate when capital gains are incorporated. However, even where capital gains are reported, they are generally reported on a realisation basis. For some of the world's richest, most capital gains are unrealised. Realised capital gains are particularly lumpy and normally represent many years of previously accrued gains, so do not cleanly inform a point in time estimate of wealth. Internationally, treatment of realised capital gains varies between methods (compare Saez & Zucman, 2022; Smith, Zidar, & Zwick, 2023).

New Zealand does not hold tax administration data capturing an individual's reported capital gains because New Zealand's tax system does not tax capital gains comprehensively. Further, data corresponding to taxable capital gains are typically grouped together with other sources of income and is not separately catalogued by Inland Revenue. Absent capital gains data we must rely solely on reported dividends to estimate unlisted and listed equity in our capitalisation methods. As this section elaborates, this has implications for the assumption of uniform returns in the New Zealand capitalisation method.

Capitalisation approaches that rely on dividend income also understate the wealth of non-dividend-generating companies. Saez and Zucman (2022) observe that some prominent Forbes individuals have their wealth concentrated in listed equities that do not pay dividends (eg, Warren Buffett and Berkshire Hathaway, Mark Zuckerberg and Facebook, and Jeff Bezos and Amazon), while others routinely make disbursements (eg, Bill Gates and Microsoft, Larry Ellison and Oracle, and Phil Knight and Nike).

International studies have also surfaced a negative relationship between the value of individuals ownership of incorporated business wealth and the implied dividend yield, with dividend yields being lower for larger possessions (Scholz, 1992; Kawano, 2014; Lundberg & Waldenström, 2018). These results suggest that lesser-wealth individuals tend to prefer high-dividend firms, while large investors may venture into low-dividend growth firms that realise capital gains irregularly. This preference among the wealthy may reflect a higher risk appetite and greater tax planning.

These studies suggest that relying exclusively on dividend payments may underweight high-income households. It would be reasonable to expect a similar dynamic in New Zealand given the strong incentive for the wealthy to favour untaxed capital gains over dividends that are subject to progressive income taxation.

We can estimate the wealth elasticity of individual dividend income²⁸ as it presents in the HES data. We estimate a β with a 95% confidence interval of [0.65, 0.67], which is significantly different than 1. In other words, a 1% increase in a household's incorporated equity holdings is associated with a 0.65 - 0.67% increase in dividend income, all else being equal. This finding suggests diminishing marginal dividend returns to incorporated equity: each additional unit of equity holdings provides a smaller increase in dividend income than the previous unit. This breaks the fixed rate of return assumption and is consistent with the wealthy favouring capital gains over dividends in New Zealand. Further detail can be found in **Appendix 5**.

Diminishing marginal dividend returns to incorporated equity suggests that the New Zealand capitalisation method likely underestimates the true level of wealth inequality in incorporated equity holdings. This provides a good reason to introduce differential rates of return to the dividend component of the capitalisation method.

However, we cannot rely on HES data directly to derive capitalisation multipliers. The capitalisation method derives multipliers directly from the tax administration data; to use HES to derive multipliers would exacerbate the effect of differences between the survey and tax administration data, introduce false accuracy, and overstate our confidence in HES data. Therefore, to reflect heterogenous returns in the New Zealand capitalisation method, we need to develop a method of deriving different multipliers on different intervals of dividend income directly from the tax administration data. To this end, one could estimate the distribution of capital gains over the wealth distribution or use the ratio of capital gains to capital income to scale dividends over the wealth distribution, to model the full economic income from incorporated equity. Further research is needed to develop such a method and incorporate heterogenous dividend returns into the New Zealand capitalisation method.

Until a method is developed to incorporate heterogenous dividend returns, our results suggest that the current capitalisation method underestimates the share of incorporated equity held at the very top of the distribution. However, this finding should be considered in the context of other aspects of the method which might be leading to an overestimation of the top tail's net worth share (see section 5.3.1 above), before we can be sure that the total effect of biases in the current method produces underestimated top shares.

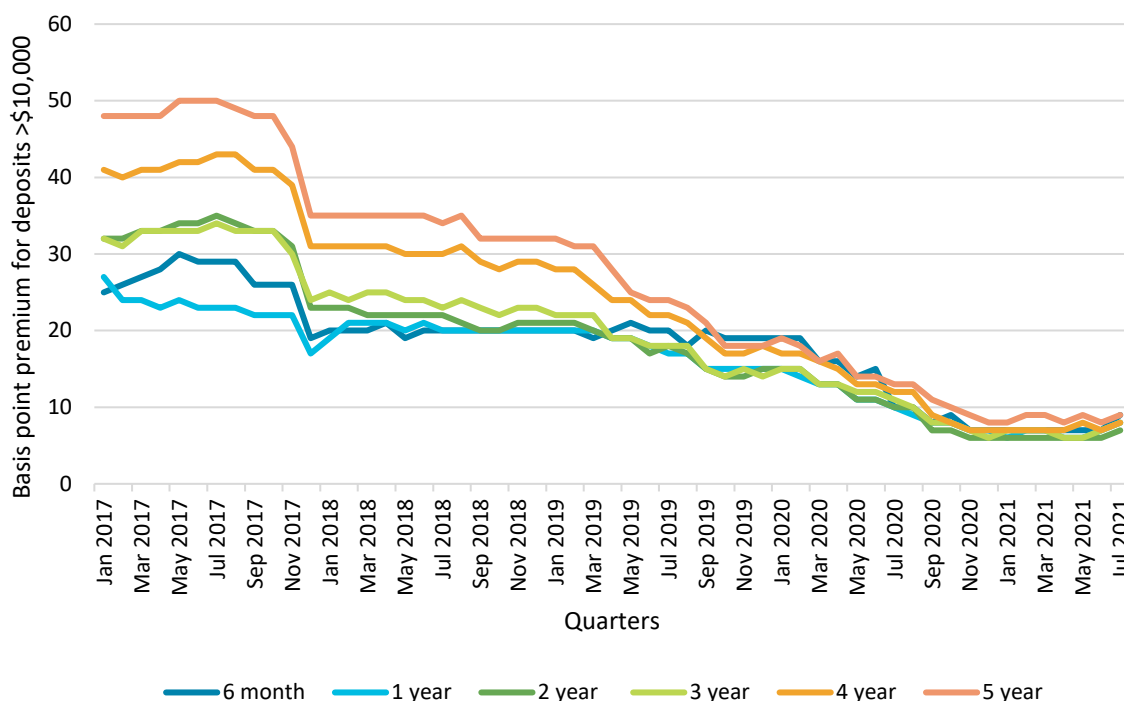
²⁸ The wealth elasticity of individual dividend income provides a measure of the responsiveness of dividend income to changes in incorporated equity holdings. It can be defined as the percentage change in dividend income associated with a 1% change in the level of incorporated equity holdings, all else equal. See Appendix 4 for more detail.

6.4 Evidence of heterogenous returns in other asset classes

Incorporated equity is not the only asset class where heterogenous rates of return might be expected, with the possibility of biasing our fixed-return capitalised wealth estimates. It is likely that heterogenous returns to wealth may also exist for other asset types, such as fixed-income assets, unincorporated businesses, and Portfolio Investment Entity (PIE) assets. In the US context, Smith, Zidar, and Zwick (2023) and Saez and Zucman (2020) have explored different methods for detecting heterogenous returns for these other asset classes. While we have not undertaken a full investigation into potential heterogenous returns for these other classes, we do have circumstantial evidence that the wealthy can generate higher returns from fixed-income assets.

Figure 15 shows the interest rate premia available across various terms for those with at least \$10,000 available to save. In March 2018, the most recent date we have capitalised wealth data, there was up to a 35-basis point premium on five-year term deposits for deposits greater than \$10,000. It can be expected that the wealthy can realise these interest rate premia by making larger savings deposits and locking them into longer terms.

Figure 15 – Interest rate premia for bank deposits of \$10,000 or more by different terms (RBNZ data)



If we could confirm rising interest rate returns to wealth, this would imply that we should be using a lower multiplier for high-interest income individuals, since the multiplier equals the inverse rate of return. Such a finding would imply that a fixed rate of return capitalisation method exaggerates the fixed-income wealth at the top of the distribution.

The potential bias arising from heterogeneous returns to fixed-income assets is unlikely to be particularly significant because the wealthy hold less of their wealth in fixed-income assets and more in incorporated equity. This means that the downward bias (discussed in section 6.3.1) for estimating top incorporated equity wealth will likely dominate any fixed-income bias in the opposite direction. However, we have not estimated the net effect of correcting both biases.

Heterogeneous returns to wealth could also be detected for different types of unincorporated businesses. For example, Smith, Zidar, and Zwick (2023) create industry-specific multipliers that can account for different returns to equity for different business types. We already know that there are heterogeneous returns on equity for different industries in New Zealand. For example, Stats NZ and Inland Revenue's business performance benchmarker shows a return on equity industry range between 4% and 124% for 2021 (Stats NZ, 2022a). If we find that certain industries are more concentrated amongst high capital income individuals, this would warrant a further refinement to our methodology to account for these heterogeneous returns.

7 Conclusion

This paper has sought to improve the understanding of the distribution of wealth in New Zealand by presenting results from a novel capitalisation method. The New Zealand capitalisation method suggests that there is a greater concentration held at the top of the distribution than indicated by the official HES statistics.

We have identified some trends in the wealth distribution in recent years. The wealth shares for the top decile and percentile are relatively stable, whereas the wealth shares for the top 0.1% declined between 2010 and 2018. By contrast, we have found that the absolute or real wealth gap has increased between the average New Zealander and the top of the wealth distribution. This growth in the real wealth gap aligns with similar research undertaken in the United Kingdom (Broome & Leslie, 2022). Whether absolute or relative wealth inequality statistics are more pertinent is highly context specific and should be determined by the question one aims to answer.

We have discussed key assumptions and limitations of the New Zealand capitalisation method. Crucially, we assumed that returns within asset classes are fixed. In contrast, preliminary investigations using HES data indicate that heterogeneous dividend returns decline over the wealth distribution and may impact our capitalisation for company equities. We also identified some circumstantial evidence for heterogeneous returns for fixed income assets and unincorporated equity. Confirming the presence of these heterogeneous returns and developing a reliable method for incorporating them into the capitalisation method is a fruitful area for future research. Alternatively, or as a complement, wealth estimates could be improved by using tax data to oversample the top of the distribution (see the six methods outlined in section 4).

The current New Zealand capitalisation method has limited value in assessing changes in the distribution of wealth over longer periods of time. This is due to the difficulty in separating changes in the underlying wealth distribution from behavioural responses to different tax settings. The period we have examined (2010 – 2018) had relatively consistent tax settings. However, extending the series to 2021 or beyond would likely lead to a bias caused by tax planning behaviour in response to the introduction of the new 39% top tax rate in New Zealand. Again, high-quality survey measures or new sources of tax data that are consistently collected across time are likely to be the best way to ensure that we can understand longer-term wealth trends. We are continuing to refine the capitalisation method to improve its applicability across longer time periods.

The distribution of wealth in New Zealand continues to be a subject of considerable interest and importance to policy making. In recent years the focus has shifted to improving our understanding of more holistic measures of wealth, such as the natural environment, human capability, and social cohesion (The Treasury, 2021b). This paper demonstrates that there also remains considerable work to do in improving our measurement and estimation methods for the distribution of physical and financial wealth. Indeed, accessible, reliable and transparent information about economic inequality is a public good that must be maintained to monitor wellbeing, inform policy-making, and support fruitful democratic discussion.

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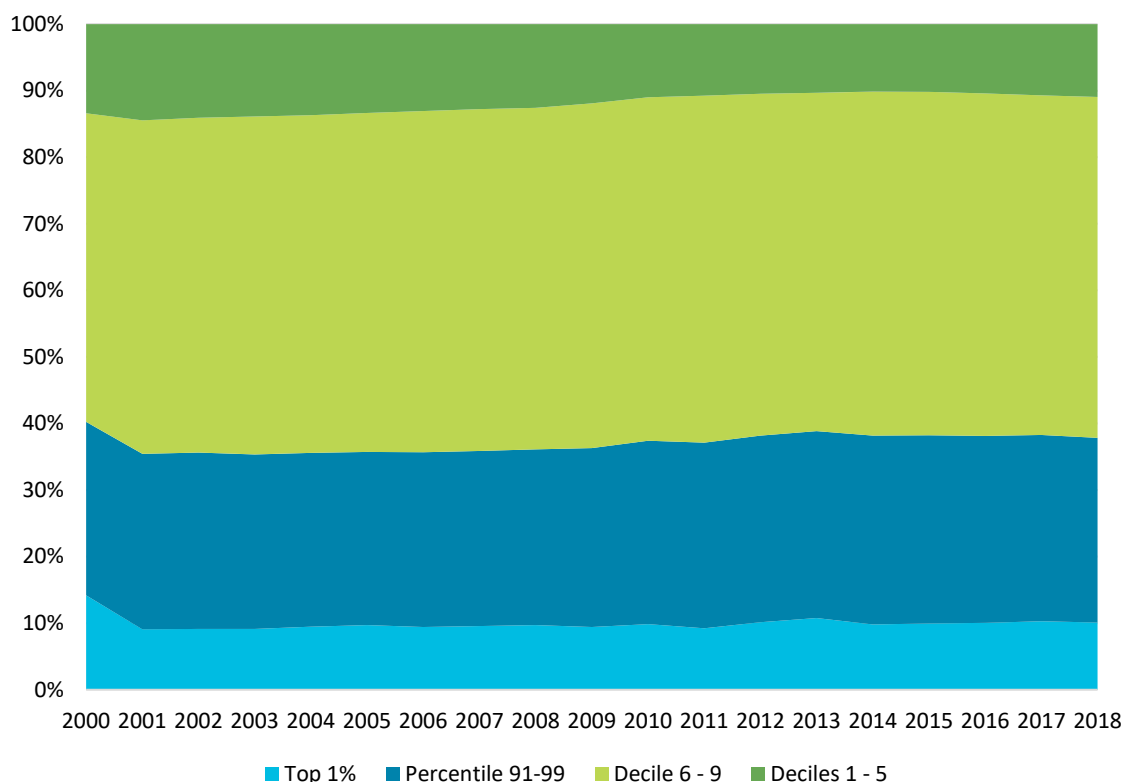
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Appendix 1 – Evidence of taxpayer behaviour driving trends in taxable income shares

It is possible that the trends in the capitalised wealth distribution do not reflect true changes but are artefacts of changing tax law, which causes breaks in the data. To minimise this risk we examined the share of taxable income by deciles and top percentiles between 2000 – 2018.

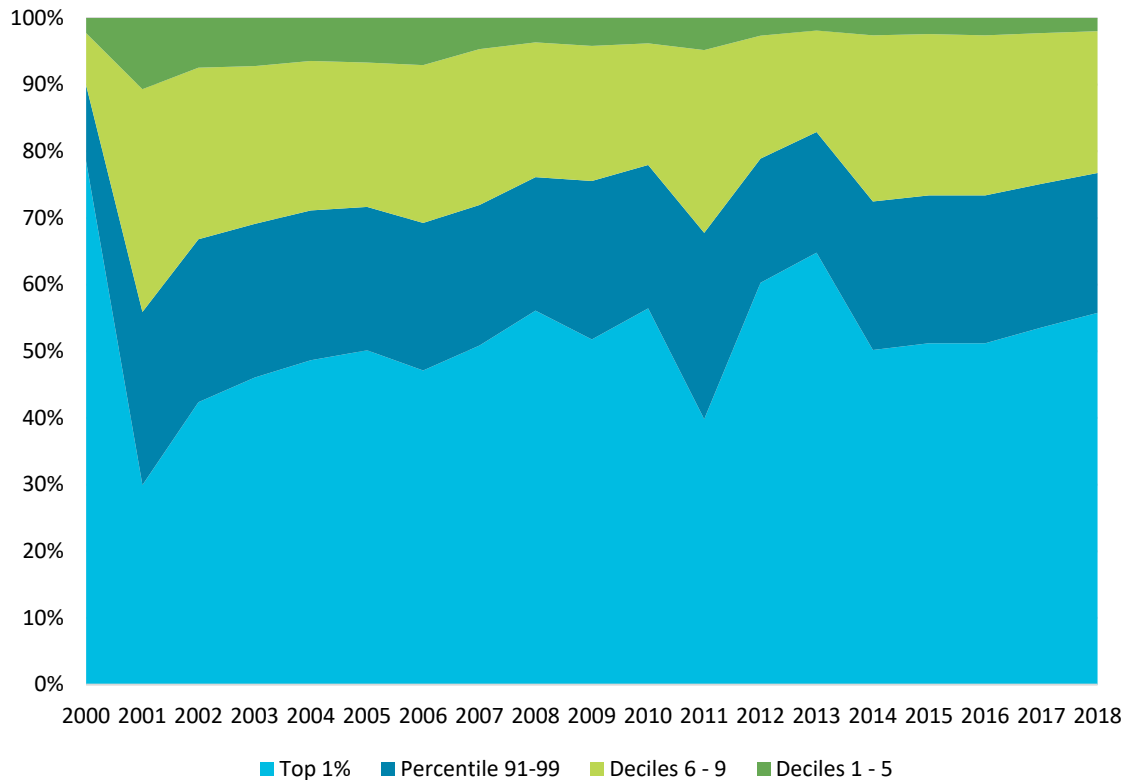
Figure 16 shows the share of taxable income for the top percentile, the next 9 percentiles (p91 – p99), the middle 40% (decile 6 – 9) and the bottom 50% (decile 1 to 5). The average top percentile share of taxable income between 2001 and 2018 was 9.7%. The most noticeable change in top taxable income shares can be seen between 2000 and 2001. The fall in top percentile income share from 14% in 2000 to 9% in 2001 can be explained by the introduction of a new top tax rate of 39% for income over \$60,000 in the 2001 tax year. In anticipation of this higher rate high income shareholders were motivated to realise dividends in 2000, ensuring they were taxed at a lower top rate of 33%. In the years following 2000 the top percentile taxable income share remained relatively stable and reaching a trough of 9.1% in 2001 and a peak of 10.8% in 2013.

Figure 16 – Taxable income shares between 2000 and 2018



Considering dividend income shares in isolation reveals a much more volatile trend. Figure 17 compares the same groupings for dividend income. Again, the most dramatic change in income shares can be seen in 2000-2001, in response to the change in the top personal income tax rate. However, top percentile dividend income shares also appear to fall significantly in 2011. This can be explained by legislated reductions in the top tax rate combined with changes in the value of imputation credits to reflect a lower company tax rate. From 2014 – 2018 imputation credits were set at a value of 28 cents and the top tax rate was set at 33%, which helps explain the more stable dividend income shares for these years.

Figure 17 – Dividend income shares between 2000 and 2018

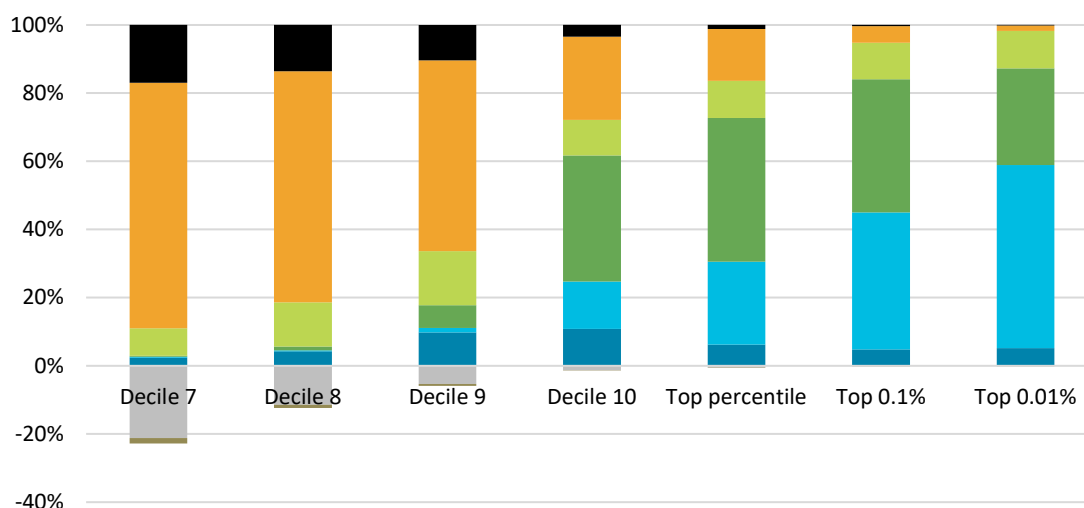


Appendix 2 – Supplementary charts and distributions

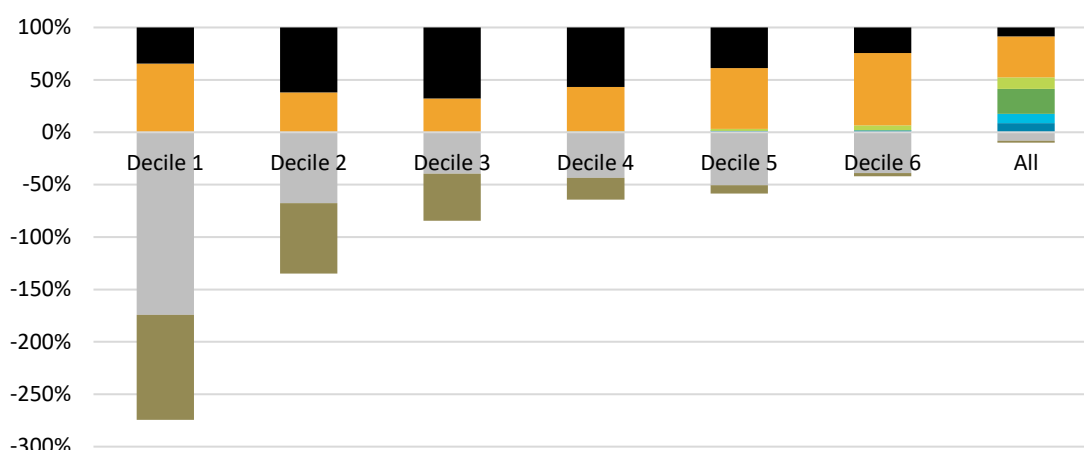
Figure 18 shows the asset composition of gross assets by deciles, the top percentile, and top 0.1% in 2018. We split deciles 1 – 6 to a separate panel because the low net worth of these deciles results in a very stretched vertical axis. Panel A shows that capitalised wealth (the shades of blue and green) contributed a gradually larger portion of net worth towards the top of the distribution, whereas owner-occupied housing (orange), consumer durables and valuables (black) together represent the main assets held by the bottom 9 deciles.

Figure 18 – Assets and liabilities as a percentage of gross assets by deciles, the top percentile, and top 0.1% in 2018 (New Zealand capitalisation method)

Panel A: Decile 6 and above



Panel B: Decile 5 and below



- Capitalised fixed income deposits
- Capitalised New Zealand companies
- Capitalised equity in unincorporated businesses
- Capitalised Portfolio Investment Entities ('PIEs')
- HES owner-occupied housing assets
- HES owner-occupied housing loans
- HES consumer durables and valuables
- HES consumer and education loans

Note: HES categories have been upscaled to agree with Stats NZ Household Balance Sheet totals.

In Panel B of Figure 18 the decile 1 and 2 loan values exceed the value of their assets, giving these individuals negative net worth.²⁹ Decile 3 has the lowest overall positive net worth value, with consumer durables and valuables making up over half of gross assets.

Figure 19 shows how each component of wealth contributed to the top 0.1% wealth share between 2010 and 2018. The category of wealth with the greatest relative decline for the top 0.1% was capitalised New Zealand company wealth, which represented 5.5% of national wealth in 2010 but only 3.3% of national wealth by 2018. The top 0.1% wealth share derived from unincorporated businesses also fell from 4.1% in 2010 to 3.2% in 2018.

Figure 19 – Decomposition of the wealth share for the top 0.1% (New Zealand capitalisation method)

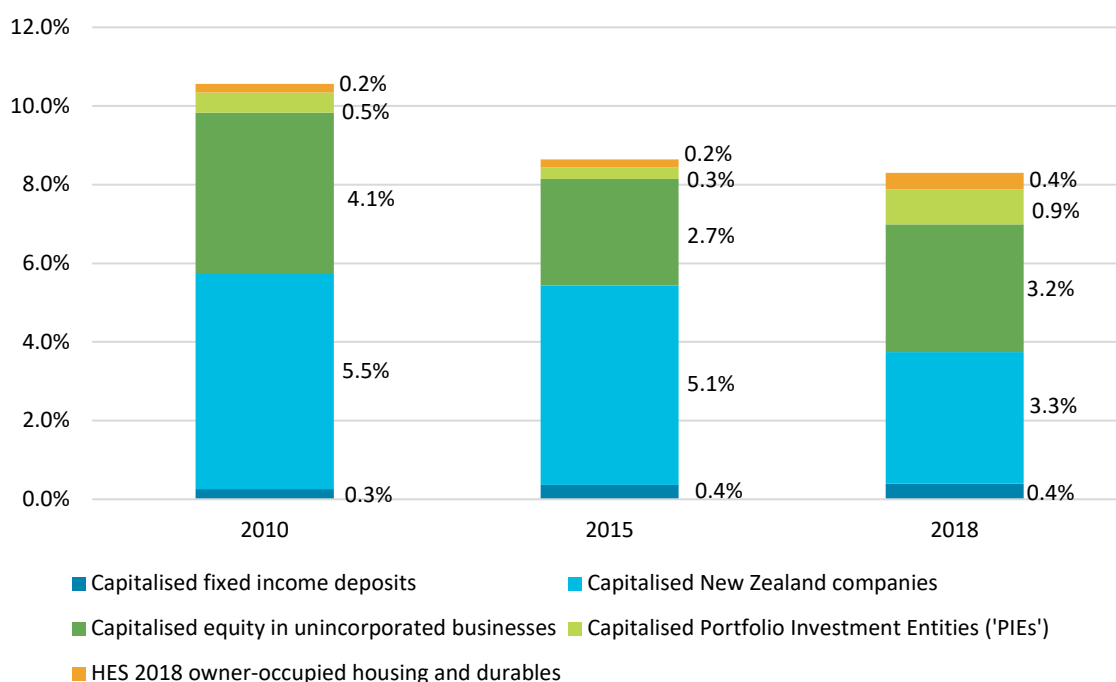


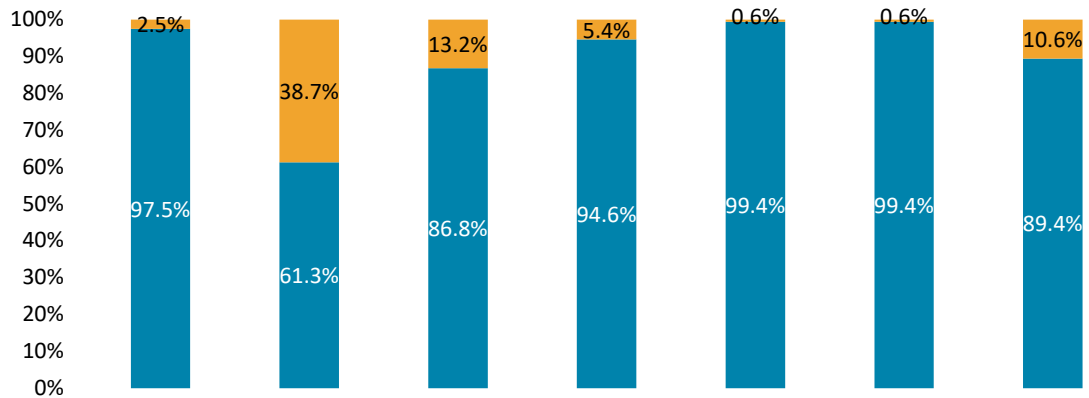
Figure 20 presents the top 0.1% net worth shares by asset class. Many of the trends identified for the top percentile also apply to the asset wealth shares of the top 0.1%. The top 0.1% holds a greater than average wealth share for all asset categories, with wealth held in companies being the most highly concentrated. The top 0.1% wealth share of 34.3% (38.7%) in 2018 (2010) can also be interpreted to mean that they hold 343 (387) times more company wealth than the average New Zealander. The net worth shares for owner-occupied property and consumer durables and valuables in Figure 23 for the top 0.1% should be treated with caution because they are a simple fraction (one-tenth) of the top percentile's wealth share for those categories.³⁰ Therefore the top 0.1% wealth shares for owner-occupied property and consumer durables and valuables presents a lower-bound of their true wealth share.

²⁹ This may partly be explained by our use of an individual unit of analysis. HES data indicate less negative net worth for the bottom deciles when using household units, although the HES 2018 decile 1 still has negative overall net worth when using household units.

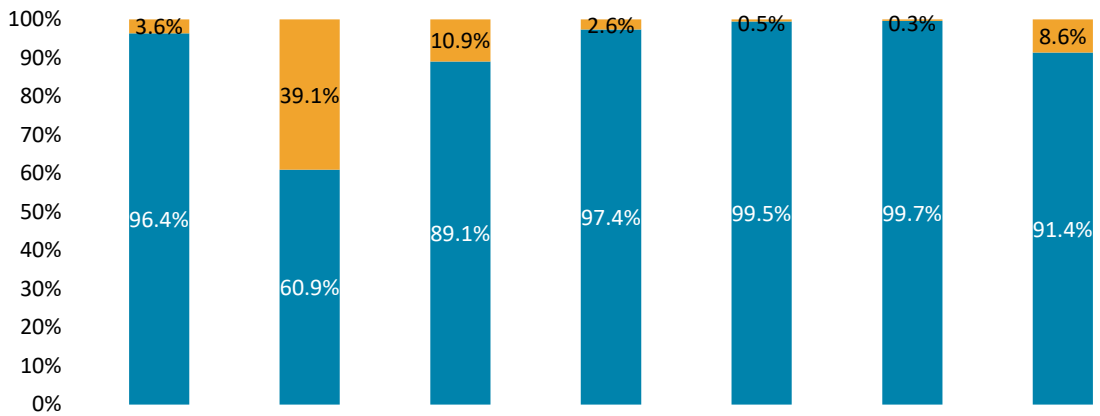
³⁰ Existing survey measures do not provide reliable measures of wealth for the top 0.1%.

Figure 20 – Wealth shares for the top 0.1% by main asset categories (New Zealand capitalisation method)

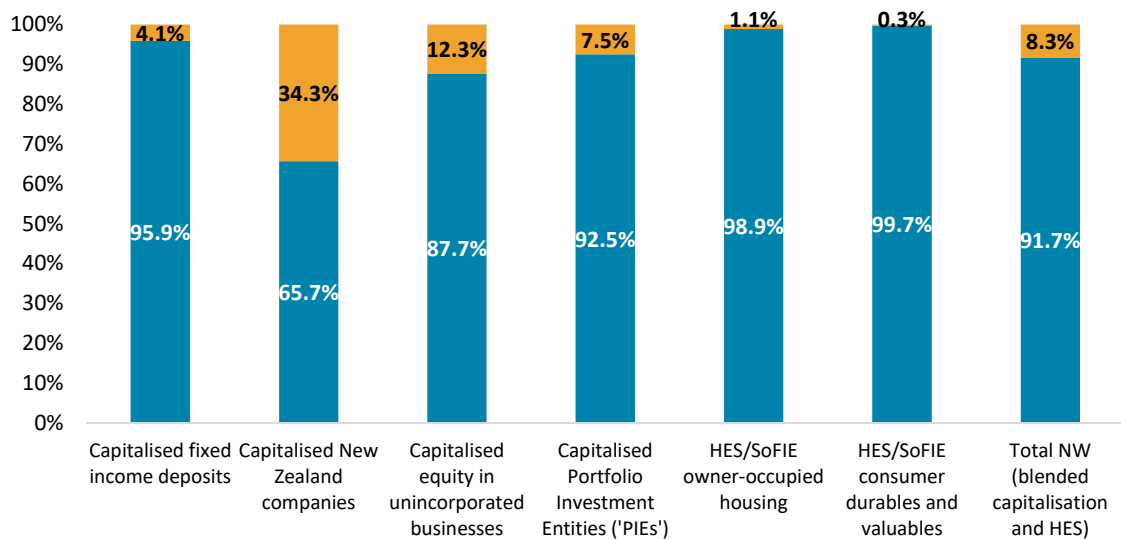
Panel A: 2010



Panel B: 2015



Panel C: 2018



Wealth share by asset type

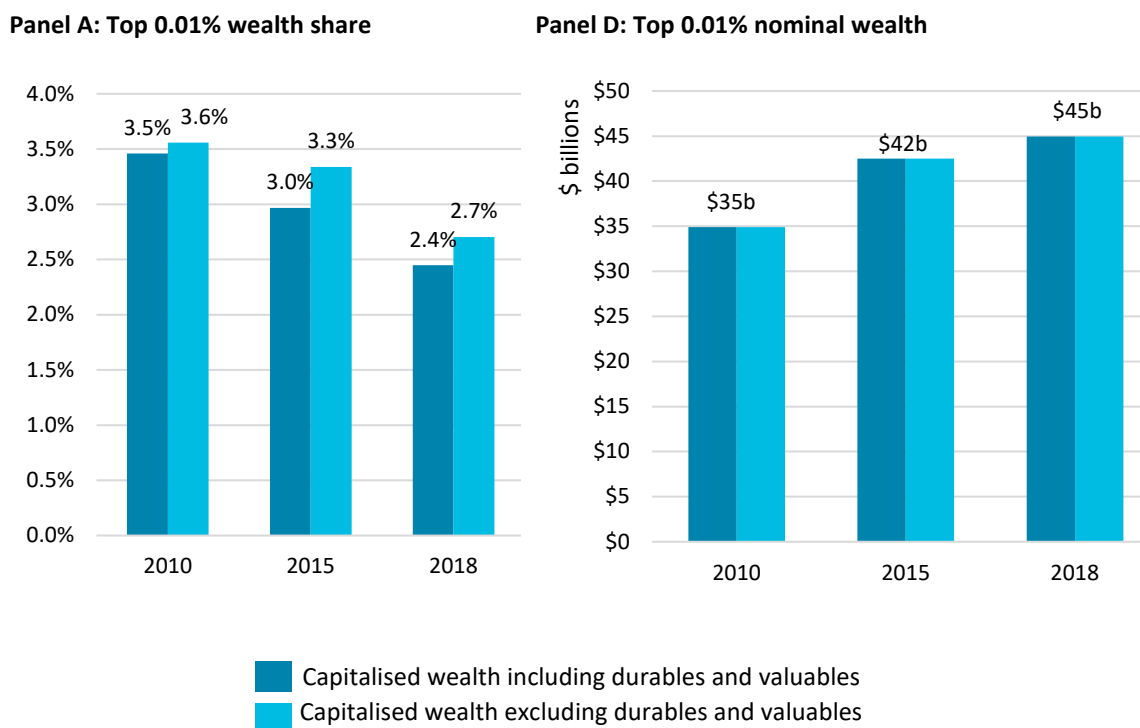
■ Bottom 99.9% share ■ Top 0.1% share

Appendix 3 – Tentative estimates for wealth held by the top 0.01%

While it is also possible for the New Zealand capitalisation method to provide wealth estimates for the top 0.01% (approximately 400 taxpayers), we found that these estimates are highly sensitive to the dividend income of individuals at the top of the distribution. Therefore, the wealth estimates presented in this appendix for the top 0.01% should be viewed as particularly uncertain and should be interpreted cautiously.

Figure 21 shows that the top 0.01% wealth share has fallen from 3.5% (3.6% excluding durables) to 2.4% (2.7% excluding durables). Over the same time nominal wealth for the top 0.01% increased from \$35 billion in 2010 to \$45 billion in 2018. These trends appear to mirror those found for the top 0.1% (see Figure 8 above). However, we have low confidence in these 0.01% wealth estimates due to the sensitivity this small group has to the dividend income of individuals at the top of the distribution.

Figure 21 – Top 0.01% wealth, with and without consumer durables and valuable (New Zealand capitalisation method 2010, 2015, 2018)

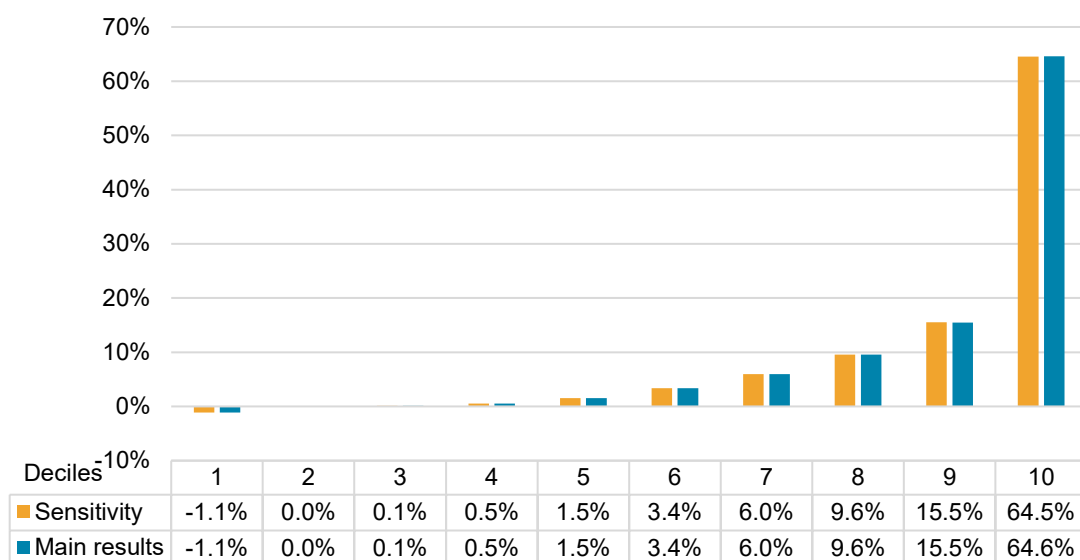


Appendix 4 – Human capital sensitivity test for 2010 and 2015

This Appendix presents further results from the human capital sensitivity test for 2015 and 2010 discussed in section 6.2. This sensitivity test scales the aggregate taxable income from partnership, self-employment, and look-through companies to 55% of the total. New multipliers are estimated for unincorporated equity and used to re-estimate the wealth distribution. This tests the effect of the alternate assumption that 45% of income from partnership, self-employment and look-through companies derives from labour rather than capital. The change had only a marginal effect on decile and percentile level wealth estimates, as shown by Figures 22 and 23.

Figure 22 – Human capital sensitivity test compared with main results for 2015

Panel A: Deciles



Panel B: Top 10 percentiles

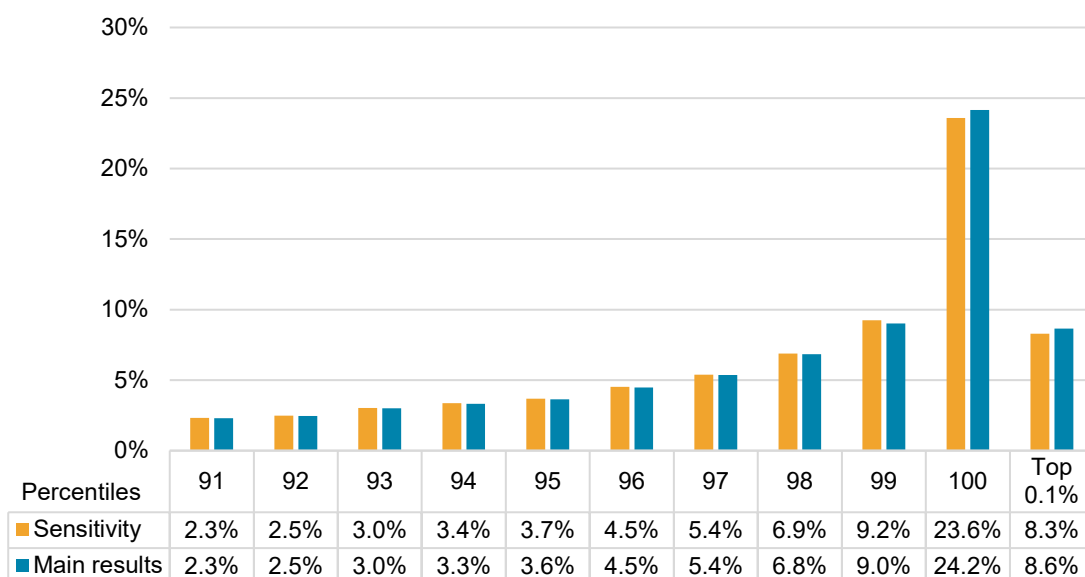
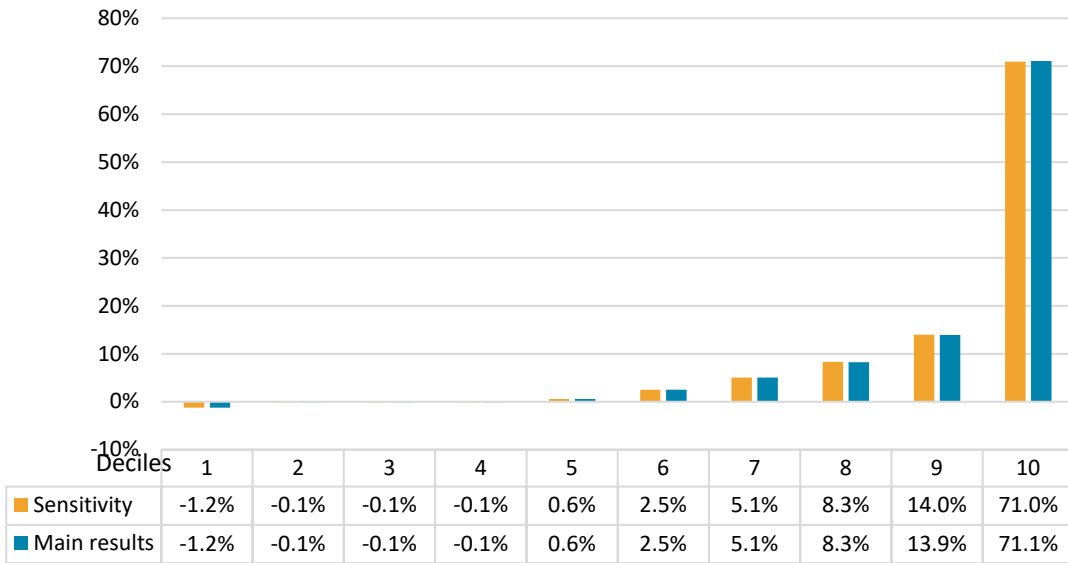
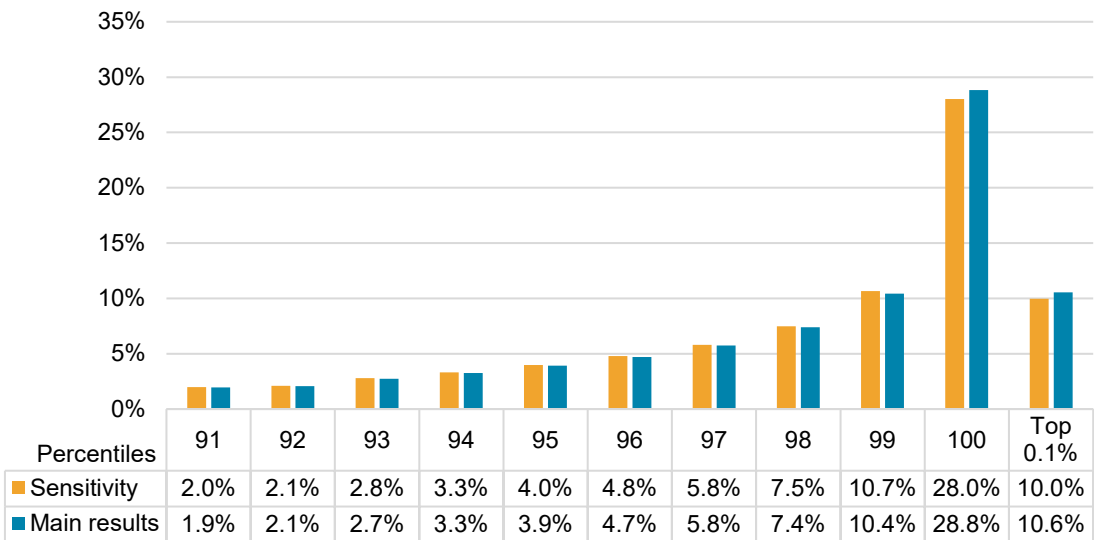


Figure 23 – Human capital sensitivity test compared with main results for 2010

Panel A: Deciles



Panel B: Top 10 percentiles



Appendix 5 – Preliminary investigations into detecting heterogenous returns for incorporated equities

This appendix uses HES data to explore the relationship between dividend returns and equity holdings in listed and unlisted corporations. These findings could help inform refinements to the New Zealand capitalisation method, which currently assumes a fixed rate of return within its four asset classes (see **section 5.1** for further details). However, there are differences between HES data and the IR3 tax administration data used by the New Zealand capitalisation method, which would need to be addressed when refining the capitalisation method.³¹

Our investigations are based on the HES 2015 net worth survey.³² Given the limitations of HES for the top of the wealth distribution (see **section 3.3**), our analyses of heterogenous rates of returns is unlikely to reflect dynamics specific to the very top of the distribution. This is a significant limitation, especially as heterogenous rates of return are typically detected around the top 1%. Nevertheless, we present our HES based investigations as an initial exploration into the relationship between dividends and equities in New Zealand.

The fixed rates of return assumption can hold if there is a linear relationship between dividend income and dividend-bearing asset holdings, such that the modelled rate of return is constant within each asset class. We test the plausibility of a linear relationship between unit-level HES data for an individual's dividend income and wealth in the form of equity in listed and unlisted corporations.

We take the data series listed in Table 6 from the 2014/15 HES Net Worth and Income modules to establish individuals' business holdings and dividend income.

³¹ Ball & Ormsby (2017) found a strong correlation between HES and IR income data, but they excluded most forms of capital income, including dividends.

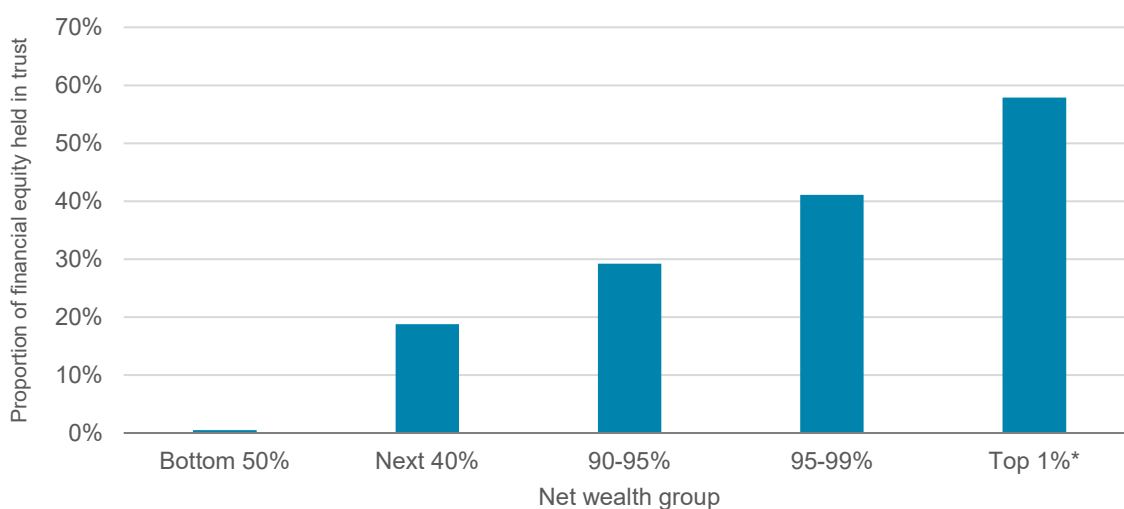
³² HES 2018 is missing unlisted shares (except for dairy-related shares or where the respondent is involved in running the business). Unlisted shares data were collected as part of the HES 2015 and 2021 net worth surveys.

Table 6 – Variable definitions from 2014/15 HES Net Worth and Income modules

Variable	HES classification
Net wealth	This is a variable made available by StatsNZ in the IDI and reflects individual's assets net of liabilities.
Dividends	2.2.0.00: "Dividend income"
Publicly listed equity	W.2.4.1.1.: "Shares in listed corporations"
Incorporated unlisted equity	W.2.4.1.2.: "Shares in unlisted corporations"
Income from trusts	4.2.0.01.: "Trust income". This is treated in more detail below.
Business wealth held in trust ³³	W.2.4.2.2.: "Financial equity held in trust". We accept that this category may include some unincorporated equity and test for sensitivity to other trust wealth specifications.
Other equity ³⁴	W.2.4.2.3.: "Other equity not held in trust". This class is made up of business equity held in unlisted incorporated enterprises, where the respondent is involved in running the business.

First, we must construct suitable dividend income and incorporated business wealth categories. In New Zealand a significant proportion of wealth is held in trust and, as shown by Figure 24, the proportion individuals hold in trusts increases with net wealth. It would be unwise to ignore this wealth and associated income from the analyses.

Figure 24 – Proportion of financial equity held in trusts (HES 2014/15)



* HES top 1% is expected to underestimate the true proportion of financial equity held in trusts (see Section 4.1)

It is difficult to identify a HES respondent's dividend income from companies held in trusts. HES respondents may report dividend income from assets held in trust either under *dividends* (2.2.0.00), in which case this category represents income from a mix of trust and non-trust equity, or aggregated with *other trust income* (4.2.0.01), and this category represents a mix of rent, interest, dividends, and irregularly, capital gains.

³³ Taking for this variable the sum of HES series *T.1.2.5.1*, *T.1.1.1.1*, and *T.1.1.1.2*, or *T.1.1.1.1*, and *T.1.1.1.2* alone, led to at most a 0.5% difference in parameter estimates.

³⁴ Exclusion of this variable led to at most a 2% difference in parameter estimates.

We need to estimate the proportion π of trust income that is from dividends earned from listed and unlisted incorporated equity held in trust. We know an individual's total dividend income from trust and non-trust assets is given by $d + \pi t$, for d (2.2.0.00) and t (4.2.0.01), while their total incorporated equity wealth is given by $D + T_d$, where $D = (W.2.4.1.1. + W.2.4.1.2)$, and $T_d = W.2.4.2.2$.

For an individual:

$$\frac{d + \pi t}{D + T_d} = ROR_d \quad \pi \in [0, 1]$$

From which we derive:

$$\frac{1}{ROR_d} d + \frac{\pi}{ROR_d} t = D + T_d$$

Knowing d, t, D, T_d for each individual in HES, we can configure an OLS regression over the HES sample wherein we determine:

$$\frac{1}{ROR_d} = \beta_1 \quad \frac{\pi}{ROR_d} = \beta_2$$

$$\frac{\beta_2}{\beta_1} = \pi$$

If we consider only assets that provide rent income and incorporated business equity (ie, subtracting out interest-bearing assets, which made up a small proportion of trust assets, for only a small number of respondents), and assume no premium is earned on assets held in trust.³⁵

$$\frac{d + \pi t}{D + T_d} = ROR_d \quad \frac{r + (1 - \pi)t}{R + T_r} = ROR_r \quad \pi \in [0, 1]$$

$$\pi ROR_d + (1 - \pi)ROR_r = ROR_t$$

And we can set up:

$$\frac{1}{ROR_d} d + \frac{1}{ROR_r} r + \frac{1}{ROR_t} t = D + T_d + R + T_r$$

$$\frac{1}{ROR_d} = \beta_1 \quad \frac{1}{ROR_r} = \beta_2 \quad \frac{1}{ROR_t} = \beta_3$$

From the regression over the HES sample we ascertain ROR_d, ROR_r , and ROR_t and from there, with the rate of return to assets held in trust given by a weighted sum of ROR_d and ROR_r , we find:

$$\pi = \frac{ROR_t - ROR_r}{ROR_d - ROR_r}$$

³⁵ r refers to rental income (2.3.0.01), R refers to rent-bearing assets (W.1.2.1.3.: Residential investment (rental) real estate), and T_r refers to rent-bearing assets held in trust (T.1.2.2.2.: Investment residential (rental) real estate – held in trust).

We obtain estimates for π , allowing us to assign a weight to the trust income an individual reports to model the component of their trust income from incorporated equity. Regression results proved largely insensitive to different values for π , with the parameter estimate for β varying by at most 0.5% between π values of 0 and 1.

The weight applied to an individual i 's trust income, for those that report a non-zero trust income, is determined by:

1. For $\frac{\text{rent-bearing assets held in trust}}{(\text{rent-bearing assets held in trust} + \text{incorporated business equity held in trust})} = 1$, assign $\pi_i = 0$
2. For $\frac{\text{incorporated business equity held in trust}}{(\text{rent-bearing assets held in trust} + \text{incorporated business equity held in trust})} = 1$, assign $\pi_i = 1$
3. For all else, assign $\pi_i = \pi$

We then have for each individual i :

$$d_i + \pi_i t_i = \text{total dividend income}$$

$$D_i + T_{ai} = \text{total incorporated business equity}$$

And can begin to examine the relationship between dividend income and dividend-bearing equity along the net wealth distribution.

Crucially, we find that linearity between an individual's dividend income and incorporated equity holdings in the HES data appears to be implausible.

The wealth elasticity of individual dividend income provides a measure of the responsiveness of dividend income to changes in incorporated equity holdings. It can be defined as the percentage change in dividend income associated with a 1% change in the level of incorporated equity holdings, all else equal, expressed as:

$$\text{wealth elasticity of individual dividend income} = \frac{\delta \log(I)}{\delta \log(W)} = \beta$$

where I is dividend income, W is incorporated equity holdings. The parameter of interest is β , estimated by ordinary least squares (OLS) regression of $\log(I)$ on $\log(W)$:

$$\log(I) = \log(W) + \varepsilon$$

In this way, we can estimate the wealth elasticity of individual dividend income as it presents in the HES data.

A fixed, wealth-invariant rate of return to incorporated equity, as is assumed in the New Zealand capitalisation method, would be reflected in a wealth elasticity of dividend income plausibly equal to 1. If the estimated wealth elasticity of dividend income is between 0 and 1, it suggests that dividend income is positively related to the level of incorporated equity holdings, but the responsiveness of dividend income to changes in equity holdings is less than proportional. In other words, a 1% increase in equity holdings would be associated with a smaller percentage increase in dividend income.

We estimate a β with a 95% confidence interval of [0.65, 0.67], which is significantly different than 1. This can be interpreted as indicating that a 1% increase in a household's incorporated equity holdings would be associated with a 0.65 - 0.67% increase in dividend income, all else equal. This finding suggests diminishing marginal dividend returns to incorporated equity, whereby each additional unit of equity holdings provides a smaller increase in dividend income than the previous unit – a violation of the fixed rate of return assumption. As a result, our current capitalisation method may underestimate the true level of wealth inequality in incorporated equity holdings.