TE TAI ŌHANGA
THE TREASURY

Analytical Note

April 2023

Tax and Transfer Progressivity in New Zealand: Part 1 Methodology

Author: Benjamin Ching

Analytical Note 23/02

JEL Classifications: C81, D31, E21, H24, H71, I38

This note is the first in a two-part series that seeks to improve our understanding of effective average tax rates (EATRs) in New Zealand. EATRs measure the net effect of taxes and transfers as a proportion of a taxpayer's income. Measuring EATRs can provide insight into some important questions with implications for the fairness and efficiency of the tax and transfer system:

- Who pays tax and who receives transfer payments?
- How much do they pay or receive?
- Where might taxes and transfers distort decisions to save and invest?

This series focusses on the first two questions and what EATRs can tell us about progressivity (defined as having higher tax rates and lower transfer rates for higher levels of income or wealth). Measuring EATRs can also help us to identify tax distortions caused by the inconsistent tax treatment of different types of income. Such distortions can create allocative inefficiencies and reduce productivity. The objectives of the tax system are outlined in Box A.

This note seeks to:

1. Explain why considering more comprehensive EATRs is valuable, and why microsimulation modelling is useful.
2. Present our method for estimating more comprehensive EATRs, which uses a prototype-extension to the Tax and Welfare Analysis (TAWA) microsimulation model that can measure the effect of multiple tax and transfer types against broad definitions of income.[1]

[1] The TAWA microsimulation model applies policy settings to individuals in its input data, and then scales up and aggregates the results so that they are representative of the New Zealand population. Further information about TAWA is available here: treasury.govt.nz/information-and-services/financial-management-and-advice/revenue-expenditure/tax-and-welfare-analysis-tawa-model

One of the challenges with measuring EATRs is deciding which taxes and transfers to consider and what to count as 'income'. EATRs are often narrowly defined as the average tax rate for a single tax (eg, income tax) against a statutory tax base (eg, taxable income). We build on traditional EATR measures by gradually combining multiple different tax and transfer types and assessing them against increasingly broad definitions of income, to estimate a more comprehensive measure.

The scenarios in this note show that taxpayers with equal taxable income can have very different EATRs when we include the effects of transfer payments and untaxed sources of economic income, such as capital gains and imputed rents (the benefit of home ownership or the notional rents that owner-occupiers pay to themselves to live in their own house). These scenarios do not demonstrate the effect of combining GST with income tax and other taxes, which is also expected to be significant for the distribution of EATRs.

TAWA microsimulation modelling, employing the experimental methods described in this note, is required to understand how these more comprehensive EATR measures may alter progressivity across the income and wealth distributions. The results from our prototype-extension to the TAWA microsimulation model are presented in part two of the series (Ching, Reid, & Symes, 2023).

We will use the terms 'wealth' and 'net worth' interchangeably throughout this paper, and these terms refer to the Household Economic Survey (HES) net worth definition.

Box A: The objectives of the tax system

The Tax Working Group's (TWG) interim report (2018) suggested that the ultimate purpose of public policy, and therefore also taxation, is to improve wellbeing. The TWG highlighted three main ways in which the tax system supports the wellbeing of New Zealanders:

- **A fair and efficient source of revenue.** Taxes provide revenue for the Government to fund the public goods and services that underpin our living standards. The tax system thus represents a way in which citizens come together to channel resources for the collective good of society.
- **A means of redistribution.** Taxes fund the redistribution that allows all New Zealanders, regardless of their market income, to participate fully in society. While much of this redistribution occurs through the transfer system, the progressive nature of income tax means that the tax system also plays a role in reducing inequality.
- **A policy instrument to influence behaviours.** Taxes can also be used as an instrument to achieve specific policy goals by influencing behaviour. Taxes influence behaviour by changing the price of goods, services, or activities; taxes can discourage certain activities, and favour others. In this way, taxes can complement – or even replace – traditional policy tools such as regulation and spending, depending on which approach reflects the most effective way to achieve society's goals.

EATRs are a tool that can help assess the tax and transfer system against its fairness and efficiency objectives ...

Tax and transfer progressivity can be understood by comparing EATRs across the income distribution. In this way, EATR measures have an important role to play in enabling individuals to make informed value judgements on the fairness of the tax and transfer system. EATRs can also be used to identify where the inconsistent tax treatment of different income sources might be driving allocative inefficiencies in the economy.

However, EATRs are not the only tool that should be used to assess the tax system against its objectives. As with any project, the right tool will depend on the job at hand, for example:

- The trade-offs faced by individuals considering working additional hours are better assessed using effective marginal tax rates (EMTRs), which measure how an increase in gross income translates to disposable income after taxes and transfer abatement (P. Nolan, 2018).
- Foreign investment incentives are best assessed by estimating how taxes affect the cost of capital, as seen in Inland Revenue's final long-term insights briefing (2022).
- Revenue sustainability is better assessed using macroeconomic modelling and projections, as seen in the Treasury's long-term insights briefing, *He Tirohanga Mokopuna 2021*.

Data gaps have hampered previous efforts to estimate more comprehensive EATRs in New Zealand …

The Tax Working Group (2018, recommendation 69) 'strongly encouraged' the Government to release more statistical and aggregated information about the tax system. A lack of data on the distribution of capital gains prevented the TWG from being able to provide precise impacts analysis of extending the taxation of capital gains. Closing this knowledge gap is particularly important because capital gains can be a significant source of economic income.

Figure 1 compares aggregate annual personal taxable income (blue) against annual accrued capital gains and losses (yellow). This figure is based on data between 2008 – 2018, which roughly approximates a business cycle.[2] Annual accrued capital gains are not taxed in New Zealand but aggregate figures are measured by Stats NZ's provisional Accumulation Accounts. Accrued capital gains are much more variable than taxable income across time and can even become negative (capital losses), as seen in 2009 and 2011. Strong recent capital gains are no indication of future growth trends, highlighting the limitations of single-year analysis. However, capital gains can also provide a very significant source of economic income, as seen in 2017 when they were equivalent to 83% of the value of aggregate taxable income.

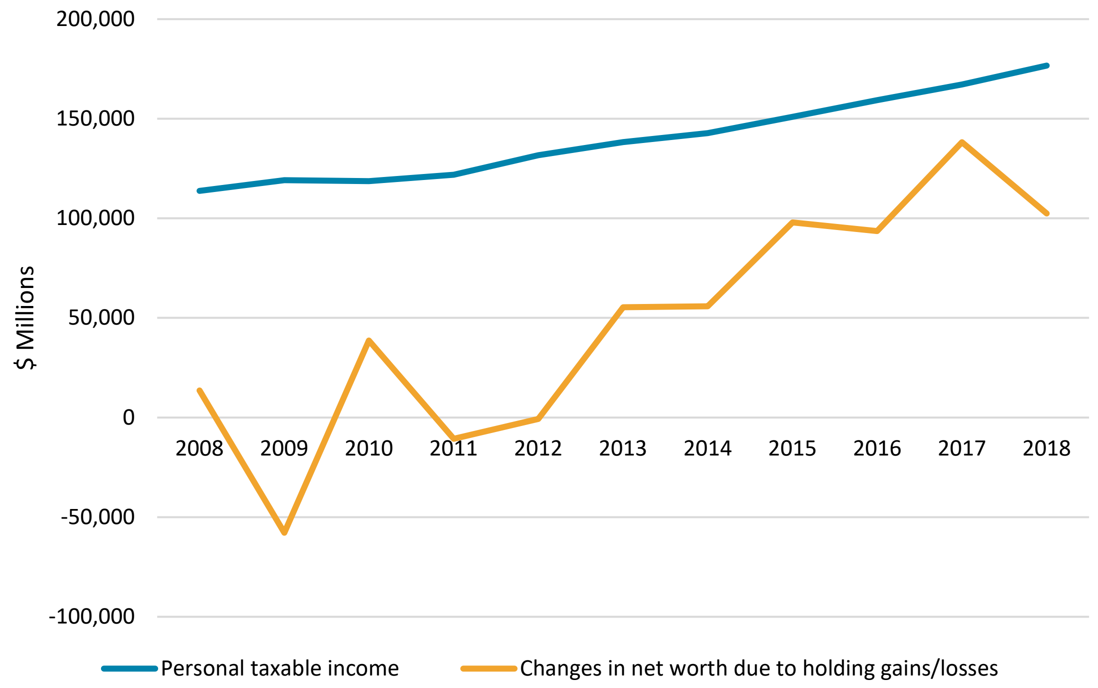
Similar data gaps have hampered efforts to understand how other sources of economic income might affect EATRs. Very little is known about the potential impact of the inclusion of owner-occupier imputed rents or earnings retained in trusts and companies on EATRs.

---

[2] The 10 years to March 2018 capture most of the downturn in asset prices seen during the Global Financial Crisis. This represents the longest period available for capital gains estimates based on Stats NZ's provisional Accumulation Accounts.

Additionally, previous analysis in New Zealand has been limited in its ability to consider the combined effect of the many different tax and transfer types on the distribution of EATRs (for example, see Tax Working Group Secretariat, 2018a).

Figure 1: Aggregate annual personal taxable income and annual accrued gains and losses 2008 - 2018



Note: Annual accrued gains and losses are based on Stats NZ's provisional Accumulation Accounts and remain subject to revision. They are compiled from a range of independent sources that are detailed here: https://www.stats.govt.nz/methods/sources-and-methods-for-the-accumulation-accounts-changes-in-assets-and-liabilities

We have developed an experimental method for estimating more comprehensive EATRs that addresses some data gaps ...

We have developed a method for estimating an EATR measure that is broader than any previously estimated in New Zealand. On the tax side we are able to estimate the combined effect of personal income taxes, transfer payments, the Accident Compensation Corporation (ACC) levy, Portfolio Investment Entity (PIE) taxes, local body rates on principal residences and secondary homes,[3] and GST. The income base includes personal taxable income, untaxed transfers, PIE income, taxable ACC income, accrued capital gains on selected assets,[4] and imputed rent for principal residence.

[3] HES data available for local body rates are limited to principal residences and secondary homes. This means we cannot identify the effect of rates on investment or rental properties, which we would otherwise include in our EATR measure.

[4] Capital gains will be estimated for owner-occupied property, other residential property, non-residential property, vacant land, unincorporated businesses, listed shares, unlisted shares, investment funds and assets held in trusts. The potential bias of the limited taxation of capital gains in New Zealand (eg, the bright-line test) is discussed in **Annex 3**.

However, while our EATR estimation method is significantly more comprehensive, it still faces data and modelling limitations. These include:

- The EATR modelling method cannot estimate the effect of company taxes and trust taxes on individuals' EATRs. This is expected to downward bias our EATR results towards the top of the income and wealth distributions, where company and trustee taxes are more concentrated.
- We also exclude excise taxes to minimise model complexity and because alcohol and tobacco data are particularly prone to underreporting.
- Modelling assumptions are required that limit the generalisability of our findings. For example, we have estimated EATRs for a single tax year. Longer periods of analysis could show very different results.
- Estimates of capital gains and imputed rents rely on novel data estimation methods that combine multiple different data sources. This includes reliance upon Household Economic Survey (HES) net worth data, which are subject to sampling and non-sampling errors. Notably, HES is known to be missing information about the wealthiest New Zealanders.

Inland Revenue's High Wealth Individual Research Project (the Inland Revenue Project) helps to provide a more complete picture, by separately estimating EATRs for some of New Zealand's wealthiest families. Together, it is hoped that these projects can help improve our understanding EATRs in New Zealand.

Key Points

This note uses scenario analysis to demonstrate the value in estimating more comprehensive effective average tax rates (EATRs). It then presents a method for estimating these more comprehensive EATRs using a prototype extension to the TAWA microsimulation model. Results are presented in part two of this series (Ching, Reid, & Symes, 2023).

Scenario analysis: We make several strong assumptions to model EATRs in different illustrative scenarios. These scenario results demonstrate the value of microsimulation modelling to estimate a more comprehensive EATR measure:

- EATRs based purely on statutory personal income tax rates and personal taxable income are expected to show a relatively smooth and progressive trend.
- EATRs for low-income groups can become negative when we treat income support payments (transfers) as a 'negative tax'. A negative EATR means that transfer payments received by these groups are greater than the tax they pay.
- EATRs will be lower when they include lower taxed or untaxed capital income eg, PIE income, capital gains, and imputed rents. How this affects tax progressivity will depend on where in the distribution this income is concentrated. Some international studies have found that the inclusion of lower taxed capital gains can create a slightly regressive trend at the top of the income distribution (Advani & Summers, 2020; Bricker, Moore, Reber, & Volz, 2020; Milligan, 2021).

These scenarios do not demonstrate the effect of combining GST with income tax and other taxes, which is expected be significant for the distribution of EATRs.

Prototype extension to microsimulation model: Scenario analysis cannot reveal the full distribution of our more comprehensive EATRs, so we present a prototype extension to the TAWA microsimulation model that can measure them across the income and wealth distributions. In total, we have developed nine increasingly comprehensive EATR measures. Starting with personal income taxes, we then add further taxes, transfers, and income types. This iterative approach allows us to isolate the effect of adding each income or tax type on the overall EATR and to address key assumptions.

Our most comprehensive EATR (see Table 2) estimates the combined progressivity of income taxes, transfers, ACC levies, local body rates on principal residences and second homes, and GST across a more comprehensive income distribution. We will also model GST separately using an annual expenditure base, to show the distribution of GST without the influence of savings and borrowings (see Annex 3).

We use novel methods to estimate the distribution of capital gains and imputed rents (see Annex 1). These methods will remain experimental. They rely upon HES net worth data and are therefore unlikely to provide an accurate picture of EATRs at the top of the income or wealth distributions. In this regard, Inland Revenue's High Wealth Individual Research Project provides separate, complementary EATR estimates for New Zealand's wealthiest families.

We describe our EATR measures as 'more comprehensive' because data limitations prevent us from including all taxes and income sources. We cannot include the effect of company taxes or trustee taxes owing to data limitations. Data limitations also prevent the inclusion of some important income sources, such as in-kind government services (eg, health and education), gifts, inheritances and household home production (eg, cleaning services). These omissions could provide fruitful areas for further research, should new data sources become available.

An EATR is a simple fraction that divides taxes paid by income …

The basic definition of an EATR is:

$$EATR = \frac{Taxes}{Gross\ Income}$$

This EATR definition highlights that choices need to be made about which taxes to include in the numerator and what income to include in the denominator.[5] Later we will discuss other necessary modelling choices and assumptions concerning the unit of analysis, time period of analysis, economic incidence, and inflation adjustment. For now, we note that our analysis will focus on the tax year ended 31 March 2018. This is a pragmatic decision driven by data availability and reliability.[6]

EATRs can be distinguished from 'statutory' tax rates, which are the rates of tax required to be paid according to legislation. Table 1 shows the statutory personal income tax rates for 2018. Since 1 April 2021, a new top tax rate of 39% has applied to income above $180,000 and this will affect the distribution of EATRs for subsequent years.

Table 1: Personal taxable income scale in 2018

For each dollar of income	Tax rate
Up to $14,000	10.5%
Over $14,000 and up to $48,000	17.5%
Over $48,000 and up to $70,000	30%
Remaining income over $70,000	33%

EATRs must also be distinguished from effective marginal tax rates (EMTRs). *Average* tax rates show how much tax is paid across all income, whereas *marginal* tax rates show how much tax must be paid on the next dollar of income. In the context of individual taxpayers, EATRs are a more useful measure of net tax and transfer progressivity; by contrast, EMTRs are useful for assessing the interaction between transfers and taxes, especially in relation to incentives to work and poverty traps (P. Nolan, 2018). There are also other tax rate measures. For example, the participation tax rate measures the incentives to join the workforce by calculating the proportion of earnings lost to taxes and the abatement of transfers for a person moving from zero hours to a given number of hours of work (Arnesen, 2022).

5 The numerator is the top half of a fraction, and the denominator is the figure on the bottom half of a fraction.

6 While HES wealth data are available for 2021, tax data for 2021 are expected to be biased by unusually high dividend pay-outs ahead of the 39% top tax rate: https://www.ird.govt.nz/about-us/tax-statistics/revenue-refunds/income-distribution

EATR analysis can provide insight into tax and transfer progressivity …

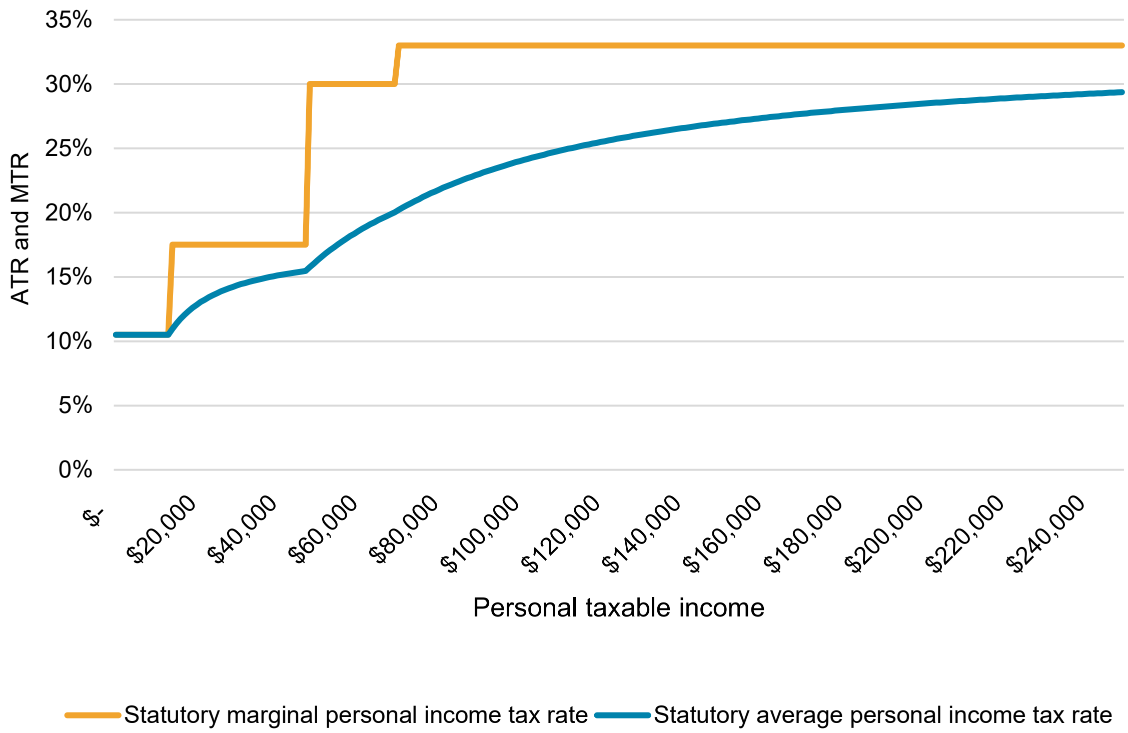
Progressivity is defined here as having higher tax rates and lower transfer rates for higher levels of income. Progressivity will be measured by comparing EATRs across different income quantiles (groupings), family types, and age cohorts, as we build a more comprehensive measure of income.

Analysis of progressivity is more broadly based on the underlying principles of ability to pay, natural rights and equal sacrifice: ‘these concepts are that those with the greatest ability to pay should pay more, that individuals have a natural right over the income they earn, and that the burden of taxation on individuals should be spread equally in terms of utility sacrificed’ (M. Nolan, 2018).

An EATR that is based purely on New Zealand statutory personal income tax rates and personal taxable income will demonstrate a progressive profile …

Figure 2 shows the statutory average personal income tax rates (blue) and statutory marginal personal income tax rates (yellow) for taxable incomes up to $250,000 in 2018. The marginal tax rate line steps up each time a new income tax threshold is reached. The average tax rate line always sits at or below the marginal tax line. Each time the marginal tax rate steps up, the average tax rate line will also bend steeply upward before gradually flattening. The average tax rate line demonstrates a progressive tax trend that gradually increases with taxable income.

Figure 2: Marginal and average statutory personal income tax rates for personal taxable income in New Zealand for 2018 (excluding tax credits and transfer payments)



The statutory income tax rates in Figure 2 are limited by the fact that they only show the effect of a single tax (personal income tax) against a narrowly defined income base (personal taxable income). Figure 2 does not show the effects of the many other taxes levied in New Zealand, such as consumption or investment taxes. Figure 2 also omits to show how taxes might interact with transfer payments and their abatement rates. Further, quite different EATRs might be expected for those earning untaxed economic income, such as capital gains or imputed rents. These more complicated questions require us to calculate an 'effective' tax rate.

Scenario analysis can illustrate how broader EATR measures might generate different results that affect tax progressivity and efficiency …

EATR scenario analysis involves estimating expected results under different simplified assumptions. Scenario analysis is commonly applied in corporate tax literature to assess investment incentives under different assumptions about interest and inflation rates (Hanappi, 2018). Scenario-based EATR estimates differ from microsimulation modelling as they are not based on data, rather they provide assumption-based illustrative examples. In this regard, the key question left unanswered by scenario analysis is how representative the scenarios are across the population. However, scenario analysis can still highlight interesting trends and show the need for further microsimulation modelling.

We will now consider the effect of broadening EATR measurement beyond personal income tax in the following ways:

1. Including transfer payments as a negative tax.

2. Including lower-taxed or untaxed forms of income.

Treating transfer payments as a 'negative tax' will reduce EATRs for recipients of tax credits, benefits, and superannuation …

The New Zealand income support system involves many different benefits and tax credits, which we will broadly describe as 'transfer payments'. Transfer payments are normally contingent on family structure and personal living arrangements. At times, the availability of one entitlement might depend on the availability of another. The Welfare Expert Advisory Group Secretariat (2019) provides a full explanation of the 2018 income support settings. There have been a number of changes to transfer payment settings and recipient numbers since 2018 and these are explained in the Ministry of Social Development's monitoring reports (Graham & Arnesen, 2022).

The New Zealand welfare system is sometimes described as having three tiers:[7]

1. Main benefits that are intended to provide an income to meet essential costs.

2. Supplementary assistance provided for specific on-going costs, such as accommodation, disability, or children (eg, the Working for Families tax credit payments).

3. Targeted hardship assistance that is generally provided in relation to an immediate need, and only available for costs considered 'essential' (eg, the Special Needs Grant).

Transfer payments can be incorporated into EATR estimates by subtracting them from taxes, which is equivalent to treating them as a 'negative tax'. Where transfer payments are greater than taxes paid by a taxpayer, the resulting EATR will be negative.[8] A negative EATR can be viewed as measuring income support generosity (Immervoll, 2002, p. 9). There are certain scenarios where we expect negative EATRs when we start subtracting transfer payments from taxes paid.

Figure 3 shows how subtracting transfer payments would alter the EATRs for three family types, based on scenarios from the OECD's Taxing Wages publication (OECD, 2018):[9]

1. A single person on the average wage,[10] without dependent children.

2. A single person on 67% of the average wage, with two dependent children.

3. A couple with one earner on the average wage and two dependent children.

---

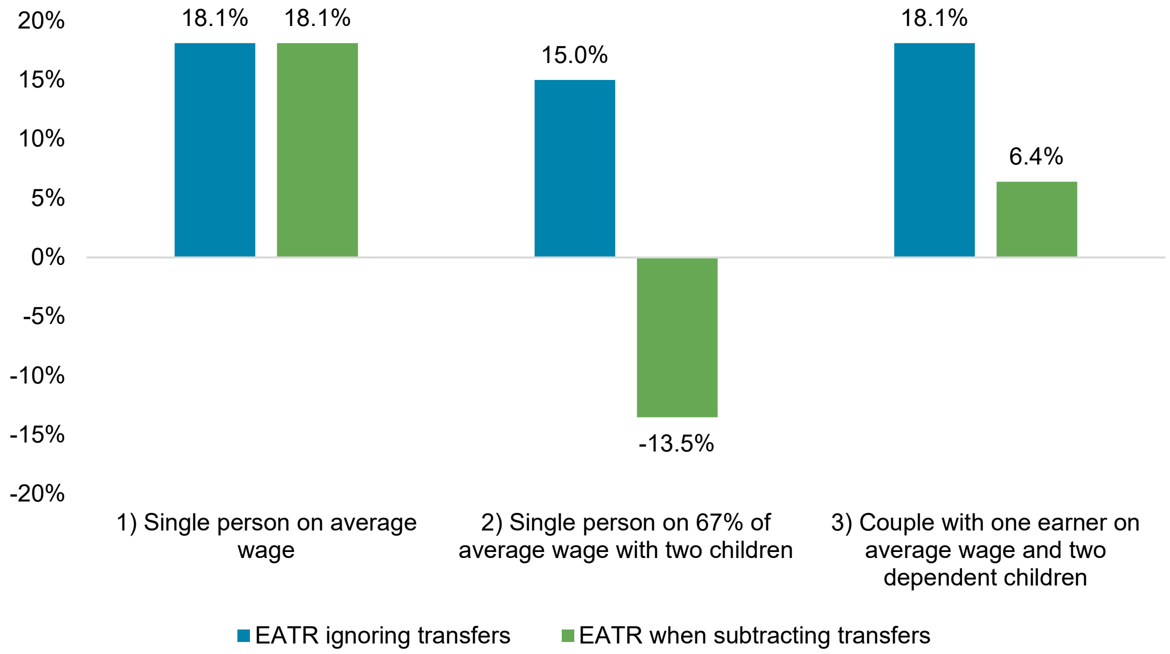
7 See footnote 2, page 15: https://www.msd.govt.nz/documents/about-msd-and-our-work/publications-resources/information-releases/welfare-overhaul-update/cabinet-paper-welfare-overhaul-update-on-progress-and-long-term-plan.pdf

8 EATRs may also be negative for those who make significant capital losses but still pay tax on taxable income.

9 These scenarios assume no other sources of taxable income. They also do not include the effect of the Winter Energy Payment or the Accommodation Supplement, which would likely reduce EATRs further in TAWA microsimulation modelling. 2021 figures are available here: https://www.oecd.org/tax/taxing-wages-20725124.htm

10 The average wage used for *Taxing Wages* 2018 was $58,824. This represents average full-time adult gross wage earnings in New Zealand in 2017. The OECD figures represent 'forward-looking' EATRs for the 2017/18 tax year, based on the average wage in 2017.

Figure 3: EATRs with and without subtracting transfer payments for selected family types, based on the OECD's Taxing Wages 2018



The scenarios in Figure 3 demonstrate that subtracting transfers from taxes can result in quite different EATRs for families with similar taxable incomes:

- A single person on the average wage does not receive any transfer payments, so their EATR is the same (18.1%) whether or not we subtract transfers.
- By contrast, the person in scenario 2 receives more in total from transfer payments ($11,254 from the Family Tax Credit and the In-Work Tax Credit) than they pay in income taxes ($5,917). This results in a negative EATR (-13.5%) for this person when we subtract these transfer payments from taxes paid.
- Scenario 3 demonstrates that there will also be instances where the subtraction of transfer payments can reduce the EATR (from 18.1% to 6.4% in this instance) with the end result still being positive. The scenario 3 family type still pays some net taxes after receiving all transfers.

Similar EATR reductions can be expected for recipients of other transfer payments, including superannuitants and beneficiaries. How these EATR reductions affect the overall progressivity of the tax and transfer system will depend on the generosity of the payments and how targeted they are towards lower income families.

Further insights into tax and transfer progressivity can be gained by including untaxed or lower-taxed income sources into EATR estimates …

The Haig-Simons definition of income is generally accepted as comprehensive: it is the increase in wealth (potential consumption) plus consumer spending (actual consumption) over a specified period.[11] This definition of economic income captures many forms of untaxed income, including some benefits, capital gains, gifts, inheritances, and publicly provided goods and services. Haig-Simons income also includes untaxed consumption, such as imputed rents, which is the estimated benefit for owners occupying their own house: ie, the notional rent payments owner-occupiers make to themselves for the right to live in their own home.

Scenario analysis can show that the concessionary tax treatment of some forms of economic income in New Zealand is likely to significantly affect EATR estimates. Consider four hypothetical types of taxpayer:

1. A person with no assets
2. An owner-occupier with a mortgage
3. An owner-occupier without a mortgage
4. An owner-occupier with two rental properties, all without mortgages.

We estimate EATRs for each of these taxpayers by making assumptions about their income mix and expenses using data from the HES.[12] We include personal income tax and local body rates as taxes in the EATR numerator. The EATR income base includes taxable income, tax-free capital gains, and tax-free imputed rents (net of housing expenses). Capital gains and net imputed rents are estimated using average returns based on HES and CoreLogic data for 2018. **Annex 4** contains the details of how these EATRs were estimated.

There are a range of other scenarios that could also impact EATRs that we have not modelled here. We do not include GST in these EATR scenarios for simplicity (see **Annex 3** for the modelling challenges associated with GST). Inflation and different levels of leverage for property ownership can also have significant effects on EATR estimates.

Figure 4 compares the EATRs for these four hypothetical taxpayers based on this more comprehensive definition of taxes and income. We compare more comprehensive EATR estimates by fixing taxable income at either $58,800 (the OECD's *Taxing Wages 2018* average wage), $100,000, or $200,000.

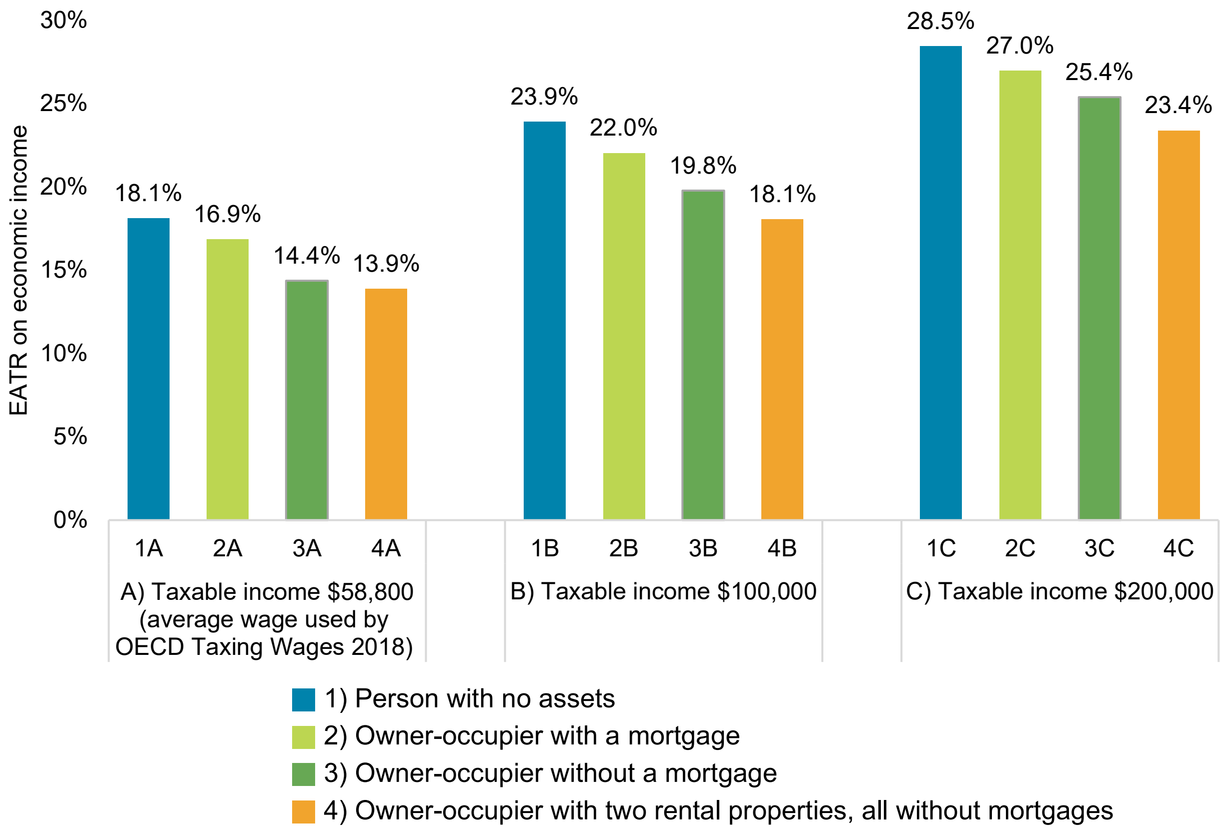
---

[11] See a detailed discussion here: https://taxworkinggroup.govt.nz/sites/default/files/2018-09/twg-bg-3950999-concepts-of-income.pdf

[12] The scenarios use the HES mean values for households reporting a non-zero response for each asset or cost in the year ended June 2018: $647,000 owner-occupied house, $17,754 rent payments (used for imputed rent income), $13,603 interest payments on mortgage, $302 mortgage service fees, $2,899 property rates, $1,778 property insurance. A 3.6% capital gain rate is assumed, reflecting the CoreLogic House Price Index percentage change for detached houses in the year ended June 2018. This gives an accrued gain of $22,483 on the HES mean house value.

Despite earning equal amounts of taxable income, each hypothetical taxpayer faces different EATRs on their economic income because they earn different amounts of untaxed capital gains and imputed rents.

Figure 4: Effective average tax rate (EATR) scenarios comparing taxpayers with different economic incomes at set levels of taxable income in 2018



At all three taxable income levels:

- Taxpayer 1, who owns no assets, faces the highest EATR (blue bar). This is because their economic income equals their taxable income. By contrast, the property owners all earn some tax-free capital gains and imputed rent, which increases their economic income and thereby lowers their EATR.

- Taxpayer 2 (light green bars) has a lower economic income and higher EATR than Taxpayer 3 (dark green bars) because we subtract mortgage interest payments and mortgage service fees from their economic income.

- Taxpayer 4 (orange bars) has the lowest EATR because they have the greatest wealth and therefore the largest amount of untaxed economic income.

The Figure 4 scenarios demonstrate that ownership of multiple properties can reduce a taxpayer's EATR on their economic income below that of someone with lower or equal taxable income, provided they can generate sufficient tax-free capital gains. For example:

- Taxpayer 4C who owns multiple properties without a mortgage has a lower EATR (23.4%) on economic income than taxpayer 1B who owns a single owner-occupied property with a mortgage (23.9%), despite taxpayer 4C earning twice the taxable income of taxpayer 1B.

- Taxpayer 4B who owns a single owner-occupied property with a mortgage has the same EATR on economic income as taxpayer 1A who has no assets (18.1%), despite taxpayer 4B earning $41,200 more in taxable income than taxpayer 1A.

These results occur because of the large untaxed capital gains and imputed rents earned by taxpayer 4. However, the low EATR results for taxpayer 4 are not unique to ownership of residential property. While owner-occupied property is particularly tax advantaged due to the possibility of both tax-free capital gains and imputed rents, the advantage from owning multiple investment properties can also be replicated via the ownership of other assets that can generate tax-free capital gains, eg, shares in businesses.

This note does not seek to draw value judgements from Figure 4 or imply that certain types of economic income should be taxed. Instead, these stylised results serve as motivation to progress further distributional research. Governments face trade-offs when setting tax policy which might justify a variation in tax treatment for different types of economic income. Decisions about whether to tax a particular type of income would require fuller consideration of a government's objectives and established tax principles, including efficiency, administrative cost, integrity, coherence, and equity.

The effect of including untaxed economic income on progressivity will depend on where these sources are concentrated in the distribution …

The four scenarios in Figure 4 demonstrate how the inclusion of untaxed economic income can lower EATRs. However, they do not show how this will affect overall tax and transfer progressivity across the economic income distribution. This will ultimately depend on where in the economic income distribution these untaxed sources of economic income are concentrated.

Expanding the EATR income base to include untaxed economic income will mean that there is significant re-ranking of the distribution.[13] Someone earning a given level of personal taxable income may be much higher or lower in the full economic income distribution once untaxed economic income is included. For example, a young salary earner might be close to the top of the income distribution for taxable income based on their salary, but could have few assets and associated capital gains, putting them lower down the distribution for a more comprehensive measure of economic income. On the other hand, a retired person might have low taxable income, but relatively high economic income derived from capital gains and imputed rents if they occupy a mortgage-free house. These simple examples demonstrate that a taxpayer's life stage (eg, student, working adult, or retiree) is likely to have a significant effect on their available economic income.

---

[13] Re-ranking of the income distribution is a common practice in distributional analysis when moving between different measures or units. For example, adult equivalisation scales are known to cause some re-ranking of the income distribution (van de Ven & Creedy, 2005). Equivalisation scales attempt to account for differences in family composition (eg, family size, age or health status of individuals) to allow comparisons of income or living standards between households. It is also common to re-rank income distributions when moving from a pre-tax to a post-tax measure of income (Creedy, Enright, & Gemmell, 2008). In the same way, we will need to re-rank our income distribution to ensure that our more comprehensive income EATRs are ordered by ascending ability to pay.

Several international studies have found that the inclusion of lower-taxed or untaxed capital gains in the income base reduces EATR progressivity and can introduce a slightly regressive trend at the top of the distribution (Advani & Summers, 2020; Bricker, Moore, Reber, & Volz, 2020; Milligan, 2021). Whether a similar trend occurs in the New Zealand context is examined in the results from our microsimulation study (Ching, Reid, & Symes, 2023).

Microsimulation modelling of more comprehensive EATRs can help us reach conclusions about progressivity …

We have developed an experimental microsimulation method that will seek to measure more comprehensive EATRs. These EATR measures provide insight as to how broadening the definition of income affects tax and transfer progressivity.

We describe our EATR measures as 'more comprehensive' because they will be broader than commonly reported EATRs, but data limitations prevent us from including all taxes and income sources required to estimate a fully comprehensive EATR. These omissions provide potentially fruitful areas for further research, should new data sources become available.

International research guides our modelling approach …

Several recent studies have attempted to estimate EATRs based on broad definitions of economic income (Smeeding & Thompson, 2010; Armour, Burkhauser, & Larrimore, 2013; Bricker, Moore, Reber, & Volz, 2020; Milligan, 2021) and an allocation of all taxes paid within the economy (Saez & Zucman, 2019). Three key principles can be identified in this international research that will guide our EATR modelling:

1. *Broad tax and transfer calculations*: The available data allow modelling of income taxes, benefits, tax credits, local body rates on principal residences and second homes, GST, PIE tax, and ACC levies. We cannot include company tax and trust rates owing to data limitations. Excise taxes are omitted as a pragmatic decision.

2. *Broad income calculations*: We will build on taxable income data and include assumptions about accrued capital gains and imputed rents to calculate a broad measure of economic income. We will miss some income types that are particularly difficult to model, including in-kind government transfers (eg, education and healthcare), gifts, inheritances, and household production (eg, cleaning services provided by family members).

3. *Data symmetry*: Where a new type of income is added to the denominator of the EATR calculation, this should be matched with any taxes paid on this income in the numerator of the calculation.

Our more comprehensive EATR method combines multiple data sources …

EATRs have been calculated using a prototype extension to the Treasury's TAWA microsimulation model. The model uses income data from the Integrated Data Infrastructure (IDI) and the HES to model taxes, tax credits, and income support payments for a given tax year.

Data on capital gains and imputed rents are not collected directly in New Zealand, so we have developed novel methods to estimate and attribute these across the income distribution using HES net worth data. **Annex 1** details these novel methods and the income data sources available for our prototype extension to the TAWA at the time of publication.

However, reliance upon net worth data from the HES limits the scope of our research …

The HES is a high-quality household survey that collects income, expenditure, and wealth data on a triennial basis. There are three existing HES net worth datasets for 2015, 2018, and 2021. Tax data for 2021 are expected to be biased by unusually high dividend pay-outs ahead of the 39% top tax rate,[14] so we focussed our analysis on the tax year ended 31 March 2018.

The HES survey typically achieves a sample of approximately 5,500 households across different demographic and socio-economic settings. However, it is limited in its ability to capture data on the wealthiest New Zealanders. The highest wealth of an individual participating in HES 2018 was $20 million, which is significantly lower than the $50 million of the lowest wealth individuals included in the 2018 NBR Rich List.

International evidence (Balestra & Tonkin, 2018; Vermeulen, 2018; Lustig, 2019) suggests that there are several reasons why household surveys struggle to collect reliable data on the very top of the wealth distribution, including:

- Limited sample size: there is a low chance that the wealthy will be selected into a household survey like HES because they are a small group.
- Non-response bias: international evidence suggests that higher wealth individuals tend to have a higher non-response rate in financial surveys.
- Underreporting bias: it is thought that the wealthy may underreport their net worth at a higher rate than the general population.

[14] https://www.ird.govt.nz/about-us/tax-statistics/revenue-refunds/income-distribution

EATRs at the top of the income distribution will be analysed separately in Inland Revenue's High Wealth Individual Research Project …

Inland Revenue (2023) has undertaken a parallel research project focussed on EATRs for high wealth individuals (the Inland Revenue Project). This Inland Revenue Project collected information from a cohort of high wealth individuals to calculate EATRs. Information collection is necessary owing to the data gap noted in HES.

Together, our modelling and the Inland Revenue Project will create a more complete picture of EATRs across the income and wealth distributions. Our HES-based modelling provides EATRs by different income, wealth, and demographic groups, including the median New Zealand equivalised-family (see Annex 2 for detail about adult-equivalent families). By comparison, the Inland Revenue Project provides insight into EATRs for the wealthiest New Zealand families.

Caution will be needed when comparing EATR estimates from these two separate projects. While each project applies similar measurement and modelling principles, the different data collection methods employed in each will result in some differences. For example, the Inland Revenue project will be able to attribute company and trustee taxes back to individuals, something that is not possible with our prototype extension to the TAWA model. A full discussion on how to compare the EATR results is provided in part two of this series (Ching, Reid, & Symes, 2023).

Despite these differences, our modelling provides a reference point for the EATR of the average New Zealander against Inland Revenue's high-wealth population.

EATR modelling requires assumptions about the unit of analysis, time period, how to allocate the incidence of taxation, and inflation …

We summarise our EATR modelling choices here and provide further explanation in Annex 2:

- **Unit of analysis:** We use the family unit (single or coupled adults, together with any dependent children) because income is likely to be shared among family members and many transfer payments and tax credits are assessed at the family level.

- **Time period of analysis:** The TAWA model estimates taxes and payments on a cash-basis for a given year. EATRs are estimated for the tax year ended 31 March 2018. This is a pragmatic decision driven by data availability and the fact that the most recent HES year available (2021) was affected by unusually high dividends ahead of the 39% top tax rate. An annual analysis is limited in its ability to explain longer-term or lifecycle trends.

- **Economic incidence:** The ultimate burden of taxation may not fall on the taxpayer legally required to make the payment. For example, GST is paid by suppliers of goods, but it is commonly accepted that the economic burden is borne by consumers (European Commission, 2011; Thomas A., 2022). We will make the following economic incidence assumptions:

    1. The full incidence of personal income taxes and ACC levies falls on individual earners.
    2. The full incidence of PIE income falls on individual investors.
    3. The full incidence of local body rates falls on owner-occupiers or landlords.
    4. The full incidence of Goods and Services Tax (GST) falls on consumers.

- **Inflation adjustment:** Results are presented in nominal terms and, separately, in real terms with an adjustment for inflation. In principle, economic income measures should be focussed on real returns. However, international EATR literature tends to use nominal figures.

These assumptions are consistent with the approach taken in tax literature and can be estimated based on available data. However, such choices carry inherent value judgements and results can differ when these assumptions are changed.

Nine increasingly comprehensive EATR measures have been developed …

In total, we have developed nine EATR measures. We started with personal income taxes, then added further taxes, transfers, and income types iteratively. This approach allows us to isolate the effect of adding each income or tax type to the overall EATR, and enables us to address key assumptions. Where an additional income source is added, we try to match it with any associated taxes. We re-rank the order of taxpayers in the income distribution as the income measure becomes more comprehensive, whereas the wealth distribution is unchanged for all nine EATR measures.

Table 2 displays the most comprehensive EATR that we have developed and modelled. We use sensitivity tests to assess the effects of inflation and differing capital gain rates. Our most comprehensive EATR measure includes GST, but we also present a separate Goods and Services Tax (GST) EATR using an annual expenditure base, to remove the influence of savings which might be spent and subject to GST in future years. Further detail on our nine EATR measures can be found in **Annex 3**.

Table 2: The most comprehensive EATR

EATR taxes (numerator)	*Personal income tax minus transfer payments* *+ PIE tax* *+ ACC levy* *+ Local body rates on principal residences and second homes* *+GST*
EATR income base (denominator)	*Personal taxable income (including taxable transfers and taxable ACC income)* *+ Non-taxable transfer payments* *+ Portfolio Investment Entity (PIE) income* *+ Accrued capital gains on selected assets*[15] *+ Imputed rent for principal residences*

Our more comprehensive EATRs provide a fuller understanding of tax and transfer progressivity but remain experimental …

This Analytical Note has set out the motivation and methodology for estimating more comprehensive EATRs. Scenario analysis has shown that taxpayers on similar taxable incomes can face very different EATRs when we consider the interactions with transfer payments and broaden the definition of income. Part two of this series (Ching, Reid, & Symes, 2023) presents microsimulation modelling results to show how this impacts the overall progressivity of the tax and transfer system.

[15] Capital gains are estimated for owner-occupied property, other residential property, non-residential property, vacant land, unincorporated businesses, listed shares, unlisted shares, investment funds and assets held in trusts. The potential bias of the limited taxation of capital gains in New Zealand (eg, the bright-line test) is discussed in **Annex 3**.

References and further reading

Advani, A., & Summers, A. (2020). How much tax do the rich really pay? New evidence from tax microdata in the UK. *CAGE Policy Briefing no 27*.

Armour, P., Burkhauser, R. V., & Larrimore, J. (2013). Levels and trends in United States income and its distribution: A crosswalk from market income towards a comprehensive Haig-Simons income approach. *National Bureau of Economic Research*, https://www.nber.org/system/files/working_papers/w19110/w19110.pdf.

Arnesen, L. (2022). *Families package changes to income support and financial incentives for model families - Technical companion report.* Wellington, New Zealand: Ministry of Social Development.

Auten, G., & Splinter, D. (2019). Top 1 percent income shares: Comparing estimates using tax data. *American Economic Association Papers and Proceedings*, 109: 307 - 311.

Balestra, C., & Tonkin, R. (2018). Inequalities in household wealth across OECD countries: Evidence from the OECD Wealth Distribution Database. *OECD Statistics Working Papers, No. 2018/01, OECD Publishing, Paris*, https://doi.org/10.1787/7e1bf673-en.

Ball, C., & Ormsby, J. (2017). Comparing the Household Economic Survey to administrative records: An analysis of income and benefit receipt. *Treasury Analytical Paper*.

Bengtsson, N., Holmlund, B., & Waldenström, D. (2012). Lifetime versus annual tax progressivity: Sweden, 1968-2009. *CESIFO Working Papers No. 3856*.

Bricker, J., Moore, K. B., Reber, S. J., & Volz, A. H. (2020). Effective tax rates by income and wealth class. *National Tax Journal*, 987-1003.

Ching, B., Reid, C., & Symes, L. (2023). How progressive is the tax and transfer system? Part 2: Results. *Treasury Analytical Note* AN23/03.

Coleman, A. (2019). *Taxing capital income in New Zealand: an international perspective.* Retrieved from Economics Discussion Papers Series No. 1902. University of Otago: http://hdl.handle.net/10523/8789

Creedy, J., & Eedrah, J. (2014). The role of value judgements in measuring inequality. *New Zealand Treasury Working Paper 14/13*, https://www.treasury.govt.nz/sites/default/files/2014-11/twp14-13.pdf.

Creedy, J., & van de Ven, J. (1999). The effects of selected Australian taxes and transfers on annual and lifetime inequality. *Australian Journal of Labour Economics*.

Creedy, J., Enright, J., & Gemmell, N. (2008). Equity and efficiency measures of tax-transfer systems: Some evidence for New Zealand. *New Zealand Treasury Working Paper 08/04*, https://www.treasury.govt.nz/sites/default/files/2008-12/twp08-04.pdf.

Elkins, D. (2007). Taxing income under inflationary conditions: The Israeli experience. *SMU Law Review*, https://scholar.smu.e3du/smulr/vol60/iss2/3.

European Commission. (2011). *A retrospective evaluation of elements of the EU VAT system*. Retrieved from https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/common/publications/studies/report_evaluation_vat.pdf

Fisher, J. D., Johnson, D. S., Smeeding, T. M., & Thompson, J. P. (2022). Inequality in 3-D: Income, consumption, and wealth. *The Review of Income and Wealth*, 16 - 42.

Fullerton, D., & Rogers, D. L. (1991). Lifetime vs annual perspectives on tax incidence. *National Tax Journal*, 277-287.

Fullerton, D., & Rogers, D. L. (1991). Lifetime vs annual perspectives on tax incidence. *NBER*.

Graham, S., & Arnesen, L. (2022). *Monitoring the families package and changes to income support from 2018 to 2021.* Retrieved from Ministry of Social Development: https://www.msd.govt.nz/about-msd-and-our-work/publications-resources/evaluation/families-package-reports/families-package.html

Hanappi, T. (2018). Corporate effective tax rates: Model description and results from 36 OECD and non-OECD Countries. *OECD Taxation Working Papers No 38*, OECD Publishing, Paris.

Immervoll, H. (2002). The distribution of average and marginal effective tax rates in European Union member states. *EUROMOD Working Paper*, https://econwpa.ub.uni-muenchen.de/econ-wp/pe/papers/0302/0302005.pdf.

Inland Revenue. (2022). *Tax, foreign investment and productivity: Draft long-term insights briefing.* Retrieved from https://taxpolicy.ird.govt.nz/publications/2022/2022-other-draft-ltib

Inland Revenue. (2023). *High-Wealth Individuals Research Project*. Retrieved from https://www.ird.govt.nz/hwi-research-project

Inland Revenue Service. (2020). *Publication 501*. Retrieved from https://www.irs.gov/publications/p501#en_US_2020_publink1000220687.

Kopczuk, W. (2019). Comment on "Progressive Wealth Taxation" by Saez and Zucman. *Brookings Papers on Economic Activity*, 512 - 526 .

Levell, P., Roantree, B., & Shaw, J. (2021). Mobility and the lifetime distributional impact of tax and transfer reforms. *International Tax and Public Finance*, 751-793.

Lustig, N. (2019). The "Missing Rich" in household surveys: Causes and correction approaches. *Commitment to Equity (CEQ) Working Paper Series 75, Tulane University, Department of Economics*.

Milligan, K. (2021). Average tax rates in the Canadian personal income tax. *National Tax Journal*, 513 - 527.

Nolan, M. (2018). Horizontal and vertical equity in the New Zealand tax-transfer system: 1988-2013. *Victoria University of Wellington Working Papers in Public Finance*.

Nolan, P. (2018). Effective marginal tax rates: The New Zealand case. *New Zealand Productivity Commission Working Paper 2018/01*.

OECD. (2018). *Taxing wages 2018.* Paris: OECD Publishing.

OECD. (2021). *Revenue statistics 2021: The initial impact of COVID-19 on OECD tax revenues.* Paris: OECD Publishing.

Okun, A. (1975). *Equality and efficiency, the big tradeoff.* Washington DC: Brookings Institution.

Perry, B. (2019). *Household incomes in New Zealand: Trends in indicators of inequality and hardship 1982 to 2018.* Retrieved from Ministry of Social Development: https://www.msd.govt.nz/about-msd-and-our-work/publications-resources/monitoring/household-incomes/household-incomes-1982-to-2018.html

Saez, E., & Zucman, G. (2019). *The triumph of injustice: How the rich dodge taxes and how to make them pay.* New York: W. W. Norton & Company.

Smeeding, T. M., & Thompson, J. P. (2010). Recent trends in the distribution of income: labor, wealth and more complete measures of well being. *Political Economy Research Institute*.

Stats NZ. (2018). *Measuring the distribution of household income and outlays within a national accounts framework*. Retrieved from https://www.stats.govt.nz/experimental/national-accounts-distribution-of-household-income-consumption-and-saving

Tax Working Group. (2018). *Future of tax: Interim report*. Retrieved from https://taxworkinggroup.govt.nz/resources/future-tax-interim-report

Tax Working Group Secretariat. (2018a). *Distributional analysis and incidence: Background paper for session 5 of the Tax Working Group.* Retrieved from Tax Working Group: https://taxworkinggroup.govt.nz/resources/twg-bg-3970237-distributional-analysis-and-incidence.html

Tax Working Group Secretariat. (2018b). *GST: Background paper for session 2 of the Tax Working Group.* Retrieved from https://taxworkinggroup.govt.nz/sites/default/files/2018-09/twg-bg-gst.pdf

The Treasury. (2021). *He Tirohanga Mokopuna: The Treasury's combined statement on the long-term fiscal position and long-term insights briefing.* Wellington: The Treasury.

Thomas, A. (2015). The distributional effects of consumption taxes in New Zealand. *Victoria University of Wellington Working Paper*.

Thomas, A. (2022). Reassessing the regressivity of the VAT. *Fiscal Studies 43(1)*, 23 - 38.

Thuronyi, V. (1996). "13 Adjusting taxes for inflation". In *Tax Law Design and Drafting: Volume 1*. USA: International Monetary Fund. https://doi.org/10.5089/9781557755872.071

U.S. Department of the Treasury. (2021). *Office of Tax Analysis*. Retrieved from https://home.treasury.gov/policy-issues/tax-policy/office-of-tax-analysis

van de Ven, J., & Creedy, J. (2005). Taxation, reranking and equivalence scales. *Bulletin of Economic Research 57:1*, 13 - 36.

Vermeulen, P. (2018). How fat is the top tail of the wealth distribution? *Review of Income and Wealth*, 357 - 387.

Welfare Expert Advisory Group Secretariat. (2019). *The income support system.* Retrieved from http://www.weag.govt.nz/assets/documents/WEAG-report/background-documents/757c27caff/Income-support-system-040319.pdf

World Inequality Database. (2021). *Income and wealth inequality in New Zealand*. Retrieved from World Inequality Database: https://wid.world/country/new-zealand/

Annex 1: Income data by source type

The Tax and Welfare Analysis model (TAWA) can use a mixture of data sources, depending on availability, which includes Inland Revenue (IR) and Ministry of Social Development (MSD) data through the Integrated Data Infrastructure (IDI), Household Economic Survey (HES) survey data, or modelled data. Approximately 95% of adults in HES can be linked to IR administrative data through the IDI. TAWA outputs based on the HES sample are weighted to allow scaling up to population totals.

Table 3 details the full suite of individual income data that might be compiled for an economic income estimation, with potential sources in brackets. Income flows without a current source need to be imputed using additional data sources.

Table 3: Individual income types by category[16]

Income category	Specific examples
Taxable market income	• Wages and salaries (IR data) • Paid parental leave (IR data) • Self-employment income including self-employment profit, partnership income, shareholder salary, and schedular payments (IR or HES data, depending on data availability)[17] • Capital income including interest, dividends, rents, trust income, other investments, overseas dividends, overseas interest and other overseas income (IR or HES data, depending on data availability)[18] • PIE income (IR data) • Taxable ACC income (IR data) • Other sources of regular income such as casual jobs and hobbies, directors' fees and honoraria, earnings compensation as a dependent, private or job superannuation income, annuities, and income protection insurance (IR and HES data: note HES has reporting issues and small sample size)
Capital gains/losses on assets (tax status depends on circumstances: see Annex 3)	• Principal residence • Other residential property • Other non-residential property • Public equities • Private equities (missing from HES 2018 data)[19] • Assets held in trusts
Imputed rents (non-taxable)	• Principal residence • Durable goods (excluded from estimates)
Everything above this point represents **private market income**	

16 Detailed data dictionary for IDI tax data found here: http://infoshare.stats.govt.nz/browse_for_stats/snapshots-of-nz/integrated-data-infrastructure/idi-data/irtax-data.aspx#gsc.tab=0

17 IR data are subject to lags and so HES data are used as a proxy if IR data are missing for self-employment income. Where IR data are missing within the survey reference period, data are imputed based on adjacent tax years. HES is subject to significant undercounting when compared to IR data totals.

18 See footnote 15.

19 See: https://www.stats.govt.nz/methods/net-worth-statistics-year-ended-june-2021-information-and-improvements

Income category	Specific examples
Taxable transfer payments	• Main benefits, including Job Seeker Support, Sole Parent Support, Supported Living Payment (TAWA modelled for individuals with IDI receipt from MSD) • National Superannuation (TAWA modelled for individuals with IDI receipt from MSD) • Student allowance (IR data) • Other main benefits including Youth Payment and Young Parent Payment (MSD data) • Overseas pensions (IR and HES data: note HES has reporting issues and small sample size)

Non-taxable income	• Supplementary assistance transfers, for example:
	    o Temporary Additional Support and Disability Allowance (MSD data)
	    o Accommodation Supplement (TAWA modelled, MSD data used to indicate receipt)
	    o Winter Energy Payment (TAWA modelled)
	• Non-recoverable hardship assistance, for example, Special Needs Grants (MSD data).
	• Regular income including child support, maintenance, alimony and educational scholarships (HES data: note HES has reporting issues and small sample size. Not linked to administrative data or modelled)
	• Irregular income including gifts, inheritance, insurance pay-outs, lump sum bursaries, prizes and matrimonial settlement (HES data: note HES has reporting issues and small sample size. Not linked to administrative data or modelled)
	• Tax credits including WFF (FTC, IWTC, MFTC, BSTC) and IETC (TAWA modelled)

Everything above this point represents **pre-tax market income and transfers**	
In-kind transfers	• Imputed healthcare (excluded from estimates) • Imputed education (excluded from estimates)
Everything above this point represents **pre-tax final income**	

Table 3 highlights that there are no readily available data sources for income arising from accrued capital gains and imputed rents. Here we propose some novel methods to estimate these income flows by combining HES net worth data with complementary data sources on expected rates of return.

Capital gains are estimated by multiplying HES asset values with capital gain rates for various asset classes …

$$Capital\ gain_{i,n} = Wealth_{\ i,n} \times Capital\ gain\ rate_{i,n} \qquad \textbf{(I)}$$

Where *i* represents each family and *n* is the capital asset.

The HES net worth survey provides valuations for the following nine asset and equity types:

1 Principal residences
2 Other residential real estate
3 Non-residential real estate
4 Vacant land
5 Unincorporated businesses
6 Public equity
7 Private equity
8 Mutual funds and other investment funds
9 Assets held in trusts (which include a mixture of the first eight asset types).

However, HES 2018 is known to be missing most data on unlisted shares, except where the respondent is involved in running the company. This is a significant limitation of basing our study on the 2018 tax year. From 2021, HES has been improved to ensure collection of unlisted share ownership.[20]

The list above includes a mixture of assets and equity values that are used for estimating capital gains. As a general principle we only net off liabilities held within entities before calculating capital gains on asset or equity values. This means:

- Capital gains are applied directly to property assets (1 – 4 above) rather than applying the capital gains rates to property equity after netting off liabilities. Similarly, where a household holds financial assets (eg, shares) and an associated liability we estimate capital gains based solely on the financial asset value.
- By contrast, most HES business values (5 – 8 above) are based on equity figures (ie, assets net of liabilities within the business), and so we use these equity values for estimating capital gains.

This approach is the best we can do with our available data sources. Ideally, we would consistently apply capital gains rates to ‘asset values’ rather than a mixture of equity and asset values. The approach we have taken is consistent with the data available for estimating capital gains rates: the asset values we use apply capital gains rates based on asset price changes, and where we use equity values we apply capital gains rates based on equity price changes (see discussion below).

[20] See: https://www.stats.govt.nz/methods/net-worth-statistics-year-ended-june-2021-information-and-improvements

There are several data sources that can provide capital gain rates for these assets. The provisional Accumulation Accounts is a useful macro data source for revaluation rates across a range of assets. Capital gain rates can be calculated on the provisional Accumulation Account revaluations using the following formula:

$$Capital\ gain\ rate_{t,n} = \frac{Accumulation\ Account\ Revaluation_{\ t,n}}{Accumulation\ Account\ opening\ balance_{t,n}} \quad \textbf{(II)}$$

Where *t* represents the chosen year (or range of years for a long-term average) over which accumulations are measured and *n* is the capital asset.

We must briefly revisit the question of the relevant period of analysis in the context of capital gains rates. Although we have decided to measure our EATRs based on annualised income, there is an argument that longer-term returns should be used when estimating capital gains. This is because capital gains are a particularly volatile type of income (see Figure 1) and a strong return in one year does not mean that the same return can be expected in the next. To address this volatility, we have modelled our estimated capital gains based on two different timeframes:

1. Capital gains estimated using the rate of revaluation for the year ended 31 March 2018. This matches the distributional data for all other income streams (eg, dividends, labour income, rents and interest) in 2018.

2. Capital gains using the 10-year average rate of revaluation between March 2008 and March 2018. This can be used to assess how exceptional the 2018 returns might be against a longer-term average, which roughly approximates a business cycle.[21]

Table 4 uses the provisional Accumulation Accounts opening balances to estimate two sets of capital gain rates. We use the 2018 rates for the main capital gain estimate and the 10-year geometric mean rates for sensitivity analysis.

Table 4: Capital gain rates by asset category (revaluation as a percentage of 2018 Accumulation Accounts opening balance)

	Capital gain rates based on 2018 revaluation	10-year geometric mean of capital gain rates (to March 2018)
Owner-occupied housing	3.6%	4.5%
Listed equity	12.4%	2.7%
Overseas listed equity	11.5%	4.1%
Unlisted equity	10.7%	5.3%
Unincorporated businesses	12.3%	3.5%
Investment funds equity	-1.5%	1.7%

Note: These capital gain rates are experimental and subject to further data revisions by Stats NZ. They are based on the author's own calculations from a customised dataset that cannot be replicated with the publicly available source.

21 The 10 years to March 2018 capture most of the downturn in asset prices seen during the Global Financial Crisis. This represents the longest period available for capital gains estimates based on Stats NZ's experimental Accumulation Accounts.

More precise estimates of capital gain rates for owner-occupied dwellings can be made using CoreLogic data. CoreLogic residential property data can provide estimates of median capital gain rates for each Territorial Authority by house size (measured by bedroom numbers), which can be matched with owner-occupied dwelling valuations from the HES net worth survey.

We use the CoreLogic House Price Index (HPI) data for estimating capital gain rates for other real estate, including residential property, non-residential property and vacant land. These other property types cannot be precisely calibrated to Territorial Authorities or property size because this information is not collected in the HES net worth survey.

Stats NZ has also been working to improve data on investment fund capital gains. We intend to use this new data series that sources investment fund capital gains data directly from Financial Market Authority (FMA) annual financial statements.

Table 5 summarises the data sources we use for estimating capital gain rates. These rates are then multiplied against HES assets (**equation I**) to estimate capital gains across the more comprehensive income distribution.

Table 5: Data source for capital gain rates by HES asset type

HES asset	Proposed data source
1 Principal residences	CoreLogic median residential property capital gain rates by territorial authority and bedroom number
2 Other real estate	CoreLogic HPI capital gain rate
3 Unincorporated businesses	Stats NZ Accumulation Accounts unincorporated business capital gain rate
4 Public equity	Stats NZ Accumulation Accounts listed equity capital gain rate
5 Private equity	Stats NZ Accumulation Accounts unlisted equity capital gain rate
6 Mutual funds and other investment funds	Stats NZ experimental series using FMA annual financial statement data for capital gain rate
7 Assets held in trusts	Assets to be split into the eight categories above and multiplied by the corresponding capital gain rate

Imputed rents are estimated using two experimental methods that rely upon MBIE rent data and CoreLogic house price data …

Imputed rents are notional payments that owner-occupiers make to themselves for the right to live in their own home. We estimate imputed rents using two different methods, in order to allow sensitivity analysis of key assumptions. The two methods apply the same underlying calculation:

Net imputed rent = gross imputed rent – operating costs

Both methods use HES expenditure data to estimate owner-occupier operating costs. These costs include interest repayments on mortgages,[22] insurance, and other housing operating costs.[23]

The key difference between our two methods is how gross imputed rent is estimated:

1. Gross imputed rent = notional rent paid for a dwelling, based on the geometric mean rent for the same number of bedrooms in the same Territorial Authority.

2. Gross imputed rent = HES value of occupied dwelling multiplied by the geometric mean rental yield for the same number of bedrooms in the same Territorial Authority.

Geometric mean rents are sourced from the Ministry of Business, Innovation and Employment's (MBIE) bond data. Rental yields are calculated by dividing the rent for a property by its matched CoreLogic property price. The property prices and rents can be matched with HES respondents' local Territorial Authority and bedroom number, in line with our estimation method for principal residence capital gains.

It is not clear which should be preferred. If we impute geometric mean rents by bedroom numbers (method 1), we risk under-estimating imputed rents if the principal residence housing stock is of a systematically higher value. Alternatively, if we multiply geometric mean rental yields by principal residence housing values (method 2), we must assume that the self-reported housing values are accurate and that rental yields are scalable across houses of different values. The potential for different results generated by each imputation method can be demonstrated by a simple example:

1. Assume that the average principal residence is a 3-bedroom house worth $1 million, while the average 3-bedroom rental property is worth only $500,000.

2. If the geometric mean rental yield is 5%, the rental property gross rent is $25,000.

3. Imputing rents for the principal residence can be modelled either by:

   Method 1: assuming geometric mean 3-bedroom rents apply, resulting in a $25,000 imputation.

   Method 2: assuming that the rental yield is the same rate, in which case you apply 5% to $1 million which gives you imputed rent of $50,000.

[22] Repayments of the loan principal will not be included as a housing expense, as this is the purchase of further equity in the home rather than an expense against income.

[23] Theoretically local body rates are also a cost of owner-occupied housing that could be deducted, but for this study we have opted to define this as a tax and included them in the EATR numerator instead.

Future research could test how complete our more comprehensive income distribution is by making comparisons with the National Account totals …

The approach to estimating more comprehensive income described in this note is based on microeconomic data, namely a prototype extension to the TAWA model that relies upon IDI administrative datasets and the HES net worth 2018 dataset. This will differ from estimates of income that are based on macroeconomic datasets, such as Stats NZ's Distributional National Accounts (DNA).

While a microdata approach builds the income distribution from the ground up, the DNA dataset takes the macroeconomic variable totals as given and distributes them among household groups by scaling up microdata totals. There are certain similarities between each method, notably both methods must model imputed rent for owner-occupied dwellings. However, there are also significant differences in these approaches that are likely to result in different income distributions. For example, capital gains are not included as 'income' in the DNA dataset and are captured separately as capital asset revaluations in the Accumulation Accounts. Each method has its own strengths and limitations with respect to estimating the distribution of more comprehensive income

Microdata income distribution	Distributional national accounts
• Income totals unlikely to match national income • Capital gains can be estimated at the unit level • Can be used for EATR microsimulations	• Income totals will match 100% of national account • Capital gains are not defined as income but instead are included in Accumulation Account revaluations • Allows international comparison of the distribution of income

Owing to the different treatment of capital gains, the income distributions that will be estimated by the method presented in this Analytical Note will not be directly comparable to the DNA dataset. However, Accumulation Account revaluation totals will be able to provide an indication of how comprehensively our method has estimated capital gains. Additionally, DNA totals for specific income lines could also be used to test how comprehensively we have captured other income sources (eg, imputed rent). There is demand to extend DNA coverage to provide a distributional split of household wealth, and the microdata distribution would likely provide most additional information required for this.

Annex 2: Further explanation for key modelling choices and assumptions

Results are primarily based on the family unit …

The chosen unit of analysis can materially impact results and ultimately relies on value judgements about the way that resources are likely to be shared (Creedy & Eedrah, 2014). The choice of unit often depends upon the analytical question, as each different unit has its own strengths and weaknesses:

- **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 dependant 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 benefit rates often differ depending on whether one is single, a couple or with children.[24]

- **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.

A further choice is whether to equivalise household or family units to account for the number of adults and children in each household or family. Perry (2019, p 14) identifies two reasons for equivalisation:

1. A larger household needs more income than a smaller household for the two households to have similar standards of living (all else being equal).
2. There are economies of scale as household size increases.

To account for these two factors, equivalisation normally applies a weight of 1 to the first adult, with lower weights applied to any other adults (eg, 0.5 in the OECD 2013 modified scale) and children (eg, 0.3 in the OECD 2013 modified scale).

With no single ‘correct’ unit of analysis, we intend to focus on the family unit of analysis, with and without adult equivalisation. Adult equivalent units are estimated using the OECD modified scale to acknowledge that needs are likely to vary with family size.

---

[24] 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

Data availability means that we use an annual time period …

The choice about the time period for analysis would be of little consequence if income, wealth and expenditure were constant across a lifetime. In reality, these variables follow lifecycle patterns which might lead to significantly different EATR distributions when measured over longer timeframes. We rely on an annual analysis because of data availability.

Ideally, we would be able to calculate EATRs using lifetime earnings. Fullerton & Rogers (1991) note that in theory a lifetime perspective would lead to a less regressive result for consumption tax distributions, assuming individuals eventually spend their savings in retirement. A lifetime perspective would also make income taxes appear less progressive, as much redistribution is intra-person across the lifecycle. While beyond the scope of this study, others have examined the lifetime progressivity of taxes using administrative data (Bengtsson, Holmlund, & Waldenström, 2012) and modelling (Creedy & van de Ven, 1999; Levell, Roantree, & Shaw, 2021).

There are principled reasons for preferring annual analysis in some circumstances, notably to assess short-term equity. Fullerton & Rogers (1991, p.4) note that lifetime and annual measures are not perfect substitutes and 'policymakers should be concerned with both "short run equity" and "long run equity".' They make the argument that the timing of taxes can be important, especially for credit constrained borrowers, and that these timing effects will not be detected by focussing on only lifetime income.

We estimate our EATRs on an annual basis, as a pragmatic choice. This can also be supported as the best measure of short-term equity but cannot assess lifecycle dynamics. In the case of GST (discussed in detail in **Annex 3**) lifecycle effects mean that we separately assess GST using an annual expenditure base.

In acknowledgement of the significant lifecycle effects that risk misrepresenting the long-term equity of the tax system, we also present our results decomposed by age groupings.

We also need to make assumptions about economic incidence …

The statutory incidence of tax (ie, who legally pays tax) can differ from the economic incidence of tax (ie, who really pays tax). Economic incidence will depend on the extent to which taxes are passed through prices and borne by households and firms. The ability to pass a tax through to prices will depend on relative price elasticities. For example, producers facing a new consumption tax on a price-inelastic good (eg, petrol) should be able to pass most of the tax burden onto consumers. In the case of a relatively price-elastic good, producers may need to absorb the tax burden.

Estimating the economic incidence of income taxes would require knowing the distribution of pre-tax income and associated prices, which is not possible. A recent study discussed three factors that prevent accurate estimation of economic incidence (Advani & Summers, 2020, p. 19):

1. Empirical uncertainty of the counterfactual.
2. Heterogeneity of response.
3. Data challenges that prevent linking of tax payments to those who bear the incidence.

The difficulty of estimating economic incidence typically leads to simplified assumptions or reverts to legal incidence. We make the following incidence assumptions:

1. The full incidence of personal income taxes and ACC levies falls on individual earners.
2. The full incidence of PIE income falls on individual investors.
3. The full incidence of local body rates falls on the property owner.
4. The full incidence of GST falls on consumers.[25]

This assumes legal incidence for all tax types except for GST, where we assume that incidence falls on the consumer. This is a reasonably common assumption in the literature and can be estimated based on available data.

While the assumption that tax incidence always falls on household income is not realistic, it allows us to consider the full tax treatment of more comprehensive income and expenditure for a given taxpayer. A higher EATR in this context will then tell us that the activities of that individual are more highly taxed. While this approach will still miss important economic incidence dynamics (eg, how taxes flow into prices), it is transparent and consistent with the household income literature. This could be a fruitful area for further research and modelling.

We present results based on nominal figures and real figures that are corrected for inflation …

This project is focussed on assessing economic income, which should only refer to real returns. The Haig-Simons ideal (current consumption plus increased wealth) incorporates increased wealth because it represents potential future consumption. In turn, wealth can only be converted into consumption to the extent that inflation has not reduced the purchasing power of wealth (Thuronyi, 1996, p. 5).

Counter to the strong ‘in-principle’ arguments to index all capital income to inflation is the fact that EATR research has traditionally used nominal values. There is not a common method for inflation adjustment in EATR research. For example, Splinter (2020, Figure 1) presents six EATR measures in nominal terms only. Therefore, we present our most comprehensive EATR measure using both nominal and real income.

We apply the balance sheet approach as outlined by Elkins (2007). In this method, the inflation adjustment is equal to:

$$Adjustment = Equity \times inflation\,rate$$

The adjustment figure is subtracted from the EATR denominator, resulting in an increase in income if the adjustment is negative and a decrease in income if the adjustment is positive. We use the annual Consumer Price Index (CPI) percentage change for Q1 2018 as our inflation rate (1.1%) when using one year capital gain rates, and we use the CPI geometric mean for the 10 years to Q1 2018 when using 10 year capital gain rates.

25 This approach is consistent with the assumptions made by European Commission (2011) and Thomas (2022).

This inflation adjustment method still faces limitations. Using a single CPI value to index returns may not accurately reflect how varied the typical basket of goods is across the income distribution. Future extensions of this work could use cost of living indices that are tailored to specific family income or other family characteristics.[26]

[26] See: https://www.stats.govt.nz/methods/household-living-costs-price-indexes-review-2020

Annex 3: Further explanation of the nine EATRs

Table 6 shows the iterative approach that we use to work towards a more comprehensive EATR measure. Where an income type is added to the EATR denominator (blue vertical column) we account for any associated tax in the EATR numerator (red horizontal row) to maintain tax and income symmetry.

Table 6: Income and tax types for EATRs

Colour Key: Robust IDI data; HES data; Experimental data		Additional taxes →						
		Income tax (incl. tax on taxable transfers)	+Transfers as negative tax	+ PIE tax	+ ACC Levy (excl.GST)	+ Local body rates on secondary homes (excl. GST)	+ Local body rates on the principal residence (excl. GST)	+ GST
	Expenditure (not income)							EATR$_8$
Narrow income definition	(A) Personal taxable income (including cash transfers)	EATR$_1$						
↓	+ (B) Non-taxable transfers		EATR$_2$					
	+ (C) PIE taxable income			EATR$_3$				
	+ (D) Taxable ACC income				EATR$_4$			
	+ (E) Accrued capital gains on assets excl. the principal residence					EATR$_5$*		
Additional income types	+ (F) Accrued capital gains on the principal residence						EATR$_6$	
	+ (G) Imputed rents from the principal residence						EATR$_7$	EATR$_9$*

*Modelled with and without inflation adjustment

Table 6 accounts for data reliability through a colour key:

- Robust IDI data: $EATR_1$, $EATR_2$, $EATR_3$ and $EATR_4$ are based on individuals' actual income and transfers receipts data sourced from Inland Revenue records. These data can be considered reliable to the extent that individuals correctly report their personal taxable income to Inland Revenue.

- HES data: $EATR_8$ uses data from the 2019 HES expenditure survey. These types of household surveys can suffer from sampling and non-sampling errors.

- Experimental data: Capital gains and imputed rent data are approximated by combining HES 2018 net worth data with complementary data sources. These methods are novel and involve strong assumptions (see **Annex 1** for detail). For example, capital gains are estimated using average rates across the economy and are unlikely to reflect the real return achieved by individuals in a given year.

$EATR_1$: Personal taxable income

This is the simplest and most familiar EATR. It is limited to assessing personal income taxes against legally defined personal taxable income, which includes salaries, wages, self-employment income, benefits, student allowances, interest, dividends and other sources.[27] Taxable ACC income is excluded at this stage then added to the income base in $EATR_4$ (below) to maintain symmetry with the inclusion of the ACC Levy in the numerator. Personal taxable income is included on a pre-tax basis.

$EATR_2$: Transfers as a negative tax

Transfer payments are closely related to taxes and analysis of tax progressivity is incomplete without considering their impact. Transfer payments may take the form of tax credits (eg, Working for Families) or cash payments (eg, Job Seeker Support). However, this distinction is quite arbitrary because some tax credits are refundable, which means they are paid out even if they exceed the tax paid by a recipient. Cash payments and refundable tax credits both have the same end effect of increasing recipients' cash income and so are included in the income base for our EATR modelling.

From $EATR_2$ onwards (except for $EATR_8$) all transfers available for modelling in our prototype extension of TAWA (see Table 3, Annex 1 for a full list) are subtracted from taxes in the EATR numerator. We also include any cash or cash-equivalent transfers (eg, refundable tax credits) in the EATR income base. This means our EATRs measure the net taxes paid or transfers received, as a percentage of the taxpayer's more comprehensive income.

27 https://www.ird.govt.nz/income-tax/income-tax-for-individuals/types-of-individual-income

A potential argument for the exclusion of all transfers from the income base is the 'ability to pay' principle, as transfers are sent to those needing income support. However, we have decided to include any cash or cash-equivalent transfers in the EATR income base for the following reasons:

- Main benefits are taxable in New Zealand and are included in the EATR income base in international literature (U.S. Department of the Treasury, 2021; Bricker, Moore, Reber, & Volz, 2020; Auten & Splinter, 2019; Immervoll, 2002).
- Subtracting transfers from the EATR numerator can result in negative EATRs for taxpayers whose transfer income exceeds the taxes they pay. If transfers were excluded from the income base, one would expect very large negative EATRs or mathematically undefined EATRs for taxpayers whose market income is near zero. The inclusion of all transfers in the income base provides an EATR floor of negative 100%, when we subtract transfers from the EATR numerator.
- $EATR_9$ includes GST in the numerator, which taxpayer's meet using their disposable income. Transfers contribute to taxpayers' disposable income, and therefore their ability to pay GST. Exclusion of transfers would imply an artificially high EATR because it is 'partially based on post-transfer consumption and not offset by any other transfers' (Kopczuk, 2019, p. 524).

$EATR_3$: Portfolio Investment Entities (PIEs)

PIEs are used to combine investor funds in different passive investments. Conceptually PIE income is no different from individual income that might arise from direct ownership of passive investments, such as shares or bonds. PIEs are often taxed at concessionary rates to ensure that investors are not taxed above their personal marginal tax rates. Finally, PIE data has recently been uploaded to the IDI enabling reliable EATR modelling. This provides a strong case for the inclusion of PIE income and taxes to build a more comprehensive EATR.

There are several types of PIEs,[28] but most are multi-rate PIEs (MRP). MRPs must attribute income, losses and tax credits to investors, and calculate and pay tax based on each investor's Prescribed Investor Rate (PIR). The aim of PIRs is to incentivise investment by ensuring that investors are not taxed above their marginal tax rate.

Table 7 compares the PIR rates against the personal income tax rates in 2018. It shows that PIRs will either match or be lower than marginal personal income rates. Depending on an investor's personal income, PIRs can offer a significantly lower marginal tax rate, which means that adding PIEs to our EATR analysis will add insight into how these concessionary rates affect EATRs across the income distribution.

---

28 The IR860 Portfolio Investment Entity Guide explains the different types of PIEs and is available at: https://www.ird.govt.nz/roles/portfolio-investment-entities/types-of-portfolio-investment-entities/listed-portfolio-investment-entity

Table 7: 2018 Personal income tax rates and PIE rates

2018 Personal Tax Rates		2018 PIE Prescribed Investor Rates (PIR)		
For each dollar of income	**Tax Rate**	**Taxable income without PIE income**	**Taxable income with PIE income**	**PIR**
Up to $14,000	10.5%	$14,000 or less	$48,000 or less	10.5%
Over $14,000 and up to $48,000	17.5%	$48,000 or less	$70,000 or less	17.5%
Over $48,000 and up to $70,000	30%	All other cases		28%
Over $70,000	33%			

PIEs can also earn tax-free capital gains (see section CX 55 of the Income Tax Act 2007). Capital gains accrued in PIE funds can be a significant source of economic income, and totalled approximately $6.1 billion in 2018 according to FMA annual returns data (processed and supplied by Stats NZ). These capital gains are included in the income base for $EATR_5$, $EATR_6$, $EATR_7$ and $EATR_9$ (Table 6 above) and are distributed according to the method described for mutual funds and other investment funds in **Annex 1**.

$EATR_4$: Accident Compensation Corporation (ACC) Levy and income

The argument for inclusion of the ACC levy in calculating a comprehensive EATR is not clear cut, but we include the levy for completeness. The ACC levy is a payment into a national insurance scheme that supports those who suffer accidental injuries. The ACC levy is akin to a tax insofar as it is a compulsory payment used to fund a Crown entity. Employers deduct ACC Earners' Levies from employees' wages, together with income taxes, as part of their 'pay as you earn' (PAYE) payments.

In 2018 the ACC levy was charged at a flat rate of $1.21 per $100 (plus GST) of taxable earnings for employees and shareholder-employees. The levy is deducted only up to an annually prescribed maximum threshold of earnings ($124,053 in 2018).

Taxable ACC income is included in the EATR denominator to maintain symmetry between income types and associated taxes. ACC provides up to 80% of a worker's income if they cannot perform work activities because of an injury. We exclude any non-taxable ACC lump sum payments, as these are typically made for specific services and are more akin to in-kind transfers (such as health or education provision) that are excluded from this study.

$EATR_5$: Accrued capital gains on investments

A capital gain is the profit that can be made by selling a capital asset eg, a house or shares. Capital gains are not comprehensively taxed in New Zealand. The Tax Working Group (2018) observed that while gains derived in the ordinary course of carrying on a business are considered income, and are therefore taxable, in practice drawing this distinction is difficult as it relies on judgements about a person's intention.

Some capital gains are taxable in New Zealand, including payments for the sale of patents, lease and surrender payments, and certain land sale gains. The most prominent rule for the taxation of capital gains is probably the bright-line rule.[29]

For the purposes of modelling EATRs, we capture any taxable capital gains obligations realised in 2018 that are declared on the personal tax return (IR3). This means that we can model tax paid on a cash-basis, which aligns with the cash income bases for $EATR_1$, $EATR_2$, $EATR_3$ and $EATR_4$ (Table 6 above).

However, modelling tax on a cash basis creates an asymmetry for $EATR_5$, $EATR_6$, $EATR_7$ and $EATR_9$ (Table 6 above). These EATRs include accrued capital gains in the income base without any corresponding accrued tax obligation that might be incurred in the future when the capital gains are realised. This is necessary because we have no way of knowing which properties held in 2018 might have eventually been taxable upon sale in subsequent years. This is a limitation of a single year's analysis.

The effect of future tax liabilities creating a bias in our EATR modelling should be limited because most residential property sales remain untaxed in New Zealand. IR data suggests that approximately 46,000 residential properties were sold and taxed in the two tax years following 2017/18.[30] This represents only 14% of the 332,000 residential property sales recorded by IR in the same two-year period. Equivalent data are not available for the proportion of taxable sales for other types of assets, such as shares.

Property owners are also required to pay local body rates for local services, but the decision to includes these as an EATR 'tax' is not clear cut. The OECD does not distinguish between property taxes levied at the local or national level and includes local body rates as part of New Zealand's tax statistics (OECD, 2021). HES collects local body rates data for principal residences and secondary homes, but local body rates data are not available for investment or rental properties. We adopt the same stance as the OECD and include available local body rates from HES data in our EATR calculations whenever we include capital gains on rateable property in the income base. This means that $EATR_5$ only includes local body rates on secondary homes, whereas $EATR_6$, $EATR_7$ and $EATR_9$ include all local body rates on principal residences and secondary homes.

$EATR_6$: Accrued capital gains on principal residences

Capital gains from principal residences are modelled separately from capital gains on investments. This is because the 'family home' was excluded from the TWG's terms of reference, demonstrating a reluctance to consider the taxation of this asset type in New Zealand.[31] However, our more comprehensive EATR estimates will include capital gains on principal residences because they represent a significant store of wealth (36% of household net worth according to HES 2018).

---

29 For property purchased after 1 October 2015, the bright-line rule deemed the capital gains made on the sale of residential property taxable if sold within two-years. The bight-line test was extended to five years for residential property sales between 29 March 2018 and 26 March 2021. For residential property purchased after 2021 a 10-year bright-line period applies (subject to certain exceptions).

30 These properties were taxed either because they were captured by the bright-line test or were subject to income tax because they were sold by land developers, builders, or dealers.

31 https://taxworkinggroup.govt.nz/resources/terms-reference-tax-working-group.html

$EATR_7$: Imputed rents

Imputed rents are the estimated benefit for owners occupying their own house, ie, the notional payments that owner-occupiers make to themselves for the right to live in their own home. In contrast to tax on rental income paid by landlords, imputed rents from a principal residence are not taxed in New Zealand.

Stats NZ estimates aggregate imputed rents as part of its National Account calculations. They have also published experimental distributional accounts, which included a method for imputing rents and deducting expenses for owner-occupied housing (Stats NZ, 2018). Annex 1 explains two experimental methods that we propose for estimating imputed rents across the income distribution.

$EATR_8$ and $EATR_9$: Goods and Services Tax (GST)

Combining EATRs for income taxes and GST raises difficult conceptual issues. The chief difficulty is that income taxes are levied on an income base, while GST is levied on consumption. A choice must be made as to which base to use when trying to combine these different tax types.

There is no universally accepted method for combining consumption and income taxes to calculate a combined EATR. Saez & Zucman (2019, Figure 1.3) calculate combined EATRs by income decile and based on annual income. A GST EATR that is based on an annual income ordering will almost certainly appear regressive. However, this approach is critiqued by those who point out that the apparently regressive distribution of consumption taxes is driven by:

1. **The role of savings**: Higher income individuals save a greater proportion of their income, which may eventually be spent and subject to a consumption tax. Therefore, using an income base for savers will make their single year's GST burden appear lower than it will be across their lifetimes. This critique is not without limitations, as the wealthy may pass on significant wealth as inheritance. It might take many generations before a particularly wealthy individual's savings are spent on consumption, and thus the effect of savings is only removed in the distant future. Furthermore, this raises the possibility of 'the inheritance being consumed overseas' (Tax Working Group Secretariat, 2018b).

2. **The role of borrowing**: Payments of interest to service past borrowing will impact net income measures. Similarly, households that borrow in the current period will pay more GST as a fraction of their income over that period than is possible across their lifetime. Therefore, using an income base would drive an apparently regressive result.

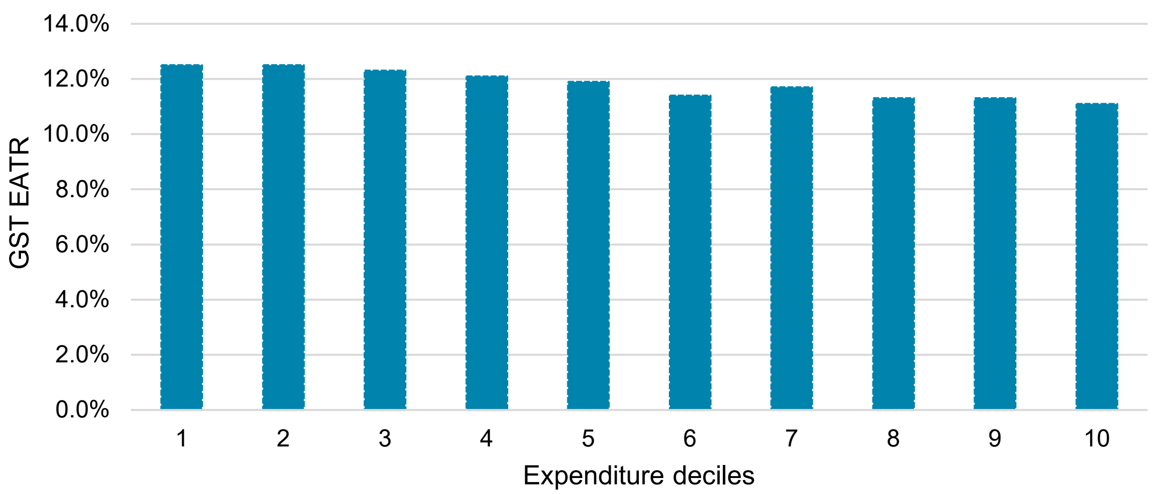
3. **The absence of income taxes**: GST is levied on disposable income after income tax is paid and income supports are received. Therefore, using a pre-tax income base will make consumption taxes appear more regressive than they are when measured against disposable income.

Ideally, we would be able to calculate EATRs using lifetime earnings as well as other measures. Fullerton and Rogers (1991) note that in theory a lifetime perspective would lead to a less regressive result for consumption tax distributions, assuming individuals eventually spend their savings in retirement. A lifetime perspective would also make income taxes appear less progressive because some redistribution is intra-person across the life-cycle. While beyond the scope of this study, others have examined the lifetime progressivity of taxes using administrative data (Bengtsson, Holmlund, & Waldenström, 2012) and modelling (Creedy & van de Ven, 1999; Levell, Roantree, & Shaw, 2017).

In the absence of lifetime income and tax data, Thomas (2015; 2022) argues that using an annual expenditure base is likely to provide a better approximation of the lifetime distributional impact of GST. This removes the influence of savings. Thomas finds this makes most consumption taxes appear proportional, although notes that, New Zealand's broad-based GST with its few reduced GST rates and exemptions 'can still produce a small degree of regressivity' (2022, p. 37). This is likely because the exemptions that do exist are on the few untaxed or exempt goods and services that the wealthy may spend proportionately more income on, eg, international flights, overseas holidays, financial services and duty-free goods.

Figure 5 reproduces the 'small degree of regressivity' identified by Thomas when modelling GST as a proportion of annual expenditure.

Figure 5: GST EATR using HES 2016 expenditure deciles according to Thomas (2022)



In acknowledgement of the concerns presented by Thomas (2022), we have modelled GST separately as a proportion of expenditure ($EATR_8$ in Table 6) as our preferred measure of longer-term GST progressivity. To show the combined effects of the tax and transfer system across a year (short-term equity), we also include GST in our most comprehensive EATR ($EATR_9$ in Table 6). $EATR_9$ will be limited in its ability to assess long-term equity outcomes owing to lifecycle dynamics, including the effects of savings, borrowings and income mobility.

Incorporating GST into $EATR_9$ requires us to combine income, wealth and expenditure data from two separate years. This is because HES follows a triennial pattern that does not collect wealth (eg, HES18) and expenditure data (eg, HES19) at the same time. We have combined these two separate surveys using a statistical imputation technique where HES19 households are donors and HES18 households are recipients of the expenditure data. We use several matching variables that probabilistically link donor and recipient households, including disposable income, benefits, number of dependants, number of non-dependants, number of families per household, total housing costs, and equivalisation factors. This extra step may introduce some errors and lowers the reliability of our $EATR_9$ estimates. The resulting modelling uncertainty could only be removed if future HES surveys collected income, wealth, and expenditure in the same year.

Annex 4: EATR calculations for Figure 4

Figure 4 shows EATR scenarios comparing taxpayers with different economic incomes at set levels of taxable income in 2018. This annex explains how these EATRs were estimated. The scenarios assume the HES mean values for households reporting a non-zero response for each asset or cost in the year ended June 2018:

- $17,754 rent payments (used for imputed rent income)
- $13,603 interest payments on mortgage
- $302 mortgage service fees
- $1,778 property insurance
- $2,899 property rates
- $647,000 owner-occupied house, which is multiplied by a capital gain rate to estimate annual accrued capital gains. A 3.6% capital gain rate is assumed, reflecting the CoreLogic House Price Index percentage change for detached houses in the year ended June 2018. This gives an accrued gain of $22,483 on the HES mean house value.

This is the general equation for estimating the EATRs in Figure 4:

$$EATR = \frac{Personal\ income\ taxes + local\ body\ rates}{Taxable\ personal\ income + accrued\ capital\ gains + net\ imputed\ rents}$$

Where *net imputed rents* vary depending on whether the homeowner has a mortgage and associated interest payments and service fees.

For Taxpayer 2 (owner-occupier with a mortgage):

$$Net\ imputed\ rent = rent\ payments - interest\ payments - mortgage\ service\ fees$$

$$- insurance\ payments - property\ rates$$

$$Net\ imputed\ rents = \$17{,}754 - \$13{,}603 - \$302 - \$1{,}778\ - \$2{,}899 = -\$829$$

For Taxpayers 3 and 4 (owner-occupiers without a mortgage):

$$Net\ imputed\ rents = rent\ payments - insurance\ payments - property\ rates$$

$$Net\ imputed\ rents = \$17{,}754 - \$1{,}778 - \$2{,}899 = \$13{,}077$$

1) Taxpayer with no assets

In this scenario each taxpayer's economic income is equal to their taxable income. This means that the EATRs are estimated in this scenario by simply applying the personal taxable income scale for 2018 (see Table 1). Table 8 shows the personal tax due and associated EATR for each level of taxable income in scenario 1.

Table 8: Scenario 1 personal income tax and taxable income figures used for EATRs

Scenario	Personal income tax	Taxable income	Economic income	EATR
1A	$10,667	$58,824	$58,824	18.1%
1B	$23,920	$100,000	$100,000	23.9%
1C	$56,920	$200,000	$200,000	28.5%

All subsequent scenarios use the same base figures that are shown in Table 8 for personal income tax and taxable income. The differences in EATRs for scenarios 2, 3 and 4 are driven by the additional economic income earned by property owners.

2) Taxpayer who is an owner-occupier with a mortgage

The taxpayers in scenario 2 earn some untaxed economic income ($21,654) in the form of net imputed rents (-$829) and accrued capital gains ($22,483). We also add local body rates as a type of tax in the EATR numerator. Table 9 shows the taxes due, taxable income, economic income and EATRs associated with scenario 2.

Table 9: Scenario 2 tax and economic income figures used for EATRs

Scenario	Personal income tax + local body rates	Taxable income + Untaxed income = Economic income	EATR
2A	$10,667 + $2,899 = $13,566	$58,824 + $21,654 = $80,478	16.9%
2B	$23,920 + $2,899 = $26,819	$100,000 + $21,654 = $121,654	22.0%
2C	$56,920 + $2,899 = $59,819	$200,000 + $21,654 = $221,654	27.0%

3) Taxpayer who is an owner-occupier without a mortgage

The taxpayers in scenario 3 pay the same total taxes as the taxpayers in scenario 2. However, in scenario 3 the taxpayers do not have any mortgage expenses and therefore they have a higher net imputed rent ($13,077) and higher untaxed income ($35,559) than the taxpayers in scenario 2. This results in lower EATRs for the scenario 3 taxpayers, as shown in table 10.

Table 10: Scenario 3 tax and economic income figures used for EATRs

Scenario	Personal income tax + local body rates	Taxable income + Untaxed income = Economic income	EATR
3A	$10,667 + $2,899 = $13,566	$58,824 + $35,559 = $94,383	14.4%
3B	$23,920 + $2,899 = $26,819	$100,000 + $35,559 = $135,559	19.8%
3C	$56,920 + $2,899 = $59,819	$200,000 + $35,559 = $235,559	25.4%

4) Taxpayer who is an owner-occupier, with two rental properties, all without a mortgage

Taxable rental income and rental expenses are assumed to be incorporated into the taxable income total for each taxpayer in scenario 4. This means that the taxpayers in scenario 4 pay the same total income taxes as for all prior scenarios. However, they now must pay local body rates on three properties ($8,697), which raises the total taxes they must pay compared to all other scenarios.

However, the taxpayers in scenario 4 also earn significantly higher untaxed income ($80,525) compared to all other scenarios. This results in the scenario 4 taxpayers having the lowest EATRs for any given level of taxable income, as shown in Table 11.

Table 11: Scenario 4 tax and economic income figures used for EATRs

Scenario	Personal income tax + local body rates	Taxable income + Untaxed income = Economic income	EATR
4A	$10,667 + $8,697 = $19,364	$58,824 + $80,525 = $139,349	13.9%
4B	$23,920 + $8,697 = $32,617	$100,000 + $80,525 = $180,525	18.1%
4C	$56,920 + $8,697 = $65,617	$200,000 + $80,525 = $280,525	23.4%