TE TAI ŌHANGA
THE TREASURY

Analytical Note

June 2023

Examining New Zealand's increased rate of income growth between the late 1990s and 2019

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Analytical Note 23/04[1]

JEL Classifications: E01 – Measurement and Data on National Income and Product Accounts and Wealth, Environmental Accounts; E24 – Employment, Unemployment, Wages, Intergenerational Income Distribution, Aggregate Human Capital, Aggregate Labor Productivity; O47 – Empirical Studies of Economic Growth, Aggregate Productivity, Cross-Country Output Convergence

Abstract

This paper provides a macroeconomic level cross-country analysis of New Zealand's material economic performance over recent decades. New Zealand's growth on traditional productivity metrics, such as real GDP per hour worked, has been lacklustre. However, its growth on more comprehensive measures, such as real net national income per capita, has been stronger since the 1990s. Consistent with this, New Zealand's real net national income per capita and real wages have somewhat caught up with higher-income countries, and emigration has reduced. The sources of New Zealand's real net national income per capita growth from the late 1990s to 2019 were different to those of most OECD countries. In most countries the bulk of the growth in real net national income per capita was due to growth in real GDP per hour worked (ie, production volumes per hour worked). In New Zealand, around 60% of cumulative growth was accounted for by a combination of a rising employment rate, a rising terms of trade, a reduced net international income deficit, and an unchanged depreciation burden (while most other OECD countries experienced increases). New Zealand has had broad-based growth in employment compared to other OECD countries. Much of the rise in New Zealand's terms of trade is attributable to rising export prices, although it has also been supported by a changing import mix.

[1] Thanks to many people within and outside the Treasury for their input and feedback on this work, including: John Janssen, Hilary Devine, Bruce White, Bevan Lye, Simon McLoughlin, Bettina Schaer, Geoff Lewis, Arthur Grimes, Richard Sullivan, David Haugh, Axel Purwin, Luca Marcolin, Luke Came, Isabelle Hermes, James Bibby, Tim Hampton, and Renee Philip. Any remaining errors are my own.

Executive summary

Aotearoa New Zealand's performance on traditional productivity metrics, such as real Gross Domestic Product (GDP) per hour worked, has been lacklustre in recent decades. However, New Zealand's growth on more comprehensive measures of material economic performance has been stronger since the 1990s – both relative to New Zealand's performance in the decades before this, and relative to other high-income countries.

On average over 1995-2002, New Zealand's **real GDP per hour worked** was 66% of the median of a sample of 19 OECD countries (chosen based on data availability). By 2019 New Zealand's real GDP per hour worked had fallen a further four percentage points behind, to 62% of the median. In contrast, over the same period New Zealand's **real gross national income (GNI)[2] per capita** increased from 68% of the median of the group to 81% of the median – a 13 percentage point improvement. New Zealand's relative performance on **real net national income (NNI)[3] per capita** was stronger still, lifting from 69% of the median to 85% of the median – a 16 percentage point improvement. NNI provides a measure of income available for consumption and growing the capital stock.

Looking across the OECD, New Zealand's income growth performance was strongest relative to some of the larger countries, such as Italy, Japan, and France. However, over this period New Zealand's incomes have also converged somewhat towards those of smaller OECD economies. Likewise, New Zealand's incomes have, since about 2011, converged a bit towards Australia's.

This paper investigates these trends by undertaking an analysis of the sources of growth in real NNI per capita in New Zealand relative to other OECD countries from the late 1990s to 2019. Growth in real NNI per capita can be decomposed into: changes in real GDP per hour worked, hours worked per capita, terms of trade impacts (export prices relative to import prices), net international income, and the depreciation burden (depreciation as a share of GNI).

Other countries' growth in real NNI per capita was mostly due to growth in real GDP per hour worked. New Zealand's growth in real GDP per hour worked was close to that of most other OECD countries, but it has outperformed in several other sources of income growth. These other sources of income growth collectively accounted for around 60% of New Zealand's overall growth in real NNI per capita – a larger share than in most other countries.

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2 Real GNI is equal to real GDP, plus terms of trade impacts, plus net international income.

3 NNI is equal to GNI less depreciation of the built capital stock.

In order of their size, these other sources of income growth have been:

1. **An increase in the share of the population in employment**. This, rather than individuals working more hours per year, has driven most of the large increase in hours worked per capita in New Zealand - both in absolute terms and compared to other countries. There will be both labour demand and supply factors behind New Zealand's increased employment rate, and part of the increase appears to be attributable to supportive demographic trends. Nonetheless, it appears that New Zealand's labour market has been relatively effective at creating employment opportunities. The increase in New Zealand's employment rate has been driven by increases in employment across a broad range of demographic groups, and real wages have increased more in New Zealand than they have in many other countries.

2. **A rising terms of trade**. New Zealand's average export prices have increased relative to its import prices. This appears to be largely attributable to global prices for food increasing relative to manufactures, but it has also been supported by changes in the composition of New Zealand's imports. New Zealand's changing import mix appears to reflect New Zealand firms adapting to import manufactured goods which have fallen the most in price rather than producing them domestically, and concentrating their domestic production on other, higher-priced, products. However, further work would be needed to determine whether this kind of adaptation has occurred to a greater or lesser extent in New Zealand than it has in other countries.

3. **A reduction in New Zealand's net international income deficit**. This is partly due to falling global interest rates, and partly due to a reduction in the level of New Zealand's net foreign liabilities.

4. **No significant change in New Zealand's depreciation burden**. In contrast, most other countries have experienced slight increases in their depreciation burdens.

The paper then documents some ways in which New Zealand's improved income growth may have impacted on broader macroeconomic outcomes. These include stronger wage growth, reduced emigration, a higher real exchange rate, and falling net foreign liabilities.

Given the significance of these other sources of income growth, it will be important to understand the extent to which they arose from luck versus policy settings, and the extent to which New Zealanders have been trading off growth in GDP per hour worked to obtain these other sources of income growth. The lack of convergence of New Zealand's productivity (real GDP per hour worked) to the global frontier remains a risk for New Zealand's long-term prosperity given that some of the other sources of income growth may not continue or could reverse in the future. Nonetheless, New Zealand's strong, broad-based employment growth and the contribution of the changing import mix to the terms of trade suggests that the New Zealand economy has been performing better than an assessment of real GDP per hour worked on its own would imply.

Introduction

Productivity growth is an important driver of improving living standards and wellbeing for people in Aotearoa New Zealand. In the broadest sense, productivity is about making the best use of all aspects of our wealth to generate as much wellbeing as possible (The Treasury, 2022). As is reflected in the Treasury's Living Standards Framework, this wellbeing can come in a range of forms, such as income, health, environmental amenity, safety, and time for family and friends (Janssen, Galt, & Bollinger, 2022).

In a narrower sense, productivity often refers to the quantity and quality of goods and services produced for a given amount of inputs. Although it is less comprehensive, productivity in this sense makes an important contribution towards wider productivity. By increasing the quantity of goods and services produced for a given amount of inputs, people have greater choices about how to use their resources to enhance their current and future wellbeing.

One key metric is labour productivity, often measured within the national accounts framework as real GDP per hour worked. Since the 1970s, New Zealand has had a low **level** of labour productivity compared to much of the rest of the OECD. New Zealand has also had a low rate of labour productivity **growth**, relative to other OECD countries. This has tended to flow through into New Zealand incomes being lower than much of the rest of the OECD.

Although the more recent literature continues to support this broad assessment, it has suggested that traditional metrics of productivity – such as real GDP per hour worked – may somewhat overstate how poor New Zealand's economic performance has been. This analytical note extends this literature by undertaking a macroeconomic-level cross-country analysis of New Zealand's economic performance over recent decades. To keep the scope tractable, this paper focuses on the narrower sense of productivity – that is, aggregate material economic performance. Readers are referred to the Treasury's publication *Te Tai Waiora: Wellbeing in Aotearoa New Zealand 2022* for an assessment of wider aspects of wellbeing and living standards in New Zealand.

This analytical note is structured as follows.

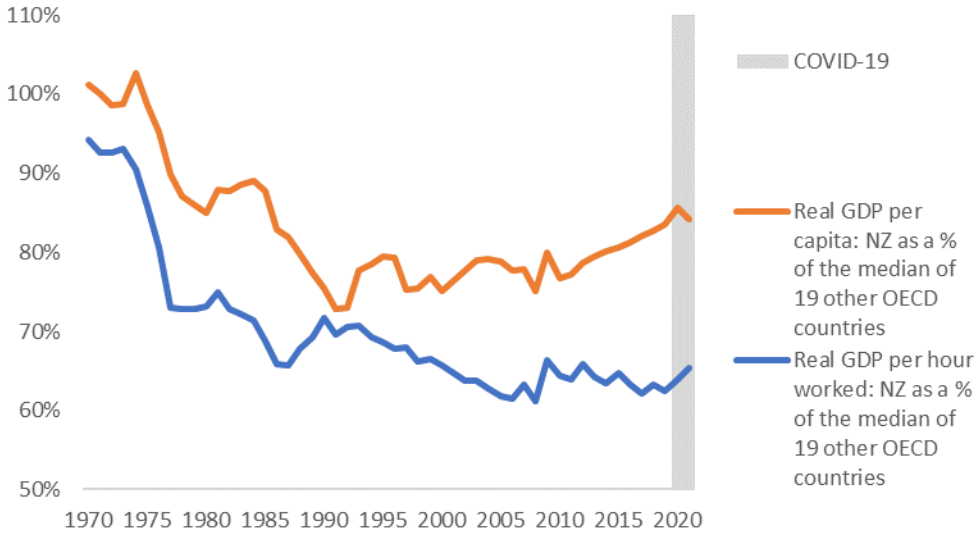
- Section one reviews recent literature on New Zealand's productivity and economic performance.
- Section two outlines the measures of economic performance, time periods, and country groupings used in the paper.
- Section three analyses New Zealand's aggregate income growth over time, relative to other countries.
- Section four provides a detailed analysis of the sources of New Zealand's real net national income per capita growth, compared to other OECD countries.
- Section five considers some ways in which increased income growth may have impacted broader macroeconomic outcomes.
- Section six discusses the results and suggests directions for further research.

1 Literature on New Zealand's productivity and income performance

Analysis of New Zealand's productivity performance has often focused on labour productivity, as measured by real GDP per hour worked (see, for example, New Zealand Productivity Commission (2021) and Conway (2018)). For several decades up to the mid-2000s, real GDP per hour worked grew in New Zealand, but at a slower rate than in other high-income OECD countries, and thereafter it grew at a similar rate to other countries. Figure 1 shows New Zealand's GDP per hour worked relative to the median of 19 other OECD countries for which continuous data for key variables is available from 1970.[4] New Zealand's real GDP per hour worked in 1970 sat around the median of these 19 other OECD countries. By 2019 it had fallen to only 62% of the median of this same group of countries, with most of the fall occurring between the mid-1970s and late-1990s.

Another metric sometimes considered in the New Zealand productivity literature is real GDP *per capita*. New Zealand's real GDP per capita has caught up a small amount relative to other OECD countries over recent decades. However, given that GDP per capita and GDP per hour worked only differ by the number of hours worked per capita, this convergence has arisen through measured hours per capita increasing faster in New Zealand than in other countries – rather than through faster labour productivity growth.

Figure 1: New Zealand's real GDP per hour worked and real GDP per capita as a % of the median of 19 other OECD countries (constant 2015 prices and PPPs)



Source: OECD, author's calculations

[4] The 19 countries are: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, the UK, and the United States. The choice of country groupings is discussed further in section 2. An alternative benchmark used in the literature is the employment-weighted current top half of the OECD over recent decades (see, for example, New Zealand Productivity Commission, 2021). This grouping differs from the 19 countries chosen in that it includes Austria, Iceland and Switzerland, and excludes Italy, Portugal, Spain, and Korea. This paper does not use the top half of the OECD as a benchmark to avoid the risk of introducing survivorship bias in the benchmark over the long time period considered.

For a long time, the lack of catch-up in the level of New Zealand's labour productivity was surprising to researchers and policymakers. Countries which are otherwise similar but initially poorer tend to subsequently catch up as they adopt the technologies and other production practices of higher productivity countries (Grimes & Wu, 2022). New Zealand's lack of productivity catch-up was even more perplexing given that its economic policies are often regarded as fit-for-purpose (Conway, 2018).

Over time, research identified four main possible explanations for New Zealand's poor productivity performance (Janssen, Galt, & Bollinger, 2022):

- **Macroeconomic imbalances** – including a persistently high real exchange rate, the slow growth of the tradables sector relative to non-tradables, and the low saving rate.
- **Low capital intensity** – perhaps a result of a persistent interest rate premium, a low domestic saving rate, the skew towards (under-taxed) housing, or the comparatively high off-the-shelf cost of capital goods.
- **New Zealand's small domestic market and distance from other overseas markets** – which limits opportunities to exploit economies-of-scale and to participate in the rise of Global Value Chains.
- **The slow diffusion of productivity-enhancing change** – a result of fewer large firms performing at or near the global productivity frontier, and a larger tail of non-frontier firms. This was variously associated with a lack of investment in knowledge-based capital, a small labour market with high skill mismatch, and poor or less ambitious management.

More recent research continues to support this overall assessment, although does reach slightly more positive conclusions.

First, a range of New Zealand's wellbeing and economic outcomes seem stronger than would be consistent with its level of GDP per capita. Janssen, Galt and Bollinger (2022) note New Zealand's unexpectedly strong ranking on many wellbeing-type indices, including the Human Development Index (HDI) and the OECD Better Life Index, in comparison to its relatively lower GDP per capita. Grimes and Hyland (2020) examine material wellbeing based on households' consumer durables and find that New Zealand has high household consumption levels.[5] These discrepancies may of course reflect trends unrelated to overall productivity or income, such as strong communities or a propensity among New Zealanders to own consumer durables. Another possible explanation, however, is that GDP per capita is overlooking some aspects of New Zealand's material prosperity.

More generally, *Te Tai Waiora: Wellbeing in Aotearoa New Zealand 2022* observed that New Zealand is a good place to live in many ways when considering a wide range of aspects of wellbeing. Life has also improved in many ways over the past 20 years, including with steady growth in household income and consumption since the mid-1990s (The Treasury, 2022).

Second, Grimes and Wu (2022) examine a measure of net national income per capita adjusted for natural resource depletion (real adjusted net national income, RANNI). They find that New Zealand's per capita growth on this measure since the early 1990s has been

[5] They find that New Zealand's consumer durables consumption was the third highest in their sample of 40 countries, only behind the US and Canada, and just ahead of Australia.

greater than it has in most other developed countries. One factor behind this is likely to be income arising from changes in the terms of trade (export prices relative to import prices). Janssen, Galt and Bollinger (2022) examine the terms of trade in further detail and find that New Zealand's rising terms of trade has resulted in New Zealand's per capita real domestic income growing faster than its per capita real GDP.

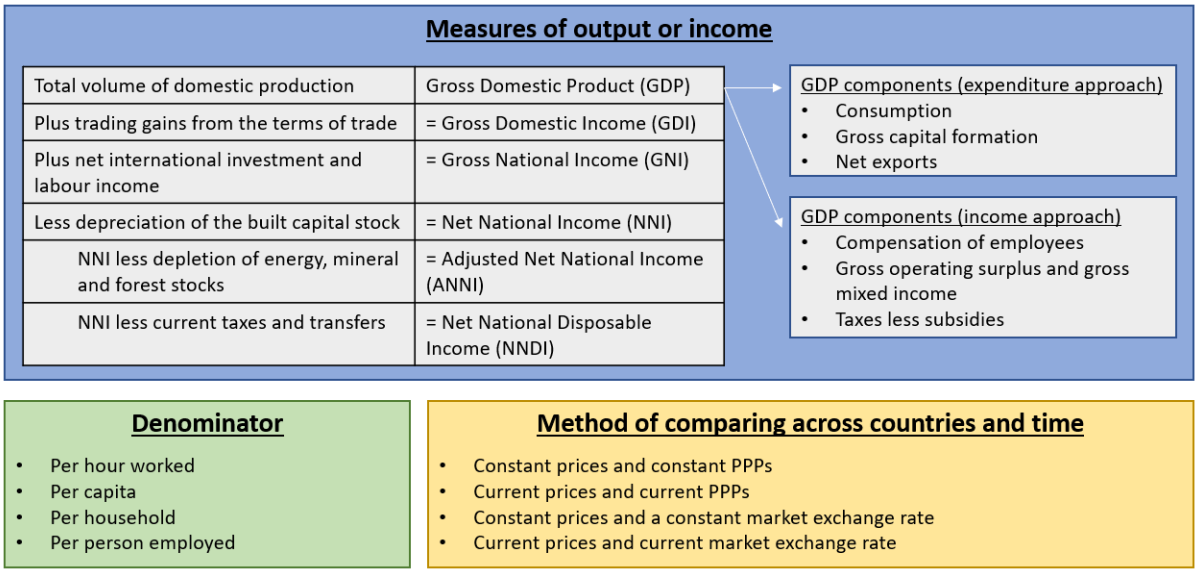
Finally, Janssen, Galt and Bollinger (2022) examine the measurement of hours worked in New Zealand relative to other countries. They find that New Zealand's measurement of average annual hours worked tends to produce systemically higher figures than other OECD countries, by up to 10%. This discrepancy primarily arises from differences in the treatment of public holidays and paid leave. The size of this discrepancy may have also been rising over time. This implies that both the level and growth rate of New Zealand's hourly productivity may be better than previously appreciated. Nonetheless, they find that neither the effect of measurement of hours worked, nor the terms of trade effect, restore New Zealand's past income relativities against high-income OECD comparators.

Overall, this recent literature provides a somewhat more positive assessment of New Zealand's economic performance since the 1990s, while not refuting that New Zealand has challenges with productivity. The rest of this paper aims to build on this literature by providing a more extensive macroeconomic-level assessment of New Zealand's economic performance compared to other high-income countries.

2 Economic performance measures, time periods, and country groupings used in this paper

Between measures of output or income, the choice of denominator, and the method of comparing across countries and time, there are hundreds of possible combinations that could be adopted when undertaking an assessment of material economic performance. Figure 2 illustrates a range of the more commonly-used metrics. These are briefly discussed next, as well as why particular metrics have been chosen for the analysis in this paper.

Figure 2: Alternative measures of economic performance



The first choice is the measure of output or income. Real GDP is a common choice because it is widely known, correlates with important economic outcomes such as labour incomes, has long historical time series for many countries, and is reliably measured in a manner that is comparable across countries (OECD, 2014). Real GDP measures the total volume of production of goods and services in a country. However, it has been well documented that it is not a complete measure of wellbeing, living standards, or sustainable consumption potential (for further discussion on this see, for example, Stiglitz, Sen, & Fitoussi (2009), OECD (2014), and Grimes & Wu (2022)).

Consumption – a component of GDP – can provide a helpful perspective on economic performance. Economists have long recognised the direct link between consumption and material living standards (Carver & Grimes, 2019). Indeed, the other components of expenditure GDP – gross capital formation and net exports – are ultimately a means of supporting consumption now or in the future. A limitation of analysing actual consumption, however, is that it may exceed or fall short of available income, resulting in either saving or borrowing (Grimes & Wu, 2022).

Given these limitations of GDP and its components for analysis of economic performance, the recent literature focuses more on measures of *income.* Grimes and Wu (2022) argue that Real Adjusted Net National Income (RANNI) is a good measure of sustainable potential consumption, and therefore a better indicator of economic performance. It aims to measure net income that is available for consumption while leaving the aggregate capital stock (broadly defined) intact. RANNI is obtained by making four amendments to GDP:

1. Accounting for income arising from *terms of trade impacts* (“Income” instead of “Production”).

2. Adding *net international income* – which includes both investment income and wages and salaries earned abroad (“National” instead of “Domestic”).

3. Subtracting *depreciation* of produced capital goods (“Net” instead of “Gross”).

4. Subtracting a further adjustment for *depletion of natural resources* (“Adjusted”).

Making the first adjustment alone (ie, accounting for terms of trade impacts) results in *real Gross Domestic Income* (GDI). While real GDP is calculated by deflating nominal GDP by the price of domestically *produced* goods and services (the GDP deflator), real GDI is calculated by deflating nominal GDP by the price of domestically *used* goods and services – with the difference between the two arising from the prices of internationally traded goods and services. GDI therefore measures the real volume of domestically used goods and services that a country’s production can buy (and is sometimes termed *command-basis GDP*).[6]

Making both the first and the second amendments (ie, accounting for terms of trade impacts and net international income) gives *real Gross National Income* (GNI). GNI measures the total income of all *residents* within the territory earned from production activities, whether earned within the territory or outside it. This contrasts with *domestic* measures, which only

[6] As the only difference between GDI and GDP is the price index used, only real measures differ from each other. Nominal GDI and GDP are equal to each other and both include terms of trade impacts.

capture production taking place within a territory. Subtracting *depreciation* of produced capital goods then gives Net National Income (NNI). NNI provides a measure of income available to a country's residents for consumption and growing the capital stock.

GDP and GNI (or Net Domestic Product and NNI) are similar for many countries but can differ considerably in some cases – particularly for small, open economies. Consequently, measures like GNI and NNI are used as headline economic indicators in some contexts. As one example, Ireland uses "modified GNI" as a headline economic indicator to measure the size of the Irish economy given the sizable activities of multinational companies there (Central Statistics Office of Ireland, 2023).[7] As another example, the United Nations uses GNI per capita as one of the three inputs into its Human Development Index (United Nations Development Programme, 2023).

Most of the analysis in this paper focuses on GNI and NNI. Theoretically, NNI is a better measure of income or welfare than GNI, although there is more uncertainty about its cross-country comparability because depreciation of produced capital goods appears to be subject to some variation in measurement methodologies across countries (Lequiller & Blades, 2014). Cross-country comparability in the measurement of GNI is reasonably good (OECD, 2014).

The analysis in this paper does not include the adjustment for natural resource depletion made in Grimes and Wu (2022) because the measures available for this appear to only have limited coverage and have little impact on the overall results.[8]

A final possible adjustment is to subtract current transfers and taxes (income which is not earned from production activities) from NNI to find *disposable income*. At a national level, current taxes and transfers include payments such as taxes owed to overseas governments, foreign aid, and remittances. This adjustment is not made in this paper because it is small for most OECD countries at a total economy level, including New Zealand. Current taxes and transfers matter more for sub-groups within an economy (OECD, 2013).

Figure 3 shows each of the indicators for New Zealand in quarterly real per capita terms, using data from Stats NZ where available. The indicators all tend to follow a similar trend, although GDI and GNI have grown more quickly than GDP. Real NNI and real ANNI sit at a lower level since they include depreciation and, for ANNI, natural resource depletion. Current taxes and transfers have little impact, as shown by the close similarity between GNI and Gross National Disposable Income.

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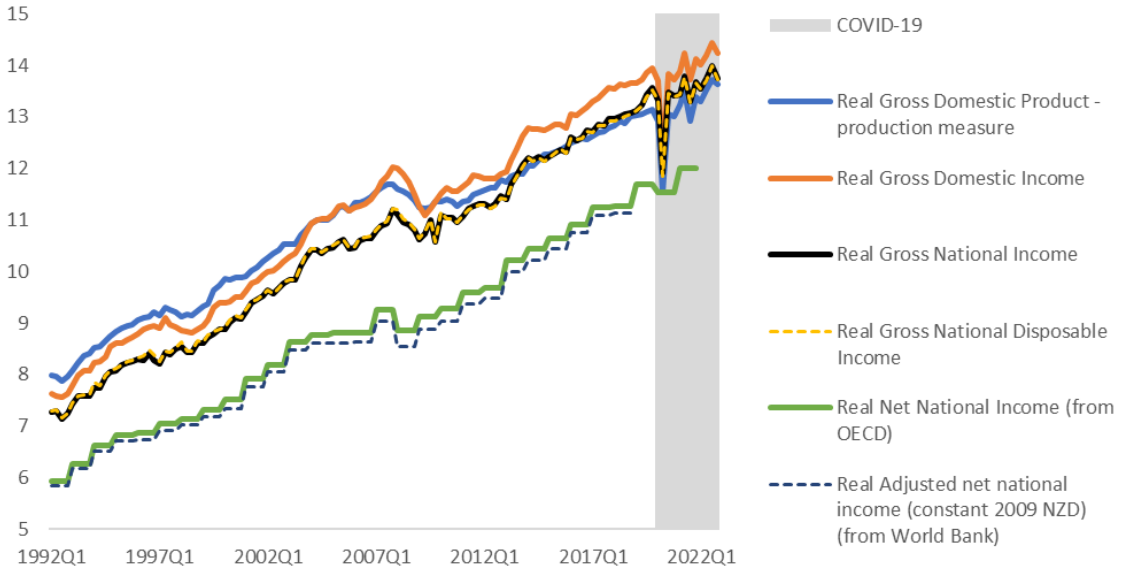
7 Irish modified GNI is GNI less some categories of depreciation and the income of redomiciled public listed companies.

8 Adjusting for natural resource depletion does, in theory, better reflect sustainable consumption. In practice, though, the adjustment made by the World Bank – the publisher of the series – appears to capture only a limited range of natural resource depletion. The World Bank's adjustment includes the depletion of energy resources, mineral resources, and net forest stocks, but does not capture, for example, freshwater quality or climate change considerations. The World Bank's adjustment is small for most OECD countries – usually below 3% of GNI. The adjustment is, however, often larger for developing countries.

Figure 3: National aggregates for New Zealand (quarterly, per capita, thousands of constant 2009/10 dollars)



Source: Haver Analytics/Stats NZ, or OECD or World Bank as noted in the chart where the series is unavailable from Stats NZ, author's calculations

Once the measure of output or income has been chosen, the second decision is the denominator. Two commonly used measures are *per hour worked* and *per capita*.[9] Hours worked can best represent actual labour input, particularly if it is assumed that people will always prefer leisure to working an extra hour. However, employment not only provides income but also contributes to social connection and self-identity. Research into subjective wellbeing shows that losing a job has significant negative effects on health and happiness beyond the loss of income, while being in satisfying work promotes overall life satisfaction (The Treasury, 2022). Given the greater measurement uncertainty around hours worked, and the wellbeing benefits of work, the analysis in this paper focuses on *per capita* measures, although with some consideration of *per hour worked* measures.

The final decision is the method of comparing across countries and time. The main measures used in this paper are *constant prices* (real volumes) compared at *constant Purchasing Power Parities* (PPPs). Lequiller & Blades (2014) recommend using this method rather than current PPPs or market exchange rates when doing time series analysis. Under the constant prices and PPPs approach, price inflation over time is accounted for using measures calculated by each national statistical authority. Differences in currencies and price levels between countries are then accounted for by applying PPPs from a single fixed year to all time periods. One alternative is to use current prices and current PPPs, however adjustments for inflation calculated by each national authority are likely to capture inflation

[9] Per employee and per household (or equivalised household) are further options. They are not analysed in this paper as these further permutations do not appear essential for the analysis and excluding them helps keep the scope of the paper contained. Per household measures can also be impacted by changing demographics over time and crowding associated with housing shortages, which has impacted New Zealand over recent decades.

more precisely than PPPs.[10] Another alternative is to use market exchange rates, however this can be misleading as market exchange rates can deviate from purchasing power parity for prolonged periods.

Therefore, combining all the choices described above, the indicator used in most of the analysis in this paper is *net national income per capita, measured in constant prices and constant PPPs*, although a range of other indicators are shown as well.

There are a range of methods used in the literature for calculating real GDI, GNI, and NNI from their corresponding nominal measures. The national accounts data in this paper is primarily drawn from the OECD, and other data sources are used to backdate this where necessary (this is noted in the relevant charts). However, one modification has been made to the method of deflating nominal NNI compared to the OECD's approach. The OECD's real NNI data is calculated by deflating nominal NNI by the Gross National Expenditure (GNE) deflator, whereas the real NNI data in this paper is calculated as real GNI less real depreciation.[11] This modification has been made to ensure that the benefits of the falling relative price of investment goods are not overcounted when subtracting depreciation to get NNI, and to ensure that the analysis of trends in the depreciation burden is consistent with the other results. Using this method instead of the OECD's method has a small impact on the results, reducing New Zealand's cumulative real NNI per capita growth between the 1995-2002 average and 2019 by 2.0 percentage points (from 58.9% to 56.9%), and reducing cumulative growth for the median of the 19 OECD countries by 0.7 percentage points (from 27.2% to 26.6%). The impact of this methodological choice is greater for New Zealand (and Australia) as the relative price of investment goods has fallen by more there compared to most other countries. Annex 2 shows how the main results in the paper compare if the OECD's method of calculating real NNI is used instead.

Finally, it is worth noting that there will always be a degree of measurement uncertainty in international comparisons using economic statistics. Specific uncertainties around hours worked and depreciation have already been noted, however there will be uncertainties for many other statistics arising from slight differences in definitions or measurement methods

between countries, as well as general measurement challenges (see, for example, Barrow & Bollard (2012) for an overview of the issues). Therefore, the paper's main conclusions are based on general trends over time rather than precise year-to-year comparisons.

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[10] Robustness checks later in the paper show that the constant PPP method and current PPP method give very similar outcomes for the main results.

[11] Specifically, the NNI data in this paper is calculated using the OECD's measure of real GNI less real depreciation, where real depreciation is calculated as consumption of fixed capital deflated by the gross fixed capital formation price index. The GNE deflator is an index of the prices of all consumption and gross investment. This is an appropriate deflator for gross national aggregates (such GDI and GNI), but investment is already mostly accounted for in NNI through subtracting depreciation (for the main countries and time periods considered in this paper, depreciation has been equal to around 50 to 90% of gross investment). In the national accounts, depreciation (consumption of fixed capital) is calculated at its current replacement cost, so captures changes in the prices of investment goods over time (Lequiller & Blades, 2014).

Country groupings

The main country comparators in this paper are high-income OECD economies with data available back to 1970.[12] Five alternative benchmarks are used as appropriate (summarised in Annex 4):

- **The G7**. The G7 is the United States (US), Canada, the United Kingdom (UK), France, Germany, Italy, and Japan. It represents seven of the largest OECD economies.
- **The 13 small and medium countries (SMCs) which have continuous data since 1970 for GDP, NNI, and hours worked**. These are Australia, Belgium, Canada, Denmark, Finland, Ireland, Korea, Luxembourg, the Netherlands, Norway, Portugal, Spain, and Sweden.
- **The G7 and the 13 SMCs together, which gives a group of 19 countries** (Canada is in both groups). This represents all OECD members as of 1974 (and Korea) excluding Austria, Greece, Iceland, Switzerland, Turkey, and New Zealand. It provides a consistent comparison group of countries that were generally prosperous when New Zealand's incomes were among the highest in the world.
- **Australia** – given the strong commonalities and linkages with New Zealand.
- **The United States** – given that it is often regarded as the global productivity frontier.

For the groups above, the comparison benchmark is calculated as the simple unweighted average (for smaller groups) or the median (for larger groups or where there may be outliers).

Time period

The main time period considered in this paper is the 1995-2002 average to 2019. The 1995-2002 average (which is centred on 1998/99, and is referred to in this paper as the 'late 1990s' for shorthand) has been chosen as the starting point because:

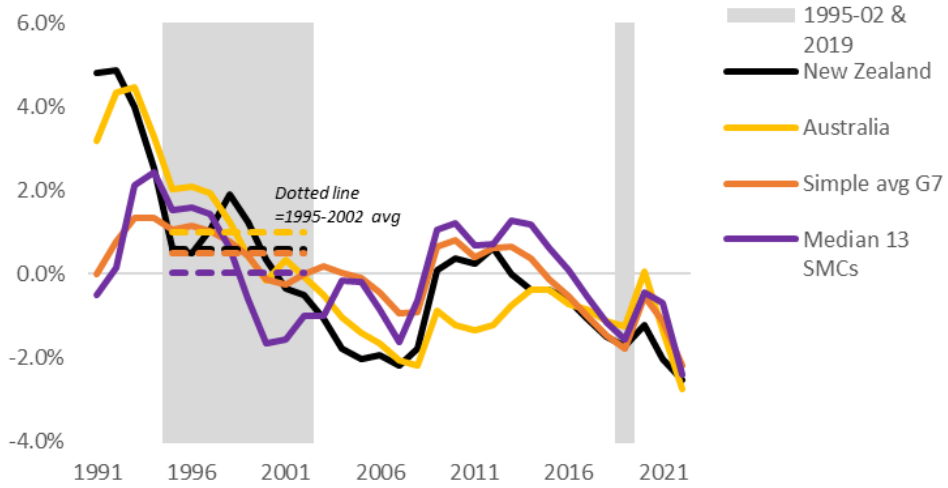
- It is after the period in which New Zealand incomes fell behind those of other high-income countries (generally identified as the late-1960s to the 1990s).
- New Zealand's structural reforms of the late 1980s and early 1990s had been completed by this time.
- Most countries across the OECD had similar cyclical positions on average during this period (Figure 4).[13]

[12] Countries that have joined the OECD more recently generally do not have as long historical time series as countries that joined earlier, and also tend to have lower incomes and higher growth rates.

[13] Other cyclical indicators are consistent with this assessment, including core inflation rates and current account balances.

The end of the period has been chosen as 2019 because data after then is impacted by volatility from the COVID-19 pandemic (approximately 2020-2022). Most OECD countries also had similar cyclical positions in 2019, which will help to minimise the impact of cyclicality on the results. Where possible, data is shown for the full period from 1970 to 2022 to put trends from the late 1990s to 2019 in their longer-term context.

Figure 4: Unemployment rates less their 1991-2022 averages



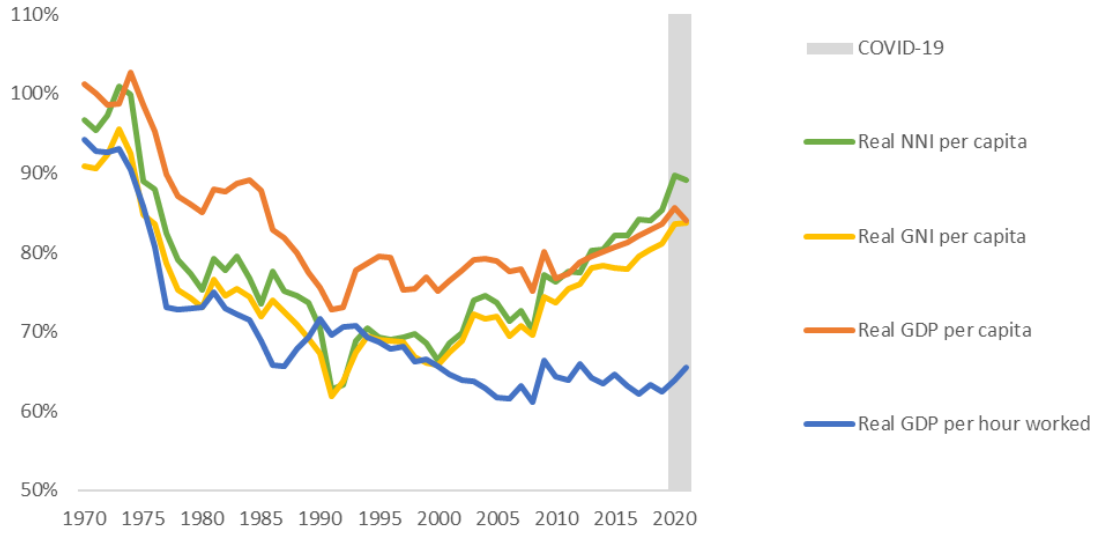
Source: Haver Analytics, author's calculations

3 Trends in per capita GNI and NNI growth

This section provides an overview of trends in New Zealand's per capita real GNI and real NNI growth relative to the other country groupings.

Despite there being no convergence between New Zealand and other OECD countries on real GDP per hour worked since the 1990s, there has been some convergence on both real GNI per capita and real NNI per capita. As with GDP per hour worked, New Zealand's real GNI per capita in the early 1970s was close to the median of the 19 OECD countries with available data. New Zealand's real GNI per capita then fell to around 68% of the median by the late 1990s (Figure 5). However, by 2019 New Zealand's real GNI per capita had increased back to 81% of the median – a 13 percentage point improvement. New Zealand's real NNI per capita has increased further still, from 69% of the median to 85% – a 16 percentage point improvement over the period. These movements are both larger than the 7 percentage point increase in New Zealand's real GDP per capita relative to this group of countries over the period, and considerably better than the 4 percentage point relative decline in real GDP per hour worked.

Figure 5: Various metrics for New Zealand as a % of the median of 19 OECD countries with continuous data (constant 2015 prices and PPPs)



Source: OECD, World Bank, Haver Analytics, author's calculations

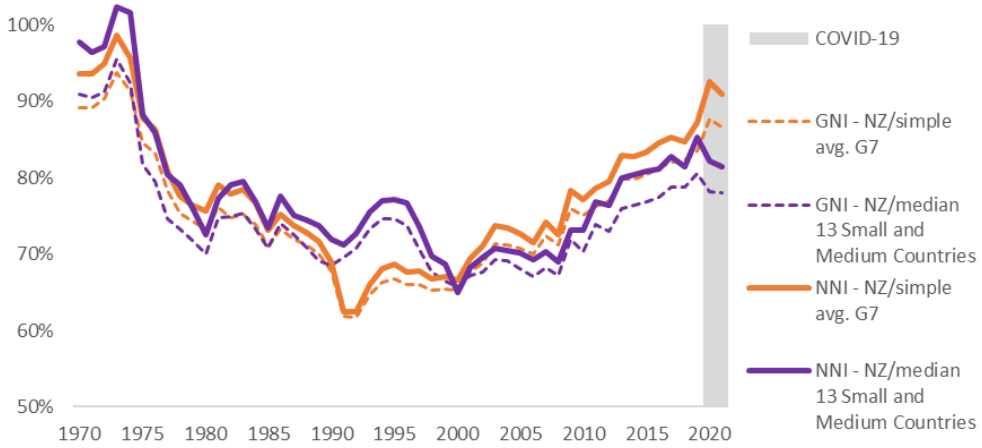
Note: In the chart above, real NNI is calculated as real GNI less real depreciation (consumption of fixed capital deflated by the gross fixed capital formation deflator) and expressed in constant 2015 PPPs. Data from the OECD has been used where available and backdated where necessary by combining OECD nominal GNI and PPP data and World Bank GNE deflator data. For France, NNI has been backdated prior to 1978 using nominal GNI from the OECD and consumption of fixed capital as a percent of GNI from the World Bank. For the UK, the GNE deflators available from the OECD, World Bank and Haver Analytics differ considerably prior to 1995. Therefore, for the UK, real GNI data from the OECD has been used from 1995 onwards, and real GNI prior to 1995 calculated using nominal GNI and PPPs from the OECD and the GNE deflator from Haver Analytics, as this provided the most central estimate among the available deflators.

When considering each of the other main benchmarks used in this paper, New Zealand's convergence on real NNI per capita was strongest against the G7 economies. New Zealand has, however, also seen some convergence towards the median of the 13 SMCs, the US, and, since 2011, Australia (Figures 6 and 7). Annex 1 shows New Zealand's performance relative to each of the individual 19 countries in the OECD benchmark.

As a robustness check, the results have been replicated using two alternative methods of doing the international comparison: first, current prices and current PPPs, and second, current prices and current market exchange rates. When measured using current prices and current PPPs, New Zealand's real NNI per capita converged by 15 percentage points towards the median of the 19 OECD countries. This is similar to the main result in the paper (a 16 percentage point improvement when measured using constant prices and constant PPPs). When measured using current prices and current market exchange rates, New Zealand's real NNI per capita converged by 31 percentage points towards the median of the 19 countries (from a lower starting point).[14] Figure C in Annex 1 shows each of these for the full time period.

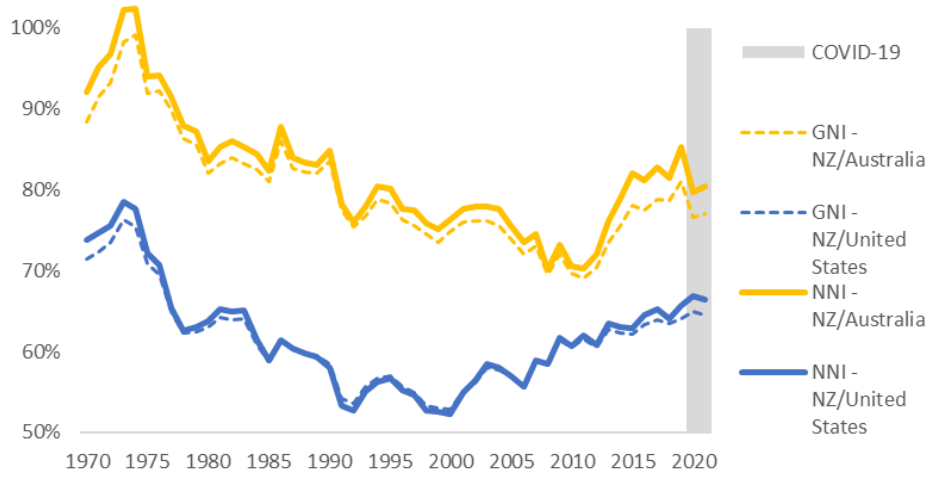
[14] New Zealand's real NNI per capita relative to the 19 countries was at a similar level under each method in 2019 (85% for constant prices and constant PPPs, 90% for current prices and current PPPs, and 90% for current prices and current market exchange rates), but the starting point in 1995-2002 was considerably lower using current prices and current market exchange rates (59% of the median of the 19 countries).

Figure 6: New Zealand's real NNI per capita (solid lines) and real GNI per capita (dashed lines) as a % of other countries (constant 2015 prices and PPPs)



Source: OECD, World Bank, Haver Analytics, author's calculations. See note to Figure 5 for a description of data sources

Figure 7: New Zealand's real NNI per capita (solid lines) and real GNI per capita (dashed lines) as a % of other countries (constant 2015 prices and PPPs)



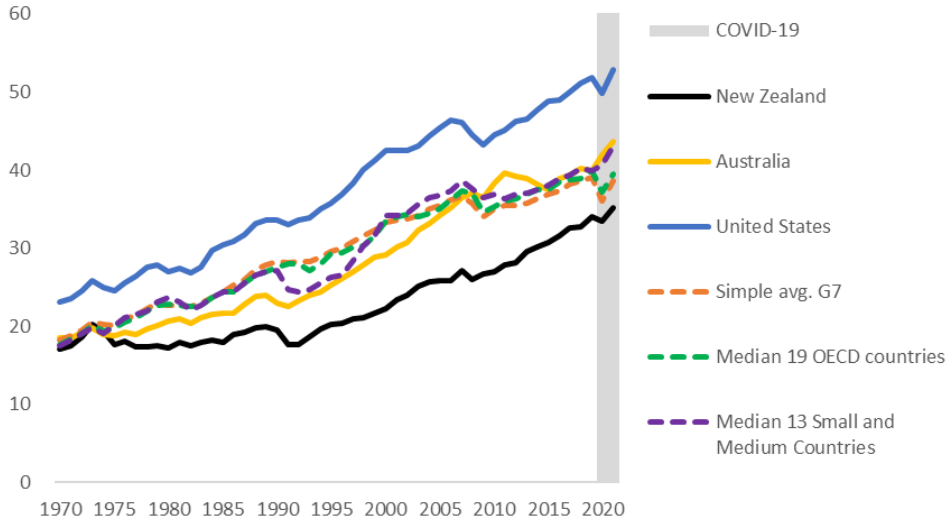
Source: OECD, author's calculations

The trends in levels provide another perspective on New Zealand's relative performance. The convergence of New Zealand's real NNI per capita towards higher-income OECD countries appears to have mainly resulted from New Zealand's real NNI per capita continuing to grow at a steady pace even as real NNI per capita growth in other high-income countries slowed over time (Figure 8).

More widely across the OECD, there has been a strong pattern of convergence in real NNI per capita over the time period considered. Countries with lower starting real NNI per capita have grown faster, and New Zealand fits this pattern (Figure 9). The pattern of convergence across the OECD over this time period is noticeably stronger for more comprehensive

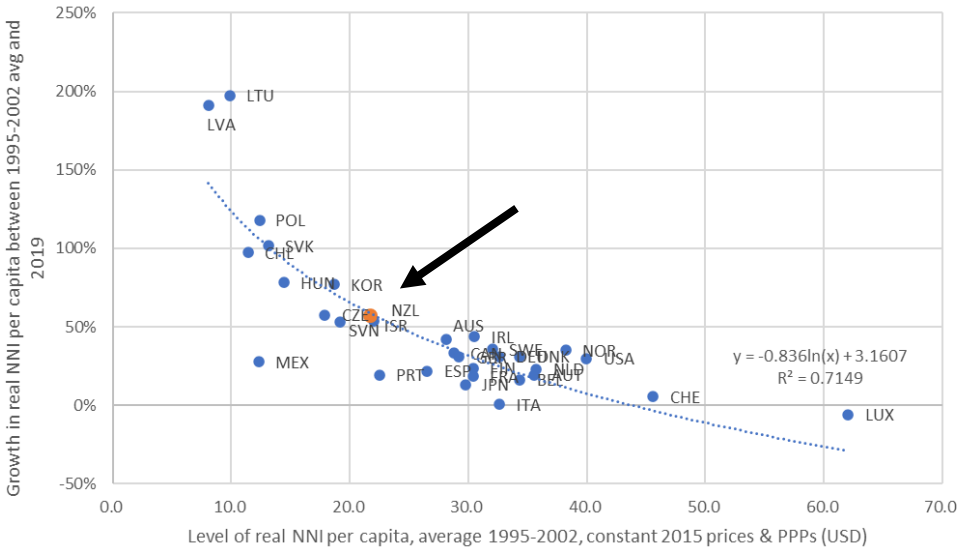
measures such as real NNI per capita than it is for narrower measures such as real GDP per hour worked.[15]

Figure 8: Real NNI per capita (USD thousands – constant 2015 prices and PPPs)



Source: OECD, World Bank, Haver Analytics, author's calculations

Figure 9: Convergence in real NNI per capita across the OECD from the late 1990s to 2019 (constant 2015 prices and PPPs)



Source: OECD, World Bank, author's calculations

Note: The chart includes all OECD countries except the following six due to data limitations: Colombia, Costa Rica, Estonia, Greece, Iceland, and Turkey. Data for Chile is unavailable until 1996, so the starting NNI is the 1996-2001 average (dropping the first and last year so that the average is still centred at the same point).

[15] The R^2 for the convergence pattern shown in Figure 8 for various indicators is as follows: Real GDP per hour worked = 0.47; Real GDP per capita = 0.53; Real GDI per capita = 0.56; Real GNI per capita = 0.66; Real NNI per capita = 0.71. All regressions have been estimated with the log regression function shown in Figure 8 to account for non-linearity.

4 Sources of New Zealand's per capita NNI growth

This section provides a more detailed analysis of the sources of New Zealand's real NNI per capita growth compared to other countries.

New Zealand's real NNI per capita growth from the late 1990s to 2019 was stronger than the growth experienced by any of the G7 countries, Australia, or the averages/medians of the groupings considered. The sources of New Zealand's growth were also quite different (Figure 10a). For most of these countries, the majority of real NNI per capita growth came from growth in real GDP per hour worked (ie, volumes of production per unit of labour input). Australia differs slightly in that its income growth was supported by terms of trade impacts, and Japan's income growth was weighed on by falling hours worked per capita and unfavourable terms of trade impacts. However, New Zealand's real NNI per capita growth came from even more diverse sources. Only around two-fifths of New Zealand's growth in real NNI per capita came from growth in GDP per hour worked. The rest arose from hours worked per capita, terms of trade impacts, and a reduced net international income deficit. In addition, the depreciation burden has been broadly stable in New Zealand, whereas it has increased in most other countries.

The median of the 13 SMCs performed slightly better than the G7, supported by some terms of trade impacts and growth in hours per capita. However, New Zealand's growth in real NNI per capita was still considerably faster than the median of the 13 SMCs.

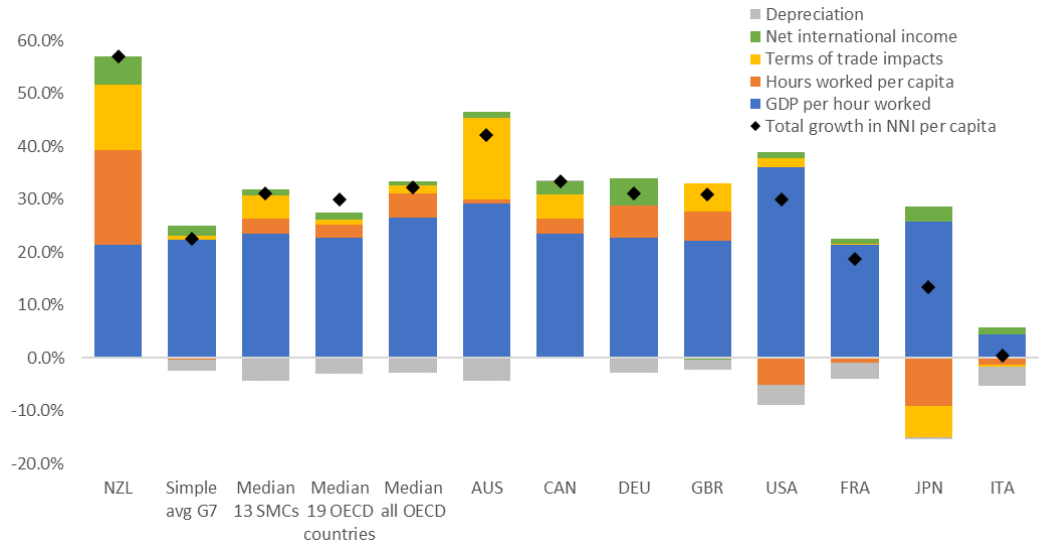
Looking across all countries in the OECD with data available, growth in GDP per hour worked still tends to account for the bulk of growth in NNI per capita, although other sources of growth have been significant for some countries (Figure 10b). Some patterns are:

- Growth in hours worked per capita has been significant in some countries that started initially poorer (in per capita terms), such as those in Eastern Europe, along with Chile and Mexico.
- Some countries have had notable terms of trade impacts, particularly commodity exporters (Chile, Australia, New Zealand, and Norway), and Latvia and Lithuania. Conversely, Korea's growth has been weighed on by unfavourable terms of trade impacts and falling hours per capita, much like Japan's.
- Some countries in Eastern Europe have experienced a reduction in their depreciation burdens.
- Ireland and Luxembourg have large offsetting sources of income growth, likely reflecting the activities of multinational companies and non-resident workers.

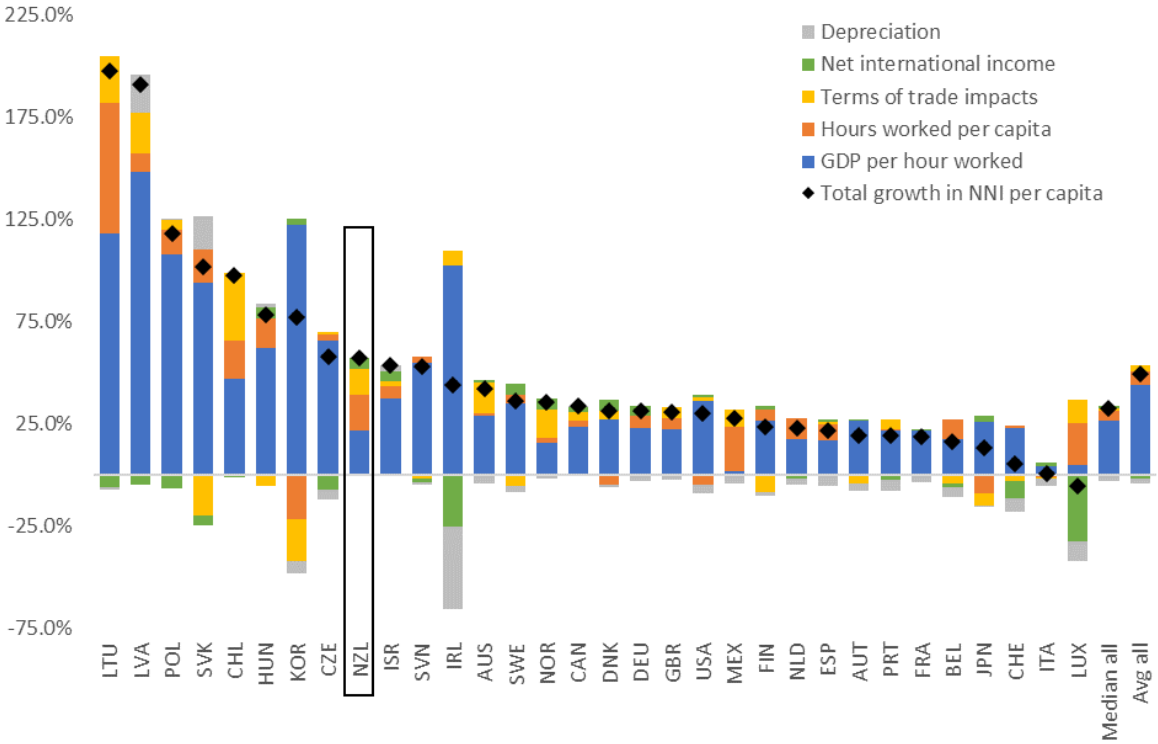
The rest of this section provides a detailed analysis of trends in New Zealand's hours worked per capita, terms of trade impacts, net international income, and depreciation.

Figure 10: Contributions to growth in real NNI per capita from the 1995-2002 average to 2019

(a) New Zealand, group averages, Australia, and the G7



(b) All OECD countries with data available



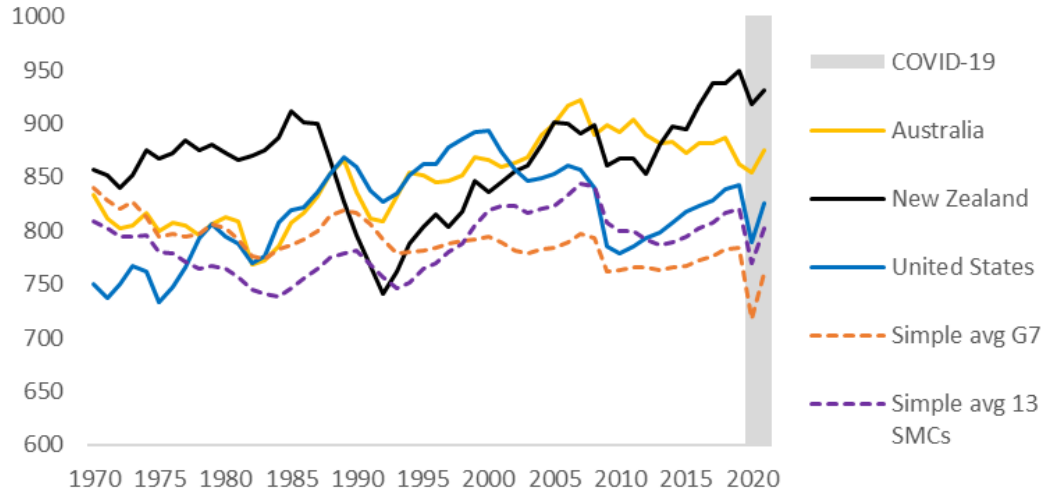
Source: OECD, World Bank, Author's calculations

Note: The contributions above have each been calculated relative to a counterfactual where the real level of each income component grows in proportion to the real level of the rest of its corresponding national aggregate. These counterfactuals are: terms of trade impacts grow in proportion to real GDP; net international income grows in proportion to GDI; and depreciation grows in proportion to real GNI. Other counterfactuals could also make sense, although this seems a useful perspective from which to consider each component and results in the sum of the components equalling the actual total. The bar for the median of the 13 SMCs shows the value of the median country for each component, so will not exactly sum to the total.

Hours worked per capita

Between the late 1990s and 2019, New Zealand's measured hours worked per capita lifted from being slightly above the G7 and 13 SMC averages to being at the high end of the OECD (Figure 11). New Zealand's high level and growth in hours worked per capita are well recognised in the productivity literature (see for example Janssen, Galt, & Bollinger (2022), New Zealand Productivity Commission (2021) and Conway (2018)).

Figure 11: Annual hours worked per head of total population



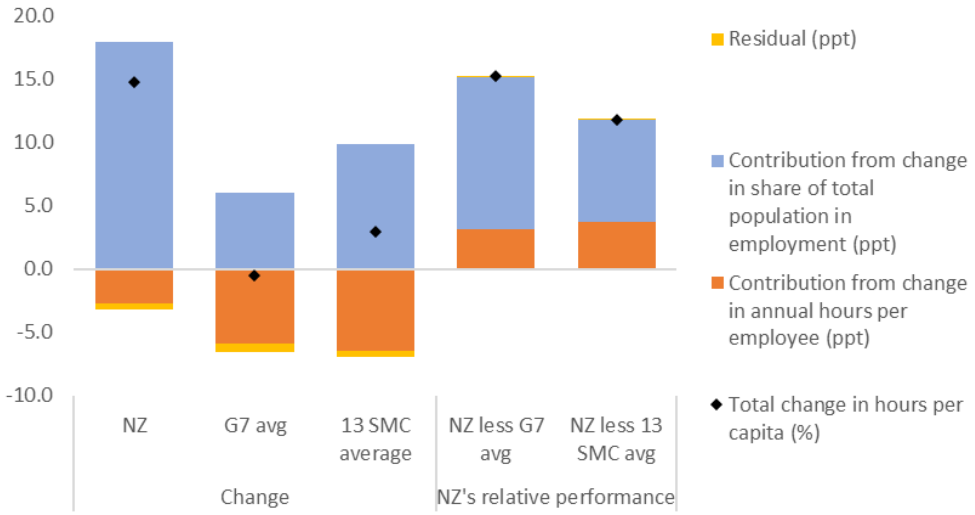
Source: OECD, author's calculations

The rise in hours worked per capita in New Zealand will reflect a mix of factors, some beneficial for wellbeing and others possibly not. Some people will be working more hours than they would otherwise wish to out of necessity to meet living costs. New Zealand's still relatively low level of incomes compared to other OECD economies would contribute to this outcome. Other people may be more motivated by the wider wellbeing benefits of being in work (as discussed above in section 2). In addition, all else equal, it would be preferable for labour productivity to increase rather than hours worked – thereby allowing more output without having to increase labour input. However, as discussed next, the lift in New Zealand's hours worked may also reflect New Zealand's labour market working well relative to those of other counties.

First, the exceptional feature of New Zealand's growth in hours worked per capita from the late 1990s to 2019 is not individuals working longer hours, but more of the population entering and remaining in employment. Hours worked per capita have been broadly flat in other countries due to two trends: average annual hours worked per employee trending downwards, offset by a rising share of the population being in work (Figure 12). In New Zealand, average annual hours worked per employee has fallen at a slightly slower rate than other countries, but the share of the population in work has increased sharply. Around three-quarters of New Zealand's larger increase in hours worked per capita relative to the

G7 and 13 SMC averages is accounted for by New Zealand's larger increase in the share of the population in work.[16]

Figure 12: Contributions to the change in annual hours worked per capita between the 1995-2002 average and 2019 (%)



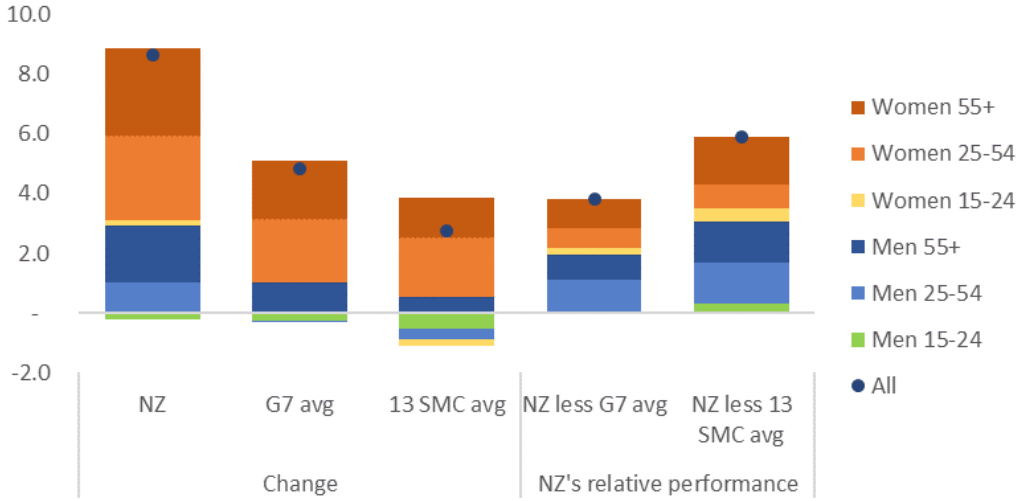
Source: OECD, author's calculations

Some of New Zealand's faster growth in the share of the population in employment is likely to be attributable to a slower rate of population ageing than in other countries, but much of it appears to be due to trends in employment rates within demographic cohorts.[17] Figure 13 shows the contributions of broad demographic cohorts to the change in the employment-to-population ratio (aged 15+), holding the demographic composition of the population across these groups constant at its starting level. Rising employment for women aged 25-54 and older people has supported employment rates across the OECD. Relative to other countries, however, New Zealand's employment rates have increased by more (or decreased by less) for all of the demographic groups considered.

[16] In the analysis of the labour market in this section, the average of the 13 SMCs is used rather than the median. This is to retain additivity and because outliers are less of an issue for labour market data than they are for real NNI or real GDP. Similar results are obtained if the median is used.

[17] Between the 1995-2002 average and 2019, the share of the population aged 15-64 was stable at 65.5% in New Zealand, but fell from 66.9% to 63.6% on average among the G7 countries (a 3.3 percentage point decline) and from 67.1% to 65.8% on average among the 13 SMCs (a 1.3 percentage point decline).

Figure 13: Contributions to change in the employment-to-population ratio between the 1995-2002 average and 2019 by age and sex, holding the demographic composition of the population constant at its starting level (percentage points)



Source: OECD, author's calculations

Note: Change taken from the 2000-2002 average for the 13 SMCs as data is unavailable prior to this for some countries. Covers working age population, generally aged 15+ or 16+ depending on the country.

Second, as noted earlier, Janssen, Galt, & Bollinger (2022) find that New Zealand's measurement methods may have over-estimated both the level and growth rate of hours worked relative to other countries. Correcting for such mismeasurement in hours worked would not change New Zealand's level or growth rate of total income, although it would alter the split in favour of labour productivity over labour utilisation. Their analysis suggests that the level of New Zealand's hours worked may be up to 10% lower if measured on the same basis as other countries. If correct, this would put New Zealand's current level of hours worked per capita around the same level as Australia and the US.[18] Furthermore, if the growth rate of New Zealand's hours worked has been overestimated relative to other countries, the cause is likely to have been an over-estimation of growth in annual hours worked per employee. Correcting for this mismeasurement may bring the change in New Zealand's annual hours worked per employee over this period more in line with other countries.

Another feature of New Zealand's employment growth in recent decades is that the jobs added appear to have mostly been high-skill and full-time (although the number of lower-skill jobs has also increased). Around 70% of jobs added from 2003 to 2022 were managers and professionals, and three-quarters of jobs added from 2014 to 2019 had post-school qualifications. The number of lower-skill jobs has generally been stable or slightly increased,

[18] At present, New Zealand's measured level of hours worked per capita is a similar amount above other countries as it was in the 1970s and 1980s, prior to the economic restructuring and deep recession of the late 1980s and early 1990s. This raises the possibility that structural factors account for New Zealand's higher level of hours worked. In other words, if this outcome is not an artefact of measurement methodology, it may reflect enduring economic settings or culture. If so, New Zealand's sharp growth in hours worked over recent decades could represent a restoration of employment to a long-run level following disruption from the economic restructuring and deep recession of the late 1980s and early 1990s.

and wage growth from 2010 to 2019 was fastest for lower-skill and middle-skill workers.[19] Although a full comparison of these trends against other OECD countries is beyond the scope of this paper, these outcomes appear relatively favourable given the challenges that automation and off-shoring have presented for middle-skill workers in many advanced economies in recent decades.[20] Moreover, a higher portion of New Zealand's net growth in employment from the 1995-2002 average to 2019 has been accounted for by full-time jobs. Over this period, 86% of New Zealand's job growth was full-time jobs, compared to an average of 71% among the OECD comparison group with available data.[21]

There will be both labour demand and supply factors behind the trends above, and unpicking these fully is beyond the scope of this paper. Nonetheless, the evidence above suggests that New Zealand's labour market has been relatively effective at creating employment opportunities. The fact that the rise in employment has coincided with rising real wages (discussed later in part 5 of this paper) suggests that labour demand has been a significant driver of the trends, rather than increased labour supply being the exclusive driver.

One final implication of New Zealand's strong growth in hours worked per capita (separate from the measurement issues discussed above) is that its productivity growth (such as output per hour worked) may be understated if its labour market has been relatively better at including lower-productivity workers. Maré, Hyslop, & Fabling (2015) found that New Zealand's employment growth from 2001-2012 disproportionately drew in lower-earning workers, and that this impacted on New Zealand's average measured productivity growth during this period. If this also held over the longer time period considered in this paper (the late 1990s to 2019), this will have reduced New Zealand's average productivity metrics relative to other countries, but the inclusion of lower-productivity workers is likely to have been positive for their wellbeing. A fuller investigation of these issues, however, is left to future research.

Terms of trade impacts

A rising terms of trade have supported New Zealand's income growth. Terms of trade impacts accounted for about 20% of New Zealand's income growth from the late-1990s to 2019, compared to about 3% for the median of the 19 OECD countries.

The terms of trade is the ratio of export prices to import prices. An increase in the terms of trade increases the real income available for consumption and investment. New Zealand's terms of trade fell to low levels in the 1970s and early 1980s, increased somewhat in the late 1980s, and increased further after the early 2000s (Figure 14). New Zealand incomes experienced greater support from terms of trade impacts than those of most of the comparison countries and groupings after 2000. New Zealand has been outpaced by

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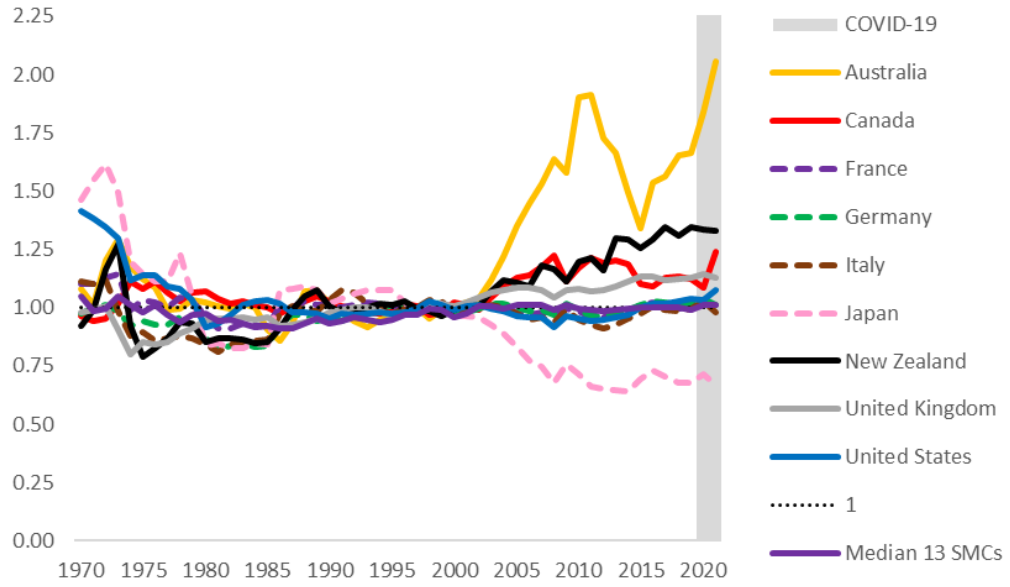
[19] Sources: Stats NZ Household Labour Force Survey - Persons employed by occupation (data starts 2003q1); Stats NZ Household Labour Force Survey - Labour force status by highest qualification (data starts 2013q2); Stats NZ Labour Cost Index – all sectors combined and occupational skill level (data starts 2009q2). Figures are calculated as the percentage change from the average of the first four quarters of the series to the average of the 2022 calendar year.

[20] International Monetary Fund (2017) provides a discussion of these global trends.

[21] Source: OECD Dataset FTPT employment based on a common definition. The definition of full-time for all countries is 30 usual weekly hours of work in the main job. The OECD comparison group used here is the simple average of the 18 OECD countries for which data is available, out of the 19 countries used as a benchmark elsewhere in the paper (data is unavailable for the US). Data for Australia starts in 2001, so for Australia growth is taken from the 2001-2002 average to 2019.

Australia during this period, but the impact of the terms of trade on Australian income growth has been attenuated by the fact that Australia's import and export share of GDP has been smaller than for New Zealand (averaging about 70% as large as New Zealand's over 1995-2019). The high degree of foreign ownership in the Australian resources sector would have further attenuated their income gains (Atkin, Caputo, Robinson, & Wang, 2014).

Figure 14: Terms of trade (1995-2002 average=1)

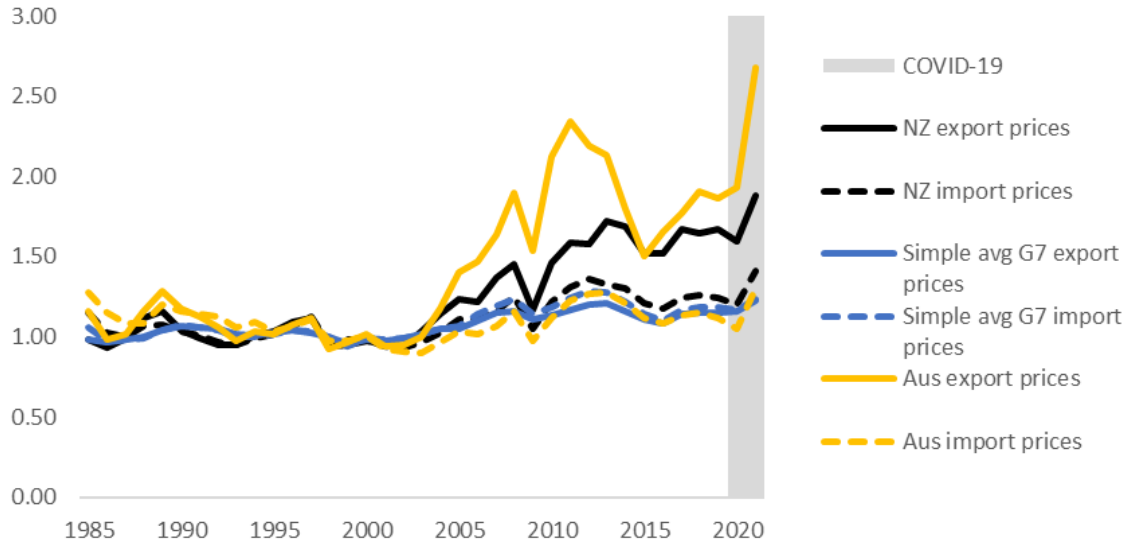


Source: Calculated from OECD national accounts data

Note: New Zealand's terms of trade is usually estimated using either Stats NZ national accounts data or overseas merchandise trade data. OECD data is used for this chart for consistency with the rest of the analysis in the paper but shows a very similar trend to these other two sources.

The lift in New Zealand's terms of trade is attributable to import prices rising broadly in line with the average price of globally-traded goods and services, while New Zealand's export prices have risen more quickly. Figure 15 shows various countries' export and import prices in foreign currency terms (expressed in terms of IMF Special Drawing Rights (SDR) – a basket of major world currencies). New Zealand's import prices have moved broadly in line with the average import and export prices of the G7 (which provides one benchmark of the average prices of globally-traded goods and services). However, New Zealand's export prices increased faster after the early 2000s. New Zealand's exports are concentrated in agricultural products, and its imports are concentrated in manufactures and fuel. In large part, New Zealand's rising terms of trade reflects increasing export prices, particularly of key commodities such as dairy and meat, along with falling import prices, particularly of capital goods (Drought & Mellor, 2020). Australia's export prices increased by even more than New Zealand's, and their import prices increased by less, giving the sharper rise in their terms of trade.

Figure 15: Nominal export and import price indexes for goods and services in world (SDR) terms (1995-2002=1)



Source: OECD, Haver Analytics, author's calculations

The terms of trade is often viewed as being largely outside of a country's control.[22] This will always be true to some extent for New Zealand because a large portion of its trade is in commodities, the prices of which are determined in global markets. However, there is evidence that some portion of New Zealand's increase in the terms of trade is a result of the economy adapting in response to global price signals. Mellor (2015) finds that a change in the composition of the import basket made a material contribution to reduced average import prices. Janssen, Galt, & Bollinger (2022) also outline some ways in which the New Zealand export sector has reoriented towards higher-value production, including reallocation between products within the agricultural sector and the relatively large and increasing role of embodied services value-add in gross exports.

The question of how much of the increase in the terms of trade is due to luck rather than New Zealanders responding to opportunities is important for understanding New Zealand's economic performance. To further explore this, the analysis below replicates elements of the analysis in Mellor (2015). This essentially decomposes changes in the terms of trade into changes in the prices of individual commodities and changes in the import and export basket.[23]

New Zealand's import mix appears to have responded strongly to changes in prices from the late 1990s to 2019. Prices of capital goods (eg, machinery, plant, and industrial transport equipment), cars, and consumption goods have fallen sharply, and import volumes of these items have increased correspondingly (Figure 16). Prices of services imports and

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22 For example, New Zealand Productivity Commission (2021) notes that: "If no activity within the country raises its productivity, yet prices of the country's exports go up, or the prices of its imports go down, New Zealanders can purchase more goods and services. Such changes are favourable shifts in the country's terms of trade. Welcome as such changes are, they are often outside a country's control – particularly for a small country like New Zealand with large exposure to commodity markets".

23 A full replication of Mellor (2015) is beyond the scope of this paper. The analysis in this paper undertakes the decomposition at a higher level of commodity aggregation and for a smaller selection of time periods.

intermediate goods (more characterised by raw materials and components) have increased and import growth has been correspondingly slower. The patterns evident here seem to reflect New Zealand increasingly importing more manufactured goods (which have fallen in price), rather than producing them domestically. This has allowed New Zealand's domestic production to focus on other, higher-priced products. Consistent with this, the share of New Zealand's real GDP in the manufacturing industry (excluding food manufacturing) fell from 10.5% in 1995-2002 to 6.5% in 2019.

There is less evidence that New Zealand's export basket has responded systematically to price signals over the time period considered. Responses are evident for some commodities: there have been larger increases in both prices and export volumes for dairy, services, and other food, and there have been smaller changes in both prices and export volumes for manufactures and textiles.

However, the prices of fuels/minerals and meat have both increased significantly without much apparent response in export volumes. The lack of an increase in fuel/mineral exports may reflect an absence of economic resource reserves rather than a lack of market effort.[24] The lack of an increase in meat export volumes is more surprising given the adaptability of New Zealand's agricultural sector evident for other commodities and as documented in Janssen, Galt, & Bollinger (2022). A full analysis is left to future research, however possible explanations include the following:

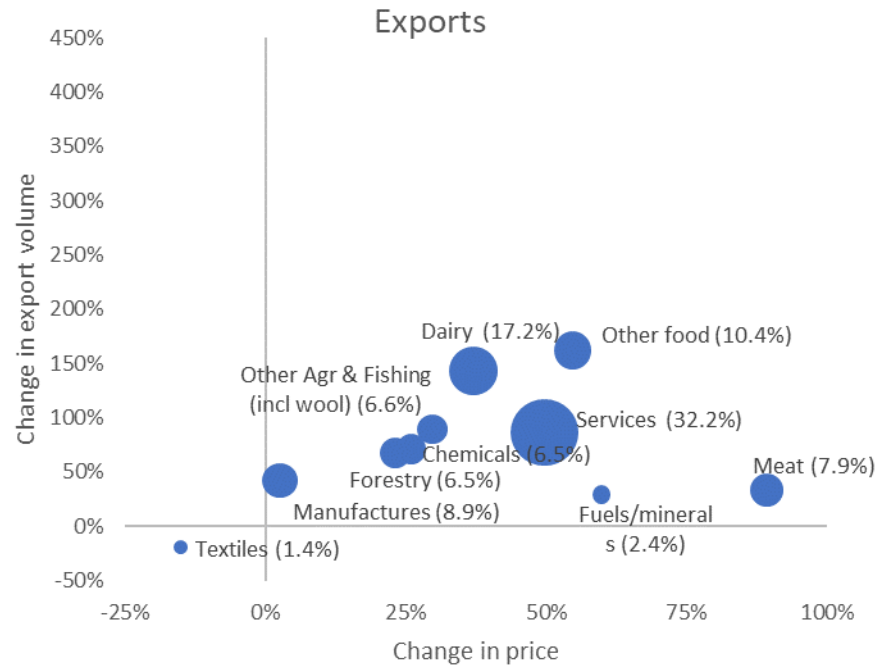
- The time periods chosen may overstate the rise in profitability, as meat prices were particularly low over 1994-1999.
- Lags in changes to production systems, as about half of the increase in meat prices occurred in the three years from 2016-2019.
- Competition with other land uses, such as dairy farming, conservation land, and forestry.
- The falling relative price for wool reducing the profitability of sheep farming.
- An increase in the quality of meat exports may not be fully captured in the calculation of real volumes and prices.[25]

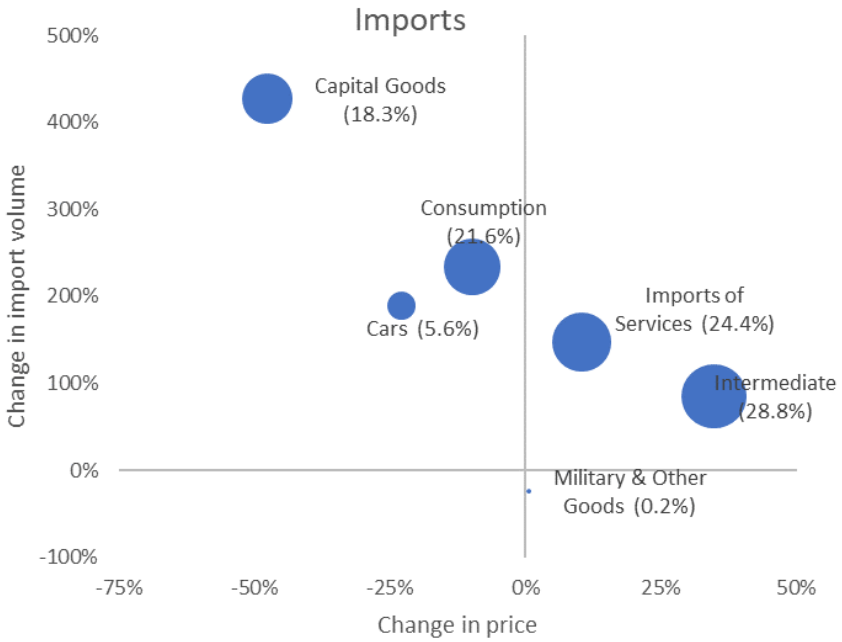
[24] As an example, exports of fuels/minerals increased to a much higher level between 2007 and 2014 as production began from new oil fields. There was considerable oil and gas exploration activity in New Zealand up until 2014, but no major discoveries from 2005 until at least 2018 (Ministry of Business, Innovation and Employment, 2018).

[25] Quality effects have previously been found in the literature. Research indicates that the increase in the Swiss terms of trade over the 1970s and 1980s was due to an increase in the quality of exports (Janssen, Galt, & Bollinger, 2022). There is evidence of New Zealand meat exports increasing in quality – for example, lamb exports have shifted away from frozen carcasses and towards chilled, frozen boneless and frozen cuts (Beef and Lamb New Zealand, 2022). This may, however, already be fully accounted for in export price indexes.

Figure 16: Changes in prices and quantities of New Zealand's main export and import products between the 1995-2002 average and 2019

(The percentage in brackets and size of the dots is each commodity's share of New Zealand's total real exports or imports in 2019)



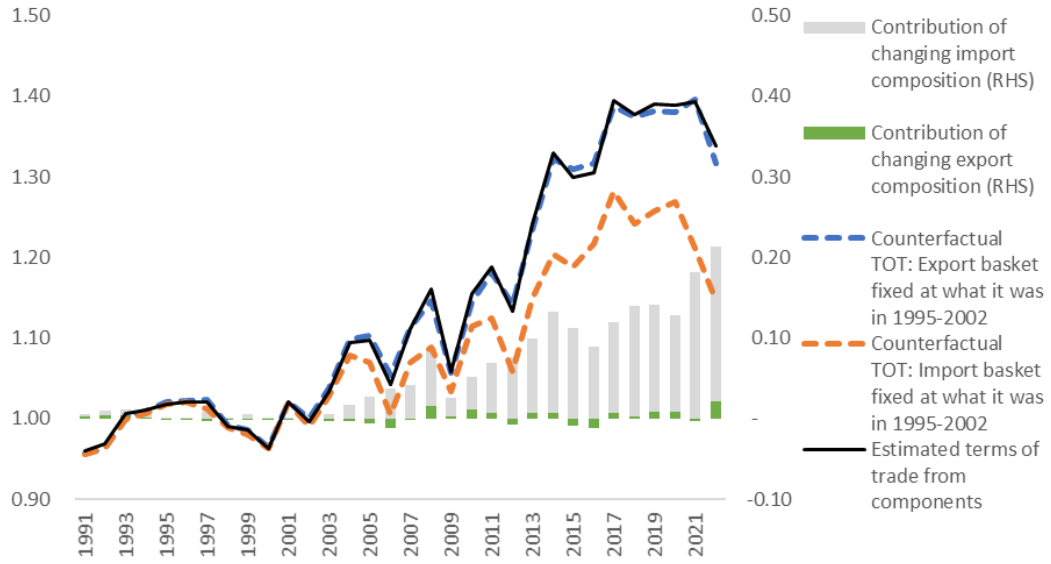


Source: Haver Analytics, author's calculations

Note: Change in volume is measured by the change in real exports of the commodity from the national accounts (constant 09/10 prices). Change in price is measured by the implicit price deflator in the national accounts, or, where unavailable, the closest matching overseas trade price index. Petrol and aviation fuel has been excluded from the import chart as it is a small portion of imports (1.2%) and the increase in price puts it off the scale in the chart (+139% increase in price; +35% increase in quantity). Most of New Zealand's fuel imports are captured in intermediate goods rather than in petrol and aviation fuel.

The components shown in Figure 16 can be used to construct counterfactuals of what the terms of trade would have been if New Zealand's import or export mix had not changed. Consistent with patterns above, this exercise suggests that if the import mix had stayed as it was in 1995-2002, the terms of trade would have only increased by half-to-two-thirds as much as they actually have (Figure 17). If the export mix had stayed as it was in 1995-2002 the terms of trade would have been similar to the actual outcome. This is consistent with there being little evidence of exports systemically responding to price signals over the time period considered, and New Zealand benefitting from the rise in the price of commodities relative to manufactures.

Figure 17: Terms of trade counterfactuals constructed from prices and quantities of the main import and export products (1995-2002 average=1)



Source: Haver Analytics, author's calculations

Note: The estimated terms of trade will not exactly equal the actual terms of trade due to a small residual arising from interactions between prices and quantities.

This exercise has not identified all of the ways in which economic adaptation could have contributed to New Zealand's rising terms of trade. Further adaptation may be identified by examining import and export trends at a more disaggregated level, considering different time periods, and investigating whether changes in the quality of imports and exports has been fully accounted for in the calculation of price indexes. Further work would also be needed to determine whether this kind of adaptation has occurred in New Zealand to a greater or lesser extent than it has in other countries.

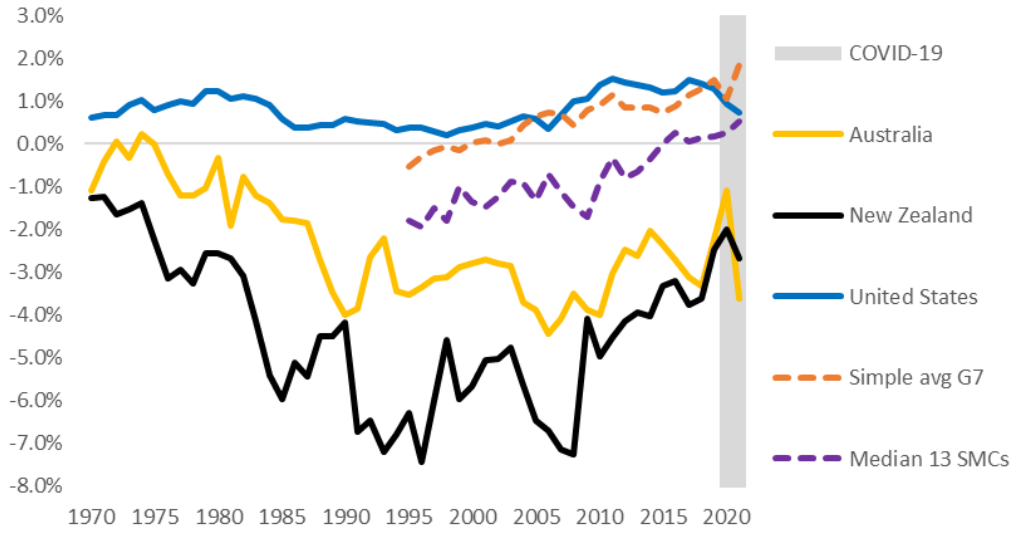
Overall, however, this analysis suggests that the rise in New Zealand's terms of trade has resulted from some mix of good fortune and adaptability. New Zealand has benefitted from the rise in the relative price of its exports, but the terms of trade has been supported by a shift in its import mix towards categories of imports that have fallen the most in price.

Net international income

New Zealand has had a net international income deficit every year since 1970, largely due to the servicing costs on its large net foreign liabilities (NFL). NFL measures the difference between New Zealand's financial liabilities and its financial assets with the rest of the world at a point in time.[26] It covers all sectors (government and private sector) and all financial assets (eg, equity, debt and derivatives).

New Zealand's net international income deficit – the share of GDP being paid to foreign nationals each year – averaged 5.8% of GDP between 1995-2002. By 2019 the deficit had reduced to 2.5% of GDP, a reduction of 3.3 percentage points. All of the comparison groups and countries considered also experienced improvements in their net international income over this period, however New Zealand's improvement was the largest (Figure 18).

Figure 18: Net international income (% of GDP, nominal terms)

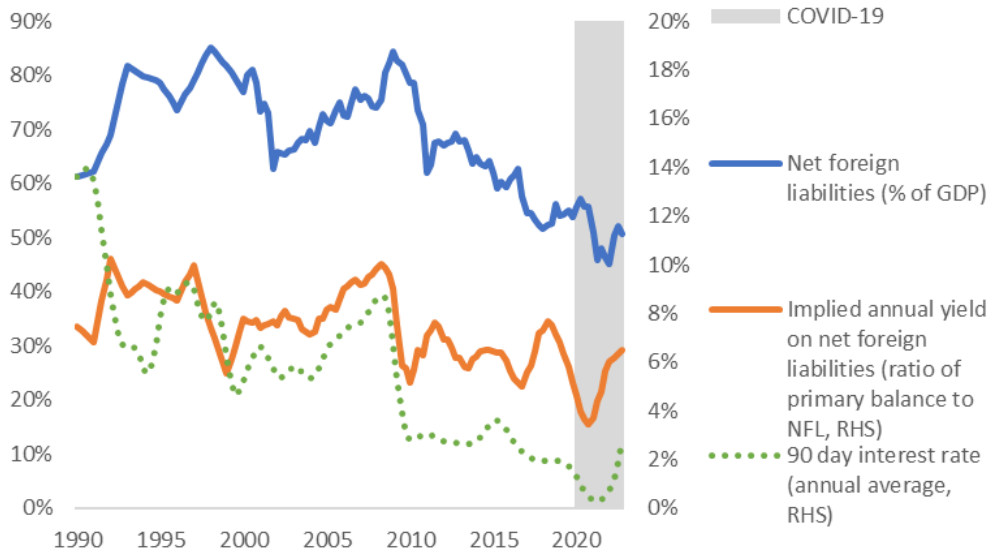


Source: OECD, author's calculations

Note: The chart above is shown in nominal terms but this is equivalent to real terms in this instance. Real net international income would be best shown as a ratio of real GDI, both of which would logically be deflated by the GNE deflator. The impact of the deflators would consequently net out.

[26] Stats NZ terms net foreign liabilities as the net international investment position (NIIP). Since New Zealand's NIIP is negative, in this paper it is described as net foreign liabilities.

Figure 19: New Zealand's net foreign liabilities and the implied yield



Source: Haver Analytics, author's calculations

The reduction in New Zealand's net international income deficit seems to be attributable to two factors. First, falling interest rates have flowed through to a modest reduction in the implied yield on New Zealand's NFL (Figure 19). However, there is only a loose relationship between interest rates and the implied yield on the NFL, given that it is made up of large offsetting asset and liability positions across a range of asset types with varying yields. The second factor is a lower level of NFL relative to GDP. Each of the two factors appear to have contributed about equally to the improvement in New Zealand's net international income since the late-1990s, as both the level of the implied yield and the ratio of NFL to GDP fell by about a third over this period.

Given these drivers, New Zealand's reduced net international income deficit appears to be a result of a mix of good fortune and choices by New Zealanders. Falling long-term interest rates mainly reflect global developments over which New Zealand has little influence (van Rensburg, forthcoming). The reduction in New Zealand's ratio of NFL to GDP can mostly be accounted for by favourable asset revaluations (The Treasury, 2022). Further research would be needed to determine whether these revaluations were exclusively due to luck, or whether they partly reflected active financial decisions by New Zealanders that yielded net gains.

Nonetheless, at some level, New Zealand households, businesses, and government entities have been sufficiently restrained in their consumption growth that the income growth and favourable asset revaluations experienced have led to a reduction in the country's overall NFL. Consistent with this, New Zealand's net saving rate averaged 4.8% in the 17 years from 2003 to 2019, up from an average of 4.1% in the 20 years prior to this.

Going forward, New Zealand's net international income deficit is expected to widen somewhat from its low point. Global interest rates have increased from their low points and there is significant uncertainty about their future long-term direction (van Rensburg, forthcoming). In addition, the Treasury's 2023 *Budget Economic and Fiscal Update* (BEFU) forecast that New Zealand's NFL as a share of GDP would increase from its current level of around 50% of GDP to closer to 60% of GDP by the mid-2020s, due to sizable current account deficits starting in 2022. Still, neither of these changes are expected to return the net

international income deficit to its previous peaks: The BEFU forecast the deficit to be steady at around 4% of GDP over 2024-2027, below the average of 5.8% of GDP seen over 1995-2002.

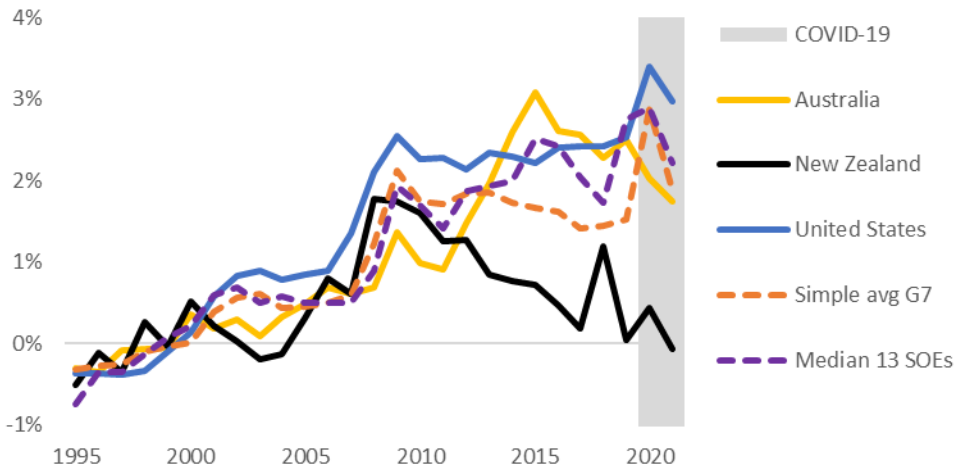
Depreciation

The final source of support to New Zealand's real NNI per capita growth has been a broadly flat depreciation burden, while most countries have experienced increases.

The depreciation of physical assets is captured in the national accounts through the consumption of fixed capital. Methodologies for estimating the consumption of fixed capital vary somewhat across OECD countries (OECD, 2013). There may be good local reasons for the use of varying methods, however the difference in methodologies does make it more challenging to undertake cross-country comparisons with confidence. To mitigate the impact of measurement differences, the analysis below considers trends in each country's depreciation over time, rather than focusing on differences in absolute levels of depreciation.

Between the 1995-2002 average and 2019, New Zealand's depreciation burden was broadly unchanged. In contrast, depreciation burdens increased by around 1-3% of GNI in the other countries and groupings considered (Figure 20).

Figure 20: Change in ratio of real consumption of fixed capital to real GNI ('depreciation burden') from the 1995-2002 average (ppt)



Source: OECD, author's calculations

Note: In this chart the depreciation burden is calculated as real depreciation (nominal consumption of fixed capital deflated by the gross fixed capital formation deflator) as a ratio of real GNI (nominal GNI deflated by the GNE deflator).

It is unclear whether New Zealand's unchanged depreciation burden in this context is a positive or negative trend for living standards. On the one hand, New Zealand may be efficient in its use of capital, or may have an industry mix that requires less growth in capital than other countries. However, New Zealand has historically been capital-shallow (Conway, 2018) and there is evidence that it has an infrastructure deficit (The Treasury, 2022). This suggests that New Zealand may be underinvesting in its capital stock, and that a higher depreciation burden would be a cost worth bearing for the wider wellbeing and productivity benefits of a larger capital stock.

5 Income growth and broader macroeconomic outcomes

This section aims to illustrate how New Zealand's improved income growth may have impacted on wages, migration, and the external position.

Wage growth

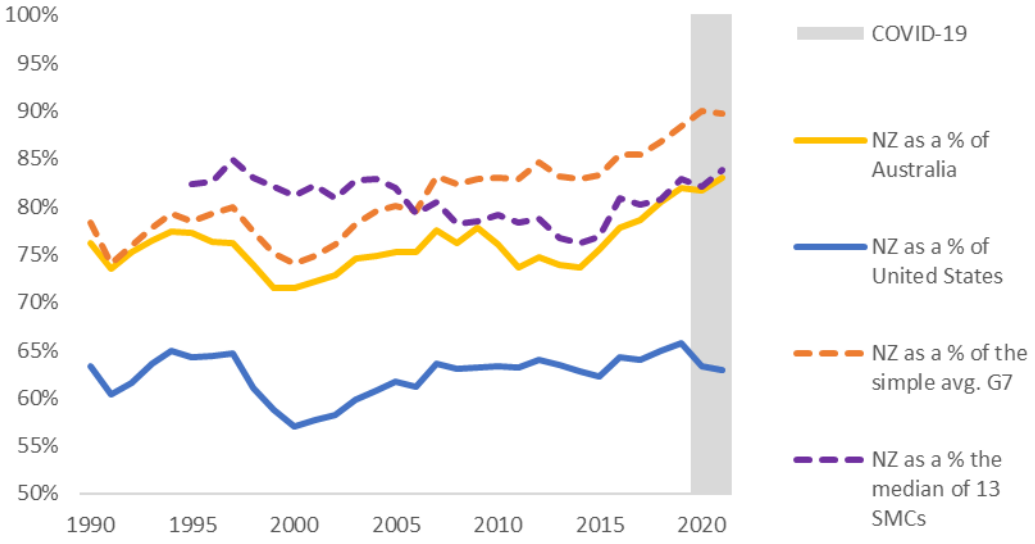
New Zealand's real wage growth has been at the stronger end of the OECD comparison group since around the year 2000 (Figure 21). Using an internationally-comparable measure of average annual real wages for a full-time-equivalent (FTE) employee compiled by the OECD, from the 1995-2002 average to 2019, New Zealand's wages increased from:

- 74% to 82% of Australia's
- 61% to 66% of the US'
- 77% to 88% of the simple average of the G7, and
- 82% to 83% of the median of the group of 13 SMCs.

These changes are in a similar direction to the changes in real NNI per capita found earlier, although are in general a bit smaller in magnitude.

To check the robustness of the findings above, Annex 5 shows growth in some measures of real hourly earnings. These also show New Zealand's cumulative real wage growth from the late 1990s to 2019 as being at the high end of the comparison group. These measures have the advantage of specifically measuring hourly earnings (rather than earnings of an FTE), but only cover the manufacturing or private sectors, do not include data for all countries, and are only available in index form (rather than levels).

Figure 21: New Zealand's average annual wages for an FTE relative to other countries (constant 2021 prices and PPPs)



Source: OECD, author's calculations

Note: The OECD obtains this measure by dividing the total wage bill in the National Accounts ("wages and salaries") by the average number of employees in the total economy, also multiplying by the ratio

of average usual weekly hours worked for full-time dependent employees in their main job to average usual weekly hours worked for all dependent employees in their main job. For information on how this data is calculated see: https://www.oecd.org/els/emp/AVERAGE_WAGES.pdf.

Net migration of New Zealand citizens

A key concern in the past related to New Zealand's relative productivity performance has been the large number of New Zealanders emigrating in search of higher incomes abroad (see, for example, 2025 Taskforce (2009)). For much of the period from the 1970s to the 2010s there was a large cyclical net outflow of New Zealand citizens (Figure 22). This averaged 0.6% of the population each year from 1979 to 2013. The main destinations were Australia (88% of the cumulative net migrant flow over this period) and the UK (6% of the cumulative net migrant flow).[27]

The outflow to countries other than Australia eased back after the 1990s, and the outflow to Australia eased back after 2014. Between 2014 and 2019 the net outflow of New Zealand citizens averaged just 0.1% of the population per year.[28]

At the same time, the net migrant inflow of non-New Zealand citizens was elevated, averaging 1.2% of the population per year from 2014-2019. This suggests that New Zealand has been a relatively attractive destination, although the flows of non-New Zealand citizens can be heavily influenced by immigration policy.

Migration trends since 2020 have been significantly impacted by COVID-19. The timeliest data available (total arrivals less departures of New Zealand citizens into Australia, including both travellers and migrants) is volatile, but indicates that the net outflow may have started increasing somewhat after the Australian and New Zealand border restrictions were progressively lifted over the first half of 2022. This outcome may also reflect strong labour demand in Australia, which has historically attracted New Zealand migrants even when labour demand has also been strong in New Zealand (Figure 23).

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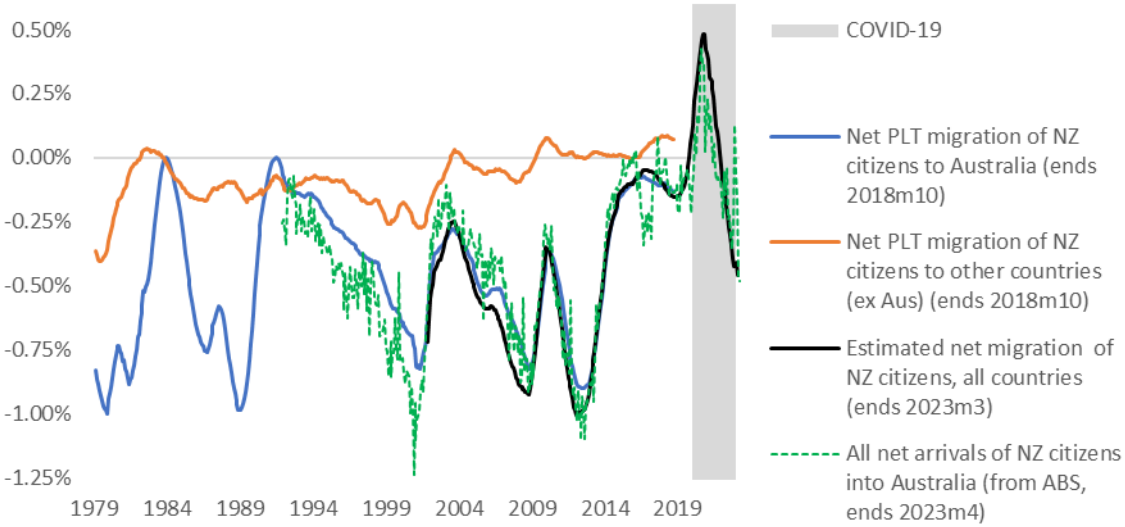
[27] Data used is net permanent and long-term migration. 3.5% of people did not state a destination and have been excluded from these calculations.

[28] This refers to Stats NZ's estimated net migration data as permanent and long-term migration data was discontinued in 2018.

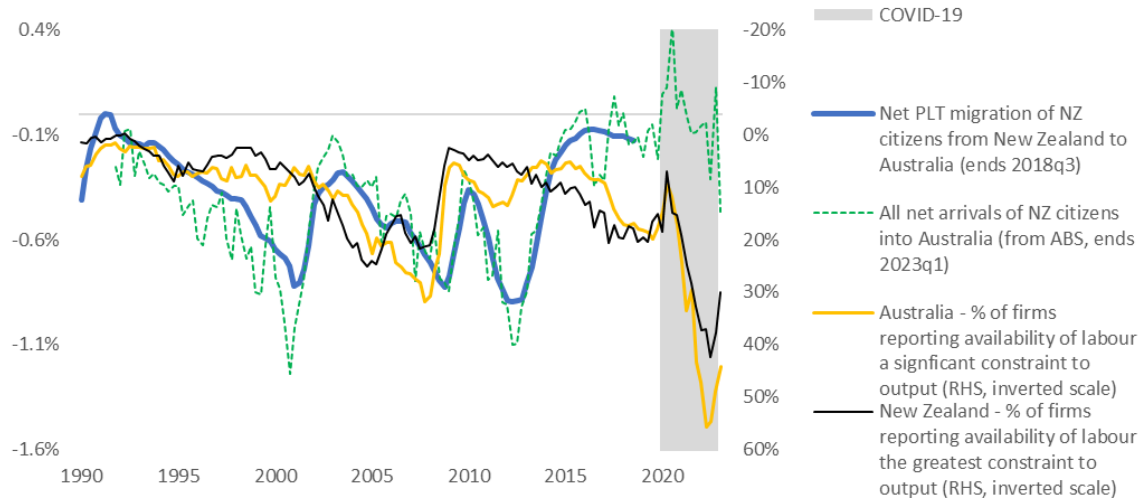
Figure 22: Measures of net migration of New Zealand citizens (annual totals, % of New Zealand population)



Source: Stats NZ, Australian Bureau of Statistics, OECD (NZ population data), author's calculations

Note: PLT migration (permanent and long-term) refers to people who indicate on their arrival or departure card that they intend to migrate for 12 months or more. The net PLT migration series ends in 2018m10 as New Zealand stopped collecting the data for this series. Estimated net migration measures actual migration outcomes after 16 months, and the latest 16 months is estimated by Stats NZ using a statistical model. All net arrivals of New Zealand citizens into Australia is all actual border crossings, including both short-term travellers and migrants.

Figure 23: Net migration of New Zealand citizens to Australia and labour demand

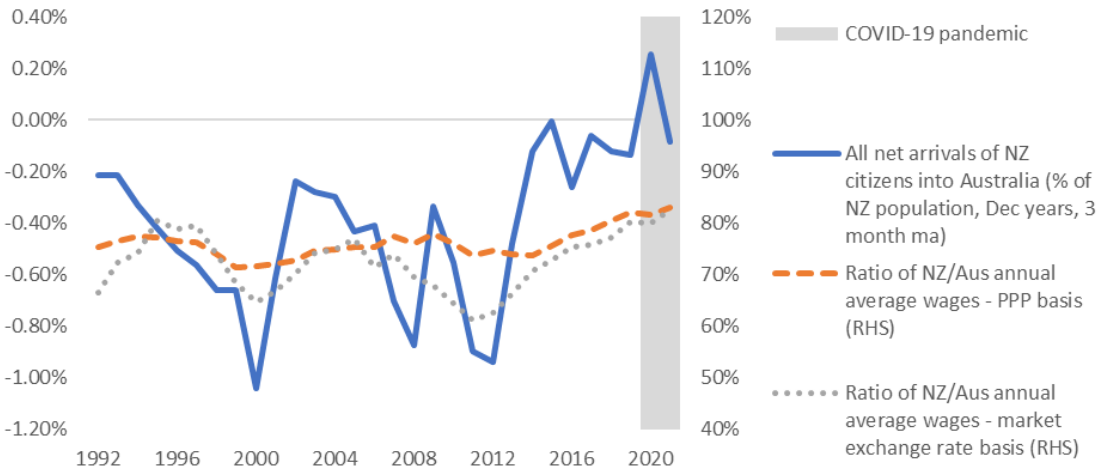


Source: Stats NZ, Australian Bureau of Statistics, OECD (NZ population data), Haver Analytics/National Australia Bank, New Zealand Institute of Economic Research, author's calculations

Nonetheless, the reduced rate of emigration by New Zealand citizens may be due, at least in part, to the narrowing gap between New Zealand wages and overseas wages. The extent of narrowing depends on the measure of wages used. Using real wages for an FTE on a PPP basis, the gap between New Zealand and Australian wages has narrowed from a peak of 29% in 1999 to 18% in 2019 (Figure 24). Likewise, on the same metric, the gap between

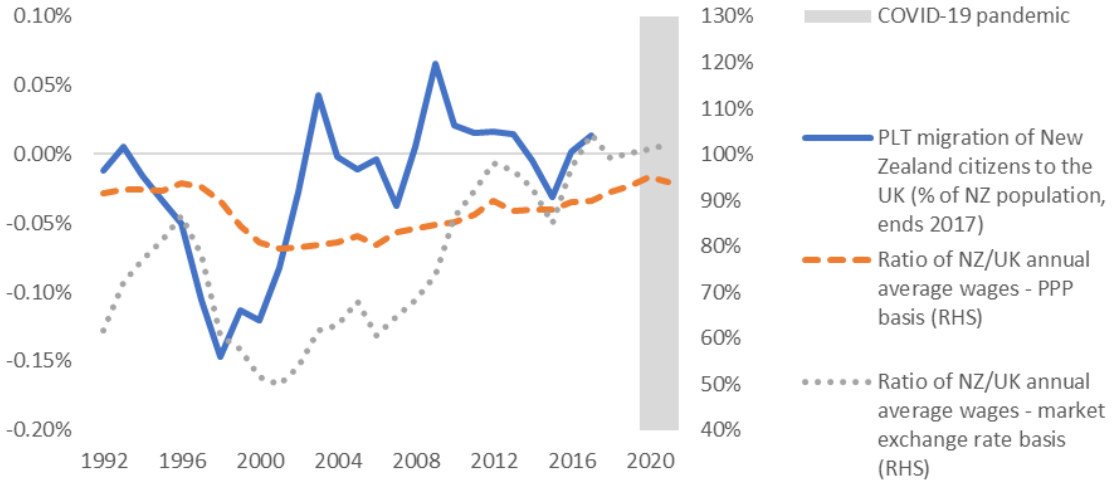
New Zealand and UK wages has narrowed from a peak of 21% in 2001 to 7% in 2019 (Figure 25). Other factors may have also contributed to a reduction in emigration to Australia, such as increased recognition of the limitations of the rights of New Zealand citizens moving to Australia (at least until changes to Australian citizenship rules were announced in April 2023 – although any impact from this is unlikely to be reflected in migration data yet).

Figure 24: Net migration of New Zealand citizens to Australia and the difference in average wages between New Zealand and Australia



Source: Australian Bureau of Statistics, OECD, author's calculations

Figure 25: Net migration of New Zealand citizens to the UK and the difference in average wages between New Zealand and the UK



Source: Stats NZ, OECD, author's calculations

The wage gap has narrowed even more on a market exchange rate basis. On that basis, the gap between New Zealand and Australian wages halved from a peak of 39% 2011 to 20% in 2019. The gap with the UK disappeared entirely (from 50% in 2001 to near zero in 2019). Although a PPP basis is usually the best basis on which to compare real wages across countries, market exchange rates have some relevance to migration decisions. They may be more visible to prospective migrants with limited information on price levels in other

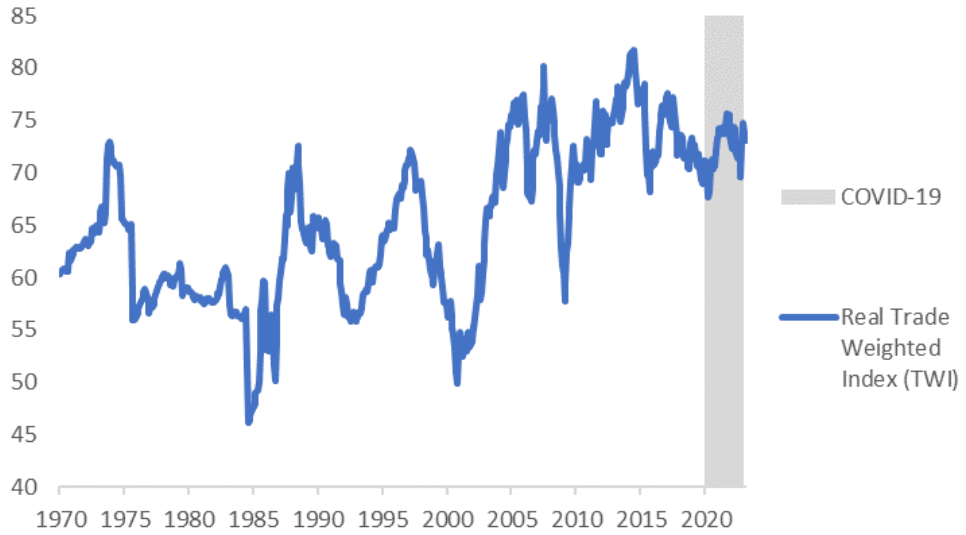
countries, and will be the most relevant metric for people who plan to migrate temporarily and bring back savings to spend in their home country. Market exchange rates may also better reflect anticipated trends in relative economic performance due to their forward-looking nature, although they are also influenced by transitory cyclical developments.

External imbalances

Another historical concern about the New Zealand economy relates to the external position, particularly New Zealand's elevated NFL and the level of the exchange rate. The specific concern has been that a high exchange rate encourages growth in non-tradable industries instead of tradeable industries.[29] This could impede productivity growth since the tradable sector is subject to more competition and has higher levels of productivity (New Zealand Productivity Commission, 2021). By discouraging growth in net exports, a high exchange rate would also work against reducing New Zealand's elevated NFL.

New Zealand's NFL increased during its period of relative economic underperformance from the 1970s to the 1990s. The level of NFL remained elevated after that, with an increase in private sector debt offsetting a reduction in public sector debt. This left New Zealand vulnerable to increases in the cost of funding its liabilities, or to a sudden stop in funding. A low savings rate was seen as a common underlying cause of the issues with the exchange rate and the NFL (see, for example, Bascand (2017) and The Treasury (2014)).

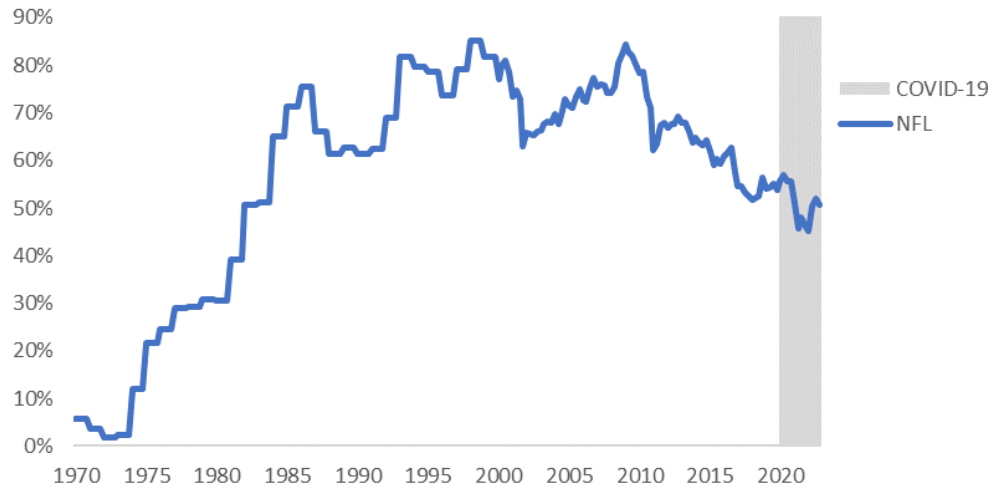
Figure 26: New Zealand's real trade-weighted exchange rate



Source: Reserve Bank of New Zealand

[29] Tradeable industries are industries where the majority of the output faces international competition. Non-tradeable industries are industries where the majority of the output faces no international competition.

Figure 27: New Zealand's net foreign liabilities (% of GDP)



Source: Haver Analytics/Stats NZ for data from 1989. Data prior to 1989 sourced from Lane & Milesi-Ferretti (2016)

Note: Data is annual until 2000 and quarterly thereafter.

Despite the elevated exchange rate, however, New Zealand has had steady income growth and NFL has trended downwards. As noted in the earlier section on net international income, the reduction in New Zealand's NFL as a share of GDP appears to be due to a mixture of favourable revaluations and a slightly increased savings rate. The IMF did not view New Zealand's exchange rate as being distinctly overvalued in 2022, and considered the external position to be broadly in line with fundamentals (International Monetary Fund, 2022). This is consistent with increased income growth (including through the higher terms of trade) being a factor behind the higher exchange rate and the falling NFL. Assessments of New Zealand's external position may be revised in due course given the significant increase in New Zealand's current account deficit starting in 2022, depending on how long this increased deficit persists for.

6 Discussion and directions for further research

The analysis in this paper suggests that New Zealand's improved income growth from the late 1990s to 2019 arose for a range of reasons. Some of it seems to have been fortunate developments outside of New Zealand's control, such as rising global food prices relative to manufactures, and falling global interest rates. Other aspects appear to reflect adaptations made by New Zealanders, such as shifting to import manufactures that have fallen in price rather than producing them locally, and putting some of the increases in income and wealth towards savings rather than putting it all towards increased consumption.

The analysis in this paper indicates that the faster rise in hours worked in New Zealand compared to other countries is part of a wider picture of a comparatively strong labour market performance. New Zealand's labour market seems to have been relatively effective at creating full-time jobs at a range of skill levels for a wide range of people compared to those of other countries.

One implication of these developments is that GDP per hour worked may only be a partial indicator of New Zealand's economic performance because it does not capture the strong labour market and terms of trade trends. These trends may have even supressed average GDP per hour worked if New Zealand's labour market has been better at including lower productivity workers (consistent with the findings of Maré, Hyslop, & Fabling (2015) for the 2001-2012 period). The rise in the terms of trade could have had a similar impact if it has reflected firms focusing on products with high or rising prices rather than products where there is potential to increase production volumes per unit of labour.

Some aspects of New Zealand's improved income performance may be enduring, whereas others may not. To the extent that the trends have arisen from effective policy settings and New Zealand firms and households adapting to make the most of opportunities, the growth in income is more likely to be maintained and extended. This may be the case for the strong growth in New Zealand's employment levels, and the contribution of the changing composition of imports to the lift in the terms of trade. Where income growth has arisen from good fortune, such as through rising global food prices and falling interest rates, there is a greater risk of the trend stopping or reversing. Some of the sources of income growth will also have natural limits, such as the rising share of the population in employment. Given the risks to the durability of these other sources of income growth, the lack of convergence of New Zealand's productivity (real GDP per hour worked) to the global frontier remains a risk for New Zealand's long-term prosperity.

This paper has aimed to provide a broad analysis of New Zealand's income growth since the late-1990s, but there are many remaining questions. Various specific questions in relation to New Zealand's income growth have been noted throughout the paper. These include questions about the measurement of hours worked, the drivers of New Zealand's employment growth, the roles of luck and adaptability in the rising terms of trade and the reduced international income deficit, and the reasons for New Zealand's slower growth in its depreciation burden.

Other broader related questions will remain important for policymakers and researchers into the future, such as:

- **Productivity**: What can New Zealand do to support productivity growth in its traditional sense (eg, real GDP per hour worked)?
- **Adaptability and resilience**: How adaptable and resilient has New Zealand been in the face of shocks and change compared to other countries? What role has our ability to bounce back from shocks and take advantage of opportunities played? How has this played out at macro and micro levels, and in the public and private sectors?
- **Distribution**: How has New Zealand's income growth been distributed? To what extent have favourable trends in the labour market been offset by distributional outcomes in the housing market?
- **Environment**: Has faster income growth resulted in greater environmental harm than other countries have experienced over recent decades? Or has increased input efficiency provided some mitigation?

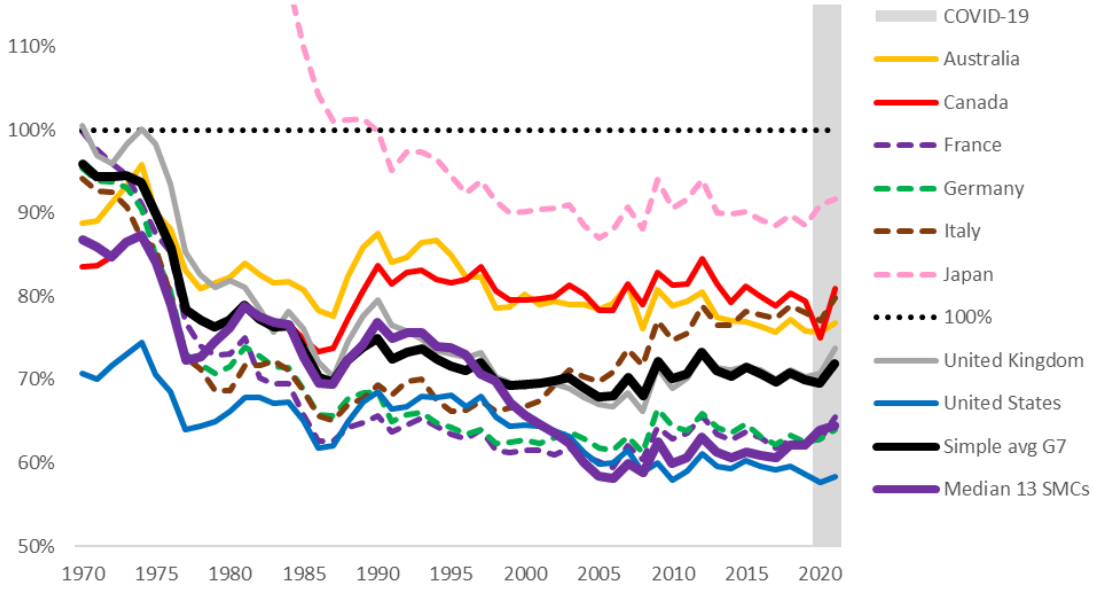
Further relevant background in relation to some of these questions can also be found in *Te Tai Wairoa: Wellbeing in Aotearoa New Zealand* and its background papers.[30]

[30] https://www.treasury.govt.nz/publications/wellbeing-report/te-tai-waiora-2022

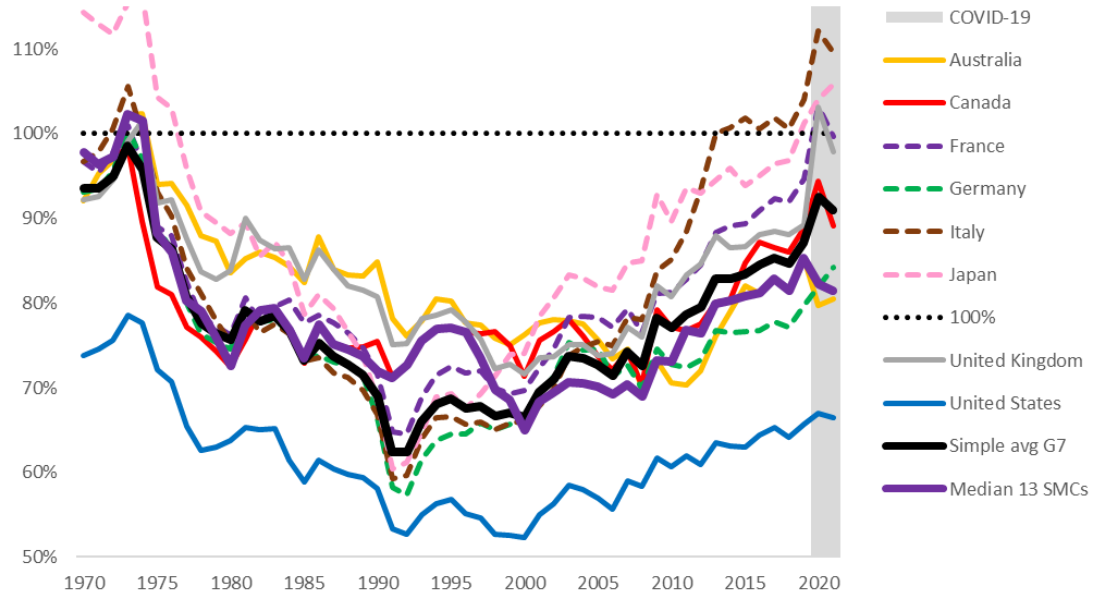
Annex 1: New Zealand's real GDP per hour worked and real NNI per capita compared to other countries

Figure A: G7, Australia, 13 small and medium country median

(i) New Zealand's real GDP per hour worked as a % of each country (constant prices and 2015 PPPs)



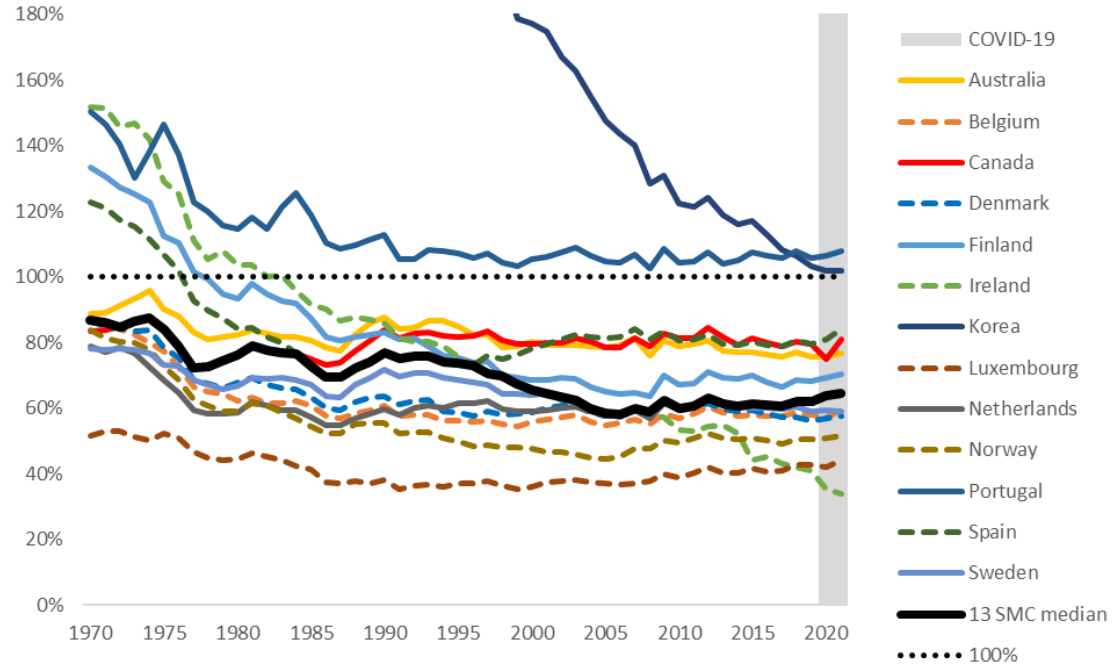
(ii) New Zealand's real NNI per capita as a % of each country (constant prices and 2015 PPPs)



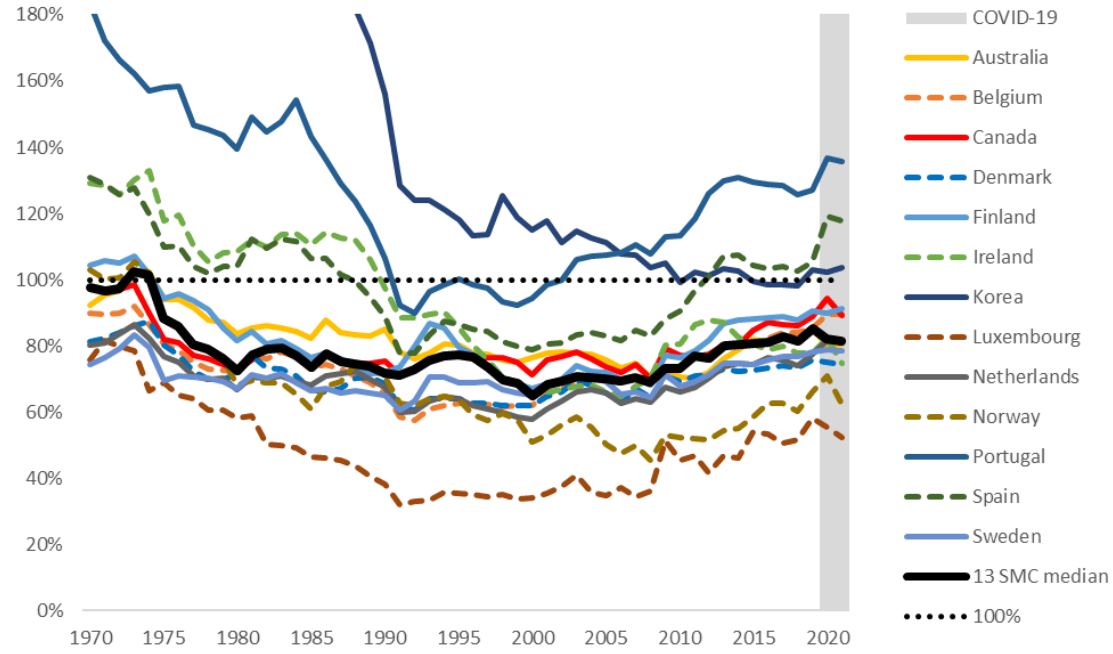
Source: OECD, World Bank, Haver Analytics, author's calculations

Figure B: 13 small and medium countries individually

(i) New Zealand's real GDP per hour worked as a % of each country (constant prices and 2015 PPPs)

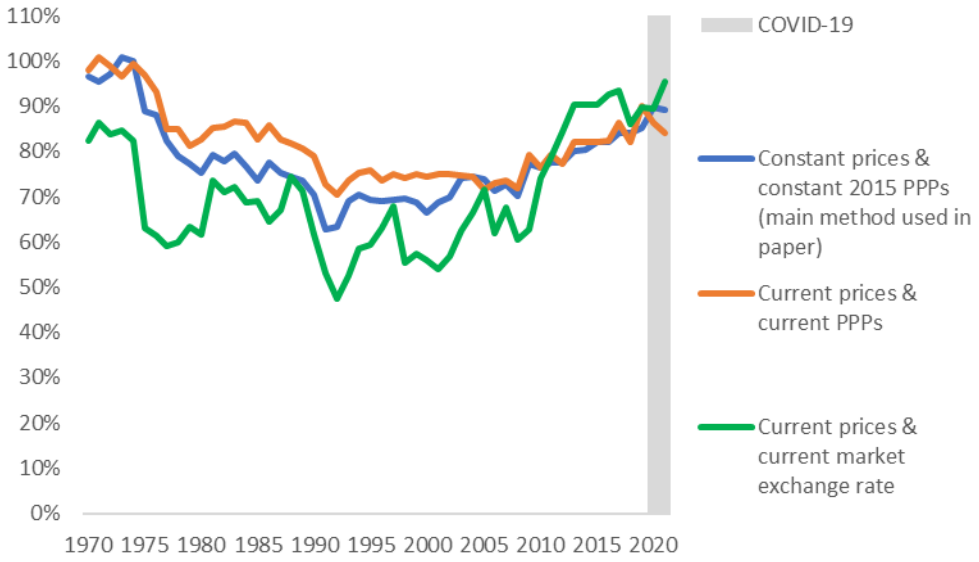


(ii) New Zealand's real NNI per capita as a % of each country (constant prices and 2015 PPPs)



Source: OECD, World Bank, Haver Analytics, author's calculations

Figure C: New Zealand's NNI per capita as a % of the median of 19 OECD countries using alternative methods of comparing across countries and time



Source: OECD, World Bank, Haver Analytics, author's calculations

Annex 2: Main results in the paper using the OECD's method of calculating real NNI

Figure D: Cumulative growth in real NNI per capita between the 1995-2002 average and 2019 using the OECD's method compared to the method used in this paper

	OECD real NNI method (nominal NNI deflated by GNE deflator)	Real NNI method used in this paper (real GNE less real depreciation)	Difference
New Zealand	58.9%	56.9%	**-2.0%**
Australia	44.5%	42.1%	**-2.4%**
United States	32.0%	30.0%	**-2.1%**
Simple avg. G7	22.6%	22.6%	**0.0%**
Median 19 OECD countries	27.2%	26.6%	**-0.7%**
Median 13 SMCs	30.7%	30.0%	**-0.6%**

Source: OECD, World Bank, author's calculations

Figure E: New Zealand's real NNI per capita as a % of other countries using original OECD data compared to the data used in this paper

	OECD real NNI method (nominal NNI deflated by GNE deflator)			Real NNI method used in this paper (real GNE less real depreciation)			Difference in change between methods
	1995-02	2019	Change	1995-02	2019	Change	
Australia	77.2%	84.9%	**7.7%**	77.2%	85.3%	**8.0%**	**+0.3%**
United States	54.3%	65.3%	**11.0%**	54.4%	65.7%	**11.3%**	**+0.2%**
Simple avg. G7	67.2%	87.0%	**19.9%**	68.1%	87.2%	**19.1%**	**-0.8%**
Med. 19 OECD countries	68.0%	84.9%	**16.9%**	68.8%	85.3%	**16.5%**	**-0.4%**
Med. 13 SMCs	69.8%	84.9%	**15.1%**	70.7%	85.3%	**14.6%**	**-0.5%**

Source: OECD, World Bank, author's calculations

Annex 3: Comparison with Grimes and Wu (2022)

In contrast to the analysis of real NNI per capita in this paper, Grimes and Wu (2022) find that there was little difference between the cumulative growth of New Zealand's real GDP per capita and its real adjusted net national income (RANNI) per capita from 1994 to 2018. This is surprising given that the large increase in New Zealand's terms of trade and the improvement in its net international income balance over this period would be captured in RANNI per capita but not in real GDP per capita.

Most of the difference between Grimes and Wu's results and those found in this paper can be attributed to:

- revisions to statistics after publication of Grimes and Wu (2022)
- the choice of deflator, and
- the time period.

Figure F provides a breakdown of the sources of the difference between Grimes and Wu's results and those found in this paper for New Zealand.

Figure F: Difference between cumulative growth in measures of net national income per capita and GDP per capita for New Zealand (percentage points)

Grimes & Wu's result: RANNI per capita less GDP per capita 1994 to 2018	1.1%
Data used in this paper: NNI per capita less GDP per capita 1995-02 avg to 2019	17.6%
Difference	**16.5%**
Sources of the difference:	
Revisions to World Bank data since Grimes & Wu (2022)	*+5.1%*
Adjustment for natural resources depletion	*-0.2%*
Differences between World Bank and OECD underlying data for GDP, NNI and CPI	*0.0%*
Difference between CPI and national accounts consumption deflator	*+6.4%*
Difference between national accounts consumption deflator and deflation method used in this paper[31]	*+0.8%*
Difference in time periods (1995-02 avg to 2019 vs 1994 to 2018)	*+4.4%*
Total	***16.5%***

Sources: OECD, World Bank, Grimes and Wu (2022), author's calculations

[31] As noted in the body of the paper, real NNI in this paper is real GNI (calculated as nominal GNI deflated by the GNE deflator), less real depreciation (nominal consumption of fixed capital deflated by the gross fixed capital formation deflator).

One reason for the difference is that the source data from the World Bank appears to have been slightly revised since Grimes and Wu's analysis was completed. This increased New Zealand's 2018 RANNI per capita such that the data now shows a 6 percentage point difference between cumulative growth in RANNI per capita and GDP per capita between 1994 and 2018.

The adjustment for natural resource depletion included in Grimes and Wu's results but not in the NNI per capita analysis above makes only a small difference. The adjustment is small and largely unchanged between the start and end of the period. Differences between OECD and World Bank data also have little impact.

The choice of deflators used to calculate real metrics from nominal metrics makes a significant difference. Grimes and Wu used the consumer price index (CPI) in their analysis, whereas the real NNI per capita analysis in this paper uses national accounts deflators. Grimes and Wu argue that a consumption deflator is the most relevant measure of prices for analysing their measure of adjusted net national income (ANNI). This is because depreciation and resource depletion are deducted during the construction of the measure, meaning that all of the income measured by ANNI is available for consumption. In practice, they use each country's CPI as the consumption deflator, noting that it is available on a similar basis for all countries in their sample. They argue that the CPI is better for this purpose than national accounts deflators because (i) as the main price index used for contractual purposes in most countries it is subject to considerable public scrutiny, and (ii) the CPI does not include prices for consumption of nonmarket services such as freely available public health services or defence, which are subject to high measurement uncertainty.

The choice to use the CPI as the consumption price index rather than measures from the national accounts has a significant impact on the results. Using the national accounts consumption deflator instead of the CPI gives around 6 percentage points higher growth in New Zealand's real NNI per capita over 1994 to 2018.

Using the CPI rather than a national accounts-based measure may have some shortcomings for an analysis of net national income. The CPI is not designed for cross-country comparative analysis over long time periods, whereas there have been efforts to align national accounts methodologies across countries. This means that, although the CPI is constructed on a somewhat similar basis across countries, there are still significant differences. For example, 25% of the US CPI basket is imputed rent on owner-occupied housing, whereas this does not feature in the New Zealand or Australian CPIs at all (instead, owner-occupied housing is measured through the cost of building a new home). The CPI can also be impacted by changes in sales tax rates.[32] Using the CPI could have some theoretical advantages for measuring real income growth, but national accounts measures are likely to be more reliable for the type of analysis undertaken in this paper.

The other difference in deflation methods is that the data used in this paper is calculated as real GNI less real investment. This effectively deflates the portion of NNI used for

[32] Moreover, the CPI is not always the measure of inflation preferred by national agencies. The US Federal Reserve targets national accounts personal consumption expenditures (PCE) inflation, which has tended to rise less over time than the CPI. Between 1994 and 2018, US PCE inflation rose a cumulative 57% and US CPI by a cumulative 73%. Reasons why the US Federal Reserve prefers PCE inflation over CPI inflation are outlined in Bullard (2022).

consumption by the national accounts consumption deflator, and the portion of NNI used for net growth in the capital stock by the gross capital formation deflator. This accounts for roughly 1 percentage point of the difference.

Finally, the slight difference between the time periods considered in this paper compared to Grimes and Wu (2022) appears to account for some of the difference. For the main time period considered in this paper (the 1995-2002 average to 2019), New Zealand's real NNI per capita increased by 17.6 percentage points more than its growth in real GDP per capita. For the time period considered by Grimes and Wu (1994 to 2018), the difference was 13.2 percentage points.

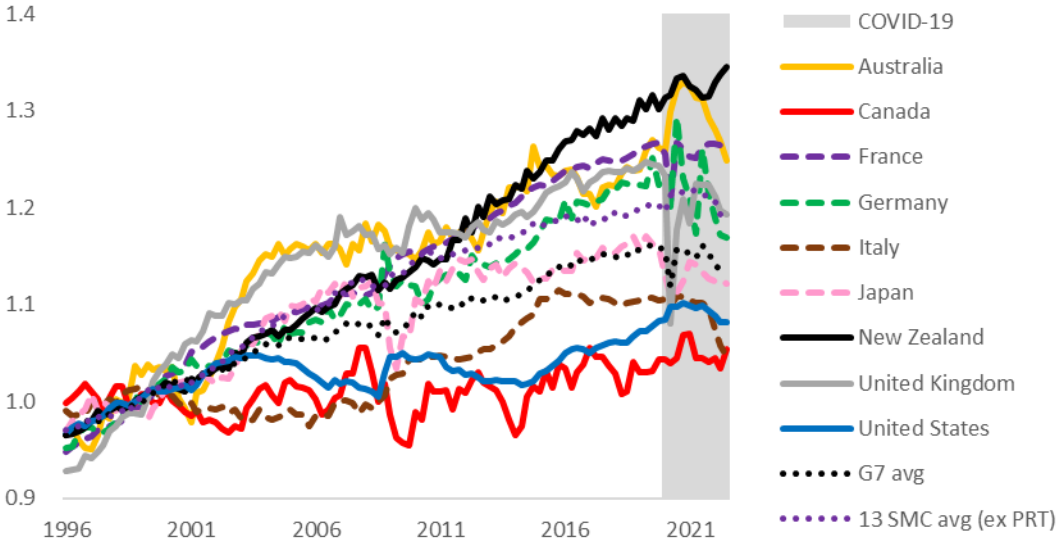
Annex 4: Country groupings used in this paper

Country	Joined the OECD	19 countries for which GDP, NNI, and hours worked data all available from 1970	Member of G7	Group of 13 small and medium countries with available data
Australia	1971	✓		✓
Austria	1961			
Belgium	1961	✓		✓
Canada	1961	✓	✓	✓
Chile	2010			
Colombia	2020			
Costa Rica	2021			
Czech Republic	1995			
Denmark	1961	✓		✓
Estonia	2010			
Finland	1969	✓		✓
France	1961	✓	✓	
Germany	1961	✓	✓	
Greece	1961			
Hungary	1996			
Iceland	1961			
Ireland	1961	✓		✓
Israel	2010			
Italy	1962	✓	✓	
Japan	1964	✓	✓	
Korea	1996	✓		✓
Latvia	2016			
Lithuania	2018			
Luxembourg	1961	✓		✓
Mexico	1994			
Netherlands	1961	✓		✓
Norway	1961	✓		✓
Poland	1996			
Portugal	1961	✓		✓
Slovak Republic	2000			
Slovenia	2010			
Spain	1961	✓		✓
Sweden	1961	✓		✓
Switzerland	1961			
Türkiye	1961			
United Kingdom	1961	✓	✓	
United States	1961	✓	✓	

Source: OECD

Annex 5: Measures of growth in real hourly wages

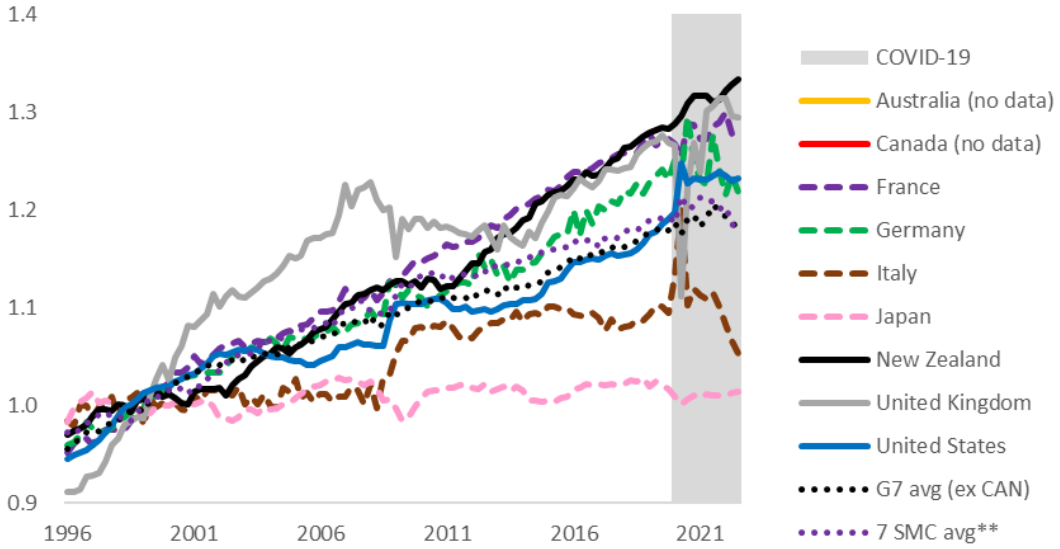
Figure G: Cumulative growth in real manufacturing hourly wages (1996-2001 average=1)



Source: OECD, author's calculations

Note: Calculated from the OECD Monthly Economic Indicator manufacturing hourly wages series, deflated by the national accounts implicit consumption deflator.

Figure H: Cumulative growth in real private sector hourly wages (1996-2001 average=1)



Source: OECD, author's calculations

Note: Calculated from the OECD Monthly Economic Indicator private sector hourly wages series, deflated by the national accounts implicit consumption deflator. 7 SMC average is BEL, DNK, KOR, LUX, PRT, ESP, SWE. These were all of the countries among the 13 SMC grouping with available data.

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