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THE TREASURY

The productivity slowdown: implications for the Treasury's forecasts and projections

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The productivity slowdown: implications for the Treasury's forecasts and projections

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Executive Summary

The world has been experiencing a productivity slowdown, from which New Zealand has not been exempt. This matters because sustainable improvements in our living standards depend upon productivity. Productivity is also a key driver of the Treasury's economic and fiscal forecasts and long-term fiscal projections, which underpin its advice about fiscal policy and fiscal sustainability. This Treasury Paper is an exploration of recent trends in productivity and the potential drivers of the slowdown.

Both labour and multi-factor productivity (MFP) growth have been slowing since the turn of the century in advanced economies, and since the Global Financial Crisis (GFC) in emerging market and developing economies. For example, average labour productivity growth across the Organisation for Economic Co-operation and Development (OECD) countries was still close to 2% p.a. in the 1990s, before falling sharply to around 0.8% p.a. from the 2000s. Like other countries, New Zealand's productivity performance has been slowing. Productivity for the whole economy averaged 1.4% p.a. between 1993 and 2013 but averaged only 0.2% p.a. over the last ten years. While New Zealand's productivity growth has been weaker than expected over a long period of time, other factors contributing to GDP have been stronger than expected, which has broadly offset the impact of lower productivity on New Zealanders' incomes.

This paper provides a brief analysis of potential causes of the productivity slowdown to inform judgements about whether recent trends are likely to continue. It draws from the evidence that we are aware of, including insights from the Treasury Guest Lecture Series (TGLS) 'Productivity in a Changing World' theme, which we have hosted over the past year. It also draws on the New Zealand and global literature, although it isn't an exhaustive review. It explores both the global and the New Zealand context as, given the global nature of the slowdown, it is likely that common factors are playing out across countries. It looks for evidence of recent trends in productivity drivers, given that a credible suspect of the productivity slowdown must align with the timing of the slowdown.

A range of possible global drivers have been identified, including mismeasurement, weak investment, lower productivity benefits from innovation, the slowdown in trade and slowing dispersion of innovation and new practices across firms. However, there is debate around the drivers of the global productivity slowdown and uncertainty around how these are playing out in the New Zealand context. There appears to be no one factor driving New Zealand's productivity slowdown, but a range of drivers contributing to the trend. We are likely to have been affected by slowing productivity growth in the frontier economies, particularly in the generation and dispersion of innovation or new technologies. The slowdown in trade is likely to have exacerbated the challenge of generating productivity growth through enhanced international connections. Investment has been growing but not strongly enough for a sustained increase in New Zealand's capital to labour ratio.

Considering the evidence, the Treasury's view is that productivity growth is most likely to remain slow over the coming years. The potential challenges to productivity growth have also intensified in the global economy. People, business, and governments may feel less resilient in the wake of increasing uncertainty from geopolitical and climate risks, leading to reduced risk-taking and innovation. Declining school achievement trends are concerning for future productivity. There are productivity opportunities from new general-purpose technologies, such as Artificial Intelligence and 'green' technologies. However, their productivity potential is contested, and New Zealand may not be well-placed to successfully absorb new productivity-enhancing innovations given falling educational attainment, our relatively low managerial capability and low, albeit growing, levels of research and development (R&D).

The Treasury has been downgrading its productivity forecasts in its published economic forecasts since the middle of 2023. While the productivity outlook is uncertain, on balance, the evidence presented in this paper supports these forecast downgrades. The Treasury is still assuming an improvement in productivity growth over the next few years towards our long-run productivity growth assumption of 1% p.a. However, the recovery in productivity growth is slower, and productivity remains at lower levels, than previously forecast.

The longer-term outlook for productivity is more uncertain. The Treasury's 1% long-run productivity growth assumption is based on a 30-year moving average of productivity growth. Given recent productivity trends, 30 years may no longer be a reliable predictor of future productivity growth. Other countries have been lowering their long-run productivity growth assumptions to reflect averages over shorter time periods, putting more weight on recent lower productivity growth.

The Treasury will continue to update its productivity forecasts as new evidence emerges and will consider its long-term productivity growth assumption as part of its work for the next Long-Term Fiscal Statement (LTFS), to be released in late 2025. We welcome feedback on the ideas explored in this paper to help inform our forecasts and long-run projections. While the policy options for lifting New Zealand's productivity performance are beyond the scope of this paper, we also encourage additional research which would inform our ongoing advice on lifting New Zealand's productivity performance.

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The productivity slowdown: implications for the Treasury's forecasts and projections

Introduction

This paper explores recent trends in New Zealand's productivity performance, with a view to better understanding the productivity outlook.

What is productivity and why does it matter

Productivity is a measure of how much output is produced from a given quantity of inputs or *what you get for what you put in*. There are two main ways that economists measure productivity. Labour productivity measures how much output we get for the number of workers we have or the number of hours they work. Multifactor productivity (MFP) compares the level of output to both our labour and capital input. MFP can be interpreted as an indicator of technological change from advances in knowledge or improvements in management and production techniques. However, MFP cannot be measured directly – it is calculated as the gap between measures of outputs and inputs. Therefore, it will also include model misspecification, errors in the measurement of variables, adjustment costs and unobserved changes in capacity utilisation (New Zealand Productivity Commission (NZPC), 2023). While perhaps not as significant as for MFP, labour productivity can also have measurement errors.

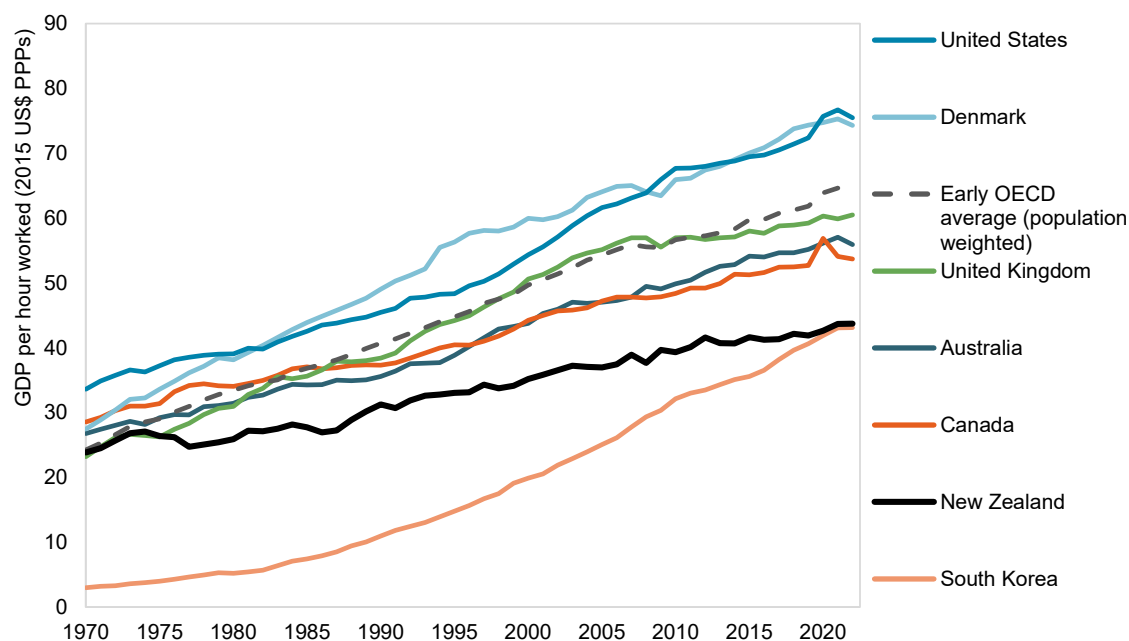
The long-term prosperity of New Zealand depends in large part on its productivity. Higher productivity means higher incomes, cheaper and better-quality goods and services, expanded choices across leisure and work, and, at a societal level, greater spending towards social and environmental goals. For workers, real wages tend to grow more rapidly when labour productivity growth is strong and are more likely to increase in high-productivity growth industries (McLiesh, 2022 and Janssen et al., 2022).

The Treasury also cares about productivity because it is a key driver of our economic and fiscal forecasts and our long-term fiscal projections, which underpin our advice about fiscal policy and fiscal sustainability.

Purpose of this paper

New Zealand's productivity growth performance has been poor over decades and the level of productivity is below that in many comparator countries (see Figure 1). The possible explanations have been well canvassed.¹ While they are inter-related, this paper is not focused on the long-standing gap in New Zealand's productivity performance but on understanding New Zealand's more recent productivity slowdown. In line with a global slowdown in productivity growth, New Zealand's productivity growth has been declining this century and has been particularly weak in the last ten years.

Figure 1: New Zealand's labour productivity has lagged other developed countries
GDP per hour worked, 2015 US Dollars Purchasing Power Parity (PPP)



Source: OECD Productivity database.

Notes: Early OECD countries are defined as those who joined the OECD prior to 1975. This includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. Ireland and Luxembourg joined the OECD before 1975 but are excluded as outliers due to GDP measurement.

Understanding what is behind this slowdown in productivity would help to inform whether these trends are likely to continue. This paper explores recent trends in the proximate drivers of productivity, including drawing from our recent Treasury Guest Lecture Series (TGLS) theme on "Productivity in a Changing World".² Given the purpose of this paper is to support the Treasury's forecasts, policy options for lifting New Zealand's productivity are beyond its scope. The Treasury's Briefing to the Incoming Finance Minister outlines the Treasury's strategic advice on the opportunities to lift productivity (The Treasury, 2023).

¹ Explanations for this poor performance vary, and include capital shallowness, macroeconomic imbalances, New Zealand's small market size and distance from other markets, and slow diffusion of productivity-enhancing change. These explanations are likely to be interrelated and a combination of these drivers is likely to be responsible for New Zealand's productivity performance. In addition to the wide range of Productivity Commission inquiries, see also: Nolan et al (2018), Conway (2018), OECD (2022), Janssen, Galt and Bollinger (2022) and OECD (2024).

² A list of the speakers so far in the seminar series can be found at the end of this paper.

Recent trends in productivity

This section looks at recent trends in productivity in both the global and the New Zealand context. The productivity measures in this section are for the total economy, rather than the measured sector as included in the Stats NZ productivity data.³

The global context

There has been a downward trend in global economic and productivity growth, with the slowdown starting in the early 2000s in advanced economies and after the Global Financial Crisis (GFC) in emerging market and developing economies (IMF, 2024).

At their Treasury Guest Lectures, Ayhan Kose and Franziska Ohnsorge from the World Bank highlighted that productivity and potential growth⁴ was slower in the last decade (2011-2021) than for the previous decade (Kose and Ohnsorge, 2023). The International Monetary Fund (IMF) estimate that a significant and broad-based slowdown in MFP growth accounted for around half of the decline in economic growth in advanced and emerging market economies (IMF, 2024).⁵

Productivity growth has been slowing across most of the Organisation for Economic Co-operation and Development (OECD) countries that New Zealand typically compares itself to. Labour productivity growth has been on a declining trend since the 1970s across the OECD and has weakened further since the turn of the century. Average OECD labour productivity growth was still close to 2% in the 1990s, before falling to around 0.8% from the 2000s (Andre and Gal, 2024). Michael Brennan, in a TGLS, highlighted that the last decade has seen the slowest productivity growth that Australia has experienced over the last 60 years. Figure 2 shows trends for selected OECD countries across recent growth cycles.

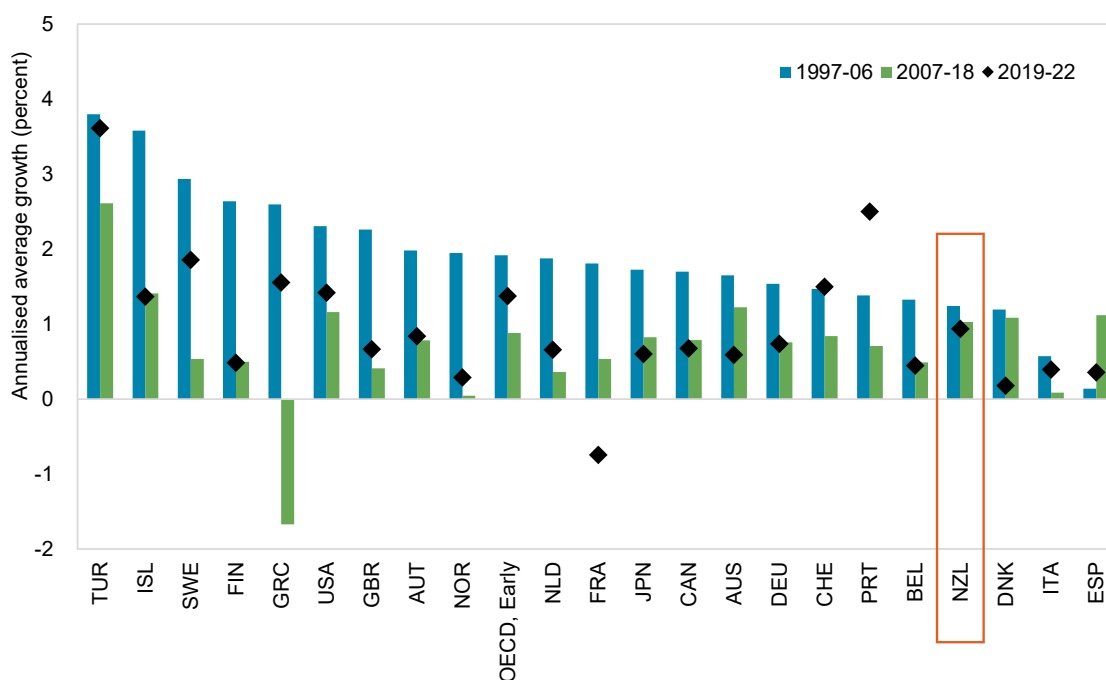
In the United States, labour productivity picked up from the mid-1990s to the mid-2000s, driven by the rising efficiency in Information and Communication Technologies (ICT) production and the diffusion of internet-related innovations. However, this rebound was relatively short-lived. Andre and Gal (2024) found that many other major OECD countries did not enjoy an ICT boost and productivity growth continued a downward trend. The long-term patterns are broadly similar for MFP growth.

³ The measured sector included in Stats New Zealand's standard productivity statistics covers all predominantly market industries. Total economy measures are used by the Organisation for Economic Co-operation and Development (OECD) for the purposes of international comparisons and by the Treasury in its economic forecasts. Other sections of this paper draw on the Stats NZ productivity data. Both series show a decline in labour and MFP productivity over the 2000s.

⁴ Potential output is an estimated value of the maximum rate at which an economy can grow without stimulating inflation.

⁵ The World Bank Database of Potential Growth includes 173 economies (37 advanced economies and 136 emerging market and developing economies) over 1981-2021. It uses the nine most used measures of potential growth. The IMF use firm level data sets (Bureau van Dijk Orbis; EU KLEMS database; Organisation for Economic Co-operation and Development) covering the period 2000-2019 for most countries in a sample of 15 advanced and 5 emerging market economies.

Figure 2: Labour productivity growth has been slowing across OECD countries
Labour productivity annualised growth, GDP per hour worked



Source: OECD Productivity Database. Replicated from Andre and Gal, 2024.

Note: Time ranges reflect productivity growth cycles. Productivity assessed over growth cycles is preferable to remove annual volatility. The time period of 2019-22 is not a 'full' cycle and as more data becomes available the cycles will be adjusted to capture COVID-19 effects (Stats NZ). As with Figure 1 above, early OECD countries are defined as those who joined the OECD prior to 1975, excluding Ireland and Luxembourg as outliers due to GDP measurement.

Trends in New Zealand productivity

While New Zealand saw a significant improvement in its productivity growth following economic reforms in the late 1980s, labour productivity growth has been slowing since before the Global Financial Crisis. It has fallen even further over the last decade. Productivity for the whole economy averaged 1.4% p.a. between 1993 and 2013 but averaged only 0.2% p.a. over the last ten years. There is some uncertainty around whether the experience of the last 10 years represents a new trend as it is a relatively short period over which to calculate trends.

The COVID pandemic has complicated the recent productivity picture. During the pandemic, GDP growth fell less than employment, implying higher labour productivity.⁶ This phenomenon was not unique to New Zealand; about two-thirds of OECD countries experienced higher average productivity growth during the pandemic (Andre and Gal, 2024). The reasons for the temporary boost to the measured level of labour productivity are unclear. NZPC (2023) suggests that firms may have been temporarily more productive as falling employment led to higher levels of capital per worker or that firms may have reduced the hours of the least productive staff first, increasing the average productivity of staff working. However, it could simply be measurement error. The unprecedented magnitude of quarterly movements in GDP and its composition will have created a greater than normal degree of measurement uncertainty.

⁶ See NZPC (2023) for an analysis of the productivity impact of COVID-19 across sectors.

The evidence had been building, prior to the COVID pandemic, that productivity growth was slowing. However, the volatility in the productivity data over the COVID period significantly increased uncertainty and delayed downward revisions to the Treasury's forecasts. As successive actual labour productivity outturns were lower than expected since the middle of 2023, it has become increasingly clear that labour productivity has returned to growth rates that are more consistent with the pre-COVID productivity slowdown.

In response to the weaker productivity data, the Treasury revised its productivity growth forecasts in its Half Year Economic and Fiscal Update (HYEFU) in December 2023. Recent data, including another weak quarter of GDP in September 2023, and accompanying downward revisions to GDP,⁷ revealed that productivity growth slowed earlier and faster than previously thought. The 2024 Budget Policy Statement (BPS) included a scenario of lower GDP growth, which included labour productivity levels around 2% lower than in the HYEFU (The Treasury, 2024). Figure 3 shows these downward revisions over time for both productivity growth rates and levels.⁸

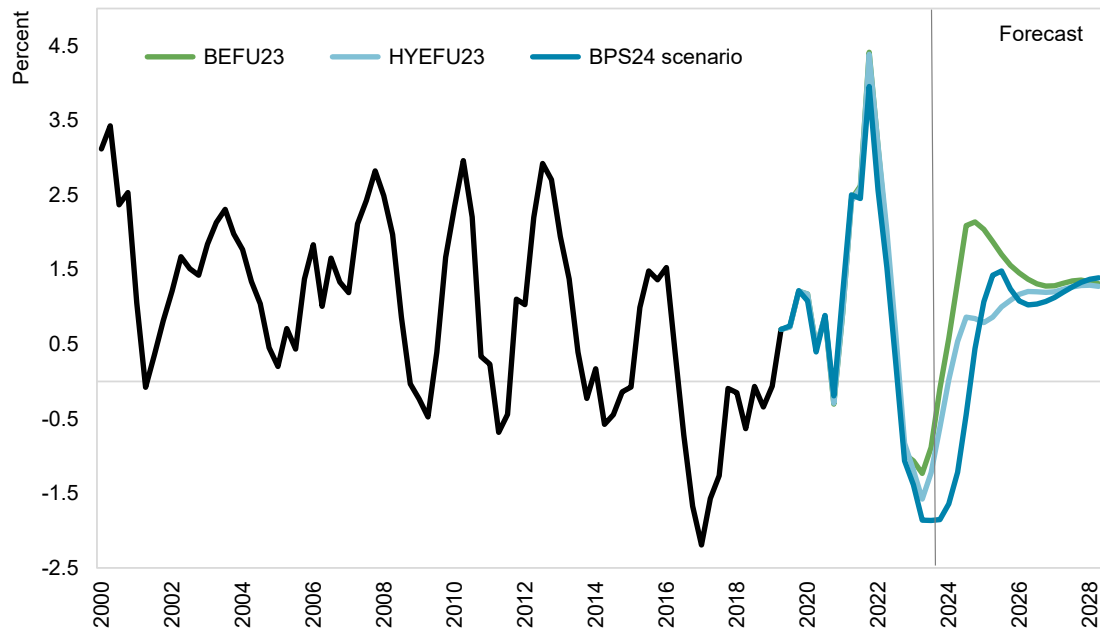
The Treasury's economic forecasts assume that labour productivity growth will trend towards the Treasury's long-term assumption of 1% p.a. However, the timing of the bounce back in labour productivity growth has been pushed out in each successive forecast round. Even though labour productivity growth is forecast to improve later in the forecast period, it is insufficient to offset the downward revisions in the early part of the period. This leaves the level of labour productivity lower across the forecast period in the BPS24 scenario than expected in BEFU23 and HYEFU23.⁹

⁷ Stats NZ frequently revises historical GDP figures, which can involve significant changes to the last three to four years of GDP history. The September 2023 downwards revisions were atypical in the sense that revisions to the real production measure of GDP have typically been on the upside in recent years. They were not particularly large compared to other revisions in recent years. However, they were much bigger than the only other recent negative revision in 2016, and the profile of the revisions flattened the GDP growth rates over the past couple of years.

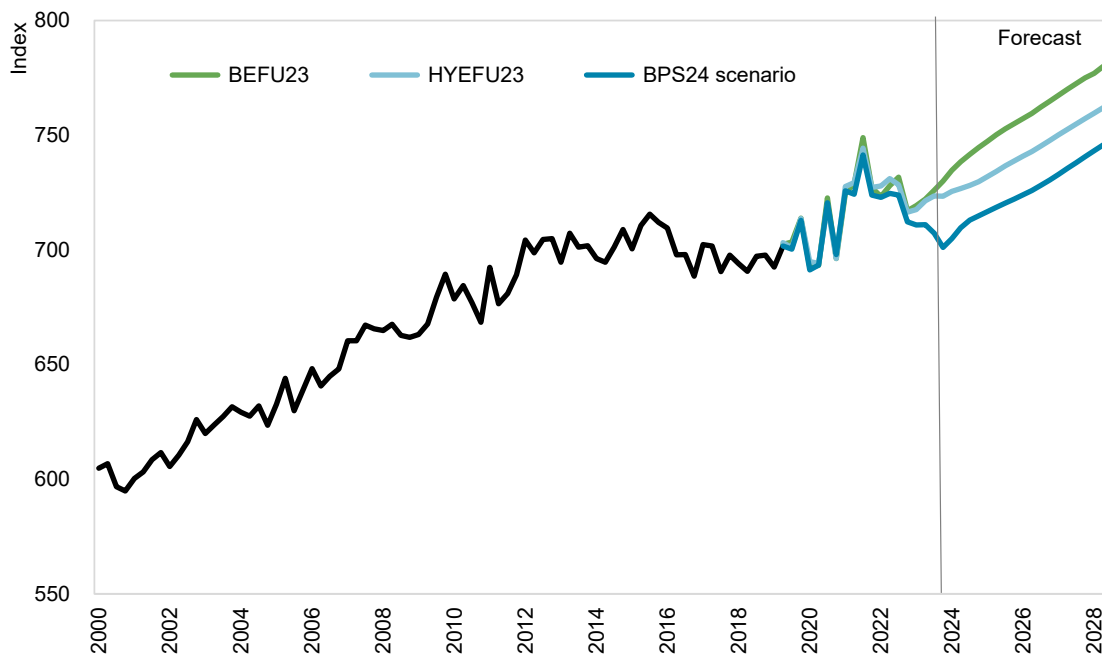
⁸ Note that the Treasury productivity numbers in Figure 4 differ from the Stats NZ official productivity forecasts as they are for the total economy rather than the measured economy. To derive a total economy productivity measure, the Treasury uses a labour measure based on employment from the Household Labour Force Survey (HLFS). This productivity measure suggests a sharper decline in labour productivity since 2012 than the Stats NZ measured sector productivity figures. However, this may partly reflect a methodological change when the HLFS was redesigned in 2016. The labour input series for the Stats NZ measured sector productivity use a range of employment data and so a direct comparison with the HLFS series is not possible. However, both the measured sector and total economy productivity figures suggest a declining trend in productivity post the Global Financial Crisis.

⁹ The forecast period includes the current year and next four years, e.g., the forecast period for HYEFU 23 covers 2024-28. Projections relate to longer-term time periods beyond the five-year forecast period and are based on long-run economic and fiscal assumptions.

Figure 3: The Treasury has been revising its productivity forecasts downwards in recent forecasting rounds and in a Budget Policy Statement scenario
Real GDP per hour worked (annual average growth)



Real GDP per hour worked (indexed)



Source: The Treasury.

Notes: BEFU23 = Budget Economic and Fiscal Update 2023; HYEFU23 = Half Year Economic and Fiscal Update 2023; BPS24 scenario = Budget Policy Statement 2024 scenario.

There is still significant uncertainty around productivity in the wake of the pandemic due to major data revisions and large swings in the GDP and productivity data. Economic and tax forecasts are inherently uncertain with many, often unpredictable, domestic and global forces affecting economic conditions. However, the recent productivity levels are more consistent with the weak productivity growth we had been seeing over the last couple of decades.

Long-term productivity growth assumption

The Treasury also makes assumptions about labour productivity growth in its fiscal projections for the Government’s Fiscal Strategy Report (FSR) and the Treasury’s long-term fiscal projections included in the Long-Term Fiscal Statement (LTFS).

Following a review in 2019, the Treasury uses a rolling 30-year average of productivity growth as its long-term labour productivity assumption (The Treasury, 2019), which is currently 1% p.a. However, the declining trend in labour productivity may mean that the 30-year average is no longer a reliable predictor of future trends. While labour productivity growth averaged 1% p.a. over the last 30 years, the 20-year average is 0.7% (see Figure 4).

Figure 4: Average labour productivity growth declines over shorter time-periods
Annual labour productivity growth (hours worked measure)



Source: Stats NZ

We see considerable benefits to retaining a long-term labour productivity growth assumption which is based on a long run rolling average. The 2019 review compared the previous judgement-based approach with the rolling horizon approach often used by agencies in other countries. A data-driven approach incorporates new data so that the trend shifts gradually over time, and it removes the role for discretionary judgement, with the associated uncertainty around how often to review the assumption (The Treasury, 2019).

However, given the trends discussed in this paper, there is a question around the appropriate period on which to base the long-run assumption. A 30-year horizon was selected in the 2019 review because it smooths out cyclical influences and was the longest period with consistent data for GDP and labour input (The Treasury, 2019). However, it may be down-playing medium-run productivity dynamics that could be relevant to productivity over the forecast horizon. It is important to balance the benefits of a heavier weighting on more recent trends with the risks that shorter time periods may reflect cyclical impacts.

Other countries have been reviewing productivity assumptions and shifting to a moving average over a shorter time-period for their long-term productivity assumptions.

For example:

- The Australian Treasury's 2023 Intergenerational Report (IGR) now assumes long-term labour productivity growth around the 20-year average of 1.2% p.a., down from the 30-year average of 1.5% p.a. used in the 2021 IGR (Australian Government, 2023). This reflects a judgement to place more weight on recent history to better reflect the recent headwinds to productivity growth.
- The United Kingdom Office of Budget Responsibility (OBR) revised its long-run productivity assumption down from 2% p.a. to 1.5% p.a. in its March 2020 Economic and Fiscal Outlook reflecting the data outturns and evidence at the time (OBR, 2022).
- The United States Congressional Budget Office (CBO) used a long-run labour productivity growth assumption of around 1.3% in its 2023 and 2024 Long-Term Budget Outlook publications, compared to a 1.5% assumption in the 2019 Outlook. The CBO has judged that projections for the next few decades should place greater weight on the slower growth of recent years than on the faster growth of the more distant past (CBO, 2023 and 2024).

The downward revisions to long-run productivity assumptions by other countries suggests that it might also be timely for the Treasury to reconsider its long-term productivity assumption. The arguments used in other countries for reducing their long-term productivity assumption also apply in New Zealand. The Treasury will consider its long-term productivity assumption as part of its work for the next LTFS, to be released in late 2025.

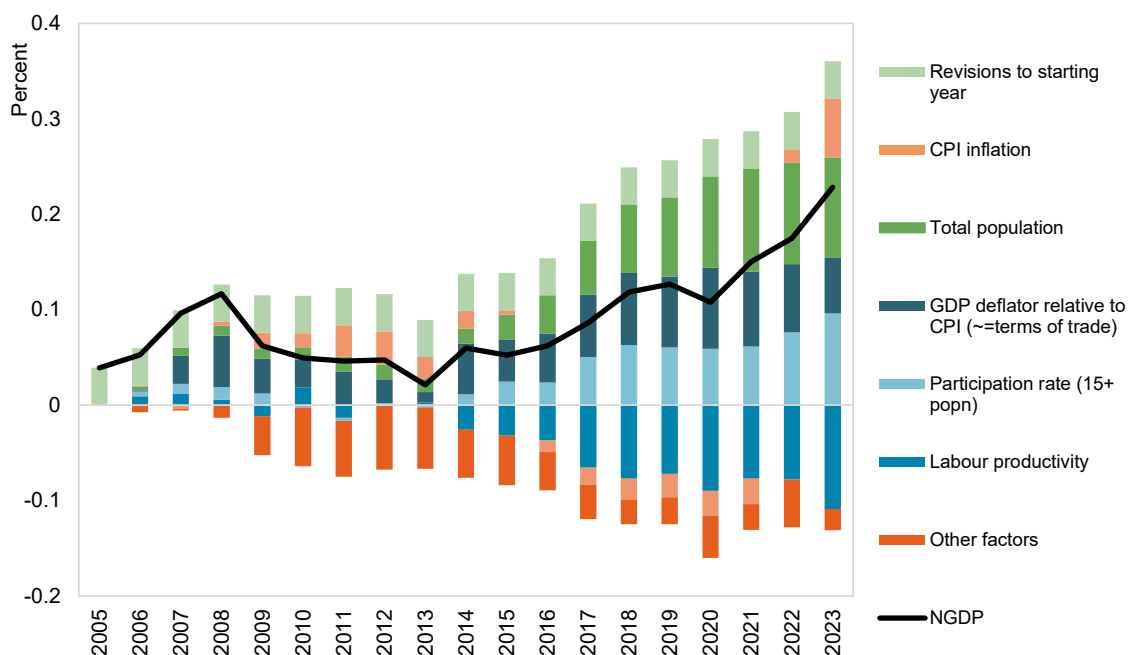
Trends in New Zealand incomes

The declining trends in productivity are concerning given the importance of productivity to New Zealand's long-run living standards. However, it is not the only driver of incomes. New Zealanders' incomes have been increasing more than would have been expected based solely on our productivity performance. While labour productivity growth has been disappointing over the past 10 to 20 years, other drivers of our nominal and real incomes have been stronger (Galt, 2023a).

Nominal Gross Domestic Product (GDP) is an important element of the Treasury’s economic forecasts and projections as it underpins tax revenue. Nominal GDP has tended to surprise on the upside. For example, nominal GDP in the year to June 2023 turned out 23% higher than was projected in the 2006 LTFS, even though labour productivity was 11% lower than projected. Figure 5 shows that the higher nominal GDP reflected a combination of higher-than-expected labour force participation, population growth, terms of trade and, more recently, inflation.¹⁰

Figure 5: Growth in nominal GDP has been surprising on the upside, despite disappointing productivity growth

Contributions to the difference between actual nominal GDP and the 2006 LTFS for each year



Source: The Treasury.

Note: The chart above breaks down nominal GDP (NGDP) growth into components by using the relationship: $NGDP = [Labour\ productivity] \times [Total\ hours\ worked] \times [GDP\ deflator] = [GDP\ per\ hour\ worked] \times [(Hours\ worked\ per\ employee) \times (Working\ age\ Labour\ Force\ Participation\ rate) \times (1 - (unemployment\ rate)) \times (Working\ age\ population / Total\ population) \times (Total\ population)] \times [(GDP\ deflator) / (Consumer\ price\ index) \times (Consumer\ price\ index)]$.

The series for “other factors” shown on the chart includes the impacts of the unemployment rate, hours worked per employee, and the working age share of the population, along with the effect of compounding between factors and other data residuals.

Rising labour force participation and increases in the terms of trade have roughly offset the impact of the shortfall in labour productivity growth on real per capita incomes. This has resulted in real per capita income being around the same as was projected in the 2006 LTFS (albeit with more of the population working than was projected). The population is around 10% larger than projected, leaving total real gross domestic income higher. Cumulative inflation has also been slightly higher than was expected, leaving nominal GDP higher still.

¹⁰ For a similar sort of vintage analysis applied to projections of NZS and the NZSF, see Section 11 of: <https://www.treasury.govt.nz/publications/wp/wp-21-01>.

These factors may have some relationship to productivity and perhaps partly explain our decline in productivity performance. Some reasons for a relationship could include:

- The labour force may have been absorbing lower-than-average productivity workers through the rising participation rate. New Zealand's labour market has been distinctive internationally, with its employment rate growing more than in comparable OECD countries (Galt, 2023a).
- New Zealand's rising terms of trade may reflect firms focussing on production in sectors where prices have been rising rather than industries with high-productivity growth in volume terms but falling prices (Galt, 2003a and Janssen et al., 2022). However, empirical analysis would be needed to identify the extent to which this is happening.
- The upside surprise to the population is likely due to higher-than-expected net migration.¹¹ The relationship between productivity and immigration is complex (NZPC, 2022). Whether migrants increase productivity depends on a range of factors, including the skills and connections of the migrants and how well they complement and integrate into our labour market.

There is more work to be done to better understand the inter-relationships between the different components of GDP. It is nominal GDP that ultimately underpins the Treasury's revenue forecasts. For example, even if labour participation did reduce productivity at the margin, it should boost nominal GDP and fiscal revenue overall. It is also likely to be positive for New Zealanders' wellbeing.

The Treasury recognises that we need to take an integrated approach to the forecasting of economic and fiscal variables to reflect these inter-relationships as much as possible, and to ensure that our forecasts and long-term projections are internally consistent.

¹¹ The 2004 LTFS used Stats NZ's 2004 medium population projections, which assumed annual net migration of 10,000. This was broadly accurate from 2005 to 2013, where net migration averaged 6,000 per year, composed of average net emigration of 31,000 New Zealand citizens and net immigration of 37,000 non-New Zealand citizens. Over 2014-2023, however, net migration averaged 47,500, composed of average net emigration of 6,000 New Zealand citizens and net immigration of 53,000 non-New Zealand citizens.

Investigating the slowdown suspects

In this section, we look at the various ‘proximate’ drivers of productivity to understand whether they may play a role in the productivity slowdown. We use the term ‘proximate’ to make a distinction with the so-called ‘fundamental’ drivers of productivity, such as incentives and preferences, some of which are more closely linked to policy settings.

The paper looks at both the global context and the New Zealand trends for each proximate driver.

The global context is important given that a wide range of countries have experienced a productivity slowdown. While it is possible that all these countries experienced the slowdown at roughly the same time for different reasons, the synchronised global collapse in productivity growth points to factors that have been experienced across countries (Goldin et al., 2024).

In understanding both the global and New Zealand context, our focus is on whether we see changes in the driver that might align with the timing of the slowdown. To be a suspect in the slowdown, negative changes in a productivity driver must pre-date, or at least coincide, with the slowdown. We also explore the potential outlook for each of the drivers to better understand whether New Zealand’s recent slowdown might continue.

We have not done a full quantitative analysis that would provide more understanding of the quantitative significance or scale of the different drivers for New Zealand. Nor is this an exhaustive review of the literature - we draw heavily from existing work by the Treasury and the New Zealand Productivity Commission (NZPC), as well as themes from our Treasury Guest Lecture Series on ‘Productivity in a Changing World’.

This paper is not seeking to be the definitive word and we recognise that there is uncertainty around both the causes of the slowdown and the outlook for the drivers. However, the available evidence does not provide a strong basis on which to expect productivity to accelerate in the near term. This assessment has informed the recent downward revisions to the Treasury’s productivity forecasts.

Education and skills

Education levels, skills, and talent are fundamental to economic development because more highly educated, skilled, and talented people tend to be more innovative and productive (NZPC, 2023). International evidence suggests that the availability of individuals with the appropriate types and levels of skills has a major impact on the efficiency and innovation of firms (NZPC, 2024).

Global context

Educational achievement has plateaued across a number of OECD countries over the last ten years or so.¹² While some commentators have identified this as a potential driver of the global slowdown, human capital still appears to be growing across many advanced countries (World Bank, 2021). Goldin et al. (2024) also summarises a number of studies that suggest a shift towards high-skilled employment across countries.

It is possible that there is a growing mismatch between the supply and demand of specific skills from rapid technological change, which could impact on productivity growth.

New Zealand trends

New Zealand's working age population has continued to become more qualified over the period of the productivity slowdown. Using the World Bank methodology, which is based on a sum of lifetime earnings depending on age and qualification, New Zealand's human capital has recorded strong growth since the 1990s (see Table 1). The stock of human capital has risen 127% and human capital per capita has increased by 48%. The key factors that explain this increase in human capital are changes in the age profile of the population, the mix of qualifications and the percentage of the population that is in the labour force (Galt, 2023b).

Table 1: New Zealand's human capital has been increasing over time
Aggregate value of New Zealand's human capital stock, 1986 to 2018 (2018 billion dollars)

Qualification level	1986	1991	1996	2001	2006	2013	2018	% of labour force ³
Low ¹	341.7	281.0	322.0	326.9	366.9	356.5	375.4	31%
Mid-level ²	412.1	476.4	516.5	525.0	619.9	689.2	820.0	42%
Bachelors	64.6	87.2	126.9	168.4	260.3	356.4	418.2	16%
Postgraduate	40.5	47.4	67.3	85.1	119.4	187.1	335.0	11%
Total	858.9	891.9	1032.8	1141.5	1366.4	1589.3	1948.4	100%
Growth rate p.a.		0.8%	3.0%	2.0%	3.7%	2.2%	4.2%	
Human capital per capita (\$000s, total population)	264.6	255.7	277.4	294.5	327.2	358.3	398.8	
Growth rate p.a.		0.7%	1.6%	1.2%	2.1%	1.3%	2.2%	

Source: Trinh Le estimates, published in Galt (2023b).

- Notes: 1. No qualifications and NCEA Level 1 or equivalent.
2. NCEA Level 2 and 3, and post-school non-degree qualifications.
3. Working age population aged 18-64.

These estimates of New Zealand's human capital are an assessment of the value of the human capital embodied in people in each year. They use the projected earnings profile for each level of education based on the level of labour market engagement and the incomes earned by older people with this level of education.

¹² See: [Summary | PISA 2022 results \(oecd.org\)](#)

Despite these aggregate figures, businesses have a different assessment of the state of the labour market. Drawing from the Business Operations Survey, the Productivity Commission highlight that the balance of firms rating the skilled labour market as being good, compared to those who report it as being bad, has generally been declining over the last ten years (NZPC, 2024).

Even though the coverage of qualifications has expanded, it is possible that the underlying quality of education has declined. Te Tai Waiora, the Treasury's first wellbeing report, highlighted that New Zealand is one in a group of OECD countries in which the proficiency of our children in reading, science and mathematics has declined over the last 10 years, as measured by the OECD's Programme for International Student Assessment or PISA (The Treasury, 2022). While the decline has been over the last ten years or so, these cohorts will still only be a small share of the overall working age population, so seem unlikely to have had a significant impact on overall productivity as yet.

There are some indications that returns to education and skills (in the form of earnings and wages) are flattening out for those with higher than school qualifications (Maré, 2022). Further research is needed on what the underlying causes are, but wages typically have a long-run relationship with productivity.

It is possible that productivity is being impacted by increasing mis-matches between the qualifications and skills of individuals and the jobs they are in. In her TGLS presentation, Sholeh Manni highlighted that New Zealand has high levels of people in jobs that they are under-qualified for relative to other OECD countries. However, we lack evidence of whether this, and other types of skill mis-matches, are worsening over time.

Productivity outlook

While the cohorts with lower educational achievement may still be a relatively small share of the labour force, the declining school achievement trends are concerning for future productivity. Recent OECD research finds that a fall of 8 points in the average country score in mathematics, science and reading in the OECD's PISA tests of student achievement is associated with a *long-term* decline in aggregate productivity levels of 1% (Egert et al., 2023). The OCED (2024) suggests that the decline of almost 29 points in New Zealand's average PISA score between 2006 and 2018 will eventually reduce aggregate productivity levels by close to 4 percentage points.

There are also questions around the extent to which immigration will continue to be an important source of future human capital. While New Zealand emigrants tend to be more highly educated than the New Zealand resident population, we also attract high numbers of tertiary educated immigrants. Currently about 50% of tertiary educated people in New Zealand are recent or historical immigrants (Ali and Scott, 2023). However, there is uncertainty about the contribution of migration to future human capital. We are seeing growth in some lower-skilled temporary migration and there is uncertainty about outward migration patterns of skilled New Zealanders post-COVID. While not a new phenomenon, there are also lags in integrating the skills of migrants in the labour market (Carey, 2019).

Employment composition

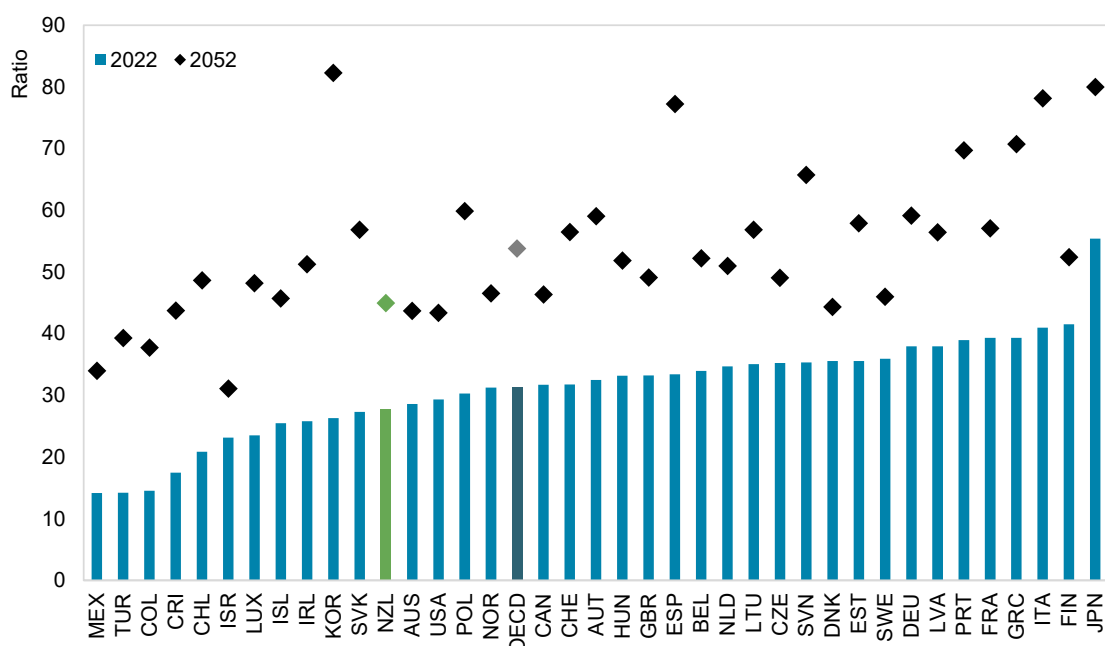
Linked to changes in education and skills, there may be other changes in the mix of the people in our workforce that might have implications for productivity.

Global context

There is a global debate about the potential role of population ageing on productivity. Populations in OECD countries are ageing rapidly, with the average old-age dependency ratio projected to rise from around 30% in 2020 to over 50% in 2050 and much steeper increases in some countries (see Figure 6).

As a global phenomenon, ageing has some attractiveness as an explanation for a cross-country productivity slowdown. However, Goldin et al. (2024) argues that there was not a marked change in ageing preceding the productivity slowdown, so it seems unlikely to be a contender for the current slowdown.

Figure 6: The old age dependency ratio will rise in all OECD countries
Proportion of population aged 65 and over



Source: OECD, Pensions at a Glance dataset. Replicated from Andre and Gal (2024).

Notes: The old age dependency ratio is defined as the number of individuals aged 65 and over per 100 people of working age, which is defined as those aged between 20 and 64.

The relationship between ageing and productivity is also ambiguous. Wages tend to have a 'hump' shape, peaking for middle age groups and declining for older age groups. If wages are assumed to reflect productivity, this could suggest that older workers have lower productivity. However, these 'humps' are capturing the workforce at a point in time rather than how earnings change for individuals over time, so reflect differences in skills and education across cohorts as well as age. Recent evidence from micro and macro studies do not suggest that older workers are less productive than prime-age workers. Indeed, microeconomic studies suggest benefits from more experience, as well as from leadership and mentoring contributions to teams (see OECD, 2020 and Andre and Gal, 2024).

There are potentially dynamic negative impacts if ageing reduces innovation, business creation and job transition; or if it shifts production towards lower-productivity sectors, like health care and leisure. Ageing could also have indirect negative effects if the associated fiscal pressures reduce the scope for productivity enhancing fiscal policy. On the flip side, adopting labour-saving and automation technologies, as well as higher savings and per capita investment could have positive impacts (Andre and Gal, 2024).

New Zealand trends

New Zealand's population is younger than many other OECD countries but our population is also ageing. We do see a 'hump shape' relationship between wages and productivity, with wages declining for older age groups. However, the hump disappears for people who have a bachelor's degree or higher,¹³ suggesting it may reflect the higher concentration of those with less qualifications in more physical occupations, where productivity is more likely to be related to age.

While the impact of ageing on productivity is ambiguous, we would expect it to impact on economic growth through reducing the size of the labour force, relative to the population, over time. This impact has so far been dampened by increased labour force participation of women and older workers. Increasing participation across OECD countries has partly offset a decrease in average hours worked to flatten out total hours worked. However, the increase in participation has been much sharper in New Zealand since around 1990, so that annual hours worked per head of the population have continued to increase (see Figure 7 and Galt, 2023a).¹⁴

This growth in participation raises the possibility that the labour market has been pulling in relatively lower-productivity workers, which may reduce average labour productivity. There is empirical evidence that periods of strong employment growth have had a cyclical negative impact on New Zealand's average measured productivity growth (Maré et al., 2015). However, these effects should wash out over economic cycles. Running counter to the theory that increasing participation has pulled down labour productivity over the medium to long-term, there is evidence that job growth over the last ten years has predominately been in higher-skilled occupations (Galt, 2023a).¹⁵ However, more research is needed to better understand the relationship between labour market participation and productivity.

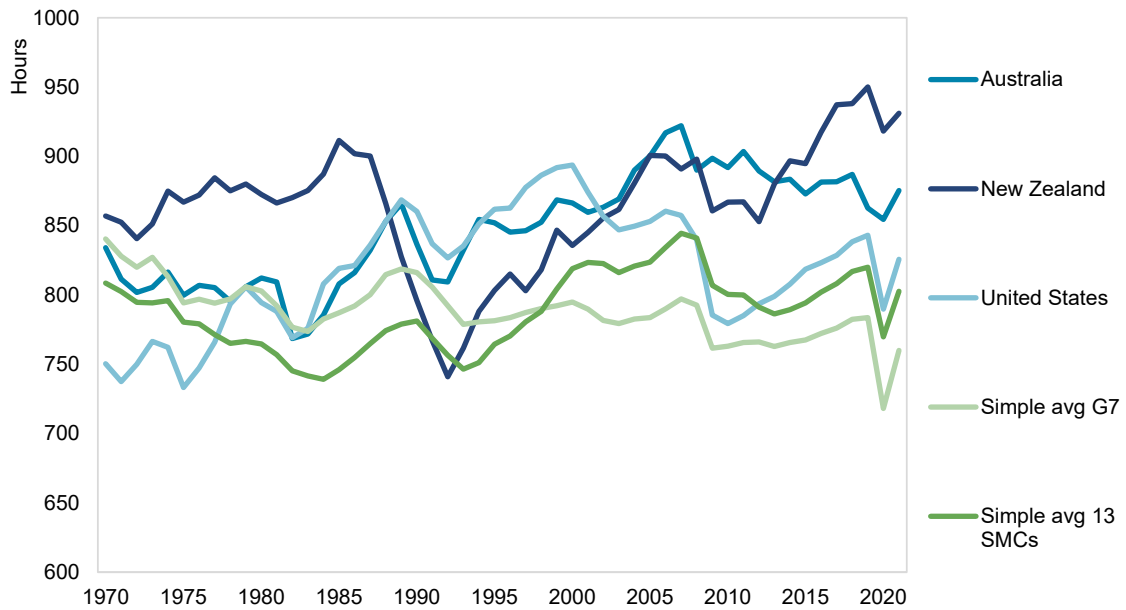
¹³ [06 - Beyond study | Education Counts](#)

¹⁴ Note that Janssen et al. (2022) found 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 this effect is not significant enough to restore New Zealand's past income relativities against high-income OECD comparators.

¹⁵ Around 70% of new jobs between 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 (Galt, 2023a).

Figure 7: New Zealand’s high labour force participation is driving continued increases in annual hours worked

Annual hours worked per head of total population



Source: OECD. Replicated from Galt (2023a).

Note: SMC= small and medium countries in the OECD. G7 = seven of the largest OECD economies.

Productivity outlook

Labour market participation is likely to continue to lift but at a slower rate as our population continues to age. We have already seen a large increase in the participation of 55 to 64-year-olds and that has probably largely run its course. However, the participation of New Zealanders aged 65 and over is still rising.

The long-term impact of increased participation, and of an ageing workforce, on our productivity is ambiguous. While the balance of evidence does not suggest that older workers are less productive, it is possible that older workers may be less adaptable to labour markets changes from emerging general-purpose technologies, such as Artificial Intelligence (see, for example, Cazzaniga et al., 2024).

Capital

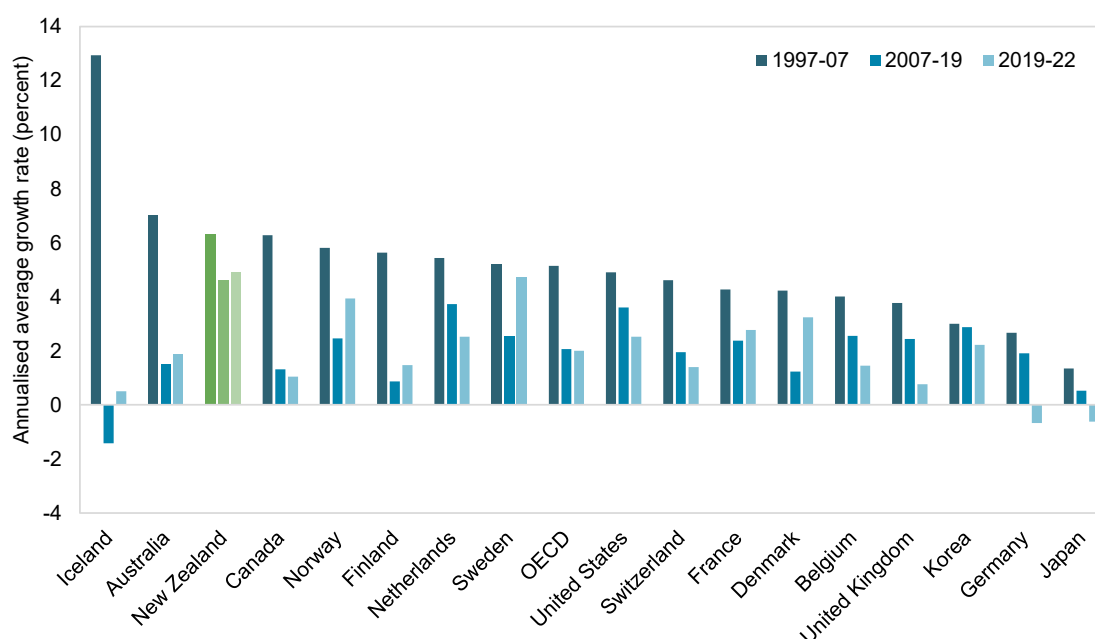
When workers have better access to capital, such as machinery, tools, or equipment, they can be more productive. Capital also impacts on MFP as new technologies are more productive than older ones and the introduction of new equipment is generally associated with improvements in production processes (Andre and Gal, 2024).

Global context

Figure 8 highlights that investment has been weak across many countries since the Global Financial Crisis (GFC) and it is often identified as a potential culprit for the global productivity slowdown (see Andre and Gal, 2024 and IMF, 2024). Lacklustre investment has been broad-based across sectors (Hanappi et al., 2023). While the decline may partly reflect the rise of intangibles,¹⁶ which are not fully captured in economic statistics, Andre and Gal (2024) conclude that weak investment may have worsened the labour productivity slowdown directly and may have contributed to the MFP slowdown indirectly through technology embodied in new capital goods and intangibles. Goldin et al. (2024) also found that a decline in the rate of capital deepening has contributed to the slowdown in a group of developed countries.¹⁷

Figure 8: Investment has been sluggish since the Global Financial Crisis across a number of OECD countries

Real business investment annualised growth



Source: OECD Economic Outlook 114 (November 2023). Replicated from Andre and Gal (2024).

The global decline in investment is partly cyclical due to financial constraints and weak aggregate demand after the GFC. However, Goldin et al. (2024) argues that the slowdown started before the crisis and structural factors may have been more important, including a change in the composition of capital toward intangibles (which are riskier), but also lower competition, increasing short termism, and the off shoring of physical investment in the context of increasingly global value chains. Jones (2021)

¹⁶ Intangible capital includes innovative property - which comprises R&D, mineral exploration, entertainment and artistic originals, new products/systems in financial services, design and other new products/systems, digitized information - like software and databases, and economic competencies – which covers advertising, market research, employer provided training, and organisational structure (Corrado, C. et al., 2021).

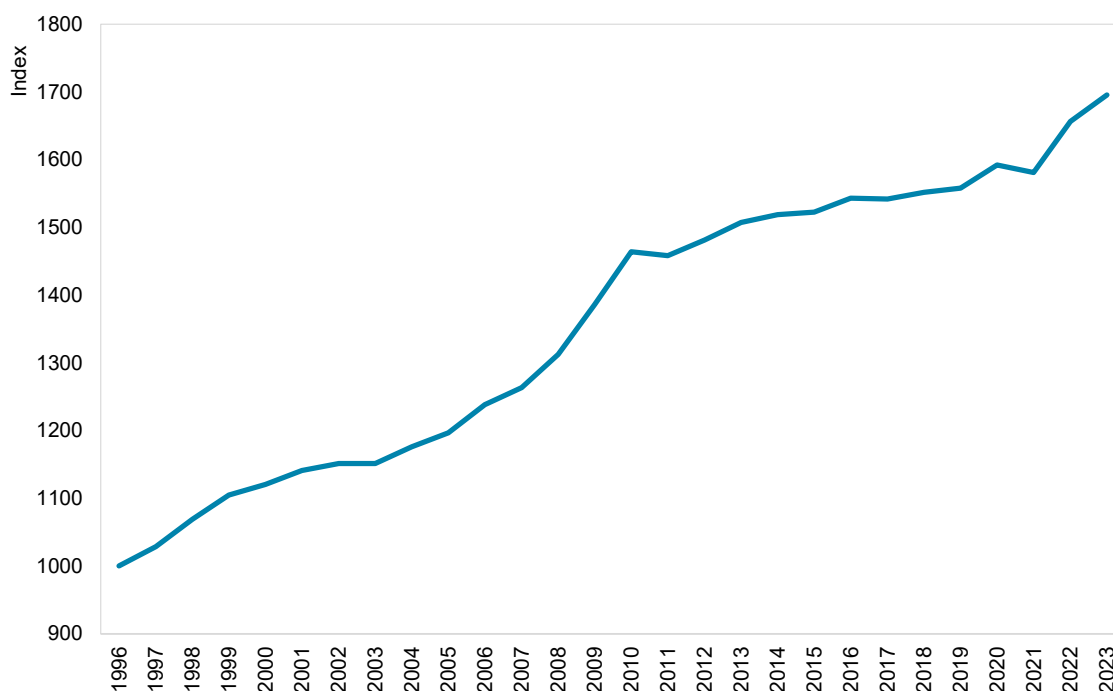
¹⁷ The study focuses on five countries: France, Germany, Japan, the United Kingdom and the United States of America.

points to indicators suggesting that increased risk aversion is dampening investment.¹⁸ Increasing risk aversion could stem from a range of factors including lingering insecurity stemming from severe crises in key parts of the global economy, international political uncertainty and ageing leading to increasing risk averse investors.

New Zealand trends

Figure 8 (above) highlights that New Zealand has experienced stronger growth in business investment in recent economic cycles, even after the GFC, compared to many other OECD countries. However, this growth has not been sufficient to keep pace with strong labour force participation, which has been reflected in the flattening of the capital-to-labour ratio in the last ten years or so (see Figure 9). The Productivity Commission (2023) argue that the failure of capital to grow in line (or indeed, above) labour has played a role in holding back New Zealand’s labour productivity since the GFC. Slowing labour productivity growth appears to reflect slowing growth in both MFP and the capital-to-labour ratio (see Figure 10).

Figure 9: The capital-labour ratio has flattened since the GFC
Capital labour ratio measured sector, Indexed 1000=1996

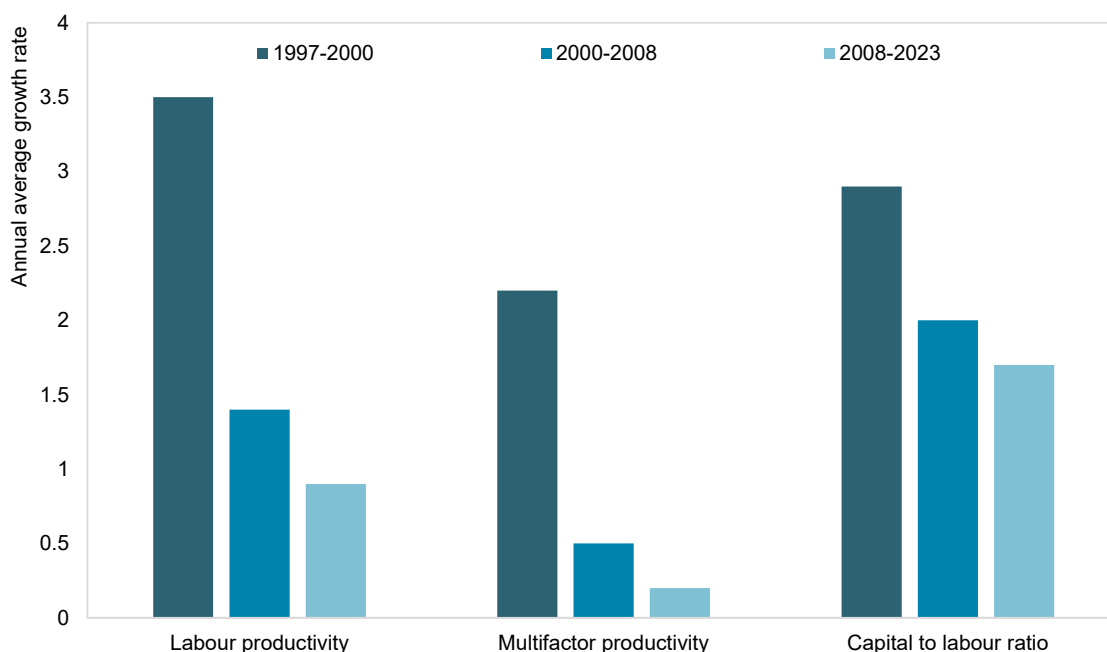


Source: Stats NZ Productivity Statistics 1978-2023 measured sector.

Note: This measure of the capital intensity of the measured sector differs to the total economy measure that is used in the Treasury’s forecasts.

¹⁸ Jones (2021) points to a persistent gap between low neutral interests and the return to capital investments, firms showing a preference for returning cash to shareholders over long-lived capital investment and unusually strong demand for safe assets.

**Figure 10: Growth has been slowing across labour productivity, MFP and capital intensity
Measured sector, indexes, annual average growth rates**



Source: Stats NZ Productivity Statistics, 1978-2023 measured sector.

Note: Labour productivity growth comprises growth in MFP and growth in the capital-to-labour ratio weighted by the capital factor share. Productivity statistics by growth cycle are published by Stats NZ defined between cycle peaks.

Productivity outlook

There has been a recent uptick in the capital-to-labour ratio (see Figure 9 above). The Treasury forecasts assume a rising capital-to-labour ratio over the economic forecast period, consistent with the assumed long-term productivity growth assumption of 1% p.a.

Over the medium-term, there is uncertainty around the future growth of physical capital. Some of the structural trends identified by Goldin et al (2024) may continue to play out, while geopolitical and climate pressures seen likely to intensify. Firms may feel less resilient, which may dampen investment and may also lead to reduced risk-taking and innovation.

Our physical infrastructure is particularly vulnerable to impacts from climate-related events and other natural hazards, which New Zealand is more exposed to than most high-income countries. Dirk Pilat, in his TGLS presentation, highlighted that climate change could increase the obsolescence of capital and destruction by natural disasters. Building resilience may come at the expense of productivity-enhancing investments (The Treasury, 2022). The large financing needs for the green transition and climate adaption may also constrain access to finance and further push up long-term interest rates (Andre and Gal, 2024). However, there may be unknown benefits from future innovation, including through innovations to support climate change mitigation and adaptation.

Dirk Pilat also highlighted the importance of looking at natural capital, alongside measures of physical capital (Pilat, 2024). Te Tai Waiora (The Treasury, 2022) suggests that New Zealand has run down aspects of natural capital in favour of building physical capital. In future, this trade-off may be less feasible, which may reduce the scope for future productivity-enhancing investments.

Innovation and technology

Innovation is perhaps the most fundamental determinant of productivity. It is the dynamic and uncertain process through which economic actors create new economic value by creating, adopting, and adapting knowledge into new or improved products and services, operational processes, organisational and managerial processes, and approaches to marketing (NZPC, 2023).

Global context

Innovation plays a leading role in the narrative around the global productivity slowdown. The productivity slowdown in the 1970s was often attributed to the exhaustion of the diffusion of innovations from the second industrial revolution. In a similar fashion, the current slowdown is often attributed to the fading of ICT-based productivity gains.

As highlighted by several of our TGLS speakers, there are diverse views about this issue from international economists. Indeed, the debate around the productivity slowdown is often presented as an argument between techno-optimists and techno-pessimists (Goldin et al., 2024).

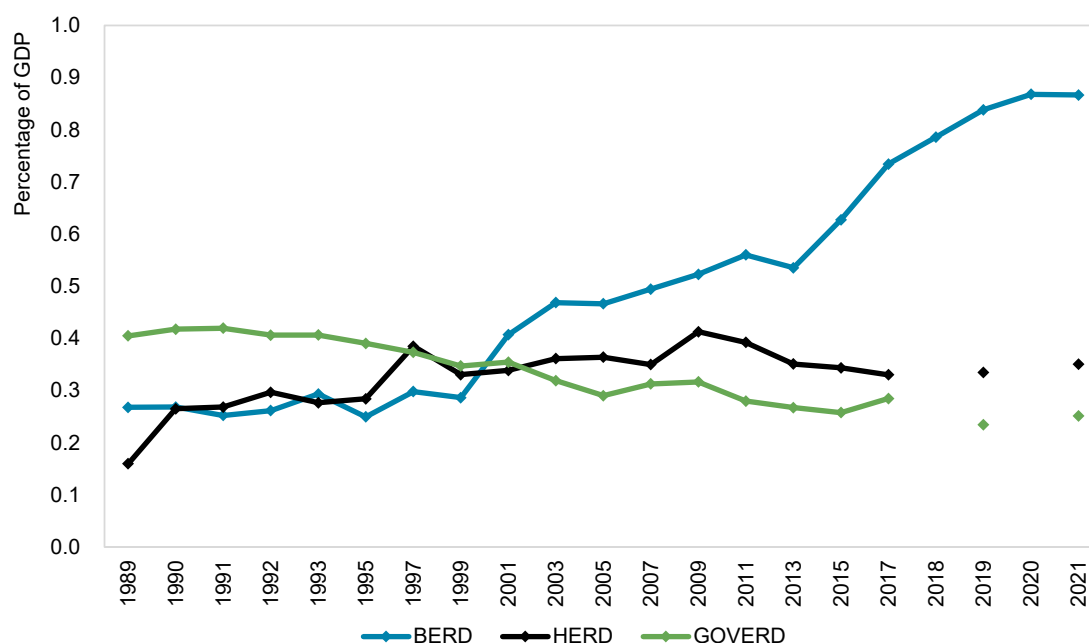
Techno-pessimists argue that big gains from general purpose innovations have run its course (Andre and Gal, 2024). Gordon (2016) argues that the technologies of the past 150 years have had such a profound impact that it is not surprising if current technologies are not able to produce the same impressive effects.

Techno-optimists argue that that the ICT and Artificial Intelligence (AI) revolutions are still in their infancy, and that it will take some time for their full potential to unfold (see, for example, Brynjolfsson et al., 2019). They suggest that recent labour productivity developments echo those of the second industrial revolution, in which phases of strong growth were interrupted by a prolonged slowdown, and that productivity enhancements related to general purpose technologies come in waves (for example, Brynjolfsson et al., 2021). This suggests a more optimistic outlook that the slowdown is temporary, as firms better understand and implement new technologies.

New Zealand trends

New Zealand's investments in R&D have been increasing, driven by business spending (see Figure 11), although our rates of business expenditure on R&D remain below most other OECD countries.

Figure 11: Business expenditure on research and development has been increasing
Expenditure on R&D as a percentage of GDP, 1989-2021



Source: OECD MSTI database.

Notes: BERD = Business expenditure on R&D. GOVERD = Government expenditure on R&D. HERD = Higher education expenditure on R&D.

New Zealand's increasing business R&D raises the prospect of productivity benefits. However, increasing spending on R&D does not necessarily translate into improvements in productivity. Andre and Gal (2024) argue that measures of innovation inputs, like R&D spending, are growing across countries but measures of innovation outputs, such as patents, are showing weaker growth. This might suggest that, as the body of collective knowledge accumulates, breakthrough ideas are becoming harder to find.¹⁹ We might be seeing a similar pattern in New Zealand, with little growth in intermediate innovation outputs, such as patents and research publications, despite the growth in R&D spending (NZPC, 2021).

Drawing from the Business Operation Survey, the Productivity Commission estimate that the product innovation rate for businesses with 100 or more employees has been trending down from 33% in 2007 to 27% in 2021 and from 27% to 22% for businesses with 50-99 employees. They did find some increase in the number of businesses introducing new operational processes between 2007 and 2021, but little change in the number introducing new organisation or managerial processes, perhaps reflecting the small size of many of New Zealand's firms (NZPC, 2024).

¹⁹ Bloom et al. (2020) provide a striking example that the number of researchers needed to double computer chip density every two years (Moore's law) is now more than 18 times higher than in the 1970s. The authors also bring further examples from the field of agriculture productivity and medical innovations.

Productivity outlook

Whatever happens to innovation in New Zealand, it is important to recognise that most new ideas originate elsewhere in the world. While we need to adapt that innovation to the New Zealand context, we will be significantly impacted by innovation trends in the world's technology leaders.

There are emerging technologies with potential to significantly transform the economy, including AI and other digital technologies, as well as biotechnology, genomics, robotics and new energy and climate technologies (see, for example Mokyr, 2014 and Pratt, 2015). As the debate between the techno-pessimists and optimists highlights, there is uncertainty around how these technologies will impact on productivity. In her TGLS presentation, Professor Beth Webster, highlighted that there are, for example, surprisingly few studies of the overall effect of digital technology on productivity.

There are also questions as to how well-placed New Zealand businesses will be to take advantage of these opportunities. In their TGLS presentations, Professor Webster, Professor David Teece and Michael Brennan highlighted that the ability to leverage innovation takes time, requires complementary investment and the ability to apply new ideas and process. David Teece emphasised the need for firms to have the dynamic capability to be constantly thinking about whether they are doing the right things in the right way.²⁰

It is not clear that New Zealand businesses have the managerial capability to leverage the benefits from recent technologies, with some evidence to suggest that managerial capability is lower than in other OECD countries (see, for example Green and Agarwal 2011, Sanderson, 2022 and Bloom et al., 2014). New Zealand may also be constrained in absorbing and exploiting new technologies by our levels of business R&D, which are still relatively low despite the recent increases. Investment in R&D is important not only to generate new ideas but also for firms to develop and maintain their broader capabilities to assimilate and exploit externally available information (Cohen and Levinthal, 1989).

New general-purpose technologies, such as AI, can also have significant labour market and distributional implications. These impacts are beyond the productivity focus of this report. However, reaping the productivity benefits of such technologies will depend on how workers adapt to changing skill demands and sector shifts (Cazzaniga et al., 2024).

²⁰ High-quality management, leadership and governance are important determinants of firm productivity, see for example, Bloom et al. (2019) and Bloom et al. (2017).

Business dynamism

Productivity can improve through the “laggards” catching-up or by more productive firms gaining more market share, including through the entry of new, more efficient companies into the market (Andre and Gal, 2023). Productivity performance could be undermined if these reallocation processes are not efficient in moving labour and capital towards the most productive firms.

Global context

There is evidence to suggest that productivity gaps between firms at the global frontier and those behind the frontier have been rising both between and within countries. Andre and Gal (2024) argue that, while there is churn at the frontier, and less productive firms do experience faster productivity growth on average, the speed of this catch-up has been slowing.

While this could reflect temporary lags in less productive firms adopting the latest technologies, increases in productivity dispersions might reflect an underlying decline in competition. Perhaps linked to the rise of intangibles, which might be more difficult to imitate or build on, there is a range of evidence that firm entry and exit rates have declined, and that pure profits and concentration have gone up (see Andre and Gal, 2024 and Goldin et al., 2024). There is debate around the extent to which superstar firms boost overall productivity from pushing the frontier forward or are just able to charge high markups from barriers to entry and limiting the diffusion of best practices to other firms (Goldin et al., 2024 and Andre and Gal, 2024). A recent IMF (2024) study found that there had been a reduction in the flow of capital and labour between 2000 and 2019 to the most productive firms in a sample of 15 advanced and emerging market economies, which could have been a drag on productivity growth.²¹

New Zealand trends

New Zealand has a strong enterprise culture: we have high levels of business start-up activity and robust rates of firm turnover relative to other OECD countries (NZPC, 2023). There does not appear to be a shortage of reallocation of resources in the New Zealand economy through this ‘churn’ (see Table 2).

However, New Zealand’s small domestic market tends to mean that relatively small numbers of firms supply a large share of the market, which may be inhibiting product market competition for some firms or sectors (Kidd, 2008). However, Maré and Fabling (2019) did not find statistically significant evidence of a relationship between competition and productivity over 2001 to 2016, which they attribute to the lack of pronounced change in competition over this period. While this may not be conclusive, it is one piece of evidence that suggests that worsening competition may not be significant driver of New Zealand’s productivity slowdown.

²¹ The median country in the sample experienced an average annual drag on MFP growth of about 0.9 percentage point from declining allocative efficiency. For the median advanced economy, this drag was 0.5 percentage points. Given that the median advanced economy saw MFP growth of only 0.5 percent during this period, this suggests that increased misallocation of capital and labour may have halved its MFP growth. A notable exception is the United States, where improvements in allocative efficiency helped to boost annual MFP growth by 0.8 percentage point over the period (IMF, 2024). Note that the sample did not include New Zealand.

The productivity distribution of New Zealand firms also appears relatively narrow and has been flat for a long period (see Figure 12). Research on MFP productivity gaps showed that, at both national and industry level, the difference has not significantly changed since 2001 (NZPC, 2021). Instead, the average growth rates of labour productivity have been very slow across the productivity distribution; and the productivity at the New Zealand frontier²² is less than 50% of the small-advanced-economies frontier, up to 2016, when data is available. Further firm and industry level analysis with the Stats NZ Longitudinal Business Database (LBD) would be needed to fully understand these business dynamism relationships further.

Table 2: Firm dynamics
Number of enterprises, enterprise births, and enterprise deaths

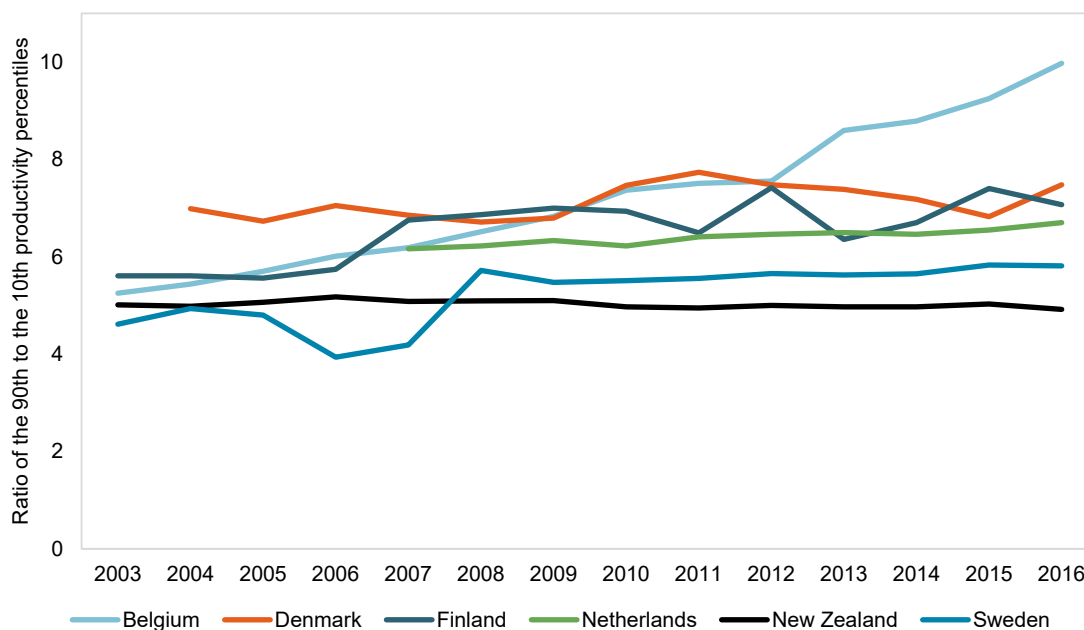
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Number of enterprises (thousands)	477.6	495.7	508.2	518.0	532.2	537.8	549.5	560.4	564.7	594.4	605.0
Enterprise births (thousands)	47.4	54.5	64.7	60.4	68.6	62.9	68.0	60.8	65.9	75.6	69.6
Enterprise birth rate	0.1	0.11	0.13	0.12	0.13	0.12	0.12	0.11	0.12	0.13	0.12
Enterprise deaths (thousands)	44.3	36.2	52.1	50.5	54.2	56.6	56.2	50.2	56.7	49.5	63.2
Enterprise death rate	0.09	0.07	0.1	0.1	0.1	0.11	0.1	0.09	0.1	0.08	0.1
Turnover rate	0.19	0.18	0.23	0.21	0.23	0.22	0.23	0.2	0.22	0.21	0.22

Source: Statistics New Zealand (2023), New Zealand Business Demography Statistics: At February 2023 (Information release)

Notes: Care must be taken when analysing the 2022 births and deaths data. In particular, deaths are highly provisional. The turnover rate is the sum of the enterprise birth rate and the enterprise death rate; due to rounding, turnover rate may not always equal the sum of the birth and death rates.

²² Frontier firms are the top 10% of firms with the highest productivity (NZPC, 2021).

Figure 12: The productivity dispersion of New Zealand firms has been relatively flat
Ratios of the 90th and 10th labour productivity percentiles, 2003-16



Source: CompNet data. Replicated from NZPC (2021).

Productivity outlook

In his Treasury Guest Lecture, Professor Syverson highlighted that there has been a recent improvement in measures of business dynamism, such as an increase in the number of new business registrations in the United States. While this is an encouraging sign, it is too early to assess whether this constitutes a turn in business dynamism (Andre and Gal, 2023). The stable relationship in New Zealand’s productivity dispersion does not currently support hopes of improved business dynamism as a source of growth for New Zealand.

Globalisation and trade

International trade and investment can support productivity through several channels. They support the flow of knowledge from overseas, help foster business relationships, provide access to finance and they support the import of technology embodied in new equipment (NZPC, 2023). Access to export markets spurs innovation by increasing market size and import competition can encourage incumbents to innovate, as well as providing access to higher-quality or cheaper capital goods (Andre and Gal, 2024).

Global context

The slowdown in productivity has coincided with the plateauing in international trade (Andre and Gal, 2024). While trade barriers were generally on a decreasing path throughout the 20th century, this trend has reversed over the past decade (Bolhius et al., 2023). Elements of globalisation, such as goods trade and cross-border capital flows have been growing more slowly. The pandemic and the Russia/Ukraine war exacerbated this trend further by closing borders, increasing concerns about economic security, and emphasising the importance of secure supply chains (Blackmore et al., 2023).

New Zealand trends

As a uniquely small and remote advanced economy, openness and global connectedness allows New Zealand to specialise in areas of comparative advantage and better achieve economies of scale. However, while our small size increases the importance of being internationally engaged, our economic distance from major markets raises the cost and challenges of stepping beyond our own border (NZPC, 2024). These barriers contribute to a relative lack of international engagement by New Zealand firms. New Zealand's international connectivity in terms of investment, trade, and absorption of ideas is relatively low and has seen little improvement this century.

New Zealand's export intensity remained relatively static at around 30% of GDP over the latter half of the 2000s, then drifted downwards over the 2010s before falling sharply to 22% in the face of the COVID-19 pandemic (NZPC, 2024). Imports have been similarly flat as a percent of GDP, while experiencing a drop over COVID, imports have rallied faster than exports since the pandemic. We have also seen little growth in New Zealand's stock of foreign direct investment (FDI), while our overseas direct investment (ODI) has been declining over recent decades (NZPC, 2023 and NZPC, 2024). While these aggregate export and investment values can be dominated by the activities of large firms or sectors, the share of New Zealand firms reporting export sales, FDI and ODI has remained largely unchanged since 2007 (NZPC, 2024). This static or declining integration in the world economy is likely to be an important part of New Zealand's productivity story.

Productivity outlook

As a small, open trading economy that has benefited substantially from the international rules-based order, New Zealand is particularly exposed to the impact of global fragmentation of the international trading system (Ministry of Foreign Affairs and Trade, 2023). A slowing of globalisation will pull down global growth and increase production costs (Blackmore et al., 2023).²³ Given we have not been part of global supply chains, we may not be as negatively impacted as some other small countries. However, heightened global tensions and geopolitical change may make it even more challenging for New Zealand to reap productivity benefits through enhanced international connections.

Sectoral composition

The mix of sectors in the economy matters as some sectors are more productive than others. This raises the question as to whether the recent decline in productivity performance is driven by declining productivity within sectors or whether industries with low productivity levels, or growth rates, are becoming larger.

Global context

The shift towards services in many developed countries has been identified as a potential factor in the global slowdown. Services tend to have lower labour productivity and their productivity is also harder to measure.²⁴

However, while there are some long-term secular trends, the literature offers little evidence that changes in sector mix explain weaker productivity over the relatively short time period of the slowdown (Goldin et al., 2024).²⁵ Instead the slowdown appears to be driven by a decline in productivity in at least some industries, with slowing productivity in manufacturing playing a substantive role in the five countries in the Goldin et al. (2024) study. In his Treasury Guest Lecture, Kevin Fox presented analysis identifying common factors driving the Australian slowdown across industries, suggesting it could not be explained by changes in industry shares (Fox, 2018).

²³ For example, an IMF (2023) scenario which assumes reshoring by the OECD and China, as well China 'friend-shoring' by both China and the OECD, suggests that for each percentage point of reshoring and friend-shoring, long-term global GDP losses are about 1.5 percent and 0.25 percent, respectively, while dialling back to 2000 levels translates into global GDP losses of 4.5 percent and 1.8 percent respectively.

²⁴ Services tend to have lower productivity because they are poorly suited to standardisation and because their quality often depends on the amount of human labour they involve (known as Baumol's disease). However, the services sector is diverse and cost disease does not affect all industries within the service sector.

²⁵ Goldin et al. (2024) found that reallocation across sectors does not play a significant role in the productivity slowdown in France, Japan, the United Kingdom, and the United States, although it does explain some of the German slowdown.

New Zealand trends

Comprehensive studies of the productivity impact of changes in the relative size of sectors are a little dated in New Zealand.²⁶ The most recent published study that we are aware of covers the 1978-2011 period (Laws and Meehan, 2015). It found that within-industry labour productivity growth was the much larger component of aggregate labour productivity growth, with changes in the labour input shares of sectors reducing labour productivity growth only slightly. Changes in sector shares made a more substantial negative contribution to labour productivity growth during the 1990s, reflecting the large changes in employment in industries that were undergoing significant reforms during this period (Meehan, 2014). The impact of changing sector composition was slightly positive between 2000 and 2008 (Laws and Meehan, 2015).

Understanding the role that changes in sector shares has played in the recent productivity slowdown would require an updating of this type of 'shift-share' analysis. It is likely that within-in industry productivity trends have played the most significant role, but it is possible that ongoing changes in the structure of the economy have had some impact. Employment data suggests that New Zealand made the transition to services earlier than other high-income countries (Janssen et al., 2022). However, services do continue to grow as a share of the economy and the relatively high productivity growth primary sector has been gradually declining from 8.8% of GDP in 2000 to 5.7% in 2023 (NZPC, 2023).²⁷ The primary sector is diverse, and it is not possible to fully understand the productivity impact without a more recent 'shift-share' analysis.

Linked to the service sector growth,²⁸ New Zealand's non-tradeable sector and tradeable sectors have been growing roughly in tandem (see Figure 13). However, there was a drop in the tradeable sector around the GFC. While the tradeable sector continued a similar growth trajectory thereafter, it was left as a smaller proportion of per capita real GDP than before the GFC. This might impact on productivity as the tradeable sector tends to have a higher level of labour productivity (Bailey and Ford, 2018).²⁹ However, the impact of this drop on New Zealand incomes has at least been partly mitigated by improving returns from our tradeable sector via our strong terms of trade. This reinforces the value of considering trends in our incomes alongside trends in our productivity.

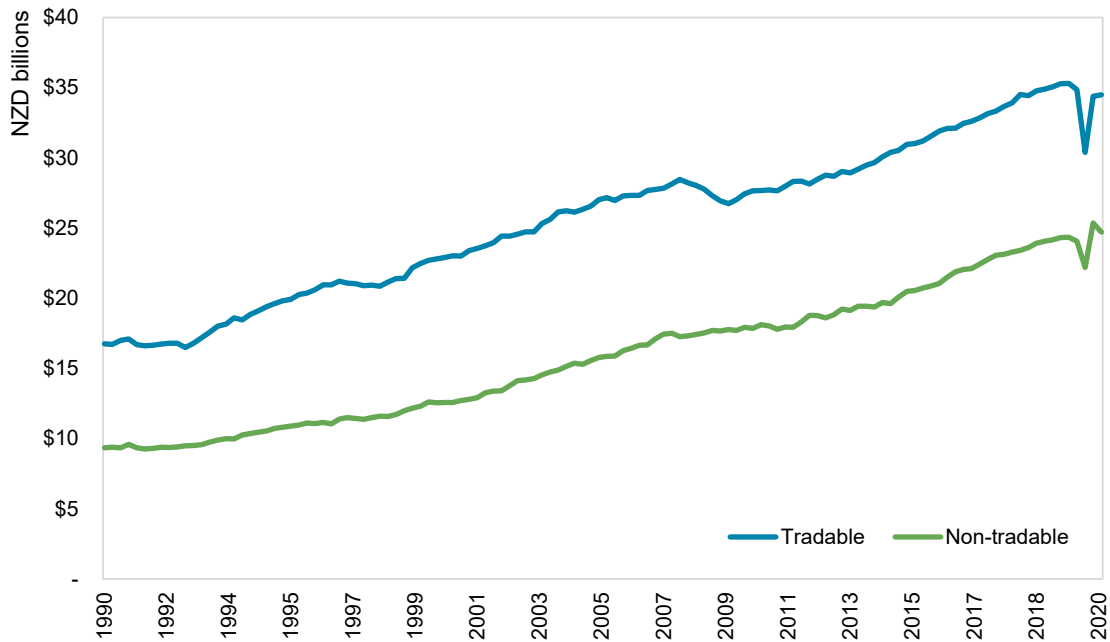
²⁶ These studies are typically called shift-share analysis. They decompose aggregate labour productivity growth into a contribution from within industry productivity growth and a contribution from employment movements across industries with differing labour productivity levels.

²⁷ See <https://www.stats.govt.nz/information-releases/productivity-statistics-1978-2023>.

²⁸ Some industries in the services sector are classified as tradeable and so the non-tradeable sector does not correspond to the services sector.

²⁹ The Bailey and Ford (2018) analysis finds that the tradeable sector has underperformed relative to the non-tradeable sector for at least the past decade and this finding is robust at different thresholds for the definition of the tradeable sector.

Figure 13: After a drop around the Global Financial Crisis, the tradeable sector has been growing in tandem with the non-tradeable sector
Quarterly, 2009/10 \$NZD billions



Source: Stats NZ.

Productivity outlook

There is a lot of diversity in productivity performance within these broad sectors. A more detailed analysis by industry would be needed to understand the impact of these sector shifts on productivity and the implication for New Zealand’s productivity outlook.

While a bit dated, the evidence we do have suggests that drivers of within industry productivity will be more important. To the extent that sector shifts do influence future productivity, they are more likely to be a drag on future performance than a source of renewed growth. Geopolitical challenges may weigh against income and productivity uplifts from the tradeable sector (see Globalisation and Trade section). Continued growth in dairy and shifts into other higher productivity land uses like horticulture may be constrained by water availability, the physical impacts of climate change and other biophysical factors. However, there is some scope for productivity enhancement in farming from agritech, including gene editing (Agritech New Zealand, 2020).

Measurement

There are always challenges in measuring productivity, across the different components of outputs, inputs, and deflators. However, measurement can only be a factor in explaining the productivity slowdown if there is an increasing downwards bias to productivity measures that coincide with the slowdown.

The increased digitalisation of goods and services may have led to an increasing under-estimation of GDP and productivity over time.³⁰ The emerging evidence in the global debate suggests that increasing measurement biases have caused a decline in measured productivity growth but are not large enough to fully explain the slowdown (see, for example, Goldin et al., 2024, Andre and Gal, 2024, Fox, 2018 and Syverson, 2017). This is also consistent with New Zealand studies (see Pells, 2018).

In his Treasury Guest Lecture, Professor Syverson highlighted that digitalisation can lead to both an under- and over-estimation of productivity. Productivity is under-stated when the intangible capital is first being built, as it is an unmeasured output. It is then over-estimated when that capital is used as an (unmeasured) input to produce outputs, leading to a J-curve impact on productivity. Computer intangibles appear to have had this J-curve effect, which lasted from about the mid-1990s to the mid-2010s (Brynjolfsson et al., 2021). However, Professor Syverson argued that AI investments were too small five years ago to explain the current productivity slowdown and that other general-purpose technologies also do not appear to be responsible.

It is possible that investments in AI could have a downward impact on measured global productivity growth in the years to come because of this J-curve process. This impact could last several years before we see the J-curve upswing as firms are able to translate investments into new or improved products and processes. There is significant uncertainty about how significant this impact might be and the impact in New Zealand will depend on our uptake of AI (see Innovation and technology section).

³⁰ Examples include the rise of streaming services, online tools that allow more and more households to provide services to themselves that used to be produced by private companies and rapid increases in computer processing and internet download speeds, which can make it difficult to measure the value of the services they provide over time (NZPC, 2023).

Overall implications for the Treasury forecasts

Table 3 provides a high-level summary of this paper's review of the potential drivers of the global and New Zealand productivity slowdown.

A range of global drivers have been identified including mismeasurement, a decline in the contribution of capital per worker, lower productivity benefits from innovation, the slowdown in trade, and less business dynamism. Sectoral reallocation and a lower contribution of human capital may also have played a role in some countries (Goldin et al., 2024).

There is debate around the global drivers and they may play out differently in the New Zealand context. However, we are likely to have been affected by slowing productivity growth in the frontier economies, particularly in the generation and dispersion of innovation or new technologies. The slowdown in trade is also likely to have exacerbated the challenge of generating productivity growth through enhanced international connections. Investment has been growing but not strongly enough for a sustained increase in New Zealand's capital to labour ratio.

What about the outlook for productivity? In broad terms, New Zealand's future productivity growth is driven by progress at the global productivity frontier, combined with how well-placed New Zealand is to benefit from improvements in the productivity of the advanced or frontier economies.

There are opportunities and challenges for global productivity growth. In the short-term, there is still significant uncertainty around productivity in the wake of the pandemic. In the medium to longer-term, progress in new general-purpose technologies, such as AI and green technologies, create opportunities to enhance productivity (Andre and Gal, 2024). However, the potential challenges to productivity growth have also intensified, including increased uncertainty related to geopolitical and climate risks (Kose and Ohnsorge, 2023). Dirk Pilat highlighted the range of mechanisms through which climate change could negatively impact on productivity in his TGLS, including through reducing agricultural yields, the obsolescence of capital, impacts on natural and human capital, and impacts on innovation.³¹ On balance, looking across the drivers, the challenges seem to outweigh the opportunities. The IMF (2024) are forecasting a continued reduction in the contribution of MFP to global economic growth from the 2000 to 2019 average of 1.0 percentage points to 0.9 percentage points by 2030.³²

³¹ See Pilat (2024) for more analysis of the inter-relationships between climate change and productivity.

³² The IMF (2024) identify factors such as the increasing difficulty of generating new ideas, slower growth of research employment, a plateau in educational attainment, and a slower catch-up process. However, they acknowledge that major technological advances, particularly in AI, could increase MFP growth substantially.

New Zealand may see some convergence towards the productivity frontier. However, there is not a strong basis on which to expect significant convergence given our recent productivity trends and weak international connections. Indeed, it may be that the recent stagnation of New Zealand's productivity growth partly reflects a fizzling out of the productivity boost from significant economic reforms in the 1980s and 1990s.³³ Table 3 highlights that it is difficult to identify a productivity driver that would deliver a step change in our productivity. Both human and physical capital, as well as New Zealand's international connections, face further headwinds. While within-industry productivity trends are likely to be more important, trends towards lower-productivity services and non-tradeables seem unlikely to reverse. In addition, New Zealand has relatively low, albeit increasing, R&D and weak managerial capability, which could limit our ability to take advantage of new technological opportunities. Declining educational achievement could also make frontier technology harder to absorb.

This evidence has supported the recent downward revision to the Treasury's productivity forecasts. The Treasury will continue to update its productivity forecasts as new evidence emerges and will also consider its long-run productivity assumption as part of its work for the next LTFS.

Unfortunately, this outlook suggests that New Zealand will continue to have a significant gap in our productivity levels compared to other OECD countries. The policy implications of reversing New Zealand's productivity slowdown, and closing our perennial productivity gap, is beyond the scope of this paper. The Treasury's Briefing to the Incoming Finance Minister outlines the Treasury's strategic advice on the opportunities to lift productivity (The Treasury, 2023). Others have also outlined proposals for improving productivity (see, for example, Conway, 2018). However, understanding how to strengthen New Zealand's productivity remains an important challenge for New Zealand's researchers and policy advisors.

³³ Our understanding of the current consensus in the literature is that the evidence does not support absolute convergence in cross-country per capita incomes and there is significant country heterogeneity. For example, Johnson and Papageorgiou (2020) highlight that much of the wave of growth in many less developed and emerging markets in the last couple of decades have been the result of removing inefficiencies, especially in governance and in political institutions. While these are not unimportant, they are one-off level effects and do not stimulate ongoing economic growth. See also The Treasury (2019).

Table 3: Summary of potential drivers of the productivity slowdown

	Global context	New Zealand trends	Outlook
Education and skills	The plateauing of educational achievement may play some role in the global slowdown, but human capital still seems to be increasing across many advanced economies.	New Zealand's human capital has continued to increase steadily over time, suggesting it is not likely to be a significant driver of our slowdown.	Human capital faces future headwinds from declining educational achievement, and risks to the positive bias in our migration skill-mix.
Employment composition	There is a debate about whether an ageing population may explain the productivity slowdown.	A drag from high labour force participation on labour productivity may be more cyclical than structural.	The impact of longer-term factors, such as population ageing, are ambiguous.
Capital	Weak global investment is frequently identified as a direct driver of the labour productivity slowdown; and an indirect driver of the MFP slowdown because of embodied technology.	Investment in New Zealand has not been growing fast enough to improve our capital-to-labour ratio.	There is significant uncertainty but many of the factors dampening investment, such as geopolitical uncertainty or climate-related pressures, will continue or intensify.
Innovation and technology	While a strong contender for the global slowdown, there are diverse views as to the potential for future productivity gains from new general-purpose technologies.	The story from our measures of domestic innovation is mixed. However, New Zealand is a technology adopter, so global trends will impact us.	There is significant potential from advancements in general-purpose technologies, but it is unclear whether New Zealand has the capability to leverage these benefits.
Business dynamism and misallocation	There is considerable disagreement on trends in business dynamism and on the consequences for productivity.	The dispersion of productivity performance between New Zealand's low and high-productivity firms does not seem to have been increasing.	Improved business dynamism seems unlikely to be a source of a significant uplift in productivity growth.
Globalisation and trade	The slowdown in productivity has coincided with the plateauing in international trade.	New Zealand's export intensity or foreign direct investment have not improved over the past two decades.	The challenging geopolitical context is likely to make it difficult for New Zealand to strengthen its productivity through enhancing its international connections.
Sectoral composition	While changes in the composition of the economy feature in the international debate, the emerging consensus seems to be that it is not a significant factor.	Declines in the size of the primary and tradeable sectors, relative to the lower productivity service and non-tradeable sectors, may have been a small drag on productivity but we need more analysis.	Trends towards lower-productivity services and non-tradeables seem unlikely to reverse. However, within-industry productivity trends are likely to be more important.
Measurement	The rise of intangibles, including increasing digitalisation, is a potential reason for the under-estimation of output and productivity.	Studies conclude mismeasurement is a factor but is unlikely to explain the bulk of recent weak productivity in New Zealand (or globally).	Mismeasurement could decrease or increase future productivity.

List of Treasury Guest Lectures in the Productivity in a Changing World theme

Speaker	Topic
Ayhan Kose and Franziska Ohnsorge, World Bank	Falling long-term growth prospects: trends, expectations, and policies
Professor Chad Syverson, University of Chicago Booth School of Business	Productivity in a changing world: challenges and opportunities
Professor Jonatan Pinkse, Manchester University / Productivity Institute UK	Towards a net zero economy while improving productivity: pipe dream or realistic outlook?
Philip Stevens, New Zealand Productivity Commission and Matthew Galt, The Treasury	Reviewing the drivers of New Zealand's productivity and income growth and implications for the future
Michael Brennan, Australian Productivity Commission	Advancing prosperity through faster productivity growth
Professor David Teece, Berkeley's Hass School of Business, University of California	Conversation with Professor David Teece: recent developments in the dynamic capabilities approach and their implications for public management and private sector innovation
Dr Dirk Pilat, Productivity Institute, United Kingdom	Climate change, productivity, and innovation
Professor Kevin Fox, University of New South Wales	What do we know about the productivity slowdown? Exploring different industry experiences
Professor Kevin Fox, University of New South Wales	Impacts of public R&D funding on innovation and productivity
Professor Valentin Zelenyuk, University of Queensland	The performance of public hospitals and activity-based funding reform: the case of Queensland, Australia
Professor Beth Webster, Swinburne University	Impact of digital innovation on new products, processes, and competition
Dr Sergey Paltsev, Massachusetts Institute of Technology	Role of hydrogen in low-carbon energy transition
Professor Sholeh Maani, University of Auckland	Productivity and skills – progress and policy learnings from five generations of research
Professor Davud Rostam-Afschar, University of Mannheim	Productivity in a changing world – insights from product and labour markets
Rui C. Mano, International Monetary Fund	The International Monetary Fund's latest World Economic Outlook – insights for New Zealand
Professor Cass Sunstein, Harvard University	Nudges: past, present, future

This is the list of the seminars at the time this report was finalised, but the TGLS 'Productivity in a Changing World' theme had not yet finished. We will be publishing a summary of the seminars from this theme after it closes in June 2024.

Details of all the lectures, abstracts, speakers' presentations and sessions' recordings can be found on the Treasury website: [Guest lectures | The Treasury New Zealand](#).

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