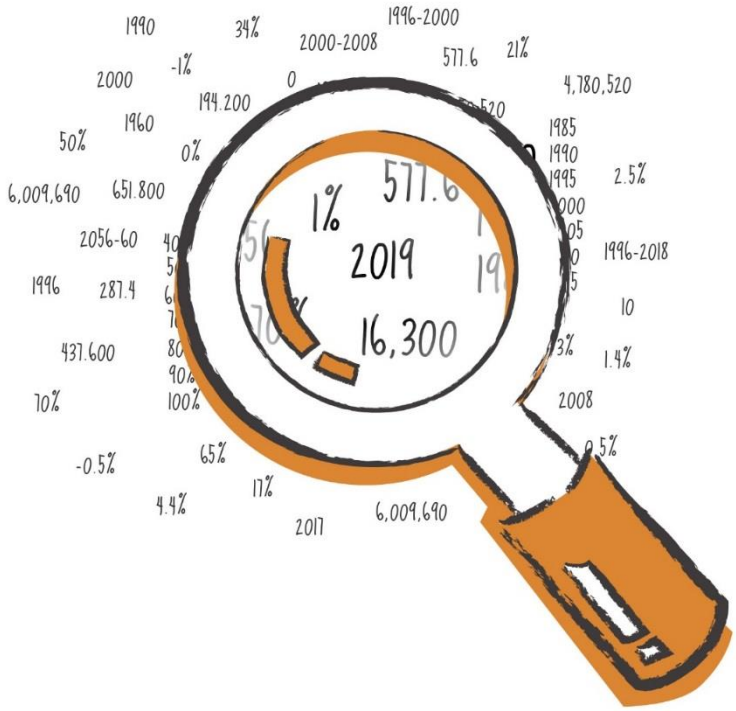
NEW ZEALAND
PRODUCTIVITY COMMISSION
Te Kōmihana Whai Hua o Aotearoa

Productivity by the numbers: 2019



Research Paper 2019/2

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Productivity by the numbers: 2019

The New Zealand Productivity Commission

Te Kōmihana Whai Hua o Aotearoa[1]

The Commission – an independent Crown entity – completes in-depth inquiry reports on topics selected by the Government, carries out productivity-related research, and promotes understanding of productivity issues. The Commission aims to provide insightful, well-informed and accessible advice that leads to the best possible improvement in the wellbeing of New Zealanders. The New Zealand Productivity Commission Act 2010 guides and binds the Commission.

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[1] The Commission that pursues abundance for New Zealand

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Summary

This report shows New Zealand's productivity performance at the level of the total economy, sectors, and individual industries. It illustrates trends in New Zealand's productivity performance through time and compared to other OECD countries. It presents figures on business dynamics and the use of inputs such as labour and capital.

The big picture

- Stats NZ's data for labour productivity in the measured sector go back to 1996 and since this date productivity growth has averaged 1.4%. In the 10 years since the Global Financial Crisis labour productivity growth has slowed, with the average annual labour productivity in the measured sector being 1.0% between 2008 and 2018.
- To illustrate the consequences of lower productivity growth, if the recent slowdown was to become permanent and New Zealand continued to achieve 1.0% productivity growth across the total economy (rather than 1.5% as assumed in the Treasury's long-term fiscal model), then by 2059-60 real GDP would be around 18% smaller than otherwise. This is equivalent to $16,300 per person (in constant 2009/10 dollars).

Benchmarking performance

- New Zealand's GDP per capita is 30% below the average of the top half of the OECD. Aside from a small improvement following the 2008 Global Financial Crisis it has remained around this level since 1996.
- This performance in GDP per capita has come about even with a high rate of labour utilisation. Labour utilisation has remained well above the average of the top half of the OECD since 1996 and hours worked per capita are now 17% higher in New Zealand than the average of the top half of the OECD.
- In contrast, labour productivity, or output per hour worked, remains around 40% below the average of this OECD benchmark. Since 1996 there has been no sign of New Zealand's labour productivity catching up to the top half of the OECD. Indeed, since 1996 the gap has increased from 34%.
- New Zealand is one of a small number of OECD countries with both a low level of labour productivity and low productivity growth. Countries with productivity records similar to New Zealand are Mexico, Greece, Portugal, Israel, and Japan.

Sector, industry, and regional performance

- The services sector accounts for 67% of total economy GDP or 62% of GDP in the measured sector. From 1996 to 2018, labour productivity growth in measured sector services averaged 1.5%, below that of the primary sector (of 2.3%) but above that of the goods producing sector (0.9%).
- Between 1996 and 2018 the share of employment in measured sector services grew by 3.4 percentage points, while the share of employment in the primary sector and goods producing sector decreased (by 4.4 and 3.7 percentage points, respectively).
- At the industry level there is considerable diversity in labour productivity growth. Since 1996, information, media and telecommunications, retail trade, and financial and insurance services have had strong labour productivity growth and growing shares of GDP. Construction and professional, scientific and technical services both experienced large increases in their share of GDP but had labour productivity below the measured sector average.

- Outside the measured sector, employment in the education and health industries also expanded over this period (by 1.5% and 2.5%, respectively) and these sectors are estimated to have experienced weak productivity growth (of -1.4% and 0.8%).
- Estimating the productivity of different regions is a complex task and requires the use of firm-level data to account for factors such as industry structure, use of capital, access to skilled labour, and variations in prices. Maré (2016) found that after controlling for these things firms in Auckland enjoyed a 2.2% productivity premium relative to other urban areas.
- Looking at industry-level data, in 2017 Auckland and Wellington had shares of GDP higher than their population shares. In contrast, regions such as Manawatu, Waikato, Northland, and the Bay of Plenty had population shares larger than their shares of output. However, while Auckland accounted for 49% of the change in national population between 2000 and 2017, its share of the national growth in real GDP was 40%. This was reflected in a change in real GDP per capita 15% below the national average.

Business dynamics

- In 2016 there were 631,800 firms in New Zealand. Of these firms, 194,200 were born prior to 2001 and 437,600 were born in 2001 or later years. Of course, many firms born since 2001 have not survived. Looking at the cohort of firms born in 2001, of this the largest share was firms born with fewer than one employee (just over 41,000 firms). Of these very small firms, around 26% were still active in 2015. Of these survivors, 78% remained in the same size category (eg, only 6% of the firms born small had survived and grown).
- The effect of these firm dynamics on labour market outcomes can be shown in the net job creation rates. Net job creation rates are the difference between the jobs created and destroyed for categories for firms between 2001 and 2016. This shows that, of the jobs created between 2001 and 2016 by the 2001 cohort, over half were created by small firms that grew from less than 1 employee in 2001, with 32.5% of net job creation being attributed to firms that grew from less than 1 employee to 20 or more. Firms born with 20 or more employees and with at least 1 but less than 6 employees were also important sources of job creation (although the net effect of these firms was reduced by relatively high levels of job destruction).
- This also highlights the importance of owner-operated businesses in the New Zealand economy. However, as Fabling (2018) found, there has been a "declining dynamism" of working proprietor entry, with an absolute decline in self-employment over the last decade (working proprietor labour input falling from 28.6 percent to 21 percent of full-time equivalent labour input from 2005 to 2015).

Input growth

- Since 1996 capital inputs in the measured sector have grown at an average annual rate of 2.8%, labour inputs have grown by 1.4%, total inputs by 2.0%, and the capital labour ratio has grown at an average of 1.5%.
- There has, however, been slowing growth in the capital labour ratio over the two most recent growth cycles (2000-2008 and 2008-2018), with the growth in the capital ratio in the earlier cycle of 1.7% (reflecting capital input growth of 3.9% and labour input growth of 2.1%) falling to 1.0% in the later cycle (reflecting capital input growth of 2.1% and labour input growth of 1.1%).
- Indeed, since 2010 capital and labour inputs have both grown at around 2.1%, which has been reflected in growth in the capital labour ratio of close to zero and labour inputs accounting for a larger share of total inputs. Low growth in the capital available per hour of work (in an environment of historically low interest rates) thus appears to have played a major role in holding back productivity growth in New Zealand since the Global Financial Crisis.

Shifting into higher gear

- A key characteristic of New Zealand's relatively weak economic performance has been poor productivity. The economy is like a car stuck in first gear, where faster growth comes from revving the engine rather than driving more efficiently. This comes at a cost to living standards. Lifting productivity would shift the economy into higher gear and put economic growth on a more sustainable footing.
- New Zealand's poor productivity performance has been a persistent problem over decades and turning this around will require consistent and focussed effort over many fronts and for many years. There is no simple quick fix.
- Candidates for reform include competition policy, infrastructure, science and innovation, and education and the labour market. Firms' management practices and ability to learn (absorptive capacity) need improvement, and there are challenges facing the public sector, eg, regarding policy-making capability (including the use of monitoring and evaluation), regulatory design and practices, and the delivery of services in the education and health sectors.

Overview

For much of this decade New Zealand has had relatively strong GDP growth. Yet changes in GDP reflect a range of factors; not only the efficiency of production but also growth in the labour market (through increases in the population or in the hours worked per person) and the utilisation of capital (including environmental resources).

Productivity research looks through changes in GDP to better understand an economy's health. Productivity is about making better use of inputs by, say, producing more or better outputs with the same resources.

The most widely used measure of productivity (labour productivity) takes GDP and divides it by hours of work. The result is a measure that is not directly influenced by growth in the population or changes in working hours but instead focusses on how much is produced for each hour of work. Cross-country studies have shown that this measure (GDP per hour worked) is a good indicator of the long run prospects for an economy.

When seen in this way New Zealand's performance has not been so rosy. The economy has been like a car stuck in first gear. New Zealand is, for example, just one of a small number of OECD countries who have had both low levels and growth of labour productivity since 1996. Our labour productivity stubbornly remains around 40% below the average of the top half of the OECD, which translates into below average incomes (even with high labour utilisation) and comes at a real cost to living standards.

To help illustrate the long-term consequences of low productivity the Productivity Commission took the Treasury's Long-Term Fiscal Model and lowered its assumed rate of long-term productivity growth from 1.5% to 1.0%. This latter rate is more consistent with New Zealand's productivity performance since the Global Financial Crisis.

The result was that the economy would be around 18% smaller than otherwise by 2059-60. This means the economy would be $16,300 smaller per person (in constant 2009/10 dollars) than otherwise. Note that in both scenarios (1.5% and 1.0% productivity) the inputs (eg, hours of work) are the same – the difference is that in the lower productivity case New Zealanders produce less for these hours of work.

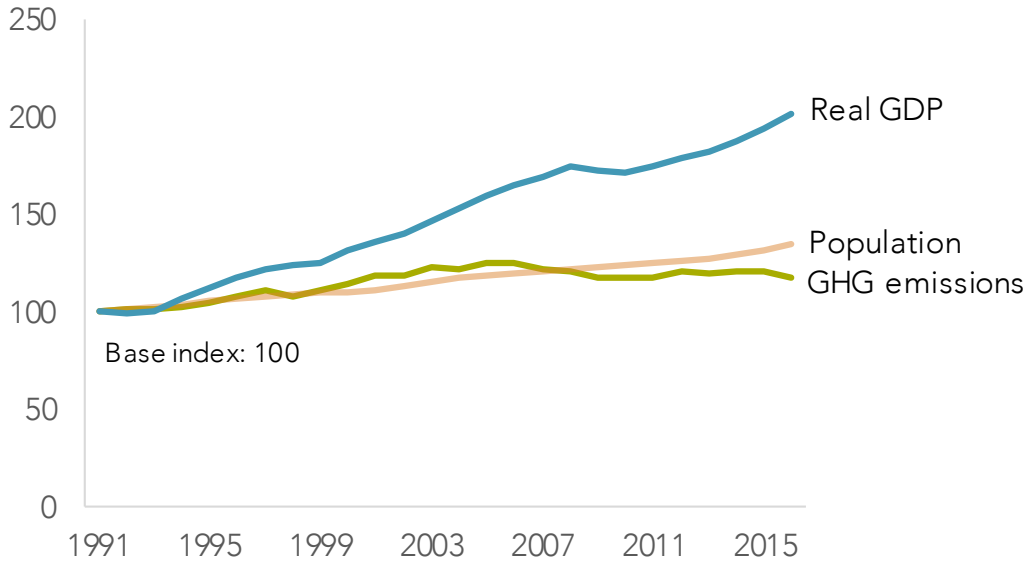
From a purely fiscal perspective, a smaller economy would have implications for tax revenues and the resources available for government programmes. As an example of what this means in practice, based on current policy settings the value of New Zealand Superannuation to recipients, which is indexed to wage growth, would be 21% lower than otherwise.

Low productivity does not only hurt New Zealanders' wallets. When productivity growth is lower, wage growth tends to be lower too, meaning some families need to work long hours to achieve decent incomes. The result is they have less time to spend with family and in the community.

Likewise, improving energy and fuel efficiency, along with lifting agricultural productivity, can help lower greenhouse gas emissions per person or unit of output, and help the shift to a low emissions economy. As the Productivity Commission (2018a) noted, technological advancements have helped bring down the average emissions per person (the average New Zealander was responsible for about 12% fewer emissions in 2016 than in 1990) and per unit of goods of services (down by about 40%).

And increasing the productivity of state services will help protect quality in the face of demographic and fiscal pressure. The future impact of demographic and technological changes on the level and nature of demand for key public services has been well canvassed. At the same time growth in the aggregate labour force can be expected to slow and pressure on government budgets to increase. The result is that state sector managers should expect their services to face increasing pressure as growth in inputs become more constrained.

Figure 1 Relative growth in gross greenhouse gas emissions, population, and real GDP (1991-2016)



Source: Productivity Commission (2018a)

For many years the drivers of New Zealand's productivity performance were not well understood. There were suspects of course: distance from international partners, small domestic markets, industry structure, and even culture. But generally New Zealand's low productivity was viewed as a paradox, particularly given the quality of some of our policy settings. Yet, as Table 1 shows, researchers have moved on from the idea of a productivity paradox: with aggregate data highlighting the role played by capital shallowness and firm-level data highlighting the role of impaired processes of reallocation and diffusion (resources like labour and capital getting stuck in low productivity firms) in explaining this performance.

Table 1 Why New Zealand's productivity is stuck in first gear

Explanations based on aggregate data	Explanations based on microdata
Capital shallowness reflecting: • High long-term real interest rates • High off-the-shelf cost of capital goods • Fast population growth	Impaired reallocation and diffusion (firms that are disconnected and stuck) reflecting: • Weak international connections • Small size of domestic markets • Low investment in knowledge-based capital • Firms' limited ability to learn • Weaknesses in the allocation of labour

Source: Nolan, Fraser & Conway (2018)

Of course, questions remain, particularly on how government policy could turn this productivity performance around. This has been a central theme of the Productivity Commission's work since 2011, with our 12 completed inquires making 525 policy recommendations. The Commission – along with organisations like the Ministry of Business, Innovation and Employment, the Treasury, Stats NZ, and Motu Economic and Public Policy Research – has also laid out a number of practical policy recommendations in research reports and other outputs (Conway, 2018).

This work has highlighted that New Zealand's poor productivity performance has been a persistent problem over decades and turning this around will require consistent and focussed effort over many fronts and for many years. There is no simple quick fix.

Indeed, work is already taking place in many areas, including in competition policy, infrastructure, science and innovation, and education and the labour market. There is growing interest in the need to improve Kiwi firms' management practices and ability to learn (absorptive capacity), which shape their ability to innovate and improve their productivity (Harris & Le, 2018). And some authors have identified the challenges lifting productivity presents for the public sector, particularly for policy-making capability (including the use of monitoring and evaluation), the design of regulation, and the delivery of services in the education and health sectors.

For these reasons the Productivity Commission sees value in reporting on national productivity performance and how this compares with other countries. This could help shape public debate in a broader way and is consistent with the requirement in our enabling legislation to promote public understanding of productivity-related matters. This is similar to benchmarking reports published in other jurisdictions, such as the Competitiveness Scorecard published by the Irish National Competitiveness Council.

This reporting will not replace our existing inquiry and research work but gives us a chance to draw together emerging themes and outline the overall direction of travel. This report is a first step in this process of regular reporting. It largely draws on data published by Stats NZ and the OECD and takes a national accounts perspective. The focus in this report is, naturally, on productivity measures, but of course we recognise there are other lenses that could be used to study the economy. The Commission expects that we will refine our approach over time and would welcome any feedback on how to improve future editions. Feedback can be sent to info@productivity.govt.nz.

1 The big picture

Key points

Figure 2 shows New Zealand's GDP per capita between 1950 and 2017 based on data from the Conference Board Total Economy Database (Adjusted version, November 2018). Individual country results are expressed as a percentage of the US per capita GDP and are based on constant Purchasing Power Parity (PPP) rates (2011 PPPs).[2]

While making international comparisons can raise measurement issues, there has been a clear decline in New Zealand's per capita GDP as a percentage of that of the US, with the New Zealand figure falling from 97% in 1950 (and the same in 1960) to 65% in 2018. The bulk of the fall took place before 1990. New Zealand's performance has remained relatively flat since.

Growth in GDP can be broken down into changes in labour utilisation and changes in labour productivity. In other words, GDP growth reflects changes in how much people work and how much they produce at each hour of work. Note that GDP is different to Gross National Income (GNI), as national income is also influenced by terms of trade and investment flows. This is explained in greater detail in Box 1.

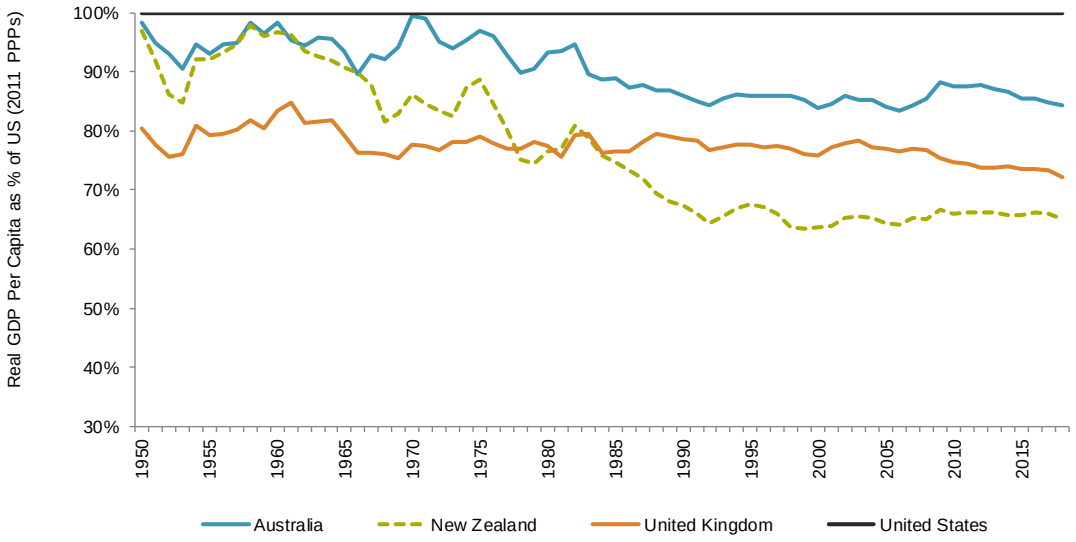
Figure 3 shows the different components of per capita GNI. Since 1996 labour productivity has made a large contribution to GNI growth. Between 1996 and 2018, per capital GNI has grown at an average of 2.0%. Of this, labour productivity contributed 1.3 percentage points, terms of trade 0.4 percentage points and labour productivity 0.3 percentage points. Over these growth cycles the growth of labour productivity has been falling.

Table 2 shows labour productivity in the measured sector in the years since 1996. This is the fullest measure of labour productivity published by Stats NZ and covers 16 industries that roughly correspond to the private sector.[3] [4] Across these industries labour productivity has grown by an average of 1.4% over this period. Following the Global Financial Crisis there was a slowdown in labour productivity growth, with average annual labour productivity in the measured sector being 1.0% between 2008 and 2018.

In a growth accounting framework, labour productivity can be broken down into multifactor productivity (the effectiveness with which inputs (such as labour and capital) are combined in the production process) and capital deepening (the capital available per unit of work). Since 1996, the contribution of capital deepening to labour productivity growth has fallen: from 0.9% over the 1997-2000 cycle, to 0.8% over the 2000-08 cycle, and finally to 0.6% over the 2008-2017 cycle. Multifactor productivity growth has remained relatively stable over the 2000-2008 and 2008-2017 cycles with growth rates of 0.5% and 0.6% respectively, although these were both well below the multifactor productivity growth of 1.7% between 1997-2000.

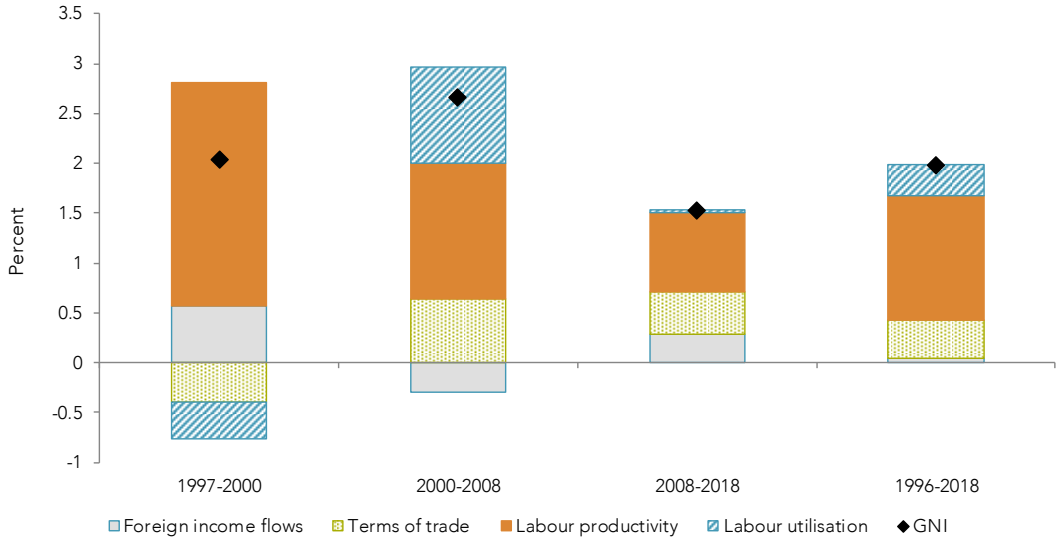
To illustrate the long-term consequences of lower productivity the Productivity Commission used the Treasury's Long-Term Fiscal Model and lowered the assumed rate of (total economy) productivity growth from 1.5% to 1.0%. The result was that the economy would be around 18% smaller than otherwise by 2059-60 (see Table 3). This means the economy would be $16,300 smaller per person (in constant 2009/10 dollars) than otherwise. A smaller economy has implications for tax revenues and government spending. As an example of what this means in practice the value of New Zealand Superannuation to recipients, which is indexed to wage growth, would be 21% lower.

Figure 2 Long-term performance of real GDP per capita (% of US)



Source: Productivity Commission based on Conference Board Total Economy Database (Adjusted version), November 2018

Figure 3 Sources of per capita income growth (total economy) over growth cycles



Source: Productivity Commission based on Stats NZ

Note:

1. The period 2008-2018 is an incomplete cycle
2. Labour input figures are based on the Stats NZ labour volume series (LVS)

[2] PPPs indicate the costs of a basket of common goods and services in different countries. PPPs are preferred to market exchange rates as they are less likely to be influenced by factors like capital flows. The OECD recommends using constant-price PPPs for comparisons over time and current-price PPPs for assessing differences in productivity levels.

[3] The "measured sector" and the "private sector" are not fully synonymous. The measured sector is based on industry classifications and entities are defined based on the industries in which they trade output (not according to their ownership). Thus, both public and privately-owned organisations are included in some industries. In 2017 the measured sector covered 78% of output and 83% of employment.

[4] Data on the measured sector are available back to 1996. Of these 16 industries, 11 industries (the so called "former measured sector") have data back to 1978. Figures back to 1996 are also published for two state sector industries (education and health).

Table 2 Measured sector (MS-16) productivity growth (1996 to 2018) over growth cycles

Growth cycle	Labour productivity	Contribution of multifactor productivity	Contribution of capital deepening
1997–2000	2.9	1.9	1.0
2000–2008	1.3	0.6	0.7
2008–2018	1.0	0.6	0.4
1996–2018	1.4	0.8	0.6

Source: Stats NZ

Table 3 Total economy productivity and the long-term fiscal outlook

	1.0% Labour productivity growth (total economy)		1.5% Labour productivity growth (total economy)	
	2018-19	2059-60	2018-19	2059-60
Real GDP ($ billion, production measure, 2009/10 dollars)	247.7	457.4	247.7	555.4
Nominal GDP ($ billion, production measure)	287.4	1190.4	287.4	1445.5
Total Crown revenue ($billion, excluding gains, nominal)	111.2	481.8	111.2	577.6
Total Crown expenses ($billion, excluding gains, nominal)	105.7	653.4	105.7	787.8
Resident population (median projections) [1]	4 780 520	6 009 690	4 780 520	6 009 690

Source: Productivity Commission based on the Treasury's 2016 Long Term Fiscal Model

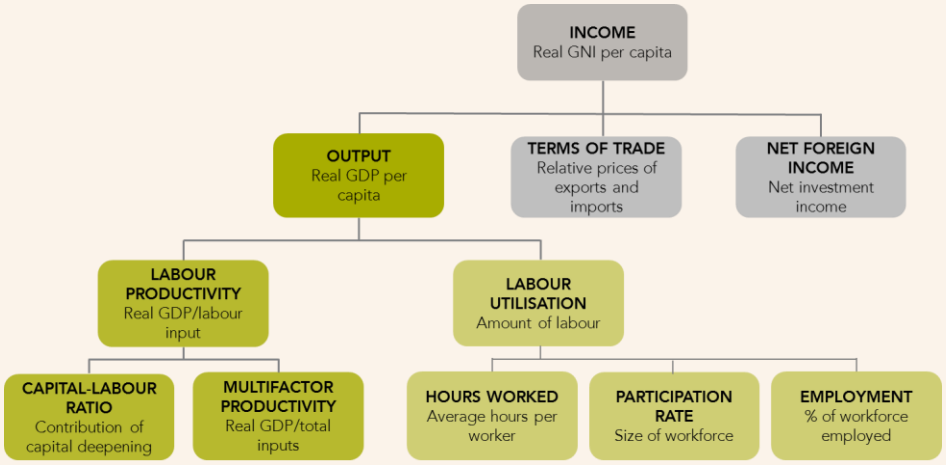
Note:

1. To ensure consistency with the 2016 long-term fiscal model the resident population projections reported here are those used in the model not the most recently publicly available figures

Box 1 Productivity in the national accounts

Productivity is a measure of the ability of an economy, industry or organisation to produce goods and services (outputs) using inputs such as labour and capital. It is a volume measure. It shows the ratio of the volume of output to the volume of inputs eg, how much output is generated per unit of input (Productivity Commission, 2018b).

Figure 4 A national accounts perspective on productivity



Source: Conway and Meehan (2013)

In a national accounting framework labour productivity is a measure of the output produced from each hour of work. Increasing labour productivity – along with increased labour utilisation – leads, other things being equal, to more output per person. This is an important component of higher per capita incomes and, in turn, better living standards.

Labour productivity can be expressed in terms of two components: the weighted capital-labour ratio (eg, capital deepening) and multifactor productivity (MFP). Both labour productivity and MFP increases can come from a range of sources such as new technology; scale, scope and specialisation economies; improvements in firm organisation, management and work practices; and firm turnover.

Productivity can also be studied using data other than national accounts data. One option is administrative and survey data linked at the level of individual firms. National accounts data and firm-level data illustrate productivity performance in different ways and often employ different methodological approaches.

In particular, national accounts data illustrate the performance of the economy as a whole, which can mask how different firms have different levels of performance (the distribution of performance). Conversely, while firm-level data can provide a deeper picture of performance, more aggregate data can be especially useful for illustrating wider trends (providing a broader picture) (see Allan (2018) and Nolan, Fraser and Conway (2018)).

2 Benchmarking aggregate performance

Key points

The material below benchmarks New Zealand's aggregate performance with key comparator OECD countries and the average of the top half of the OECD. Note that over time the countries that make up the OECD have changed. In this report the top half of the OECD is defined as the 18 OECD countries that currently have the highest incomes.[5] Differences in purchasing power are accounted for using OECD PPPs (see Note 2).

There are also some differences between these OECD data and the Stats NZ data in this report, as the OECD figures are for the total economy and so cover both the measured and non-measured sectors (see Note 2). There are also some differences in the treatment of labour inputs (with the OECD's measure of labour inputs drawing on the Household Labour Force Survey (HLFS) not the Stats NZ labour volume series (LVS)).

Figure 5 and Figure 6 benchmark New Zealand's performance with the top half of the OECD. Figure 5 shows that New Zealand's GDP per capita is 30% below the average of this OECD benchmark. Aside from a small improvement following the 2008 Global Financial Crisis it has remained around this level since 1996 (the earliest year for which we have comparable data).

Figure 6 illustrates the role that labour utilisation and labour productivity play in shaping New Zealand's relative GDP per capita. This figure shows that New Zealand's rates of labour utilisation are above the average of the top half of the OECD and have been so since 1996. Data for 2017 show that hours worked per capita are, on average, 17% higher in New Zealand than the average of the top half of the OECD.

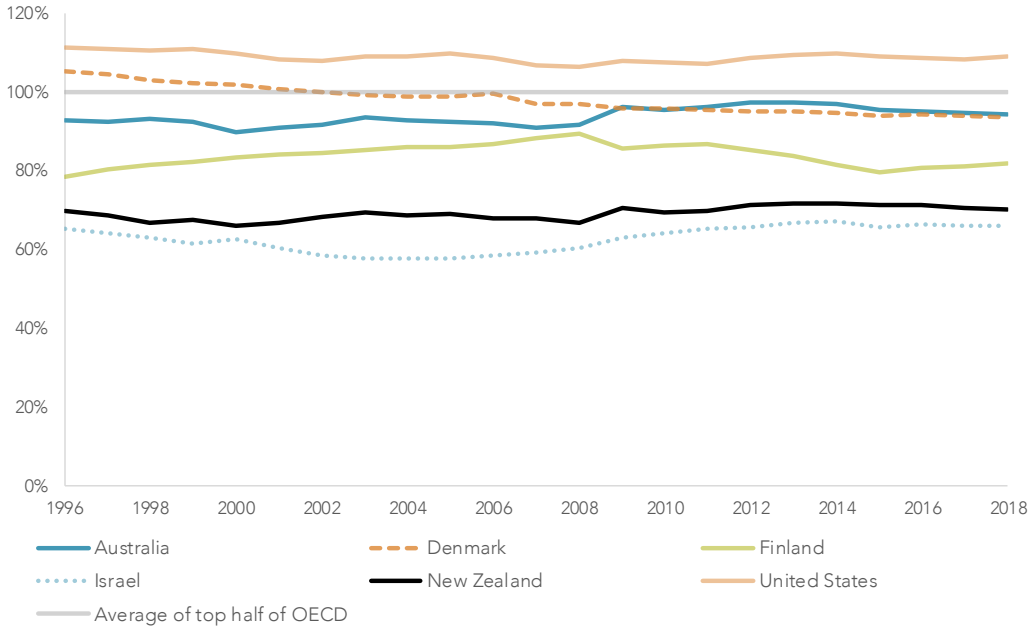
Labour productivity or output per hour worked is, in contrast, around 40% less. Since 1996 there has been no sign of New Zealand's labour productivity improving relative to this OECD benchmark. Indeed, since 1996 the gap has increased from 34%.

A broader comparison of New Zealand's productivity performance is shown in Figure 8. This figure includes all OECD countries and shows both labour productivity *growth* between 1996 and 2017 and labour productivity *levels* in 1996. In principle, countries with lower initial levels of productivity could be expected to exhibit higher rates of growth (as they have greater scope for "catch up").

New Zealand is, however, one of a small number of countries with both a low level of labour productivity and low productivity growth. Countries with similar records include Mexico, Greece, Portugal, Israel, and Japan.

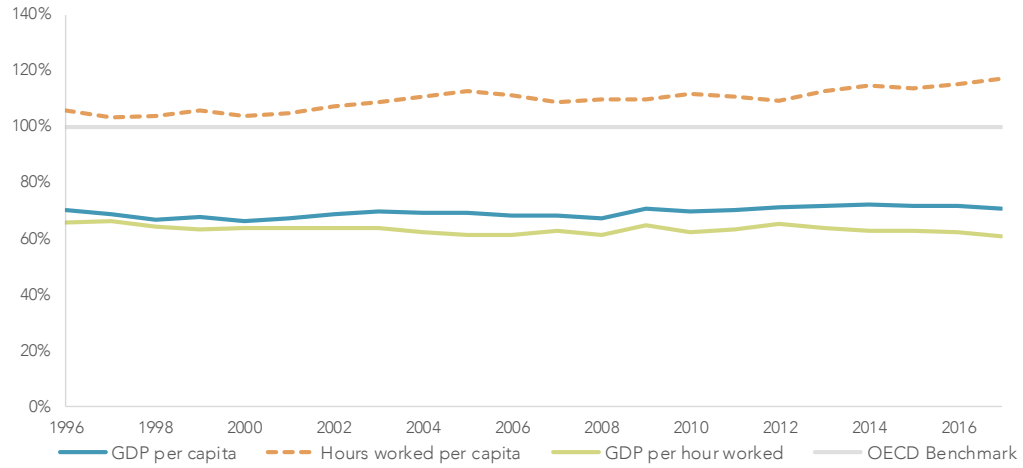
[5] These countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Japan, Luxembourg, Netherlands, Norway, Sweden, Switzerland, United Kingdom, and the United States.

Figure 5 GDP per capita (% of average of top half of the OECD)



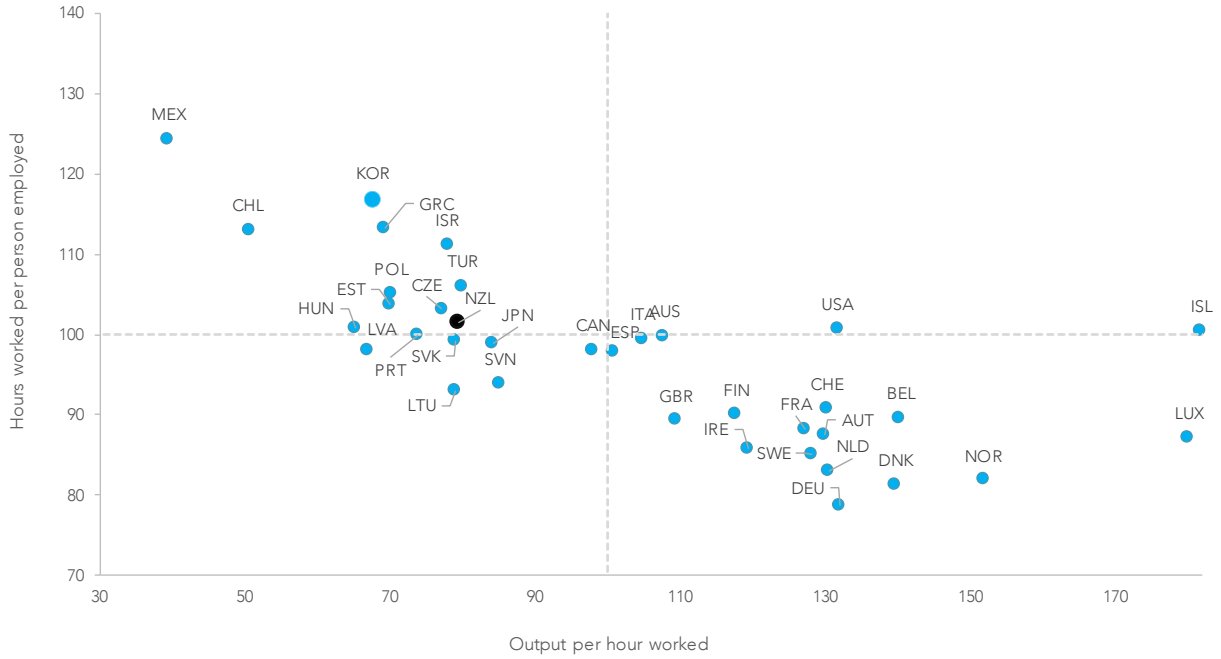
Source: Productivity Commission based on OECD

Figure 6 Sources of GDP per capita (% of average of top half of the OECD)



Source: Productivity Commission based on OECD

Figure 7 Hours worked per worker and output per hour worked (2017) (full OECD, OECD average = 100)

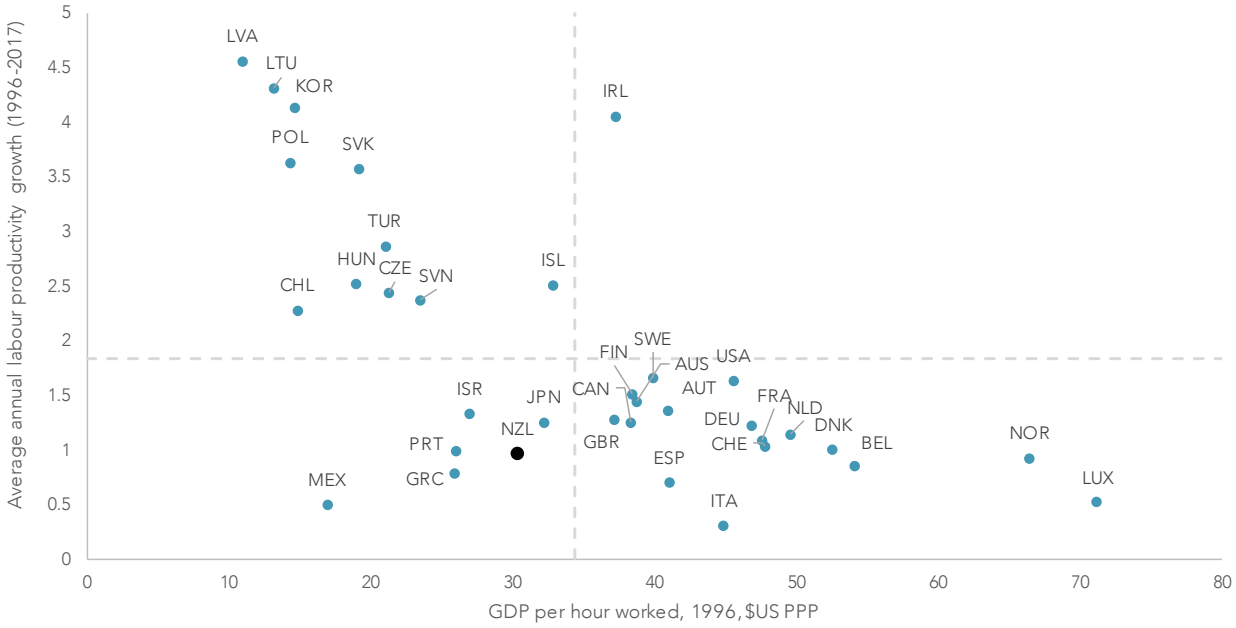


Source: Productivity Commission based on OECD

Notes:

1. Figures are for the total economy
2. Labour input figures for New Zealand are based on Household Labour Force Survey (HLFS) data

Figure 8 Labour productivity levels (1996) and growth (1996-2017, full OECD)



Source: Productivity Commission based on OECD

Notes:

1. Figures are for the total economy
2. Labour input figures for New Zealand are based on Household Labour Force Survey (HLFS) data

3 Sector, industry, and regional performance

Key points

Table 4 shows the labour and multifactor productivity performance of different sectors over recent growth cycles. Within the measured sector, from 1996 to 2018 labour productivity growth was highest in the primary sector – with an average of 2.3% annual growth compared with 1.5% in the services sector and 0.9% in the goods producing sector. Productivity growth in the services sector is important, with the share of employment in this sector growing by 3.4 percentage points between 1996 and 2018, while the share of employment in the primary sector and goods producing sector decreased by 4.4 and 3.6 percentage points, respectively.

Outside the measured sector, employment in the health and education industries also expanded (by 2.5% and 1.5%) and these sectors had weak productivity growth (of 0.8% and -1.4%, respectively).

The average labour productivity growth in the measured sector between 1996 and 2018 was 1.4%. Most industries made a positive contribution to aggregate productivity growth, but a few detracted from it. Overall, industries that accounted for around 50% of measured sector GDP contributed about 80% of aggregate labour productivity growth – 1.1 percentage points of 1.4%.

At the industry level there is considerable diversity in labour productivity growth. An industry's contribution to aggregate productivity depends on both its own productivity and its size (reflecting resource shifts into and out of the industry). Figure 9 shows the change in the share of GDP for which individual industries accounted along with the average growth in labour productivity from 1996 to 2018.

Over this period, for example, information, media and telecommunication, retail trade, and financial and insurance services had strong labour productivity growth and growing shares of GDP. Manufacturing had labour productivity growth around the average for the measured sector but a declining share of GDP. Construction and professional, scientific and technical services both experienced large increases in their share of GDP but had labour productivity below the measured sector average.

Table 5 and Table 6 contain data on the relative performance of different regions. Table 5 shows the regional GDP and population in 2017 and shows the share of the change in national GDP and population growth between 2000 and 2017 that can be attributed to particular regions.

Estimating the productivity of different regions is a complex task and requires the use of firm-level data to account for factors such as industry structure, use of capital, access to skilled labour, and variations in prices. Maré (2016) found that after controlling for these things firms in Auckland enjoyed a 2.2% productivity premium relative to other urban areas.

Looking at industry-level data, in 2017 Auckland and Wellington had shares of GDP higher than their population shares. In contrast, regions such as Manawatu, Waikato, Northland, and the Bay of Plenty had population shares larger than their shares of output. However, while Auckland accounted for 49% of the change in national population between 2000 and 2017, its share of the national growth in real GDP was 40%. This was reflected in a change in real GDP per capita 15% below the national average.

Table 4 Sector level productivity over cycles

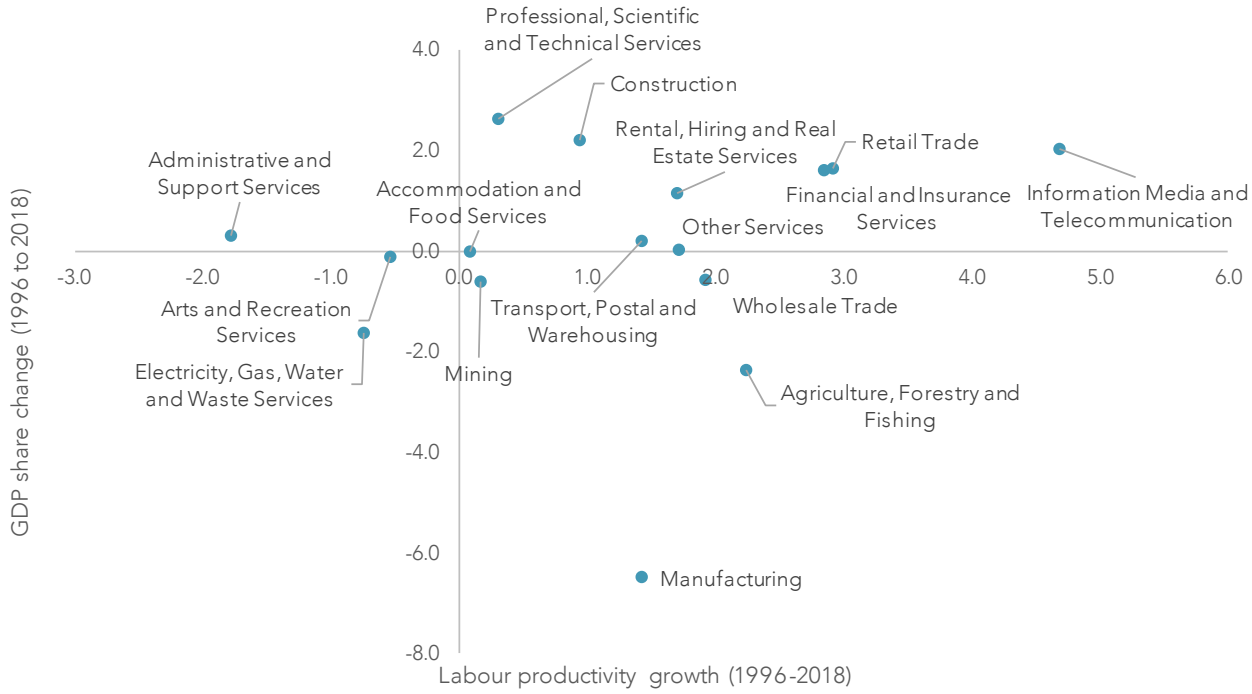
	1997-2000		2000-08		2008-18		1996-2018		Employment share	
	LP	MFP	LP	MFP	LP	MFP	LP	MFP	1996	2018
Measured sector	2.9	1.9	1.3	0.6	1.0	0.6	1.4	0.8	82.6	77.9
Primary industries	-0.4	-0.4	2.1	0.3	2.0	0.7	2.3	0.9	11.3	6.9
Goods-producing industries	3.2	2.0	0.6	0.1	0.4	0.0	0.9	0.3	26.0	22.3
Service industries	3.3	2.2	1.7	0.9	1.1	0.7	1.5	0.9	45.3	48.7
Education and training	-1.3	-1.9	-1.5	-1.7	-1.3	-1.6	-1.4	-1.7	5.8	7.3
Health care and social assistance	5.6	5.1	0.8	0.5	-0.3	-0.3	0.8	0.5	6.6	9.1
Public administration and safety									5.0	5.6

Source: Stats NZ

Note:

1. Employment share based on industry level annual hours of work (labour volume series)

Figure 9 Change in industry share of GDP and labour productivity (1996-2018)



Source: Productivity Commission based on Stats NZ

Table 5 Regional GDP and Population (2017)

	Population	Nominal GDP ($millions)	Nominal GDP per capita ($)	Share of national population	Share of national GDP
Auckland	1 657 200	101 370	61 169	35%	38%
Canterbury	612 000	34 933	57 080	13%	13%
Wellington	513 900	35 603	69 280	11%	13%
Waikato	460 100	22 781	49 513	10%	8%
Bay of Plenty	299 900	14 370	47 916	6%	5%
Manawatu-Whanganui	240 300	10 249	42 651	5%	4%
Otago	224 200	11 701	52 190	5%	4%
Northland	175 400	6 987	39 835	4%	3%
Hawke's Bay	164 000	7 437	45 348	3%	3%
Taranaki	118 000	8 319	70 500	3%	3%
Southland	98 400	5 686	57 785	2%	2%
Nelson	51 400	2 780	54 084	1%	1%
Tasman	51 200	1 962	38 321	1%	1%
Gisborne	48 500	1 923	39 649	1%	1%
Marlborough	46 200	2 818	60 996	1%	1%
West Coast	32 500	1 655	50 923	1%	1%
New Zealand	4 793 900	270 574	56 441	100%	100%

Source: MBIE Modelled Territorial Authority Gross Domestic Product (MTAGDP) data

Table 6 Regional GDP and Population (% Change, 2000-2017)

	Population change	Change in real GDP	Share of change in national population	Share of change in national real GDP	Change in regional GDP per capita as % of the national average
Auckland	38%	66%	49%	40%	85%
Canterbury	24%	77%	13%	15%	139%
Wellington	17%	37%	8%	10%	82%
Waikato	25%	64%	10%	9%	96%
Bay of Plenty	22%	64%	6%	6%	99%
Manawatu-Whanganui	5%	34%	1%	3%	76%
Otago	19%	70%	4%	5%	126%
Northland	21%	63%	3%	3%	82%
Hawke's Bay	11%	36%	2%	2%	66%
Taranaki	11%	43%	1%	3%	130%
Southland	6%	49%	1%	2%	136%
Nelson	21%	43%	1%	1%	69%
Tasman	23%	73%	1%	1%	91%
Gisborne	5%	32%	0%	0%	66%
Marlborough	14%	86%	1%	1%	193%
West Coast	4%	58%	0%	1%	144%
New Zealand	24%	59%	100%	100%	100%

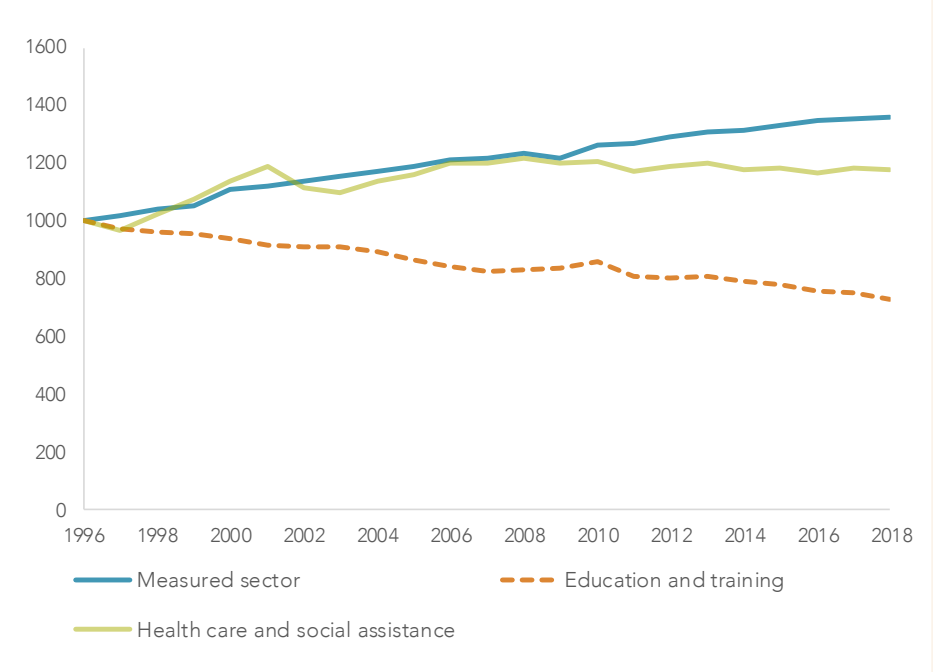
Source: Productivity Commission based on MBIE Modelled Territorial Authority Gross Domestic Product (MTAGDP) data

Box 2 State sector productivity

State services make up close to one fifth of the economy and poor productivity in this sector can be a drag on the whole economy. More productive state services can help protect quality in the face of demographic and fiscal pressure and ensure higher living standards for New Zealanders.

Stats NZ regularly publishes estimates for education and training and healthcare and social assistance as part of their annual releases of industry-level productivity measures (Productivity Commission, 2018b). Figure 10 shows labour productivity indexes for education and healthcare and for the measured sector. These show how the productivity of the state sector has lagged that of the measured sector. Thus, while measured sector labour productivity averaged 1.4% between 1996 and 2018, the average for healthcare averaged 0.8% and for education and training averaged -1.4%.

Figure 10 Stats NZ labour productivity indexes (1996–2018)



Source: Stats NZ

While the data for the state sector are not explicitly quality adjusted there are techniques for doing this. In the case of the education sector, for example, Gemmell, Nolan and Scobie (2017) tested a range of quality adjustments to productivity estimates for New Zealand schools based on sector level data. They found that the most reliable adjustments provided a broadly consistent picture of flat or declining productivity in the school sector.

4 Business dynamics

Key points

National accounts data and firm-level data illustrate productivity performance in different ways and can provide complimentary perspectives on this performance. A rich literature is being developed using firm-level data in New Zealand. For summaries see Allan (2018) and Nolan, Fraser, and Conway (2018).

Table 7 shows the number of firms in New Zealand by their year of birth.[6] These data show, for example, that in 2016 there were 631,800 firms in New Zealand, and of these 194,200 were born prior to 2001, that 49,300 were born in 2016, and so on.

Firms are constantly being born, growing and dying. Meehan and Zheng (2015) refer to these dynamics as a "perpetual motion machine". When firms shrink and die, jobs are destroyed but they also give way to new firms and new jobs. In normal circumstances there is a considerable amount of churn in the economy and, on balance, additions outweigh subtractions. Studying the dynamics underlying these trends can provide insights into the functioning of the economy and causes of, or barriers to, productivity growth.

Table 8 shows the employment growth by firm size for one cohort of firms (those born in 2001). This analysis makes use of the longitudinal nature of the LBD. In 2001 there were just over 48,000 firms born. Of this the largest share was firms born with fewer than one employee (just over 41,000 firms). As shown in Figure 11, of these firms with fewer than one employee, around 26% were still active in 2015. Of these survivors, 78% remained in the same size category (eg, 22% of these firms born small had grown).

In contrast, those firms born large (eg, with 20 or more employees) had a survival rate of 60%, although there was a much smaller number of these firms (just over 250 born in 2001). Of these surviving firms with 20 or more employees, most (74% of survivors) remained in this size category, while close to a quarter (26%) of survivors moved into a smaller size category. Further, given the relatively small number of firms born large, firms born with fewer than 6 staff in 2001 accounted for 46% of firms with 20 or more staff in 2015.

The effect of these firm dynamics on labour market outcomes can be shown in the net job creation rates in Table 9. Net job creation rates are the difference between the jobs created and destroyed for these categories for firms between 2001 and 2016. This shows that, of the jobs created between 2001 and 2016 by the 2001 cohort, over half were created by small firms that grew from less than 1 employee in 2001, with 32.5% of net job creation being attributed to firms that grew from less than 1 employee to 20 or more. Firms born with 20 or more employees and with at least 1 but less than 6 employees were also important sources of job creation (although the net effect of these firms was reduced by relatively high levels of job destruction).

The discussion above also highlights the importance of owner-operated businesses in the New Zealand economy (Fabling, 2018). However, as Fabling (2018) found, there has been an absolute decline in self-employment over the last decade, with working proprietor labour input falling from 28.6 percent to 21 percent of full-time equivalent labour input from 2005 to 2015. Further research on this issue of the "declining dynamism" of working proprietor entry could play a key role in helping understand future job growth in New Zealand.

[6] These data on firm births and deaths are taken from the Longitudinal Business Database (LBD) (Stephenson, 2019). The population of interest is economically active firms operating in the private sector. Data is firm level rather than plant-level. Changes in firms' legal status, which can confound analysis of firms over time, has been addressed using "permanent" enterprise identifiers that are based on Fabling (2011).

Table 7 Number of firms in New Zealand by year of birth (selected years)

Year	Birth year					
	Pre-2001	2004	2008	2012	2016	Total
2000	474 700	0	0	0	0	474 700
2001	450 200	0	0	0	0	498 500
2002	419 500	0	0	0	0	516 100
2003	392 000	0	0	0	0	540 700
2004	366 400	60 400	0	0	0	566 000
2005	344 100	58 600	0	0	0	589 600
2006	321 600	53 400	0	0	0	604 900
2007	303 200	48 000	0	0	0	622 000
2008	285 200	43 100	56 600	0	0	633 200
2009	269 400	39 000	54 000	0	0	631 300
2010	254 700	35 400	48 200	0	0	622 200
2011	243 000	32 900	43 100	0	0	617 600
2012	231 800	30 700	38 600	34 900	0	611 900
2013	222 600	28 800	35 300	33 600	0	608 000
2014	214 000	27 200	32 500	30 700	0	617 800
2015	203 200	25 300	29 500	27 000	0	618 800
2016	194 200	23 900	27 500	24 400	49 300	631 800

Source: Stephenson (2019)

Notes:

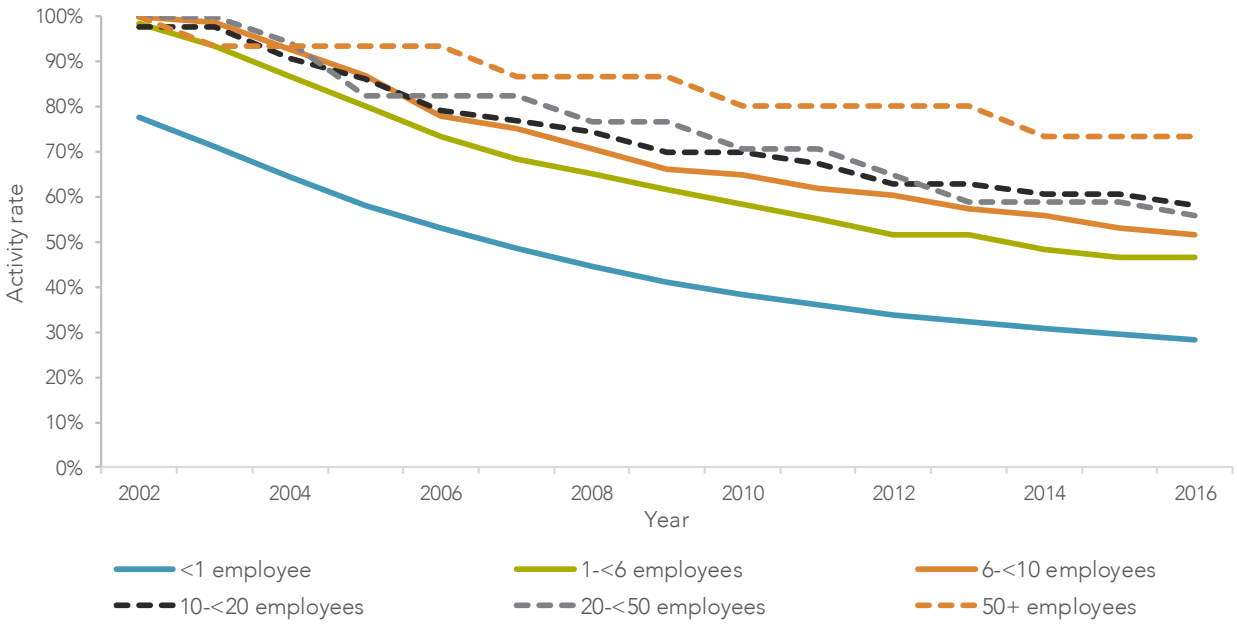
1. Given space limitations only selected years are shown. Data for a larger number of years can be found in Stephenson (2019).

Table 8 Employment growth for the 2001 cohort (2001-2015)

Year	Birth size	Firm size (employees)					Total	Survival rate	Hazard rate	Born
		<1	1-<6	6-<10	10-20	20+				
2001 cohort in 2015	<1	8 484	1 944	210	141	96	10 875	26%	29%	41 085
	1-<6	648	1 596	222	165	84	2 715	45%	8%	5 982
	6-<10	45	87	108	57	45	342	50%	7%	678
	10-<20	9	27	54	102	54	246	58%	6%	426
	20+	6	9	6	18	111	150	60%	2%	252

Source: Stephenson (2019)

Figure 11 Activity rates by birth size (2001 cohort)



Source: Stephenson (2019)

Table 9 Net job creation and destruction between 2001 and 2016 (2001 cohort)

Birth size (no. of employees)	Size in 2016 (Surviving Firms)					
	<1	1<6	6<10	10<20	20+	Total net job creation
<1	50	4 000	1 700	1 800	10 600	18 150
1<6	-1 700	350	1 000	1 700	4 600	5 950
6<10	-370	-340	0	330	1 700	1 320
10<20	-260	-260	-260	-40	3 200	2 380
20+	-360	-450	-340	-330	6 300	4 820
Total	-2 640	3 300	2 100	3 460	26 400	32 620

Source: Stephenson (2019)

5 Input growth

Key points

Figure 12 shows indexes of the growth of labour inputs, capital inputs, total inputs, and the capital-labour ratio (the capital-labour ratio is the ratio of the capital input index to the labour input index). There has been slowing growth in the capital labour ratio over the two most recent growth cycles (2000-2008 and 2008-2018), with the growth in the capital ratio in the earlier cycle of 1.7% (reflecting capital input growth of 3.9% and labour input growth of 2.1%) falling to 1.0% in the later cycle (reflecting capital input growth of 2.1% and labour input growth of 1.1%). Indeed, since 2010 capital and labour inputs have both grown at around 2.1%, which has been reflected in growth in the capital labour ratio of close to zero.

Figure 13 shows how, since 2014, growth in the *overall population* has been driven heavily by net migration. Before this the key driver of population growth was the natural rate of increase. The population increased by 28.3% between 1996 and 2016. This reflected both natural increases (accounting for around 60% of the population growth over this period) and net migration (40%). Since the beginning of the current economic cycle (2008) net migration has contributed just over 50% of total growth in the overall population.

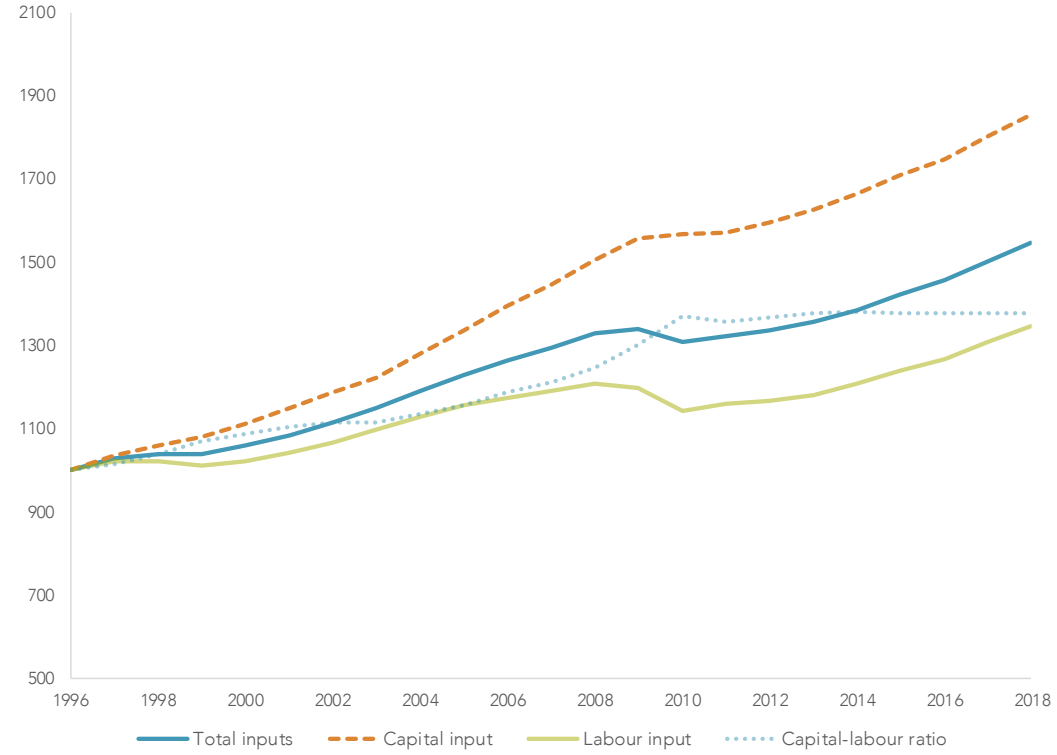
Of course, overall population growth and the growth in the labour inputs used in productivity measures are not synonymous. Other considerations are the growth in the *working aged population* (people aged 15 to 65), changes in the rate at which working aged people participate in the labour market (*participation rates*), the share of the labour force in *employment* (as the labour force participation rate includes people out of work but seeking employment), and changes in *hours worked*. The labour productivity measures used in this report are based on changes in working hours.

Table 10 shows the average annual growth in population and hours of work (for the total economy, MS-16 and two non-measured sector industries (health and education)). MS-16 accounts for around 83% of the hours worked, and the average annual increase in hours of work since 1996 has been 1.3%. Looking at the last two growth cycles, the 2000-2008 cycle saw average annual growth in hours worked of 1.9%, but in the most recent cycle this fell to 1.0%.

Looking at the total economy figures, while the hours of work have increased by an average of 1.3% since 2008, this is just below population growth over this period. This explains the low contribution of labour utilisation to per capita GNI in Figure 3. There are also significant differences in labour volume series and the HLFS data on total hours worked, which is one factor in the differences between Stats NZ and OECD productivity estimates.

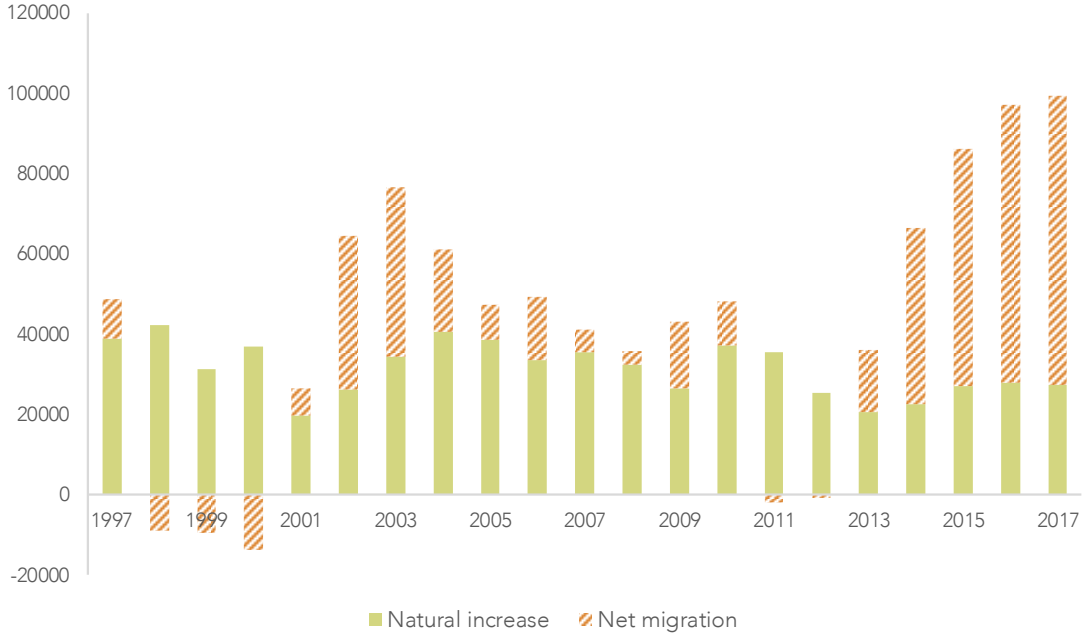
Figure 14 graphs the labour income share (LIS) and indicates the extent to which increases in national income accrue to the owners of labour or capital. Note that because an increasing number of people earn income by both participating in the labour market and owning capital, the LIS indicates the income split across inputs to production, rather than across two distinct groups of people in the economy. Changing technology, globalisation and policy changes can all impact on the labour income share. Data on MS-16 from 1996 to 2017 showed a fall in the labour income share from 57.4% to 55.4% of national income. The labour income share mostly declined in three short bursts: 1982-1984, 1992-1995, and 1999-2002. Outside of these periods any decline has been gradual.

Figure 12 Input growth (measured sector)



Source: Stats NZ

Figure 13 Contributions to growth in the overall population (total economy)



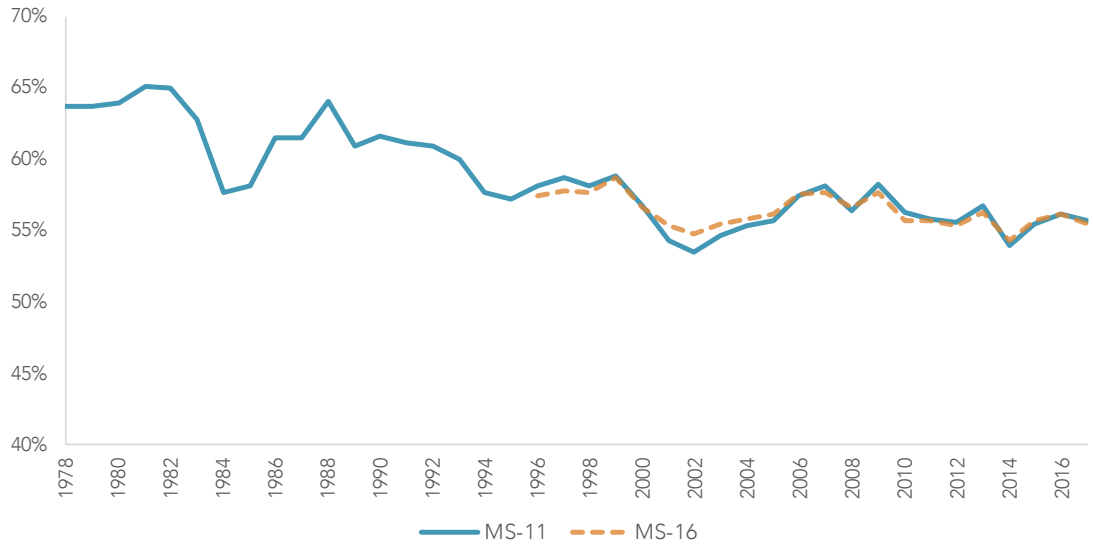
Source: Stats NZ

Table 10 Growth in population and hours of work (average annual % change)

	1996-2018	2000-08	2008-18
Estimated resident population	1.2	1.2	1.4
Hours Total Economy (LVS)	1.5	2.2	1.3
Hours MS-16 (LVS)	1.3	1.9	1.0
Hours Education (LVS)	2.6	3.0	2.0
Hours Health (LVS)	3.1	3.5	3.1
Hours Total Economy (HLFS)	1.7	2.1	1.7

Source: Productivity Commission based on Stats NZ

Figure 14 The labour income share (MS-11 and MS-16)



Source: Stats NZ

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