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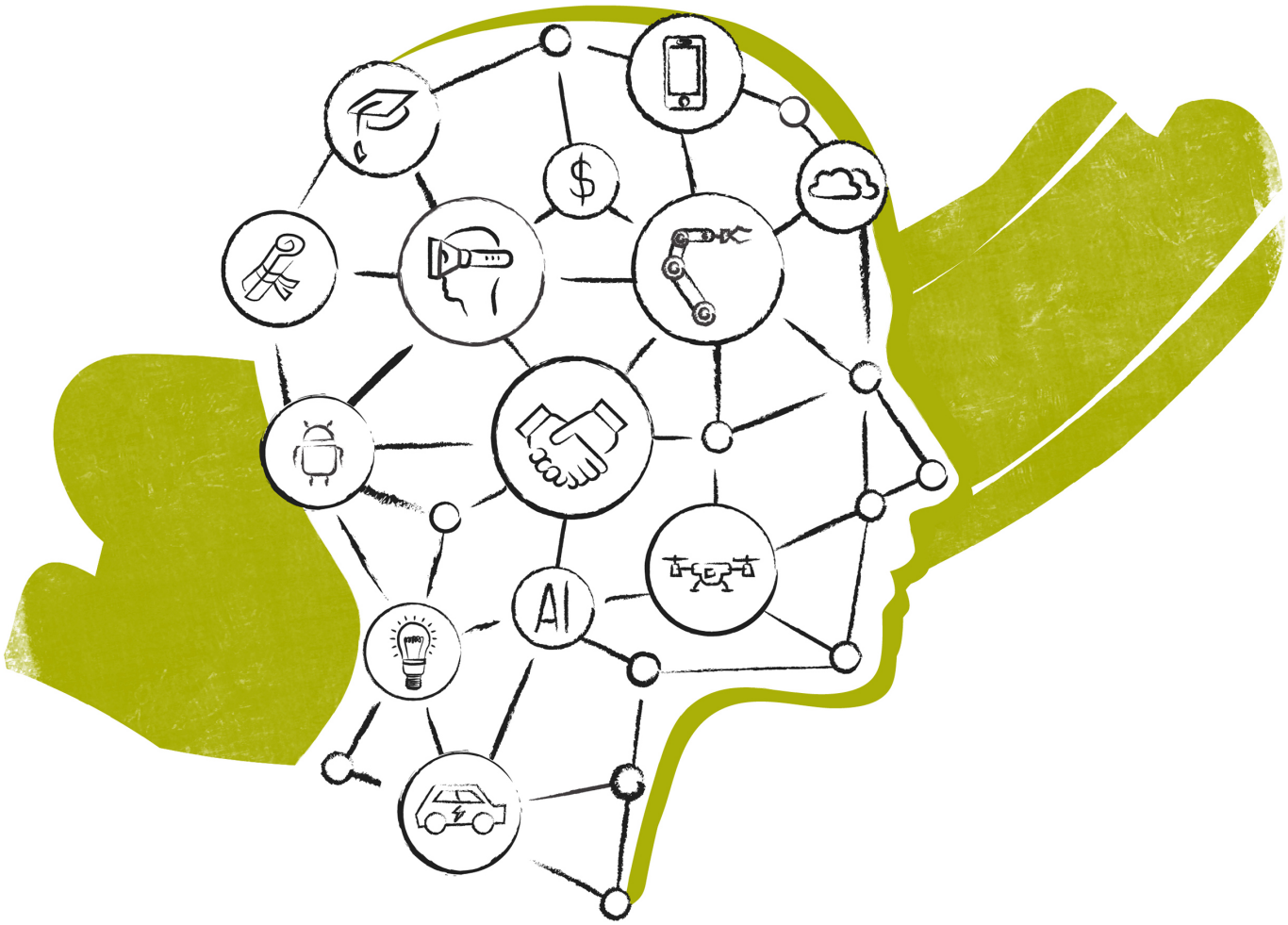
Te Kōmihana Whai Hua o Aotearoa



Technological change and the future of work

March 2020

The Productivity Commission aims to provide insightful, well-informed and accessible advice that leads to the best possible improvement in the wellbeing of New Zealanders.

Technological change and the future of work

Final report

March 2020

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.

Foreword

As this report was being completed, New Zealand was in lockdown in the midst of the global COVID-19 pandemic. It is now clear that the short run effect on economic activity and employment will be significant and negative for many people.

The terms of reference for this inquiry steered us towards longer-term issues – namely, how technology affects jobs and employment, whether and how technological forces are shaping work, and how New Zealand and New Zealanders should best prepare for change in the future. Because of this longer-term focus and the rapidly evolving nature of the pandemic, this report does not incorporate advice on current events.

Nevertheless, the historical analysis of labour markets in this report points to three broad lessons that are of relevance. First, economic shocks such as recessions dramatically reduce voluntary movements between jobs, opportunities to find better work, and overall employment levels. This puts a premium on effective macroeconomic management that minimises the scale and harm caused by recessions and returns the economy to growth as soon as possible. Second, building the resilience of workers and the wider economy to economic shocks is of enduring importance. Third, careful policy thinking is required to foster a quick recovery, including openness to innovation and new technologies.

New Zealand, and the rest of the world, will emerge from the pandemic and the issues discussed in this report will resurface. New Zealand's future prosperity will depend on how well it is able to adopt technology. Rather than treat technology as a threat, the Government needs to remove barriers to firms adopting technology and to assist New Zealanders to both gain the most from innovation and adapt effectively to change. Steps that can be taken now – more flexible and accessible training, a high-performing and more equitable schooling system, greater income smoothing, better careers advice and retention of a flexible labour market – will build resilience and reap wider benefits, regardless of how the future unfolds.

I acknowledge the support of my fellow Commissioners Professor Sally Davenport, Dr Graham Scott (until May 2019), Andrew Sweet (from June 2019) and Professor Gail Pacheco (from July 2019) in overseeing this important work. We acknowledge the co-operation and support of those who engaged with us on this inquiry and provided valuable information that informed this report. We also acknowledge the work and commitment of inquiry director Judy Kavanagh and her team: Ron Crawford, Terry Genet, Nik Green, Dave Heatley, John MacCormick, Tim Maddock and Amelia Sharman.

Murray Sherwin
Chair, Productivity Commission
March 2020

Terms of reference

New Zealand Productivity Commission Inquiry into Technological Change, Disruption and the Future of Work

Issued by the Minister of Finance, the Minister of Education, the Minister for Economic Development, the Minister for Workplace Relations and Safety and the Minister for Government Digital Services (the "referring Ministers"). Pursuant to sections 9 and 11 of the New Zealand Productivity Commission Act 2010, we hereby request that the New Zealand Productivity Commission ("the Commission") undertake an inquiry into how New Zealand can maximise the opportunities and manage the risks of disruptive technological change and its impact on the future of work and the workforce.

Context

Technology, and its rapid development and adoption, is one of the critical dynamics in the changing world of work. The transition to a low-emissions economy has begun and will accelerate, providing scope for New Zealand to increase its focus on technology and changing economic opportunities. While technological innovation and disruption is nothing new, the increasingly pervasive nature of disruptive technologies and the pace of change will create significant opportunities for New Zealand to achieve a productive, sustainable, and inclusive economy. However, systemic, rapid change can be daunting and it is important for government to understand and respond to this prospective change so that these opportunities are realised and the risks managed. The opportunities and risks also need to be communicated in a clear and accessible way to New Zealanders. Technology is changing how government interfaces with the public and business, so government needs to be ready to respond to change in an agile and adaptive manner.

It is difficult to predict exactly what technological change will mean for New Zealand and how widespread disruption will be, but impacts are being felt already in the form of changing business models and some jobs being replaced or transformed by automation. While non-government parties (businesses, consumers and communities) will to a large extent drive change, government also has an important role to play by actively managing the impacts on different groups (positive and negative), and using policy and regulation to promote the innovative and beneficial use of technology across the public, business and not-for-profit sector.

New Zealand has had much success in labour market participation and employment on the whole but some groups are under-represented in labour market participation and employment. While technological disruption may pose fresh challenges in terms of policy and regulatory changes needed to help workers and firms adjust, it also provides opportunities to reduce barriers for participation. The government must actively manage a just transition, such as through its range of initiatives that support workplace productivity, regional labour markets and filling skills gaps. Finally, the government has a vital role in how it chooses to promote the innovative use of technology in the public sector and business community and to ensure a level playing field for different technologies.

Well-designed and coordinated government responses could allow New Zealand to:

- fully realise the potential of disruptive technologies for economic productivity and social prosperity;
- improve the services provided by government and increase the efficiency and effectiveness with which government functions; and
- provide an enabling environment without unnecessary barriers to desirable change, while effectively managing risks.

Together, these would also help to prepare New Zealand for any rapid labour displacement and distributional impacts.

Scope and Aims

The purpose of this inquiry is to provide an independent assessment of the scale and potential impacts of rapid technological change and its disruptive impact on the future of work and the workforce in New Zealand. The overriding aim is to harness changes to maximise the wellbeing of New Zealanders. The assessment should provide material for future government policy development and other initiatives to prepare the country for a productive, sustainable, and socially-inclusive future, despite uncertainties around the impact of technology.

For this inquiry, 'disruption' is primarily about the impacts of technological change. The inquiry should acknowledge the potential for disruption to have both positive and negative impacts.

Two broad questions should guide the inquiry:

- What are the current and likely future impacts of technological change and disruption on the future of work, the workforce, labour markets, productivity and wellbeing?
- How can the Government better position New Zealand and New Zealanders to take advantage of innovation and technological change in terms of productivity, labour-market participation and the nature of work?

We encourage the Commission to break the inquiry down into a series of shorter, related reports, published throughout the term of the inquiry, with a final report summarising findings and providing recommendations. For example, the topics could be as follows:

1. A scene setter:
    - A definition of disruption;
    - An analysis of the status quo in New Zealand, including the government's institutional and regulatory ability to flexibly adapt to a rapidly changing environment, and to support the diffusion of innovation;
    - The likely nature and scale of the impact of technology change on labour- market participation, under-employment, productivity, wages, education and skill requirements, and the nature of jobs (e.g. the gig economy);
    - The likely scale and pace of technology change, including across regions and industries, and the distributional impacts within the population; and
    - New Zealand's distinctive features in this space, and its comparative advantages and disadvantages (e.g. relatively flexible labour market and high employment, significant incidence of low skills).
2. How can active labour market policies, including their interaction with the welfare system, assist (or hinder) displaced workers to transition to different types of work and work places?
3. How can New Zealand's education and training systems be more effective in enabling adaptation to technological disruption?
4. How can we address the digital divide in New Zealand?
5. Identifying how technological change will affect different groups of workers, and therefore what are the appropriate types and levels of support required.
6. How can the regulatory environment enable adaptation to change, provide opportunities for new technologies to be tested and understood in New Zealand, and become more responsive to disruptive change?
7. How can government best encourage technology innovation and uptake, with a focus on wage growth and the development of appropriate high-engagement, high- performance actions and behaviours in New Zealand workplaces and industries?

8. How can New Zealand firms improve their employees' management capability in terms of adapting to technological change?

Report and Recommendations

The inquiry should explore New Zealand and international research and experience related to the questions above. However, the focus should be on practical applications relevant to New Zealand's circumstances.

Given the uncertainty around future technology and its impact, the inquiry is not expected to make detailed, quantified predictions of impacts. Rather, it should give a sense of the nature and relative scale of impacts in different scenarios.

The inquiry should have a long-term focus, with recommendations that can be implemented in the short- to medium-term. It should provide a resource for government to develop policies and programmes that make the most of the technological opportunities on offer and allow New Zealanders to face an uncertain future with confidence.

The report should build on previous relevant inquiries undertaken by the Productivity Commission.

The final report should provide recommendations for how New Zealand should manage a transition to a more technically advanced economy in relation to both technology's upside and downside risks, while still maintaining or improving incomes and wellbeing across all groups in the population, through recommendations on appropriate policy settings.

Consultation

Given that technological change is an issue of national significance, the Commission should consult with a broad range of stakeholders including: central and local government; the Future of Work Tripartite Forum, Future of Work Ministerial Group, the Just Transitions Unit in MBIE, and any new Future of Work groups established in Government agencies; relevant industry and NGO groups, including the NZCTU and Business NZ; academic bodies, businesses, Iwi, and the general public.

This inquiry is intended to complement and take account of existing policy work and other current work by evidence-gathering groups on the future of work and the impacts of technological change. The groups include the Law Commission, the AI Forum, and the OECD.

Timeframes

The Commission should present a final report to referring Ministers by 31 March 2020.

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Overview

This inquiry deals with two questions. What will technological change mean for work and employment? And how can New Zealand best position itself to take advantage of opportunities that could arise from technological change? The inquiry was prompted by recent advances in specific technologies, such as artificial intelligence and robotics, that some believe are starting to replace human labour on a wide scale.

Concerns about the potential for technology to replace labour are not new, and there are examples of industries and workers whose roles have been overtaken by technological progress. However, technology has many effects on labour, and many of these are positive. Technology and innovation provide the essential foundations for improvements in living standards and wellbeing, and have liberated much of humanity from poverty, drudgery and dangerous work. Historical and recent innovations have created new jobs, tasks and activities. It is difficult to predict in advance how any specific technology will affect the labour market, and it is foolhardy to rely on predictions of technology's wider future impact on national, local or sectoral employment, or on specific types of jobs, workers or occupations.

Worries about accelerating technological change and imminent, widespread disruption also appear misplaced. It is difficult to measure technological change directly. But the available proxy indicators, including productivity growth, business start-up rates and occupational churn, do not show faster technological progress and adoption across the developed world. Indeed, they consistently point in the opposite direction. Although future, large-scale disruption of the sort envisaged by well-publicised predictions cannot be entirely dismissed, it does not appear likely given historical experience and the information available in 2020.

New Zealand's productivity and income growth has been slow and disappointing for some time. The biggest opportunities available to New Zealand from technological change are higher household incomes and greater future wellbeing. Rather than treat technology as a threat, the country should embrace technology and take steps to encourage more adoption and diffusion, while looking after those adversely affected or less well equipped to adapt.

New technologies can expand employment options, raise productivity and incomes, lower costs to households, and overcome barriers to participation in work. These benefits can be most valuable to those marginalised in the labour market.

Some specific economic and social conditions matter for technology adoption: a population welcoming of technological change; a dynamic business environment in which resources (eg, capital, labour) move to higher-productivity firms; a labour market that adapts to change; a well-educated population; and policy settings that promote openness. New Zealand scores well on some of these but less impressively on others.

Efforts to promote greater technology adoption should retain New Zealand's strengths and deal with its weaknesses. New Zealand's strengths include:

- a labour market that is flexible, adjusts well to change, and has created an abundance of diverse employment opportunities that meet people's differing preferences and circumstances;
- an adult population that by international standards has high levels of literacy, numeracy and problem-solving skills, and high levels of participation in training; and
- policy settings that generally (with a few notable exceptions) promote openness to the flow of goods, services, business investment, skills, data, ideas and technology.

Areas of weakness include:

- a schooling system that exhibits declining performance in core skills and produces persistently poor outcomes for some young people, especially children in socio-economically disadvantaged communities, and Māori and Pasifika students;
- high house prices in cities that make it harder for some people to move to places where there are more employment opportunities and better matches for their skills;

- low dynamism in the business environment, reflected in weak innovation, and slow rates of reallocation (ie, the movement of resources from lower- to higher-productivity firms);
- weak management capability, which may limit the ability of firms to identify, learn about and adopt productivity-enhancing technologies and develop new products; and
- comparatively lukewarm attitudes towards emerging technologies.

There are many steps that the Government can take to improve the ability of New Zealand and New Zealanders to adapt to and benefit from greater technological change.

First, the Government should monitor local and international economic and labour-market trends. If disruptive technology does emerge, there will be time to see it coming and respond in a well-informed way.

Second, the training system should be made more accessible and flexible. While adult New Zealanders have high overall rates of training, more-qualified workers participate more than those less qualified. Regulatory and funding barriers make it hard for some people to gain new skills or upgrade existing skills. Rules restricting the funding, design and delivery of micro-credentials should be eased, adults should be able to borrow through the Student Loan Scheme for short-course tuition fees, and rules that require adults to enrol in full qualifications before they qualify for public funding should be removed.

Third, the quality and reach of careers advice and guidance should be improved. The Tertiary Education Commission (TEC) has the responsibility for leading a careers system strategy and the delivery of better services but is likely to struggle given its other commitments. The TEC's mandate to develop the careers system strategy should be strengthened, and it should be adequately resourced to carry out this role.

Fourth, employment law should be updated. Some public comment has highlighted digital work platforms and their reliance on contract labour as a cause of abuse, however issues of abuse are broader in nature and not specific to any particular technology. Digital platforms create many benefits for users and workers, including employment opportunities for people often marginalised in the labour market. The legal tests distinguishing "employees" and "contractors" should be updated to rely on the fundamental nature of the work relationship – the extent of employer control, worker autonomy and choice, and the extent of lock-in to a specific firm. The Government should also consider creating a "safe harbour" for firms wishing to offer benefits such as training or health support to their contractors. This would reduce the risk of legal challenge to the employment status of an employer's contractors in receipt of such benefits and supports.

Fifth, there is merit in providing greater income smoothing for displaced workers. Labour-market changes are financially and personally challenging, especially when change results in fear of or actual unemployment, or reduced chances of gaining employment. Government could provide better income support for people who lose their jobs, to relieve distress and better promote resilience to labour-market change from technology and other sources. Better income support might also promote more positive attitudes to technology adoption. The Commission identified three income-smoothing options that could be worth pursuing – adjustments to current benefit and tax credit policies, unemployment insurance, and portable individual redundancy accounts. Further analysis is required to identify the best of these options.

Sixth, the Government should urgently address the performance of the school system. Large disparities in achievement between the best and poorest performing students, along with an absolute decline in core skills – reading, mathematics and science – risk leaving many young people ill-prepared to adapt to, or prosper in, the future work environment.

Finally, the Government should review and refresh its regulatory settings to ensure they are up to date, do not unnecessarily inhibit technology adoption, and support a dynamic labour market. Four regulatory regimes came to the Commission's notice during the inquiry that deserve attention. Competition policy should be reviewed to ensure it can deal with issues created by digital technologies. Controls on genetic modification technologies may be out-of-date and overly restrictive. Policy work on data access and consumer data rights should be accelerated to help create new markets and increase business dynamism. Less restrictive land use regulation would ease upward pressures on house prices and reduce constraints on firm growth.

1 The Commission's task

1.1 Two key questions

This inquiry is about how technology affects employment and productivity. Two questions lie at its heart.

- What are the current and likely future impacts of technological change and disruption on the future of work, the workforce, labour markets, productivity and wellbeing?
- How can the Government better position New Zealand and New Zealanders to take advantage of technological change in terms of productivity, labour-market participation and the nature of work?

This inquiry responds to developments in technology, which many have seen as fundamentally different to earlier forms and potentially disruptive to human labour. These developments include recent improvements in the power and quality of artificial intelligence (AI) (Box 1.1), the spread of robotics, and the emergence of digital platforms as ways to seek and organise work.

Box 1.1 **Artificial intelligence**

"Artificial intelligence" is an umbrella term that encompasses several distinct technologies and techniques, including machine learning, deep learning, neural networks and pattern recognition. The AI Forum (2018, p. 26) defined AI as

> advanced digital technologies that enable machines to reproduce or surpass abilities that would require intelligence if humans were to perform them. This includes technologies that enable machines to learn and adapt, to sense and interact, to reason, predict and plan, to optimise procedures and parameters, to operate autonomously, to be creative, and to extract knowledge from large amounts of data.

There have been several recent breakthroughs in AI. For example:

- British AI company DeepMind announced in 2018 that it had developed a healthcare algorithm that could detect over 50 eye diseases as accurately as a doctor (Vincent, 2018).
- An AI system has achieved 95% accuracy in reading lips, considerably outperforming human lip readers (who were only right 52% of the time) (Manyika et al., 2017).
- An IBM program took part in a live debate with humans in 2018 in "what was described as a ground-breaking display of artificial intelligence" (D. Lee, 2018).
- Image recognition software now exceeds human accuracy levels (Shoham et al., 2018).

Driverless cars – somewhat of a poster child for advanced applications of AI – will make us "permanent backseat drivers" from 2020, according to a 2015 *Guardian* article (Adams, 2015). That widely predicted future did not come to pass. AI and related technologies have not advanced so quickly (Glaser, 2019; T. B. Lee, 2018; Naughton, 2019). Recent predictions are more restrained. Litman (2020), for example, predicted that driverless vehicles will not be common and affordable until the 2050s or 2060s.

There is no consensus about the pace of current and future progress in AI. Some scholars are sceptical about the likely future speed and trajectory of development in AI technologies. Rather than speeding up, Marcus (2018, p. 3) posited that AI "may well be approaching a wall" due to inherent limitations.

AI has previously experienced large increases in investment and activity, only to be followed by "winters" during which funding and interest in AI research dried up (1974–1980 and 1987–1993). Rather than a smooth curve of improvement, the development of AI in the past is more a process of "fits and starts" (Snow, 2018).

Like many new technologies, AI raises a variety of social and ethical issues.[2] This inquiry considers only the labour-market (and related economic) implications of emerging technologies such as AI.

Improvements in the accuracy of AI, and its expansion into new tasks, has led some scholars to predict that large swathes of human jobs and tasks will soon be automated. Such studies typically forecast the extent and timing of the effects of emergent technologies on the labour market. One early and influential example was Frey and Osborne's 2013 study concluding that 47% of all US jobs were at "high risk" of automation. Later studies attempted to disaggregate the effects by different job types, industries or regions (Box 1.2).

Box 1.2 **Future job disruption: from Frey and Osborne to predictions for New Zealand**

Many forecasts have been made about the number, types and locations of jobs that will be lost to automation (see Figure 2.4). Pioneering researchers Frey and Osborne categorised occupations "according to their susceptibility to computerisation" and examined the "expected impacts of future computerisation on US labour market outcomes" (2013, p. 2). They grouped occupations into those at "high", "medium" and "low" risk of automation. They concluded that about 47% of total US employment was in the high-risk category, "ie, jobs we expect could be automated relatively soon, perhaps over the next decade or two" (2013, p. 48). Particularly at risk were "most workers in transportation and logistics occupations, together with the bulk of office and administrative support workers, and labour in production occupations" (ibid).

CAANZ and NZIER adapted the Frey and Osborne model in 2015 to forecast the effects of disruptive technologies on New Zealand (CAANZ & NZIER, 2015). They concluded that 46% of the overall New Zealand workforce faced a high risk of automation, ranging from 75% for labouring jobs to 12% of professional jobs.

More recently, McKinsey prepared a forecast of job creation and destruction in New Zealand out to 2030 for the Future of Work Tripartite Forum (McKinsey & Company, 2019). This forecast included three main labour demand scenarios based on the pace of technology adoption ("early", "mid-point" and "late") and broke the results down by region, occupation type and industry. McKinsey found that:

- The earlier automation technologies are adopted, the more jobs will be lost with higher resulting unemployment. Under their early-adoption scenario, there is a net job loss of 600 000. In comparison, under their late-adoption scenario, net employment increases by 1 million.
- Under their mid-point scenario, 21% of work activities would be automated by 2030.
- Most regions benefit from net employment growth (except Southland and the West Coast), although the largest growth rates are expected to occur in Auckland and Wellington.
- Employment growth would be concentrated in managerial, technical and associated professional, service and retail jobs. There would be an overall reduction in administrative, trade and manual work jobs.

This is not the only period in history when people became worried about the replacement of labour with machines (section 2.5). John Maynard Keynes (1932) coined the term "technological unemployment" in the 1930s, at a time of high unemployment and seemingly fast technological change in Britain.

Although periods of technological progress did disrupt specific sectors and occupations, they did not lead to lasting and widespread unemployment (D. Autor, 2015). People found new work elsewhere, and resources flowed to new firms and industries.

[2] See, for example, Heatley (2019b) on algorithmic bias.

The concern expressed in this era is that technology will have a different and more permanent impact on labour and employment, as.

- technology is progressing faster than in the past, at a rate that is overwhelming society's ability to adapt; and
- whereas technology in the past replaced muscle, today technology is replacing cognition. This will leave people with no comparative advantages and no work to do.

The task of this inquiry was thus to understand the pace and scale of technological change, and its effects on work and employment, and to recommend policy changes to deal with any adverse effects in New Zealand.

1.2 How far away is the future?

The further into the future one peers, the less reliable predictions become. Those looking forward fifty years ago predicted flying cars and humans on Mars by 2020. Others predicted global famines (Ehrlich, 1968) and running out of oil (Meadows et al., 1972). It is unlikely that anyone predicted social media or crypto-currencies.

Most of the studies of automation and labour markets that motivated this inquiry make predictions for the next 10 to 20 years. Accordingly, the Commission adopted the midpoint (15 years) as the forecasting timeframe for this inquiry. This report presents the Commission's best judgement as to what will happen – due to technology – over the years 2020–35. But this will not correspond exactly with events up to 2035. Technological effects on labour markets will interact with – and may be swamped by – political, social and economic changes that are outside the scope of this inquiry.

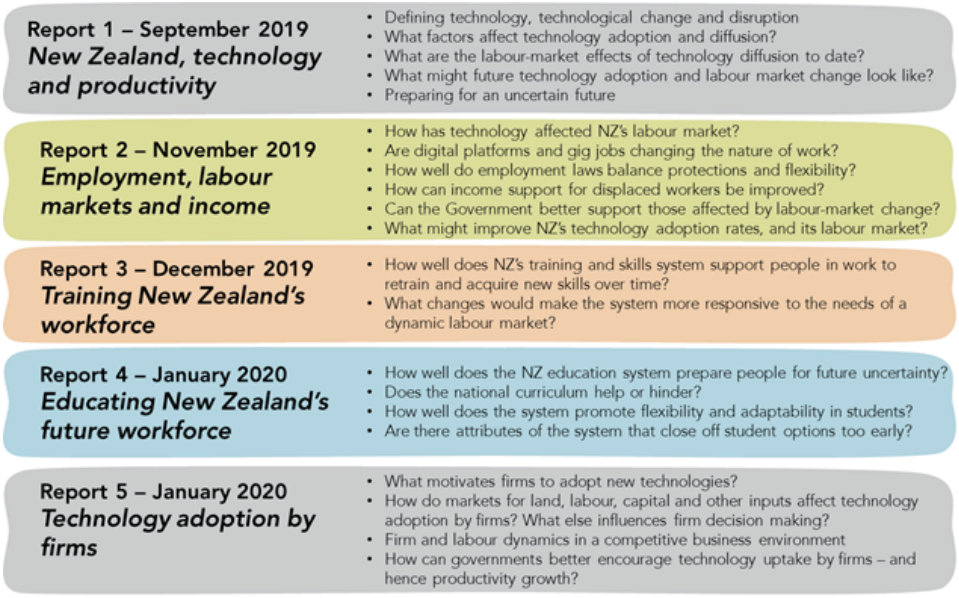
1.3 The nature of work

The inquiry's terms of reference also refer to, but do not define, the "nature of work". This term could encompass everything from the role of work in society, the sense of personal identity associated with a job, interpersonal and contractual workplace relationships, the process by which work is arranged, regulated and unregulated work conditions, wage and salary levels, hours and the tasks undertaken. Technology can affect all of these over the long run. Having said that, social norms and culture change more slowly than technology. This report concentrates on those aspects of work more likely to change between now and 2035.

1.4 The Commission's approach and this report

For this inquiry, the Commission took a different approach from its past practice to developing and communicating its advice. It published five short draft reports on specific themes, rather than a single one (Figure 1.1).

Figure 1.1 The inquiry's draft reports



The inquiry team commissioned a series of internal and external research reports and workshops to inform its analysis (Table 1.1).

Table 1.1 Inquiry research reports and workshops

Title	Authors and year
Subject choice for the future of work: Insights from focus groups	Eyre & Hipkins (2019)
Subject choice for the future of work: Insights from research literature	Hipkins & Vaughan (2019)
The impacts of job displacement by education level	Hyslop (2019)
Digital divide workshop	NZPC (2019a)
Micro-credentials roundtable	NZPC (2019c)
Measuring the "gig" economy: Challenges and options	Riggs et al. (2019)
Unemployment insurance: What can it offer New Zealand?	Spencer (2019)
New Zealanders' attitudes towards robots and AI	Heatley (2020)
Job-to-job transitions and the regional job-ladder	Coleman & Zheng (2020)
Income protection in the New Zealand tax-transfer system	Mok & Nolan (forthcoming)
Returns to adult education and training in New Zealand	Hyslop et al. (2020)

This *final report* draws on this research, and on the analysis, findings and recommendations in the five draft reports. Its structure follows the questions outlined in section 1.1.

- Chapter 2 discusses the historical, current and future effects of technological progress on productivity, employment and the demand for labour.
- Chapter 3 assesses how New Zealand is currently positioned to take advantage of innovation and technological change.
- Chapter 4 then looks at policy and other steps the Government could take to improve New Zealand firms' ability to adopt technology and New Zealanders' ability to adapt to, and benefit from, technological change.

2 The scale and pace of technological change

Key points

- Technology can have many distinct effects on the labour market. It can, for instance, replace or augment human labour, or increase the demand for labour by reducing the costs of goods and services. It can also improve matching between workers and employers. These effects interact, making it difficult to predict the aggregate effect of specific technologies on labour.
- Over long periods of time, the effects of new technology on the demand for skills has been changing. Current rewards for skills emphasise the importance of a well-educated population for meeting the challenges of technological change. The effects of technological change on the demand for and rewards for specific types of skills in the future is unknown.
- Models predicting the effects of technological change on jobs rely on assumptions about whether and when emerging technologies will be successfully commercialised and diffused and what the labour-market effects will be. These models do not provide a reliable basis for future labour-market policy.
- The rate of technological change cannot be measured directly, as there is no systematic and consistent way to measure the relative importance of different technologies. Productivity growth is a useful proxy indicator of the long-run rate of technological change.
- Productivity growth has slowed across the developed world over the past two decades, including New Zealand. This is consistent with a slow rate of technological change. Even so, current measured productivity growth may fail to capture technological change that could turn out to be transformative.
- In an economy with rapid or increasing technological change, business dynamism would be expected to increase. Change would likely be seen in a variety of labour-market indicators such as the unemployment rate, occupational churn, the age structure of the workforce, job tenure and the balance of employment arrangements (such as the proportion of the workforce self-employed or undertaking temporary work).
- The rate of technological change – as measured by productivity growth, business dynamism and labour-market change – currently appears to be static or slowing. While no single indicator on its own provides strong support for this conclusion, together the evidence is strong.
- Under the likely futures envisaged in this inquiry, the best stance for the Government is to adopt policy settings that encourage technology adoption and support New Zealanders to take advantage of technological change.

2.1 What is technology and technological change?

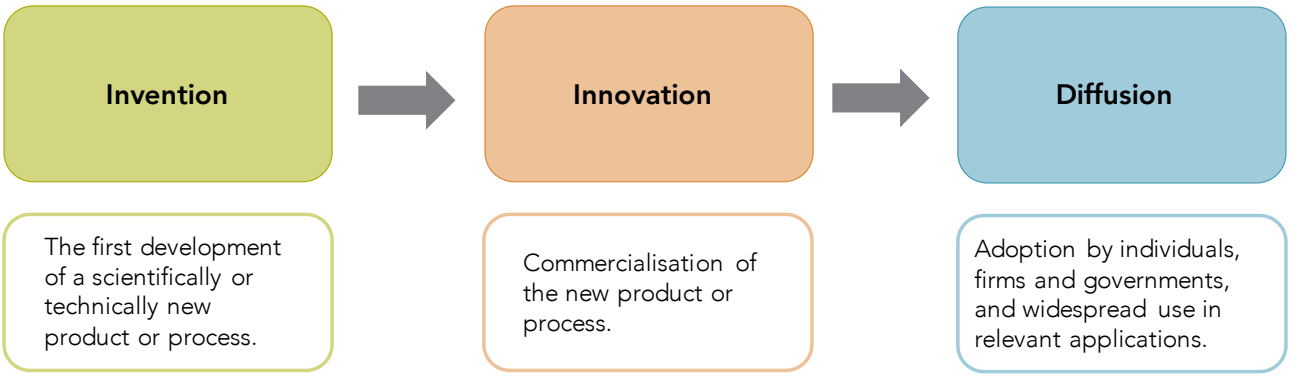
Technology is central to economic thinking. Definitions of technology in economics typically focus on the production of goods and services for sale in markets. For example, the *Dictionary of Economics* describes technology as "the application of human knowledge to create machines and methods [that] improve products and their production and marketing" (Collin, 2006, p. 200). Jones and Vollrath (2013) defined technology as "the way inputs to the production process are transformed into output" (p. 80). However, technology and ongoing technological improvement are similarly important for the delivery of goods and services by governments and not-for-profit entities (NZPC, 2015a, 2017b).

Technology, especially its recent manifestations, has yielded significant consumption benefits for households. Digital technologies have facilitated personalisation of services, provided more channels through which to purchase goods and services, and created opportunities to earn income from household assets (eg, cars and homes) (APC & NZPC, 2019). Technology has also changed the nature of some transactions between producers and consumers. For example, consumers now undertake some activities once done by employees, such as checking in at an airport or checking out at a supermarket.

The Commission adopted the following definitions for this inquiry.

- *Technology* is the application of knowledge to improve the production, quality or delivery of goods and services, or to create new goods and services. This knowledge can be embodied in products, physical assets (eg, machinery) or in intangible assets (eg, software, product designs, business processes).
- *Technological change* is the overall process of invention, innovation and diffusion of technology (Figure 2.1).
- *Technological disruption* occurs when new or existing technologies make existing firms, business models, skills or occupations obsolete, at a pace and scale that is abrupt, unexpected, larger than ordinary rates of change, and overwhelms the ability of people and systems to adapt.

Figure 2.1 Three stages of technological change



Source: Adapted from Jaffe, Newell and Stavins (2000).

The creation and commercialisation of new technologies is critical to technological change. But New Zealand firms and researchers will only invent a small share of the total number of technologies that could affect labour markets in this country. Accordingly, diffusion is of more importance than invention or innovation in the context of this inquiry.

While individual events and changes can cause disruption to the lives of some people and the fortunes of some firms, the Commission believes the term "technological disruption" is best reserved for abrupt and unexpected change that creates significant adjustment costs across the economy. This reinforces the idea that technological change is both normal and ongoing, and that planning for and adapting to it should be "business as usual" for individuals, firms and governments.

2.2 Technology affects the labour market in myriad ways

Public debate about technology's impact on work tends to concentrate on the potential for technology to replace human labour. But while some applications of technology do replace human labour, others increase the demand for labour, permit more effective use of labour, or allow people to find work that better suits their skills and preferences (Table 2.1). These effects interact, making it difficult to predict the aggregate impact of a specific technology on the demand for labour.

Further, it can be misleading to characterise *specific* technologies as labour replacing or labour augmenting. The introduction of computer programs, for example, displaced bookkeepers and the manual preparation of spreadsheets but increased the demand for people who were able to carry out spreadsheet-based financial analysis (Kestenbaum & Goldstein, 2017). Federated Farmers argued that in the primary sector, "greater

technological development and productivity improvements have resulted in more employment, not less" (sub. DR409, p. 11).

Table 2.1 Six effects of technology on the labour market

Labour effect	Explanation
Labour replacing	Labour-replacing applications of technology are those that allow jobs or tasks that were once carried out by people to be undertaken by machines, computers or other assets. An example is the replacement, by machines, of people responsible for checking the quality of goods on production lines.
Labour augmenting	Labour-augmenting applications of technology are those that directly boost the productivity of workers, and thus increase the demand for labour able to use the new technology. The automatic teller machine, for example, freed up counter staff to undertake complex sales, marketing and customer-relations tasks.
Market creating	Technology creates new goods and services, and thus demands for new types of skills and jobs. For example, Trade Me was a new service that matched buyers and sellers, creating spin-off firms handling the delivery, insurance and other aspects of trades.[3]
Cost reducing	Cost-reducing technologies permit existing goods or services to be produced at a lower cost. In a competitive market, such cost reductions get passed on to consumers in the form of lower prices. This affects the labour market through three main channels. • Lower prices can increase the demand for a product (and for the labour that produces it). • Lower prices free up consumer incomes for spending on other products. This creates demand for labour elsewhere in the economy. • Lower prices for the products and services consumed by other firms frees up their income for investment or further spending on labour.
Improved labour-market matching	Technology has changed the operation of the labour market, with new platforms and new tools for matching workers to jobs. Examples include Seek, LinkedIn, AI services that find suitable candidates for jobs, and algorithmic tools that screen job applications for employers. Better job matching can lift productivity, improve worker wellbeing and satisfaction, and increase labour-market dynamism.[4]
More effective monitoring	Technology may make it easier for firms to monitor and direct the performance of workers, including those who are not employees. This may lead to improved workplace and public safety, but may also reduce worker agency, workers' trust in fair treatment, and job quality.

Some technologies can embody more than one labour-market effect at once. For example, digital platforms (Box 2.1) can reduce the costs involved in labour-market matching, provide more effective monitoring (eg, by allowing for more detailed specification of work and standardising contracts) and create new markets. This combination of effects can expand work opportunities for people in thin labour markets and those seeking flexible work.[5]

[3] Trade Me both created new markets and substituted for existing economic activity. Print media, for example, lost classified advertising revenue.

[4] Some, however, have warned that digital matching technologies (eg, hiring and vetting algorithms) may "inadvertently reinforce discrimination in hiring practices" (Mann & O'Neil, 2018).

[5] Digital labour platforms have also raised concerns that an increasing share of work in the future will be conducted through employment arrangements that lack traditional legal protections and other benefits such as employer contributions to retirement savings (see section 4.8).

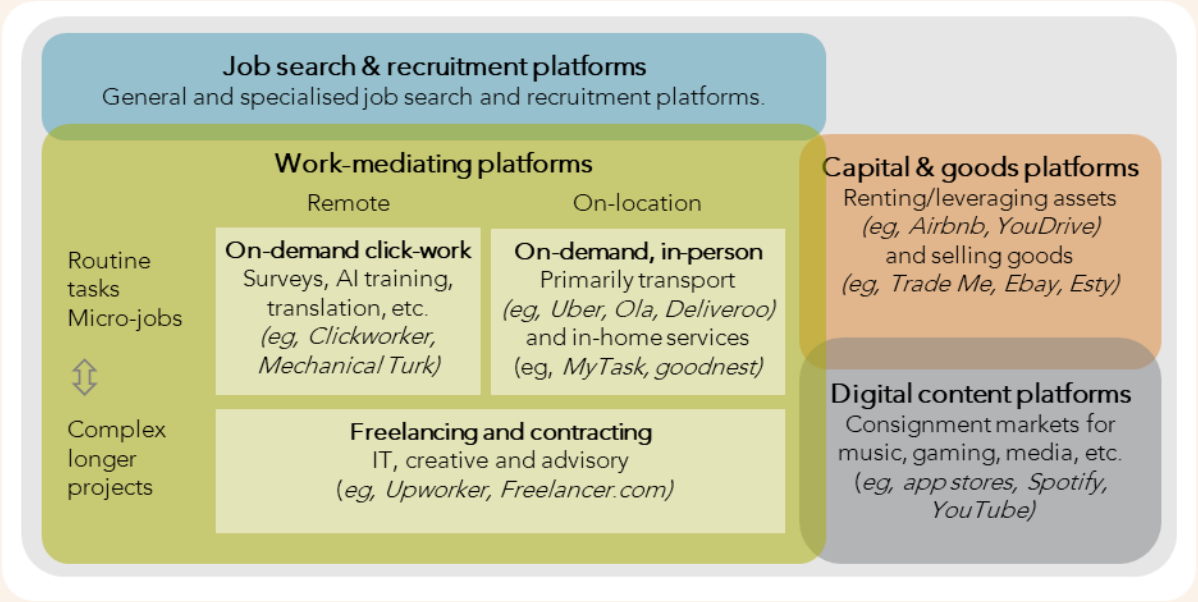
Box 2.1 **Worker and household activities using digital platforms**

Job search and recruitment platforms help job seekers and employers find each other and reduce the costs of job search and hiring.

Work-mediating platforms match those willing to pay for tasks to those willing to do them for reward. Examples include Freelancer.com and Uber. Tasks range from relatively routine micro-tasks requiring low skills, to longer and more complex projects requiring specialised skills. Work-mediating platforms allow people to specify tasks, determine wages/prices and other contract terms, match clients and tasks to workers, monitor and assess performance, and facilitate payment. These mechanisms tend to become more standardised and prescriptive for more routine and repetitive tasks. Some tasks on work-mediating platforms require workers to supply vehicles, equipment or a home office. For such tasks, income from the platform has both capital and labour components.

Capital and goods platforms allow people to rent out their homes, cars or other assets. There is often a labour component to such rentals. For example, Airbnb hosts' income is a mix of property rent income and pay for work (eg, marketing, hosting guests and cleaning). Similarly, the income people earn from products they make for sale on goods platforms includes a labour component.

Digital content platforms support work creating digital content (eg, music, photography, games). Content is posted or described on the platform and the creator's earnings are based on user volume (eg, a share of advertising, subscription or download sales). Platform exposure helps some content creators to sell endorsements, live performances or merchandise.



Source: Productivity Commission; Kenney and Zysman (2018); De Groen et al. (2018).

F2.1 Technology can have many distinct effects on the labour market, and more than one effect can occur. Technology can replace human labour, augment human labour, increase the demand for labour by reducing the cost of goods and services, create new markets and occupations, and improve matching between workers and employers. These effects interact, making it difficult to predict the aggregate impact of technology on labour.

2.3 The impact of technology on work has changed over time

The introduction and diffusion of new technologies creates both costs and benefits. Typically, people who have invested in older technologies and associated skills bear the short-term costs. Benefits accrue in part to investors in successful new technology, but mainly to society at large. Historically, different technologies have varied in who they affected, and how they were affected. Impacts have also varied across time and across countries.

An early deskilling effect …

The diffusion of water and steam power throughout Europe in the first industrial revolution (1760–1850) tended to have a "deskilling" effect. Jobs that were previously undertaken by (or under the supervision of) skilled artisans were replaced by mechanised processes that could be overseen or carried out by less-skilled workers. This reduced the demand for skilled labour relative to unskilled labour (Goldin & Katz, 1998). As a result, jobs that were once socially and economically valued were either fundamentally transformed or eventually disappeared. Atack, Margo and Rhode (2019, p. 67) noted that:

> Faced with such competition, blacksmith shops either shifted away from making objects to fixing them by offering repair services, or simply disappeared. The job of blacksmithing was once considered sufficiently numerous to warrant its own industry classification, but by the very end of the nineteenth century it was dropped from the manufacturing census as no longer worth the trouble to enumerate.

The implications of the first industrial revolution for living standards were not straightforward. While most British workers and their families did not experience a deterioration in their standard of living during and after the industrial revolution, neither did they enjoy rapid progress (Feinstein, 1998). Real wages in Europe increased only slowly over the first half of the 19th century. Drawing off English primary data, Feinstein (1998, p. 649) calculated that "over the 75 years from 1778/82 to 1853/57 the increase in real weekly earnings, allowing for unemployment and short-time working, was less than 30 percent".

These wage gains were partly offset by higher costs from other factors such as disease, pollution and food adulteration (Feinstein, 1998). Others have cited falls in the recorded heights of European adults (indicating malnourishment), increases in child mortality, and very long working days as evidence of stagnant living standards (Komlos, 1998; Voth, 2001). As a result of pressure from organised labour and other social campaigns, governments in the Western world progressively took on larger roles in regulating the labour market, setting standard working hours, enforcing safety rules, prohibiting certain forms of work (eg, child labour) and enabling bargaining between workers and employers about wages and conditions.

… followed by rewards for skills and a boost to incomes

Average incomes in Europe and the United States began to increase more rapidly in the second half of the 19th century. One factor contributing to higher incomes was an increase in the relative demand for skilled labour. This increased demand reflected the increasing size and complexity of factories, changes in production methods, and the move from steam to electric power.

Overall, the economic impacts of technological change on the labour market tended to favour higher skills, especially from the mid-to-late 1800s to the early 1900s. Katz and Margo (2013, pp. 2–3) observe that while de-skilling occurred in manufacturing, the opposite effect occurred in the US economy as a whole:

> … although de-skilling in the conventional sense did occur overall in nineteenth century manufacturing … de-skilling did <u>not</u> occur in the aggregate economy; rather, the aggregate shares of low skill jobs decreased, middle skill jobs remained steady, and high skill jobs expanded from 1850 to the early twentieth century.

A more recent shift favouring complex analytical tasks and skills

Beginning in the late 20th century alongside the introduction of computers and the internet, technological change was even more favourable to the higher-skilled (especially university-educated) people, while displacing the middle-skilled. This trend has been described as "job polarisation" (see section 2.3). Autor,

Levy and Murnane (2003, p. 1284) argued that this development "marks an important reversal" and was related to the nature of the tasks conducted.

> Previous generations of high technology capital sharply increased demand for human input of routine information-processing tasks, as seen in the rapid rise of the clerking occupation in the nineteenth century … Like these technologies, computerization augments demand for clerical and information-processing tasks. But in contrast to its nineteenth century predecessors, it permits these tasks to be automated … Over the last three decades, computers have substituted for the calculating, coordinating, and communicating functions of bookkeepers, cashiers, telephone operators, and other handlers of repetitive information-processing tasks.

What drove these patterns was not the skill requirements of jobs, but how routine and predictable were the tasks that made up those jobs.[6] Tasks that were highly routine and predictable in nature could be more easily automated, while less routine or predictable tasks (including those that are largely manual rather than cognitive) could not (Table 2.2).

Table 2.2 Direct employment effects of computerisation on different types of workplace tasks

	Routine tasks	Non-routine tasks
Analytic tasks	Human labour can be substantially replaced by computers	Computers augment, rather than replace, labour
Examples:	Record-keeping; calculation	Managing others; persuading & selling; forming & testing hypotheses
Manual tasks	Human labour can be substantially replaced by computers & robots	Currently only limited opportunities for computers to either replace or augment labour
Examples:	Repetitive assembly; picking and sorting	Truck driving; janitorial services

Source: Adapted from Autor, Levy and Murnane (2003).

The effects of technology on rewards for skills continue to change over time. Future effects will depend on the nature of the technologies that emerge, and how they interact with evolving capabilities in the population. Other factors will also be important. These include the extent of globalisation and international trade policy, the effects of climate change on economies, and changing social preferences. As a result, the effects of future technological change on the long-term demand for and rewards for specific types of skills is unknown (and likely unknowable). Even so, current rewards for skills indicate that a well-educated population will be best placed to meet the challenges of technological change.

F2.2 Since the industrial revolution in the 19th century, new technologies have had changing effects on the demand and reward for skills. Current rewards for skills emphasise the importance of a well-educated population for meeting the challenges of technological change. The effects of technological change on the demand and rewards for specific types of skills in the future is unknown.

2.4 Technology's role in New Zealand's development

Technology embodied in cultivation methods … and refrigerated shipping

New Zealanders have adopted and adapted technologies since the first days of human settlement, particularly in agriculture. Initial technologies were embodied in imported plants and seeds (eg, kumara, grass) and cultivation methods. Early technology adoption by Māori was driven by the need to feed local

[6] While it can be analytically convenient to split tasks from jobs, in practice a *job* is bundle of related and often interdependent tasks. This makes it infeasible (or at least uneconomic) to automate, outsource or offshore all the routine and predictable tasks within a typical job.

communities and adapt to local conditions.[7] Contact with Europeans and Americans in the 18th and 19th centuries saw increased production for export to Australia, to service visiting ships, and for the growing non-Māori resident communities.

The introduction of refrigerated shipping in the 1880s transformed New Zealand's economic fortunes. This created new markets (eg, dairy for export), encouraged producers to adopt technologies to manage market risks (eg, crossbreeding sheep to create animals that provided both good meat and wool), and prompted the emergence of ancillary firms, industries and employment opportunities (eg, freezing works, milk processors) (Hawke & Lattimore, 1999).

Protectionist policies distorted investment choices … and technological change contributed to falling export prices

High unemployment and the economic misery resulting from the Great Depression led successive governments to introduce controls to shield New Zealand from external shocks, maintain its balance of payments, develop domestic industry and ensure full employment. These controls included high tariffs, import licensing, financial subsidies to industry and regulations that directed firm activities (eg, requirements to use trains to transport goods over distances longer than 30 miles).[8] These protectionist policies distorted technology and investment choices by protecting inefficient and high-cost industries, limiting competition and reducing flexibility (OECD, 1983; Reserve Bank of New Zealand, 1981, 2007). These policies also reinforced a "breadwinner model" based on full male employment and an industrial relations system that kept full-time (male) wages high.[9]

New Zealand's economic circumstances began to deteriorate from the late 1960s when the country's terms of trade fell:

> Private and public sector foreign debt combined rose from 11 percent of GDP to 95 percent between March 1974 and June 1984. Net public debt increased from 5 percent of GDP to 32 percent during the same period. Annual inflation remained in double digits for the entire December 1973 to March 1983 period (and was subsequently controlled only through an extensive wage-price freeze). The current account deficit in the balance of payments climbed to 8.7 percent of GDP, while the government's financial deficit amounted to 6.5 percent of GDP in 1983/84 (Evans et al., 1996, p. 1860).

Technological change contributed to falling export prices; for example, the development of synthetic fibres reduced demand for crossbred wool.

A painful adjustment … and a move towards a services economy and technology-biased skills

Wide-ranging reforms in the 1980s and 1990s led to high unemployment and economic disruption in many regions. Formerly protected firms and industries closed or reduced their workforce, and displaced workers often faced significant financial hardship. These reforms, however, were a response to economic tensions and problems that had developed over the preceding decades.

The 1930s to 1990s is a controversial period in New Zealand's history, and there are competing and divergent narratives.[10] An economic interpretation is that new technologies change prices, and changing prices create adjustment costs for firms and individuals. Protectionist policies can shield locals from price changes in the wider world. However, they defer rather than eliminate the consequential adjustment costs (NZPC, 2018). Should local and world prices diverge, a reckoning is all but inevitable when protectionism ends. The economy is then faced with adjustment costs accumulated over the period of protectionism. Furthermore, the economy must deal with the devaluation of investments that were profitable based on protected prices, but not world prices.

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[7] Downs and Wojasz (2019, p. 6) cited the example of the kumara pit as an early agricultural innovation: "Finding the climate too temperate for growing their favoured crop, the sweet potato, [Māori] created a way to build small walls around the pits the kumara were grown in. This allowed the rays of the sun to be absorbed during the day, and warm the earth in the evening, elongating the growing period".

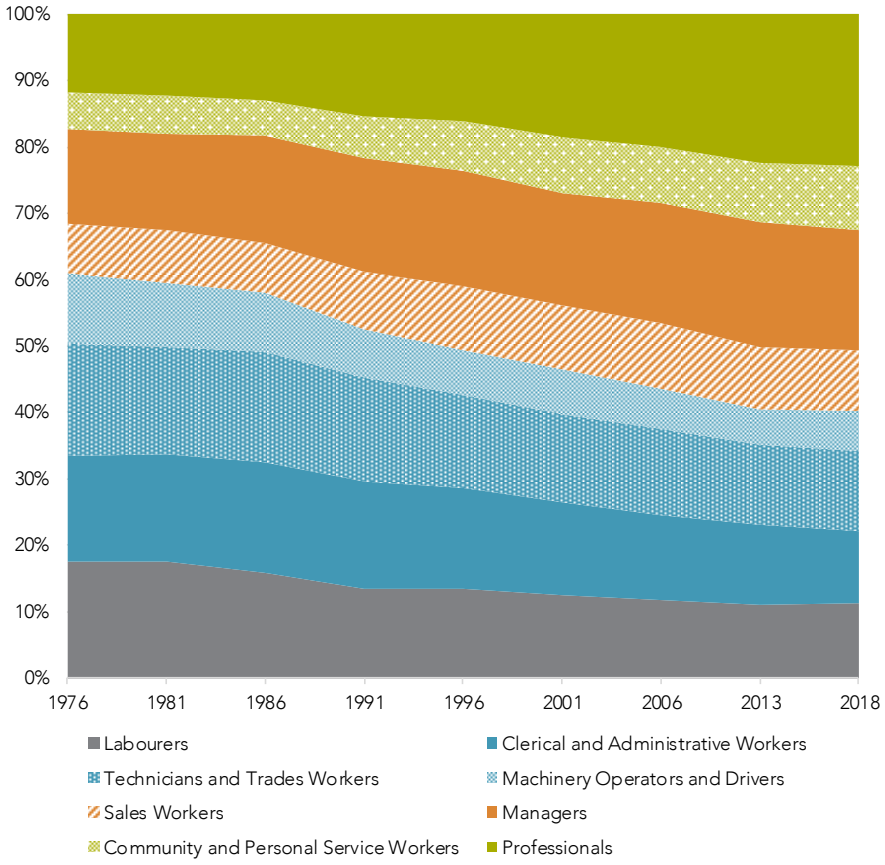
[8] Road transport of most goods was limited to 30 miles from 1936 and subsequentially increased to 150 km in 1977 (Heatley, 2009). Entry to the road transport business was also restricted, and freight prices were controlled. Governments removed the regulatory protection of rail between 1983 and 1986.

[9] Described for Australia by Castles (1994), but also applicable to New Zealand.

[10] New Zealand Council of Trade Unions Te Kauae Kaimahi (sub. 41, p. 67) presents one alternative view.

In line with the experience of other developed countries, changes in New Zealand's economy prompted rapid shifts in the labour market towards the service sector, away from manufacturing (Figure 2.2) and towards higher-paid and higher-skilled occupations.

Figure 2.2 Changing occupational shares, level 1 categories, New Zealand, 1976–2018



Source: Maré (2019).

These changes favoured New Zealand's larger cities and cities with desirable amenities. The bulk of new jobs created over 1976–2013 in information-intensive and skill-intensive sectors, such as finance and professional and business services, took place in Auckland. Some regional centres, smaller towns and cities struggled to adjust and diversify as local manufacturing employment declined. The places that adjusted most successfully tended to have other attractions, such as a favourable climate. Employment growth in these places was concentrated in firms and organisations providing services to local consumers (eg, health, education) (Coleman et al., 2019).

Like most developed countries, there has been a shift in New Zealand towards jobs requiring higher levels of education. Yet the income premium for a tertiary education qualification is lower in New Zealand than the OECD average, and much lower than that in the United States. Moreover, wage growth in New Zealand over the past 30 years has been more evenly distributed across education levels than in, for example, the United States.

In contrast with several other developed countries, job polarisation is not apparent in the New Zealand data. The employment share of both low-paid and middle-paid occupations has declined, while the share of high-paid occupations has increased. This pattern also holds for occupations classified by required education level.

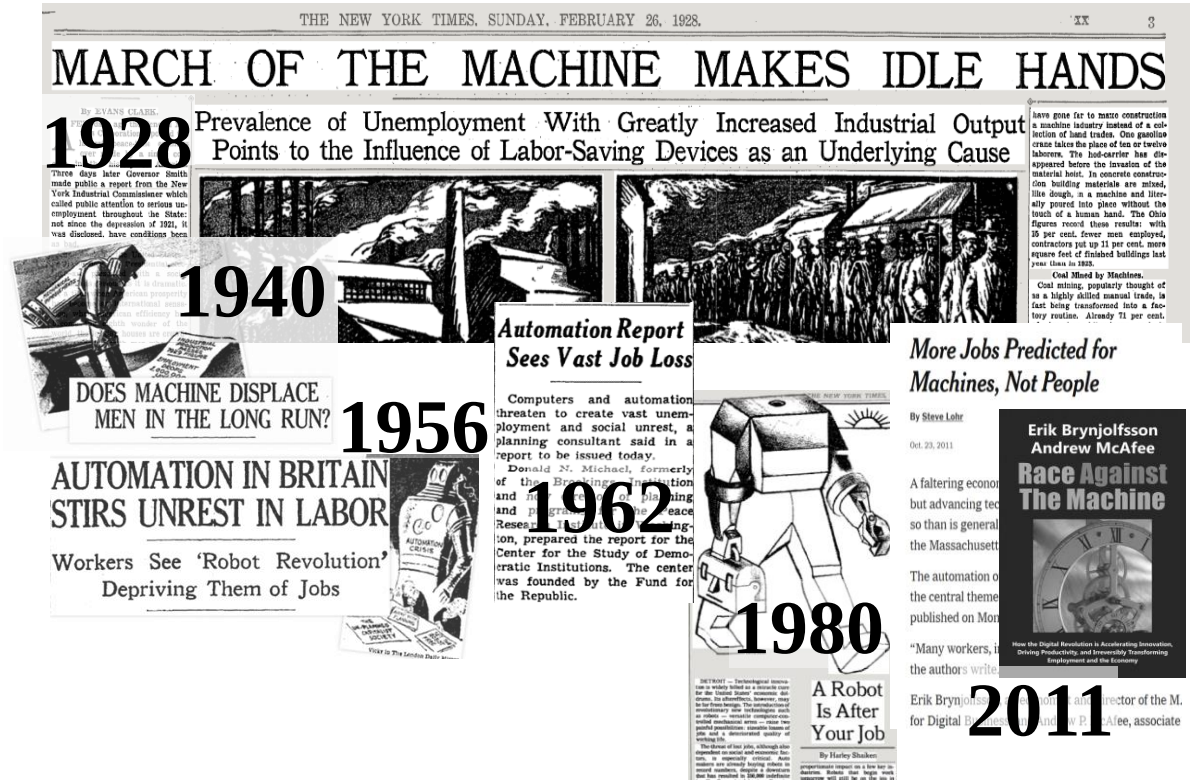
Individual technologies become available when they are created and commercialised. Adoption rates vary by country, however, as can the labour-market effects of technology adoption (such as job polarisation). Such variation reflects, among other things, differences in industry structure, policies and institutions across countries.

2.5 Past and current concerns over technology and jobs

A long history of recurrent anxiety

A belief that technological change is accelerating, and associated anxiety over its effects on the labour market, has a long history as Figure 2.3 illustrates.

Figure 2.3 Machines, robots and jobs: selected headlines from the New York Times



Source: *The New York Times*, various dates.

Mokyr, Vickers and Ziebarth (2015) placed current concerns within this long history:

> From generation to generation, literature has often portrayed technology as alien, incomprehensible, increasingly powerful and threatening, and possibly uncontrollable. …
>
> So it is surely not without precedent that the developed world is now suffering from another bout of such angst. In fact, these worries about technological change have often appeared at times of flagging economic growth (p. 31).

As just one example, technological progress in the 1960s led to concern about its possible negative effects in the United States. In President John F. Kennedy's famous "we choose to go to the Moon in this decade" speech, technological change was occurring at "a breath-taking pace, and such a pace cannot but create new ills as it dispels old, new ignorance, new problems, new dangers" (Kennedy, 1962).

New Zealand has not been immune to these beliefs and anxieties. In an introduction to the proceedings of a 1979 national seminar titled *The acceleration of technological change and its implications for employment and industrial relations*, the director of the Industrial Relations Centre at Victoria University wrote:

> In offering this seminar the Industrial Relations Centre sought to facilitate community understanding of a complex set of issues facing New Zealand. When the seminar was planned, it was very evident that some sections of the community were seriously concerned at the likely impact of micro-processors and new technologies on employment opportunities and the control of the economy itself. In others, new technologies were seen as a means of breaking away from New Zealand's abysmally low performance in matters of productivity and economic growth. At the same time relatively little attention seemed to have directed to broader questions: the use of technology to improve the quality of working life and their application to more general community improvement. (Young, 1980, p. iii)

With the benefit of hindsight, 1980s concerns about "micro-processors and new technologies on employment opportunities and the control of the economy" seem misplaced. Still, Young's "complex set of issues facing New Zealand" remain, not the least in "New Zealand's abysmally low performance in matters of productivity and economic growth".

An AI resurgence from 2007 brought old anxieties to the surface again

Breakthroughs by AI researchers starting about 2007 – and subsequent increases in R&D investment from the early 2010s – raised concerns about potential labour-market effects. Furman argued that accelerating progress in AI could lead to "sustained periods of time with a large fraction of people not working" and to a fall in "both the labor force participation rate and the employment rate" (2016, p. 7).

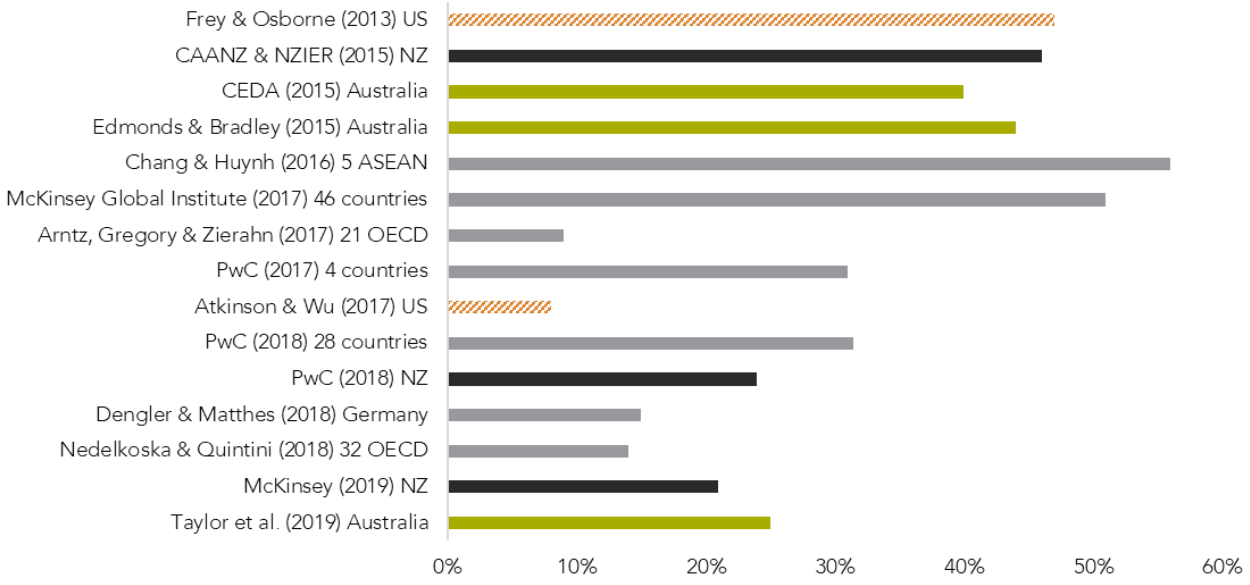
AI will not have significant effects on the labour market without fast and prolonged development, and widespread diffusion of AI applications. Both the direct and aggregate effects of development and diffusion would need to be labour replacing. The predictions of large-scale job losses from AI assume that all these effects are about to happen.

Concerns have been fuelled by widely publicised predictions of job losses

Concerns about large-scale job losses from technologies such as AI and robotics can be traced to Frey and Osborne (2013). That study has been widely interpreted as concluding that 47% of US employment *would* be automated over the next 10–20 years. Frey recently expressed concern about this interpretation, emphasising that *actual* job automation levels "will depend on many other things, such as cost, regulatory concerns, political pressure and social resistance" (The Economist, 2019, p. 66).

Frey and Osborne's predictions, and those that followed them, typically rely on models that forecast the extent and timing of the introduction and diffusion of emerging technologies, make assumptions about the effects of those technologies on the labour market, and thus estimate numbers of jobs affected.[11] Such models typically look at a country's labour market in aggregate over a forecast period of 10–20 years. Figure 2.4 shows the headline predictions of a selection of such models.[12] Of note is the variability in their findings, and a general trend over time towards fewer job losses.

Figure 2.4 Predicted jobs at risk from automation over the following 10–20 years, selected models



Source: NZPC (2019d).

[11] Most of the subsequent studies reused or adapted Frey and Osborne's methodology, and reused some of their datasets.

[12] The models included were comprehensive, as at September 2019, for New Zealand and Australia, and representative for other countries.

These models tend to assume that what is technologically possible will be successfully commercialised and diffused widely, and that the labour-market effects of these technologies are known. NZPC (2019d) also found the models had significant methodological issues.

These types of models typically do not present a baseline for normal rates of labour-market change, against which predictions of future change should be compared. Labour-market change due to technology and other factors is normal – jobs are created and destroyed all the time. In a typical year, new and disappearing jobs are about 13–15% of all jobs in New Zealand (Page, 2010). Roughly 21% of New Zealand workers on average have changed jobs each year over the past two decades.

According to the AI Forum (2018, p. 53), in New Zealand:

> Over the next 40 years more than 10 million jobs will be displaced by normal market changes, so even in a worst case scenario of a million jobs lost to AI, this only represents 10% of the total change. Even if AI related job elimination were additional to the existing churn, it would be a relatively modest influence.

Irrespective of the rate of technological change, a large number of workers retire each year – roughly 2.5% of the workforce on average. This equates to a natural workforce adjustment of 37.5% every 15 years due to retirement. This alone exceeds the 30% average job losses from technology predicted for New Zealand (averaging the three studies listed in Figure 2.4).

Quantitative predictions based on complex and non-transparent models offer an artificial sense of certainty about the future, and can encourage governments to make poor policy choices, or act too slowly or too swiftly.

F2.3 There are inherent difficulties in predicting the labour market effects of technological change. There are many "jobs at risk from automation" models. Each model makes many assumptions about whether (and when) emerging technologies will be successfully commercialised and diffused and what the labour-market effects will be.

Testing the predictions

It is now seven years since Frey and Osborne's 2013 study – 70% of the way to the near end of their prediction period (10 years) and more than a third of the way to the far end (20 years). Similarly, it is five years since publication of predictions for New Zealand and Australia, roughly a third of the way through the forecast period (Figure 2.4).

If these predictions were correct, then the effects should by now be obvious. An economy with rapid or increasing technological change would exhibit measurable changes in various economic and labour-market indicators.[13] These indicators fall into three broad groups:

- the pace of technological change (section 2.6);
- the effects of technological change on firms (section 2.7); and
- the labour-market effects of technological change (section 2.8).

Evidence of change in and across these indicators consistent with the predictions would support the methodology of the models and the assumptions and datasets on which they rely. Conversely, a lack of such evidence would cast significant doubt over these models.

Section 2.9 presents an overall assessment.

[13] Labour-market data changes with the seasons, the business cycle and structural change. This inquiry is concerned with structural change; hence the Commission presents long-term data where it is available and avoids drawing strong conclusions from short-run trends.

2.6 Measuring the pace of technological change

Many contemporary studies claim that the pace of technology development and adoption is "accelerating", or that today's emerging technologies are "exponential" in a way that distinguishes them from earlier ones. Ideally, such claims could be tested against a measure of the pace of technological change that met three criteria: robustness, wide acceptance and the availability of long-run data. However, no measure meets these criteria. Some studies examined the rate of diffusion of specific technologies, while others used productivity growth as a proxy for technological change.

The diffusion times for specific technologies are an unreliable indicator of the pace of technological change

A decreasing trend in the time taken for a given proportion of the population to adopt specific technologies is evident in data such as that presented in Table 2.3.

Table 2.3 Time from commercial availability to use by 25% of US population, selected technologies

Technology	First year commercially available	Years until used by 25% of US population
Electricity	1873	46
Telephone	1876	35
Radio	1897	31
Television	1926	26
Computer	1975	16
Mobile phone	1983	13
World-wide web	1991	7

Source: Chartered Accountants Australia New Zealand and New Zealand Institute of Economic Research (2015).

Comin and Hobjin (2010) came to a similar conclusion. After examining technology adoption rates in 166 countries, for 15 major technologies, they reported that:

> … newer technologies have been adopted faster than older ones. This acceleration in technology adoption has taken place during the whole two centuries that are covered by our data. Thus, it started long before the digital revolution or the postwar globalization process that might have contributed to the rapid diffusion of technologies in recent decades (p. 2033).

However, Manyika et al. (2017) concluded otherwise. While technologies were probably being adopted faster than was the case 100 years ago, they found no evidence of acceleration over the past six decades.

A possible explanation for the apparent increase in diffusion rates may be "a shift away from technologies that require significant new public infrastructure to facilitate their adoption (such as electricity, the telephone and automobiles) towards those that do not (such as microwaves and air conditioning)" (APC, 2016, p. 23).

These widely differing conclusions may also be the result of *selection bias*. The studies' conclusions might have been quite different if the researchers had chosen a different set of technologies to report. It took only 10 years after the 1908 introduction of the mass-produced internal combustion engine car, for example, before there was 25% uptake in the United States.[14] Adding this datapoint to Table 2.3 would undermine its orderly progression and clean conclusion.

A further problem is that such studies report results only for technologies that proved successful. This makes them less useful in informing the present about today's seemingly exciting but yet-to-be proven technologies. Many, perhaps most, of these will fail to realise their current promise if history is any guide.

[14] Ford first produced the Model T in 1908. It sold 15 million over the next 20 years. The US vehicle fleet grew to approximately 27 vehicles per 100 households by 1918 (Productivity Commission calculations using US Census Bureau, US Department of Transportation and Pew Research data).

The electric car, for example, had 38% market share – nearly double that of gasoline cars – in the United States at the beginning of the 20th century. But it had largely disappeared by 1920 (Cromer et al., 2018). (Its resurgence in the 21st century currently falls far short of its previous high point.)

Attempts to measure the pace of technological change from the attributes of specific technologies suffer from an aggregation problem – it is impossible to measure the impacts of different technologies on the economy and society to compare their relative importance. Was the invention and diffusion of the smartphone, for example, more or less important for wellbeing than the invention of the washing machine?

While some evidence supports the idea that that diffusion rates for some important technologies sped up during the 20th century, such observations are not a reliable indicator of rates of technological change.

Productivity growth is a good indicator of the long-run pace of technological change

Firms adopt technology to improve their performance – to increase profits, grow their market, or further their mission. Decisions that improve firm performance typically also raise national productivity – the ability to produce more or better goods and services with the same or fewer inputs.

These observations suggest that productivity growth in an economy could be a useful indicator of the rate of technological change affecting that economy (Box 2.2).

Box 2.2 **Productivity growth and technological change**

President Lyndon B. Johnson, concerned about the impact of technological change on workplaces, created the US National Commission on Technology, Automation, and Economic Progress in 1964.[15] Future Nobel Laureate Robert Solow was a member. Faced with the problem of measuring the pace of technological change, the US Commission (1966, pp. 1–2) found productivity growth to be the "most useful" measure.

> It is beyond our knowledge to know whether the computer, nuclear power, and molecular biology are quantitatively or qualitatively more "revolutionary" than the telephone, electric power, and bacteriology …
>
> There appears to be no direct method of measuring the rate of technological change through the number of significant innovations or their economic effects. Therefore, indirect measures must do. The most useful appear to be indexes of productivity and productivity growth … any great change in the overall rate of technological progress capable of having major effects on the economy is most likely to be reflected in [productivity].

Other factors contribute to productivity growth, including better education of workers, and improvements in resource allocation and institutions. Still, the majority of long-run productivity growth can be attributed to technological advancement. As the US Commission noted, productivity grew at 3% a year in the United States between 1947 and 1965, meaning that output doubled in 24 years. This rate of productivity growth was enough to justify a feeling of "continuous change" in technology (ibid, p. 2).

Similarly, development economist William Easterly observed that, over the long term (a hundred years) technological change has led to economic growth and improvements in living standards across all countries; and that these are far larger than current differences between countries (Easterly, 2001).

Lipsey and Carlaw (2002) were critical of the notion that multifactor productivity (MFP) growth measures technological change. They argued that MFP growth is an imperfect measure of the super-normal gains that may be associated with growth-creating technological change. Still, they found that "technological change has associated with it many gains that should yield positive [MFP] measures" (p. 3)

[15] The US Commission's terms of reference were uncannily similar to those of this inquiry – 55 years later (Heatley, 2019a). A key task for the US Commission was to "identify and assess the past effects and the current and prospective role and pace of technological change".

F2.4 The rate of technological change cannot be measured directly, as there is no systematic way to measure the relative importance of different technologies. Productivity growth is a useful proxy indicator of the long-run rate of technological change.

To reiterate a point from section 2.5, if predictions of accelerating technological change from five or more years ago were correct, then the effects should by now be clear in the relevant indicators. Productivity growth is one indicator. The rest of this section examines long-run trends in productivity growth. Sections 2.7 and 2.8 examine trends in other relevant indicators.

Productivity growth is slowing

Productivity growth rates in many developed countries have fallen to very low levels (Figure 2.5; Figure 2.6).

Figure 2.5 Labour productivity: annual growth rates, selected countries, 1971–2017

Source: Australian Productivity Commission (2019, p. 45).

Notes:

1. Labour productivity is the output per unit of labour input.
2. Growth rates are based on averages of annual changes in real GDP per hour (purchasing-power-parity adjusted) for each year in the span.

Figure 2.6 Multifactor productivity: annual growth rates, selected countries, 1987–2016

Source: Productivity Commission analysis of OECD data.

Notes:

1. Multifactor productivity growth measures changes in output that cannot be attributed to changes in the level of capital or labour input. It captures factors such as advances in knowledge and improvements in management and production techniques.

Is slowing productivity growth compatible with increasing technological change?

One possible explanation for apparently slow productivity growth over recent decades is that national statistical agencies have been unable to properly measure the effects of new technology on productivity. However, this only explains a part of the disparity between high levels of technology hype and low measured productivity growth (Box 2.3). Even with some degree of mismeasurement, there has been a notable and broad-based productivity slowdown across the developed world.

Box 2.3 **Can weak productivity growth be attributed to measurement problems?**

Some scholars have attributed recent weak productivity growth to measurement problems – in particular, the inability of GDP measures to account for the welfare benefits from zero-price goods such as free digital services (Brynjolfsson & Oh, 2012). Others have agreed that mismeasurement can explain part of the productivity slowdown, but argue it only accounts for a relatively minor share (Pells, 2018).

Byrne, Fernald and Reinsdorf (2016, p. 109) found "little evidence that this [productivity] slowdown arises from growing mismeasurement of the gains from innovation in information technology-related goods and services". They concluded that mismeasurement issues with ICT goods and services preceded the productivity slowdown and hence could not be its cause; estimated gains from zero-priced services such as Google search and Facebook "are too small to compensate for the loss in overall well-being from slower market sector productivity growth"; and other measurement issues were "also quantitatively small relative to the slowdown" (ibid).

Syverson (2017, p. 167) has been similarly sceptical of mismeasurement explanations, noting that the productivity slowdown occurred "with similar timing across at least two dozen other advanced economies", despite large differences in ICT "intensities" across these countries. He also agreed that the estimated surpluses from free digital goods are "modest" and could not account for the substantial slowdown in productivity that has occurred.

Such mismeasurement may not be particularly relevant to labour markets, and thus to this inquiry. Free digital services benefit consumers, but this benefit is not included in GDP or productivity as traditionally measured. Productivity measures, however, do capture efficiency improvements on the supply side, including labour inputs.

It is also plausible that transformative technological change is underway, but measured productivity growth lags the change (Box 2.4).

Delayed effects are plausible. Even so, there is no way of knowing exactly where on stylised curves (such as those in Figure 2.7) technology development is currently at; nor how long it will take technology to diffuse; nor what the size of eventual productivity pay-offs will be. Instead, observed weak productivity growth may simply indicate that current investments in AI and other technologies are not, and will not be, economically transformative (Box 2.5).

Box 2.4 **Technological change will turn up in the productivity numbers, just later**

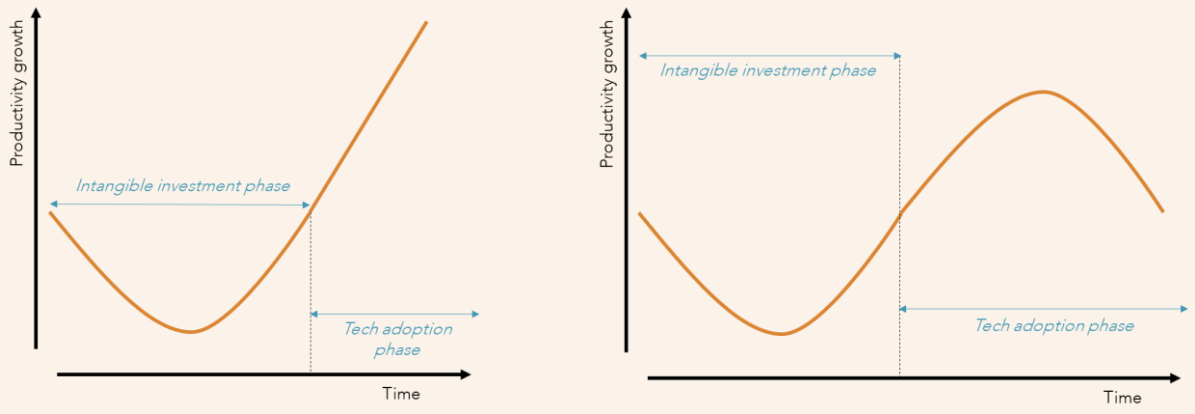
Drawing off historical experience, Brynjolfsson, Rock and Syverson (2018) argued that recent developments are a temporary pause, as firms try to find the right investments and organisational changes that will realise the full productivity benefits of new technologies such as AI. They hypothesise that AI will prove to be a general-purpose technology (GPT), which have historically accounted for a large share of economic growth (Bresnahan & Trajtenberg, 1995). GPTs such as steam engines, electric motors and semiconductors are "characterized by the potential for pervasive use in a wide range of sectors and by their technological dynamism … Most GPTs play the role of 'enabling technologies', opening up new opportunities rather than offering complete, final solutions" (ibid, p. 84)

The diffusion of GPTs can involve a productivity slowdown, as firms have to make "larger intangible and often unmeasured investments and [undertake] a fundamental rethinking of the organization of production itself" to realise the full potential of the technology (p. 2).[16] This pattern leads to a productivity "J curve" (stylised in the left-hand panel of Figure 2.7), whereby "measurable resources are committed (and measurable output foregone) to build new, unmeasured inputs that complement" the new technology (Brynjolfsson et al., 2018, p. 3). Many of these investments fail to pay off, further depressing productivity growth. Once firms discover and implement the right types of investments and organisational changes, productivity growth increases.

History suggests that that the "intangible investment phase" of the J curve can be lengthy, as can the adoption and diffusion phase. For example, it took four decades after the first central power station opened for business in the United States for half of factory mechanical-drive capacity to be electrified (David, 1990). The diffusion and full exploitation of electricity was delayed because of an absence of complementary inputs (especially expertise in reorganising factories to best suit the new power source), uncertain returns from investments in electrical power, and the continued viability of non-electric power sources.

The stylised J curve implies an unbounded future boom in productivity. However, currently weak levels of productivity growth are also compatible with a "brief bounce" (stylised in the right-hand panel of Figure 2.7). This alternative describes the delayed but ultimately short-lived burst of productivity growth that followed the diffusion of ICT.

Figure 2.7 A J-curve or brief bounce?



[16] Whether a particular technology qualifies as a GPT can only be known in retrospect (Bekar et al., 2018).

Box 2.5 **The technology hype is unjustified, and productivity growth will continue to be slow**

Gordon (2018) argued that although leading firms are making large investments in capital and intangible assets (Benzell & Brynjolfsson, 2019), these investments will not ultimately pay off because:

- "it is becoming ever more resource-intensive to find ideas that have a major impact" (Gordon, 2018, p. 17);
- progress in automation technologies has been slow in the past and is likely to remain so; and
- there are many economic and social forces (eg, falling fertility, stagnant life expectancies for lower income groups, rising inequality, slowing increases in educational attainment rates) that will lean against future productivity gains (ibid).

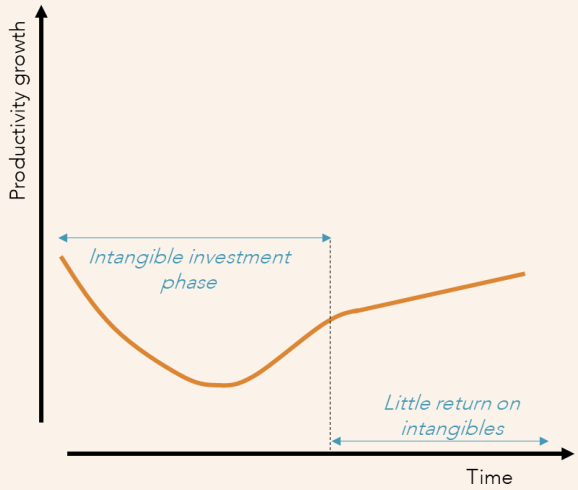
Echoing Gordon, Bloom et al. (2017) found that the R&D driving improvements in computer chips, for example, was subject to diminishing returns.

> Our robust finding is that research productivity is falling sharply everywhere we look. Taking the U.S. aggregate number as representative, research productivity falls in half every 13 years – ideas are getting harder and harder to find. Put differently, just to sustain constant growth in GDP per person, the U.S. must double the amount of research effort searching for new ideas every 13 years to offset the increased difficulty of finding new ideas. (p. 46)

Gordon did not argue that there will be no technological change, just that the rate of technological progress will continue to be slower than that of the 20th century (and it might slow even further). The large investments currently going into intangibles such as AI R&D will end up offering poor returns to their investors.

This future might be represented by a stylised "slow grind" curve, in which productivity (and income) growth would remain weak for the foreseeable future (Figure 2.8).

Figure 2.8 A slow grind



In summary, measured productivity growth is a good indicator of long-run technological change, and recent weak productivity growth is consistent with a slow rate of technological change. However, measures of current productivity growth may not be picking up the potential for future transformative change. For that reason, this indicator should not be relied on in isolation.

F2.5 Measured productivity growth is a good indicator of long-run technological change, and recent weak productivity growth across the developed world is consistent with a slow rate of technological change. However, current measured productivity growth can fail to capture technological change that could turn out to be transformative in the future. Accordingly, this indicator should not be relied on in isolation.

The next two sections explore the possibility that transformative technological change is occurring that is affecting firms and the labour market, but not yet observable in the productivity growth data.

2.7 Measuring the effects of technological change on firms

Technology creates new business models and opportunities to be exploited, and thus openings for new firms. It can also threaten the business models of existing firms or expose them to new competitors. Consequently, accelerating technological change should be accompanied by increased business dynamism (Box 2.6).

Box 2.6 **Why technological change increases business dynamism**

Technology adoption is both a source of, and a response to, firm dynamism. New technologies can "pull" firms to adopt them, because they create new market niches or lower-cost ways to serve existing markets. And a firm can be "pushed" into adopting technology should better-performing rivals threaten the firm's profitability or ongoing viability.

Christensen's classic study of the hard-disk-drive industry illustrates how technology can be the source of business turbulence (Christensen, 1993). Large-scale integrated firms led the development of the industry in its early years:

> The most successful firms aggressively developed the new component technologies required to address their leading customers' needs, but this attention caused leading drive makers to ignore a sequence of emerging market segments, where innovative disk drive technologies were deployed by new entrants. As the performance of these new-architecture products improved at a rapid pace, the new firms were eventually able to conquer established markets as well. As a consequence, most of the integrated firms that established the disk drive industry were driven from it, displaced by networks of tightly focused, less integrated independent companies. (p. 1)

At different scales, and in different ways, competition for markets and for market share combined with new technologies, can lead to rapid changes in the rate of business start-ups, and the growth of some firms and exit of others.

Firm start-up rates and self-employment are two indicators of business dynamism.

Firm start-up rates are declining

Firm start-up rates – a measure of business dynamism – declined in most OECD countries between 2001 and 2013 (Figure 2.9). In New Zealand, the start-up rate fell by about 30% between 2001–04 and 2009–13.

Figure 2.9 Business start-up rates in OECD countries, 1998–2013

Source: OECD (2016e).

Notes:

1. Entry rates are calculated as the number of entrants with positive employment divided by the total number of units with positive employment.
2. Sectors covered are manufacturing, construction and non-financial business services.

Slowing rates of business start-up may have negative implications for future employment, because young firms are the fastest growing and small young firms have higher job creation rates than do larger firms (Ayyagari et al., 2011). Stephenson (2019) found that, in a cohort of New Zealand firms "born" in 2001, job creation was concentrated in the early stages of firms' lives (whatever their size), and that the creation of new firms was an important driver of overall job growth. The contribution of young small and medium-sized firms to employment, job creation and job destruction is high in New Zealand in comparison with other OECD countries (Criscuolo et al., 2014).

Self-employment is stable or declining in New Zealand

Where people choose to be self-employed, this suggests that they expect the benefits of working this way (both financial and other benefits, such as flexibility or autonomy) to exceed those available to them from available options for work as an employee, or to earn income in other ways – even accounting for increased risk. Self-employment accounts for a substantial number of jobs, but there is no evidence that self-employment is increasing in New Zealand (section 2.8).

F2.6 Local and international data shows slowing business dynamism over recent decades. This does not support claims of an accelerating rate of technological change.

2.8 Measuring the effects of technological change on the labour market

In an economy with rapid or increasing technological change, measurable changes in a variety of labour-market indicators would be expected. Possible indicators include the following.

- *Unemployment and labour-market participation rates.* Fast rates of technological change would likely create frictional unemployment, where an increased number of people are displaced from their current jobs, and time between jobs would add to the average unemployment rate.
- *Rates of occupational churn.* New technology would likely create new occupations (elevator operators in the early 20th century) and eliminate old ones (elevator operators in the 1970s), or more generally, shift the relative proportions of occupations demanded by employers.
- *Exit rates for older workers.* Older workers are more likely to have their skills made obsolete by new technologies and have the least to gain from retraining and would be likely to leave the labour market in greater numbers.
- *Average length of job tenure.* Shorter job tenure would result from the prior three effects.
- *Shifting boundaries between jobs performed within and outside of firms.* Technology might change what jobs are more efficiently done in-house or contracted out. These effects might show up in changes in rates of self-employment and temporary work vis compared to rates of full-time permanent employment.

This section examines New Zealand trends to see if they support claims of accelerating technological change. It also looks at international trends, particularly for Australia (as its labour market is to some extent linked to New Zealand's) and for the United States (as it is a significant developer and early adopter of emerging technologies).

Unemployment rates are low, while labour-market participation is high

As at the start of 2020, New Zealand's unemployment rate was close to its lowest in three decades. Previous low rates of unemployment occurred with lower participation rates, making the current combination unprecedented (NZPC, 2019b, fig. 1.9). Unemployment rates were low and participation rates high in Australia. In 2019, the United States experienced its lowest unemployment levels for the past 50 years.

F2.7 Low unemployment rates and high participation rates in New Zealand, Australia and the United States are not consistent with expectations of technological unemployment or increased frictional employment that might result from an accelerating rate of technological change.

Occupational churn is at historically low levels

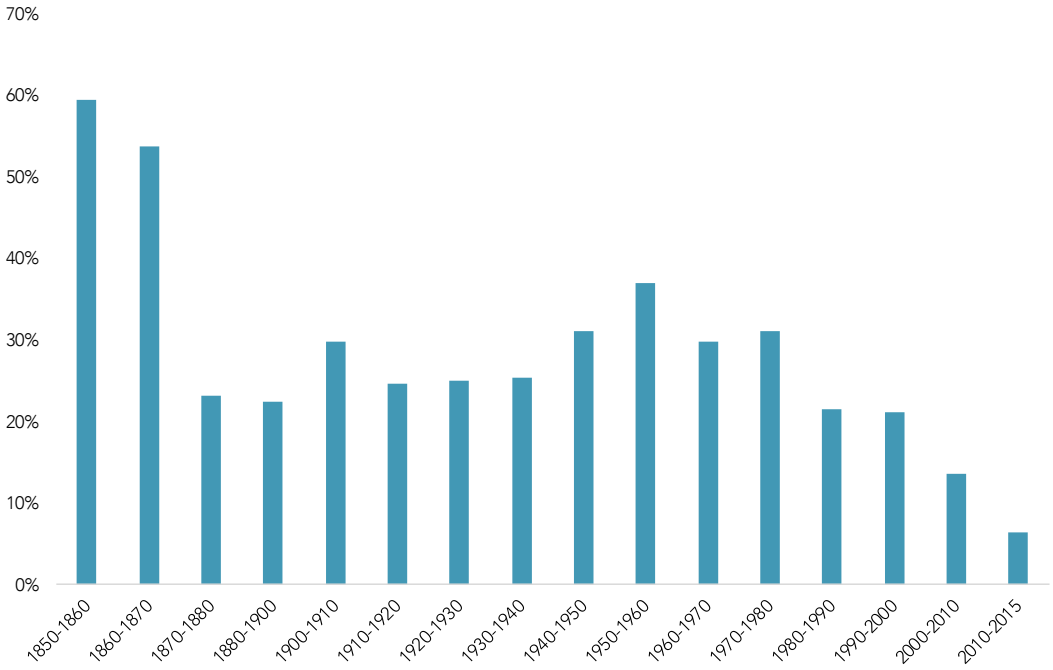
Occupational churn measures shifts in the proportions of occupations demanded by employers in an economy.[17] This is the best single measure the Commission has found of the *labour-market effects* of technological change over extended time periods.[18] The logic behind this observation is that shifts between occupations are often costly to workers, so they will generally only make such shifts in an economy that is itself changing significantly (and thus changing what jobs are offered and rewarded). Technological change is the most common cause of such economic changes.

Drawing on 150 years of data, Atkinson and Wu (2017, p. 2) concluded that "the rate of occupational churn in recent decades is at the lowest level in American history – at least as far back as 1850" (Figure 2.10).

[17] More specifically, it measures the occupations of those in employment at specific times (eg, in a national census) and changes in the relative proportions of those occupations over time.

[18] The occupational classification systems used by statistical agencies change over time, to reflect the creation of new occupations and the decline of others. To establish long-term data series, researchers need to determine a concordance between older and newer classification systems.

Figure 2.10 Occupational churn, United States, 1850–2015



Source: Atkinson and Wu (2017).

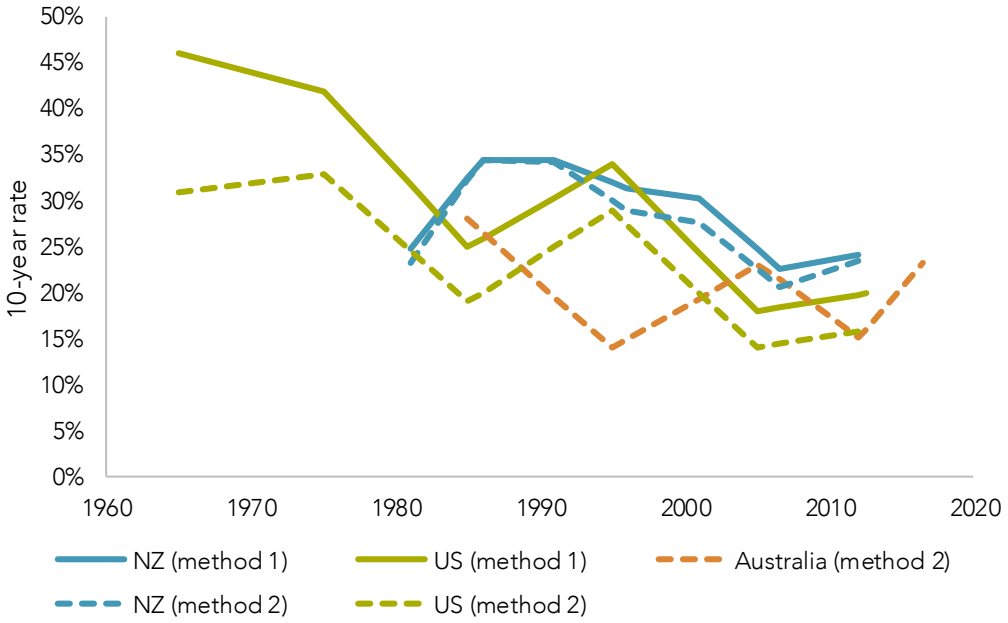
Notes:

1. This figure uses 1950 occupational classifications. Atkinson and Wu's analysis using 2010 occupational classifications showed a similar general pattern over a shorter time period, with higher churn rates over 1950–1980 and declining churn from 2000.
2. This figure shows the results of the authors' method 1, in which occupation churn is calculated as "change in each occupation relative to overall occupational change … Absolute values were taken of negative numbers, and the sum of employment change was calculated for all occupations. This was then divided by the number of jobs at the beginning of the decade to measure the rate of churn" (2017, p. 12). The results of the authors' method 2 show a similar pattern, as evident in Figure 2.11.

No long run relationship is apparent in the United States between occupational churn and unemployment levels (NZPC, 2019d). To the extent that occupational churn measures technological change affecting the labour market, this in incompatible with the concept of technological unemployment.

An analysis for Australia covering a shorter time period found falling occupational churn from 2000 onwards (Office of the Chief Economist, 2018, p. 11). Maré (2019), conducting research for the Commission, replicated Anderson and Wu's methodology and found a similar pattern for New Zealand (Figure 2.11).

Figure 2.11 Occupational churn, New Zealand, Australia and the United States, 1960–2020



Source: NZPC (2020a).

Notes:

1. This figure shows the results of Atkinson and Wu's methods 1 and 2 for both New Zealand and the United States. For Australia, results are only available for method 2.
2. Method 2 assesses "only gains or losses in occupations that decline both absolutely and relatively, or that grow both absolutely and relatively … When aggregate employment growth is zero, the two methods are identical" (D. Maré, 2019, p. 3).

Older workers are staying in the workforce for longer

Older workers would likely find their skills becoming redundant if technological change was accelerating. And, as older workers have less to gain from retraining than younger workers, it might be expected that older workers would drop out of the workforce at increasing rates. However, participation in the labour force of people aged 55–64 has been *rising* across the OECD over the past two decades (OECD, 2019d). The increases for New Zealand and Australia have been dramatic (Table 2.4).

Table 2.4 Labour force participation rates, 55–64 years, selected countries

	2000	2007	2017	2018
Australia	48.2%	58.1%	66.3%	66.7%
New Zealand	59.7%	72.9%	80.5%	79.9%
OECD	50.3%	55.7%	63.0%	63.9%
United States	59.2%	63.8%	64.5%	65.0%

Source: OECD (2019d) statistical annex.

Notes:

1. Data for the OECD is the country average weighted by population.

Rising educational attainment, improving health and increases in the age of eligibility for government-provided retirement income partly explain these trends. The rate of technological change has not been rapid enough to outweigh these influences on rising participation of older people in the workforce.

Longer average length of job tenure

In Australia, Borland and Coelli (2017, p. 388) reviewed job market indicators over the 1970s to 2000s to "evaluate the pace of structural change and job turnover". They found rising average job tenure, due in part to an ageing workforce: the "proportion of workers in very long duration jobs has increased from

19.3 percent in 1982 to 26.7 percent in 2016, and there has been a corresponding decrease in the proportion of workers in their jobs for less than a year" (2017, p. 389). They concluded that there was "no evidence that increasing use of computer-based technologies has been associated with a higher rate of job destruction or a faster pace of structural change in the Australian labour market" (ibid).

US data also shows an increase in length of job tenure. The proportion of US workers with five or more years' tenure on their main job increased from 44% to 51% over 1998–2014, and the share of workers with one year or less tenure fell from 28% to 21% (Hyatt & Spletzer, 2016, p. 364). Hyatt and Spletzer attributed much of this shift to worker ageing and declining business births, which in turn led to falls in hiring rates.

The Commission was unable to determine average job tenure trends for New Zealand, due to lack of suitable time-series data.[19]

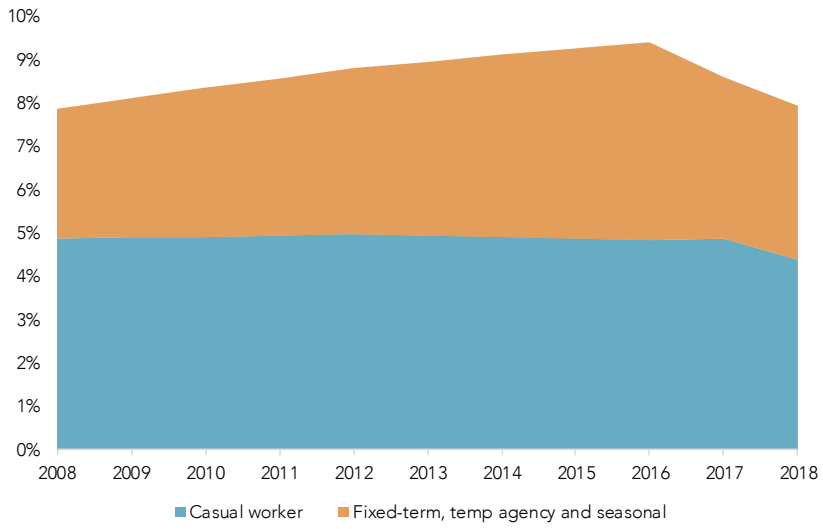
F2.8 Data from New Zealand, Australia and the United States shows declining occupational churn, and an increasingly older workforce. Data from Australia and the United States shows increasing average length of job tenure. This data does not support claims of accelerating technological change.

No significant changes in the types of employment arrangements

Technology has the potential to cause shifts in employment arrangements. As technology changes, so do the tasks and activities most efficiently done within a firm, and those most efficiently done outside the firm (Coase, 1937; Williamson, 1981). So, an indirect indicator of technological change is the proportion of jobs that move across this boundary. This could be, for instance, through increases in the proportion of temporary or casual work, or of self-employed workers.

New Zealand data does not show significant shifts in these types of employment arrangements. The proportions of casual, fixed-term, temp agency and seasonal employment in New Zealand have been either stable or falling over the past decade (Figure 2.12).

Figure 2.12 Proportion of the workforce on a casual, fixed-term, temp agency or seasonal work arrangement, New Zealand, 2008–18



Source: Productivity Commission; Stats NZ linked employer-employee database.

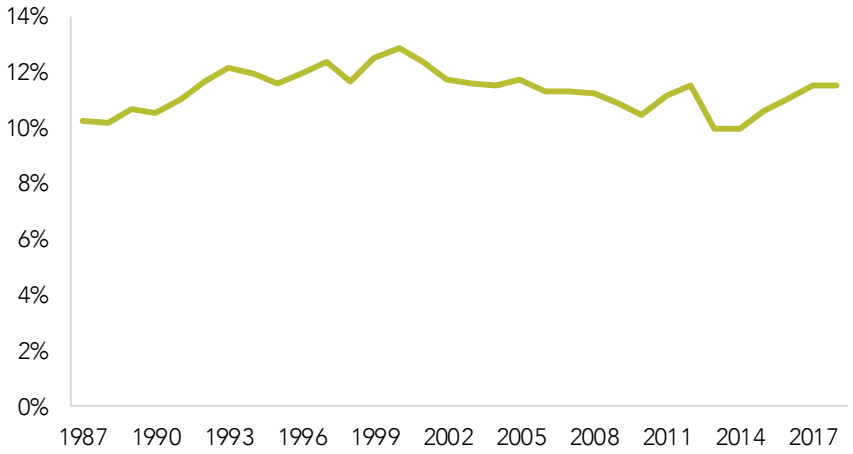
Notes:

1. Data is available for 2008, 2012, 2016, 2017 and 2018 years. Other years interpolated. Data for 2008 and 2012 is from the Survey for Working Life (a supplement to the Household Labour Force Survey (HLFS)) and was collected in the June and December quarters respectively. Data from 2016 onwards was collected as part of the core HLFS.

[19] Stats NZ began collecting regular data on job tenure in 2016, using the household labour force survey to do so (Stats NZ, 2016).

The rate of self-employment in New Zealand has been broadly stable over the past thirty years (Figure 2.13). The 2015 rate of 11.5% was slightly above the 2016 OECD average of 10.0% (OECD, 2018a). Rates rose between 1995 and 2016 in some countries and fell in others, with no consistent trend. Policy changes (tax and regulatory incentives) rather than technology appear to have driven changes in rates of self-employment.[20]

Figure 2.13 Proportion of the workforce self-employed, New Zealand, 1987–2018



Source: Stats NZ linked employer-employee database.

F2.9

Data from New Zealand shows that the proportion of temporary and casual work has remained broadly stable over the past decade. Self-employment rates have also been stable or have declined in New Zealand, and trends in other countries have been mixed. This data does not support claims that New Zealand's employment arrangements are being significantly affected by technological change.

Another possible effect of rapid technological change might be seen in changes to the proportion of jobs offered through job-mediating platforms. Though New Zealand data is lacking, US evidence suggests that platform-mediated work such as ride-share driving for Uber, or click-work for Amazon Mechanical Turk, remains a small proportion of all work. In the United States, approximately 1% of households earned income through such work in 2018. Most of these households are doing so for short periods, and not as a primary source of income. For example, a US bank study found that 60% of transport work earners (eg, Uber) and nearly 70% of other platform earners in the year to July 2017 received platform income in three or fewer months of that year (Farrell et al., 2018).

A trend to more temporary, casual and platform-mediated work would likely result in an increase in the numbers of people working multiple jobs. There was no significant change over the three years from June 2016 in the proportion of New Zealand workers who reported having more than one job (NZPC, 2019b).

2.9 All current indicators point to static or slowing rates of technological change

All of the indicators in sections 2.6, 2.7 and 2.8 present a consistent picture. Technological change – as measured by productivity growth, business dynamism and labour-market change – is static or slowing. While no single indicator on its own provides strong support for this conclusion, together the evidence is strong.

This conclusion casts significant doubt on the predictions of the jobs-at-risk-from-automation models. It would be imprudent to plan for the future based on the predictions of one, or a group, of these models.

[20] Japan, Denmark, Norway, Germany, Sweden, Luxemburg, Hungary, Estonia and Switzerland have the lowest rates of self-employment (all between 4.2% and 5.6%). Many of these countries have legal constraints, and strong tax and social insurance incentives, to favour employee status. The OECD is concerned that policy unduly deters self-employment in some of these countries (OECD, 2018a).

F2.10 Technological change – as measured by productivity growth, business dynamism and labour-market change – is static or slowing. While no single indicator on its own provides strong support for this conclusion, together the evidence is strong.

There is no historical precedent for general purpose technologies leading to fewer jobs in the long run. All previous GPTs have led to more employment in the long run. Whether AI proves to be different is an open question (Box 2.7). The Commission does not find the evidence currently available to be convincing.

Box 2.7 **This time is different – AI, technological unemployment and the more distant future**

Some predictions of the effects of technological change rely on what economists have dubbed the "lump of labour fallacy" – the idea that the both the amount of work to be done in an economy (and hence supply of jobs from employers) and the number of people who want work (and hence demand for jobs from workers) are inflexible (Schloss, 1891). A consequence of this idea is that anything else that directly replaces labour leads to unemployment, and more specifically that automation leads to technological unemployment.

History shows however, at least for past rounds of automation, that apparently labour-replacing technologies have wider effects on the economy that increase the demand for labour. Section 2.2 explores some of the mechanisms by which this occurs, including that technology adoption tends to reduce prices, which increases demand; and that new technology makes it possible to service previously unmet demand.

Susskind (2020) echoed the Commission's finding that technological unemployment is highly unlikely in the foreseeable future.

> Current fears about an imminent collapse in the demand for the work of human beings are overblown. In the short run, our challenge will be in avoiding frictional unemployment: in all likelihood, there will be enough work for human beings to do for a while yet, and the main risk is that some people will not be able to take it up (p. 129).

Susskind further explored a scenario for the more distant future – a "world without work". In this scenario AI becomes better and cheaper to employ than *all* types of human labour.

> But in the longer run … we have to take seriously the threat of structural technological unemployment, where there is simply not enough demand for the work of human beings. But how distant is that threat? Why bother worrying about it if, as Keynes famously quipped, "in the long run we are all dead?" In writing about technology and the long run, I have in mind decades, not centuries (p. 129).

Susskind's "decades, not centuries" falls beyond the 15-year outlook of this report (section 1.2). However, it does leave open two questions. Is this scenario realistic? And, if so, is there anything useful that could be done about it today?

Given that technological unemployment is historically unprecedented, a high burden of proof falls on those who believe that this time is different. It would be unwise to base current policy on speculation. A sensible and responsible strategy would be to maintain a watching brief of the indicators in Chapter 2 and act only in response to emerging labour-market change.

Even if technological unemployment is highly unlikely, technology adoption can still cause *frictional unemployment*, the costs incurred as people and regions adjust to changes in the products and services demanded, and in the skills needed to produce them.[21] Indeed, such changes will almost certainly occur – as they have in the past.

What about effects on particular groups of people?

Concerns about technological change are often presented alongside claims that specific industries, occupations, countries, regions, ethnicities or genders will be particularly affected. Submissions on the inquiry's draft reports asked for a fuller analysis of opportunities, risks and options for policy responses specifically for Māori and Pacific communities, for women, and for people with disabilities (eg, Building and Construction Industry Training Organisation, sub. DR412; Auckland Regional Public Health, sub. DR411; NZEI Te Riu Roa, sub. DR426; Ministry of Education, sub. DR430).

Different groups have gained or lost during previous episodes of fast technological change, as section 2.3 explains. So, a reasonable question to ask is who will be affected by current emerging technologies? Moreover, even without technological disruption of the labour market, might some groups be disproportionally affected by frictional unemployment?

The simple answer to such questions is "yes, but". The "but" arises because knowing which group, when and how much is all but impossible. Difficulties arise because the effects of a particular technology on a specific group might be very different from the effect of other technologies on that same group. A study predicting aggregate effects might be able to look at a group of say 20 technologies and make a forecast based on half of them successfully diffusing (and hope that the 10 that did were not too different in their effects than the 10 that did not). However, a study wanting to predict more localised effects is much more sensitive to the exact timing and specific technologies involved.

McKinsey & Company (2019) attempted such an exercise for New Zealand (Box 1.2).[22] But it relied on assumptions about the arrival dates and diffusion rates of specific new technologies, and how each technology affected different occupations and industries. It combined that information with existing data about the locations of those industries and people working in them to estimate impacts on regions and groups of people. Its results are likely to be very sensitive to those assumptions.[23]

F2.11 Predictions of the effects of technological change on particular groups of people (by, for example, region, industry, ethnicity or gender) are not reliable.

A lack of reliable forecasts about the effects of technological change on specific groups did not prevent the Commission from making recommendations that would assist workers from potentially disadvantaged groups (Box 2.8).

[21] Frictional unemployment is unemployment "that occurs because, as people change jobs when some sectors of the economy grow and others contract, it is not practicable to dovetail precisely leaving old jobs and starting new ones. At times of fairly full employment, frictional employment may form an appreciable fraction of total unemployment" (Black et al., 2013).

[22] Technology has many distinct effects on the labour market, and those effects interact (section 2.2). McKinsey & Company's methodology ignores most of those effects – they assume, for example, that no prices change.

[23] McKinsey & Company (2019) does not include a sensitivity analysis.

Box 2.8 **How this report deals with distributional impacts**

This inquiry's terms of reference emphasised the Government's aims for a socially inclusive future. It sought advice on likely impacts of technological change for particular groups of workers, and on maintaining or improving incomes and wellbeing across all groups in the population. The Commission was not able to produce reliable forecasts of likely impacts on specific groups (see main text).

While concerns about the potential adverse impacts of technological change on vulnerable, under-represented or disadvantaged groups in the labour market are understandable, it is important not to lose sight of the benefits technological change can offer. New technologies can expand employment options (section 4.8), raise productivity and incomes, lower costs to households (Table 2.1), and overcome barriers to participation in work (section 2.8). These benefits can be most valuable to those marginalised in the labour market.

The best measures to protect workers from disadvantaged groups and to maximise their opportunities are those that promote opportunity, resilience and adaptability. These include:

- improving achievement of foundation skills (including literacy, numeracy and digital skills), and competencies that give people access to work and lifelong learning opportunities (section 4.2);
- improving access to high quality career information and guidance, work experience opportunities (especially for young people at risk of poor employment outcomes) (section 4.4);
- improving the educational achievement of school students at risk of poor labour-market outcomes (section 4.2);
- reducing barriers to workers' mobility (both in the labour market and the housing market) (section 4.5);
- widening eligibility for training and labour-market programmes (sections 4.2 and 4.7); and
- greater income smoothing for displaced workers (section 4.6).

2.10 What is the best policy response for New Zealand?

There is no evidence that technology adoption is currently leading to widespread unemployment or broad economic disruption. Although future, large-scale disruption of the sort envisaged by Frey and Osborne cannot be entirely dismissed, it does not appear likely given historical experience and the information available in 2020.

Notwithstanding a small and energetic technology sector in New Zealand, the vast majority of technologies used by New Zealanders in business, work and everyday life were created offshore, and that is likely to remain the case (APC & NZPC, 2019).

So, the likely pace and scale of labour-market change in New Zealand will depend on global technology developments –.and changing trends should be visible in the data for other countries before they are in New Zealand. Monitoring these trends will provide early warning to New Zealand policy makers, with more than sufficient time for policy responses, should they be justified. Moreover, delayed policy responses can be informed by the actual technologies involved, and can target occupations, regions or firms directly affected. Such responses are far more likely to be effective than any that rely on the assumptions underpinning recent predictions.

Although continued low to moderate rates of technological change implies a very low likelihood of widespread disruption, this is not necessarily a positive scenario for New Zealanders. Faster productivity and income growth rely on faster technological change and adoption. New Zealand's problem has not been *too much* technological progress; it has been *too little*. By failing to pick up and spread the world's best

technologies, New Zealand has lost opportunities to raise living standards. The path to greater wellbeing lies with more technology adoption and diffusion.

The future is inherently unknowable. But under the likely futures envisaged in this inquiry, the best stance for the Government is to adopt policy settings that encourage technology adoption and support New Zealanders to take advantage of technological change. Importantly, adopting new technology and improving economic performance will help New Zealanders deal with shocks – from whatever source.

F2.12 Under the likely futures envisaged in this inquiry, the best stance for the Government is to adopt policy settings that encourage technology adoption and support New Zealanders to take advantage of technological change. Importantly, adopting new technology and improving economic performance will help New Zealanders deal with shocks – from whatever source.

The next chapter considers how well-placed New Zealand is to take advantage of technological change.

3 Is New Zealand well positioned to take advantage of technological change?

Key points

- There are many economic and social conditions that support technology adoption – a population welcoming of technological change; a dynamic business environment; a labour market that adapts to change; a well-educated population; and policy settings that promote openness.
- New Zealanders seem less positive than Europeans about the effects of emerging technologies on the economy and on society. Even so, New Zealanders are relatively unconcerned that robots will "steal people's jobs".
- A dynamic business environment supports technology adoption by providing opportunities for new firms to enter and better-performing ones to expand. National productivity growth occurs particularly through such "reallocation" – the growth of higher-performing firms, entry of new firms and the exit of poorly performing ones. Reallocation is sluggish and innovation is weak in New Zealand.
- Flexibility to adapt to change is a strength of the New Zealand labour market. The best form of income protection and insurance available in a time of change (from any source) is a labour market with an abundance of job opportunities.
- New Zealand's wider policy settings support worker mobility, by ensuring that access to social assistance (eg, healthcare, retirement savings, unemployment benefits) are not linked to jobs or particular work arrangements (eg, full-time employment, as opposed to contracting).
- New Zealand adults have high levels of literacy, numeracy and problem-solving skills in international comparisons, and high levels of educational attainment. They are relatively confident about their digital skills in the workplace (compared to adults in many European countries). New Zealand adults also have high rates of participation in further education and training, especially those in professional occupations.
- New Zealand 15-year olds' skills in reading, mathematics and science are above international averages, but have been declining over time. The New Zealand education system produces persistently poor outcomes for some young people, especially children in socio-economically disadvantaged communities, and Māori and Pasifika students.
- New Zealand generally has low barriers to trade and rates well on the OECD measures of regulatory restrictiveness, however, as assessed by the OECD, New Zealand has high barriers to foreign direct investment.
- In many respects New Zealand is well positioned to take advantage of technological change, but there are areas of weakness that can and should be addressed. Two important areas are:
  - addressing persistent inequities and falling average performance in educational achievement; and
  - improving the responsiveness of the vocational education and training system.
- New Zealand's future prosperity will be best served by maintaining its dynamic labour market and openness to the flow of goods, services, business investment, skills, data, ideas and technologies.

What might New Zealand need to take advantage of technological change? Successfully adopting and adapting technology can be a challenging feat, requiring a series of connected decisions and investments by firms. Governments do not have the information and levers needed to direct these individual decisions, but they can encourage conditions that support technology adoption.

- *A population welcoming of technological change.* Social norms affect the willingness and ability of firms to successfully adopt technology.
- *A dynamic business environment.* High rates of entry by new firms and the exit of old firms, and higher-performing firms growing at the expense of lower performers – is an important means by which new technology is diffused in an economy.
- *A labour market that adapts to change.* Technological change and other forces can change the demand for labour. A labour market that allows people to move jobs and enter employment easily, and permits firms to reorganise production, provides the best insurance for workers.
- *A well-educated population.* Skills play a central part in technology adoption, and international studies support the importance of education for technology diffusion. Better-skilled people tend to earn higher incomes and generally face a lower risk of displacement.
- *Policy settings that promote openness.* Openness implies keeping barriers low to the flow of goods, services, business investment, skills, data, ideas and technologies. This better allows local firms to learn about new technologies, provides competitive pressures on local firms to innovate, and helps forge connections to international markets.

This chapter assesses New Zealand's economy and labour market against these characteristics.

3.1 A population welcoming of technological change

European countries that are successful adopters of technology also tend to have the most favourable attitudes towards technology in population surveys (NZPC, 2019b). Popular acceptance of technology creates an environment in which firms are more easily able to adopt technology.

The Commission asked Colmar Brunton to survey 1 001 New Zealanders about their attitudes to emerging digital technologies in February 2020 (Heatley, 2020). The questions asked were a subset of those asked by the European Commission across 28 European Union (EU) countries in March 2017, allowing for an approximate cross-country comparison.[24]

New Zealanders' attitudes towards emerging technologies

New Zealanders seem less positive than Europeans about the effects of emerging technologies on the economy (Figure 3.1) and on society (Heatley, 2020).

[24] The surveys differ due to differences in timing and sample selection. Attitudes in EU countries may have been shifted in the intervening three years by frequent news coverage of robots and AI, and gloomy predictions of their effects on workers and society. The cross-country comparisons presented here are subject to those caveats.

Figure 3.1 Attitudes towards the effect of emerging technologies on the economy

Source: Heatley (2020, p. 3).

Compared to Europeans, New Zealanders are negative about the potential for socially positive uses of robots and AI (ie, to help people do their jobs, carry out daily tasks at home, or do jobs that are too hard or dangerous for people).

In their submission to the inquiry, Chartered Accountants Australia New Zealand commented that while "New Zealanders are generally enthusiastic technology adopters ... many New Zealanders (both workers and business owners) remain uncertain about both technology itself and about what successful adoption of that technology looks like" (sub. DR417, p. 1).

Fifty percent of New Zealand respondents to the Commission's survey agreed that "robots and AI steal people's jobs". However, this proportion was lower than in almost all other countries surveyed. (Heatley, 2020).

New Zealanders with incomes below $50 000 showed less favourable attitudes towards digital technologies than those on higher incomes. This effect was particularly pronounced in responses to the statement "robots steal people's jobs". There was little difference between those earning $50 000–$100 000 and those earning above $100 000. It could be that respondents with low personal incomes have less favourable attitudes because they believe that:

- they are more likely to be adversely affected by robots and AI; or
- they will, if adversely affected, suffer greater consequences that those on higher incomes (Heatley, 2020).

F3.1

Countries that are successful adopters of technology tend to have the most favourable attitudes to technology in population surveys. New Zealanders seem less positive than Europeans about the effects of emerging technologies on the economy and on society. Even so, New Zealanders are relatively unconcerned that robots will "steal peoples' jobs". New Zealanders with incomes below $50 000 show less favourable attitudes to digital technologies than those on higher incomes.

3.2 A dynamic business environment

Technology adoption is both a source of, and a response to, a dynamic business environment. New technologies can "pull" firms to adopt them, because they create new market niches or lower-cost ways to

serve existing markets. And a firm can be "pushed" into adopting technology should better-performing rivals threaten the firm's profitability or ongoing viability.

High rates of entry by new firms and the exit of old firms, and higher-performing firms growing at the expense of lower performers – "reallocation" – is an important means by which new technology is diffused in an economy. Reallocation is the main driver of productivity growth in an economy (Box 3.1).

Box 3.1 **The four sources of productivity growth in an economy**

Aggregate productivity growth in the market sector is the combined result of individual firm decisions. Existing firms can adopt new technology and business models that make them more productive. High-productivity firms may decide to increase the scale of their operations. Entrepreneurs may enter a market with new technology and business models, or new products that make them more productive than incumbent firms. Unsuccessful low-productivity firms may be bought out or go out of existence.

When investors, entrepreneurs and managers make decisions and take actions, they can contribute to national productivity growth through four "sources":

- *within-firm* – firms get better at what they do (ie, increase their productivity over time);
- *between-firm* – high-productivity firms gain market share at the expense of low-productivity firms;[25]
- *entry of new firms* – new firms that have better than average productivity levels; and
- *exit of poor performing firms* – low-productivity firms cease business.

Technology is an important part of this story. Technology creates new uses for resources and can change their relative values in different uses. Any gap between a resource's current use and its best use is an opportunity for productivity growth.

Productivity improvements in one industry can also have flow-on effects in other industries. Technology-driven price reductions, for example, can support the growth both of the adopting firm and of firms in unrelated industries (NZPC, 2019d). Similarly, the reallocation of inputs, such as labour, across industries will also affect aggregate productivity if those inputs make different contributions to productivity in different industries.

F3.2

Aggregate productivity growth in the market sector is the combined result of individual firm decisions. When investors, entrepreneurs and managers make decisions and take actions, they can contribute to productivity growth through four "sources":

- productivity improves within firms;
- higher-productivity firms gain market share at the expense of low-productivity firms;
- new firms with better than average productivity enter the market; and
- low-productivity firms cease business.

Within-firm improvements are a less important source of overall productivity growth than reallocation – the growth of stronger firms, entry of new firms and the exit of poorly performing ones. Reallocation is an important means by which new technologies are diffused in an economy.

[25] These are also potential sources of productivity decline. For example, reallocation can have negative effects on productivity if resources move from high-productivity firms in markets with elastic demand to low-productivity firms in markets with inelastic demand (Baumol, 1967; Nordhaus, 2006).

New Zealand has not seen enough reallocation happening between firms

Meehan (2019), in a study of reallocation over 2001–12, found that the majority of New Zealand workers were employed in firms with labour productivity below the median. Labour reallocation towards higher-productivity firms was positive but slow.

Commenting on an earlier version of these results, Conway (2018, p. 44) noted that

> … firms in the lower two quartiles of the productivity distribution in their industry account for a larger share of employment and capital compared to firms in the upper two quartiles … This contrasts with the pattern in a number of other OECD economies in which firm productivity and size distributions are positively correlated. As well as weak competition that allows low-productivity firms to survive, this result may also reflect size constraints for relatively productive firms operating in New Zealand's small domestic markets. More encouragingly, employment growth over the 2000s was weighted towards relatively productive firms, although capital tends to flow to relatively unproductive firms ...

Recent work conducted for the Commission's *Frontier firms* inquiry finds that New Zealand has normal aggregate rates of firm exit and entry by international standards, but that capital growth was fastest for the second least productive decile of firms (NZPC, forthcoming).[26]

Capital is an essential input into technology adoption and subsequent productivity growth by firms. So, Meehan and Conway's observations are concerning, and warrant further investigation (Box 3.2).

Box 3.2 Why is capital not moving to the most productive firms in New Zealand?

Meehan (2019) found that capital did not appear to be moving towards the most productive firms. On the face of it, this suggests that investors are making poor decisions. Why, after all, should an investor put money into (or leave money in) a firm with poor productivity when they presumably could get larger returns if their money was in a higher-productivity firm?

There are some plausible explanations:

- Only some types of capital are being measured. Meehan measured firm-level "capital services as the average of opening and closing book value multiplied by a 10% user cost of capital plus reported depreciation, plus rental, hiring and leasing costs" (ibid, p. 10). The capital that contributes to book value is predominately "fixed" or "tangible" capital. "Intangible" or "knowledge-based" forms of capital such as in-house software, product design, inter-firm networks, brand recognition and organisational know-how, have become increasingly important as inputs to productivity and economic growth (Haskel & Westlake, 2018).
- Restricted access to capital markets for cooperatives and state-owned enterprises (SOEs). These corporate forms are relatively common among large firms in New Zealand.[27] They can struggle to raise equity (and debt) to fund business expansion.
- Regulatory restrictions, for example those on foreign ownership (section 3.5).
- A thin or poorly functioning "market for corporate control", in which people who think they could do a better job of managing a firm purchase it from its current owners (Manne, 1965).
- Investors seek profitability and although higher productivity is one route to greater profits, sometimes business activities with low productivity can be highly profitable.

It is not clear which, if any, of these explanations apply. But, as capital is hugely important to maintaining and raising productivity, this topic is worthy of further investigation.

[26] This work made different assumptions about the production technologies used in New Zealand firms and so is not entirely comparable with Meehan's study.

[27] "Among firms with $1 billion plus turnover is a prevalence of farmer-owned cooperatives and partly-privatized state-owned enterprises. A common factor across these firms is a reluctance to provide capital for growth and a strong aversion to risk, especially associated with expansion into overseas markets." (Conway, 2018, p. 50)

A misallocation of capital could contribute to the continuing productivity gap between New Zealand's best-performing firms (those at the "domestic frontier") and the world's best-performing firms (those at the "global frontier"), consistent with the observations of Conway (2016).

Nolan et al. (2019, p. 5), in answering "Why New Zealand's productivity is stuck in first gear?", noted that firm-level data highlights "impaired processes of reallocation and [technology] diffusion" in New Zealand.

F3.3 Available information suggests capital is not moving efficiently towards New Zealand's most productive firms. As capital is needed to adopt new technology, this could be indicative of slow rates of technology adoption by those firms, and a misallocation of capital.

Weak innovation

Another indicator of a dynamic business environment is high levels of innovation by firms, leading to the introduction of new business processes and the creation of new goods and services. New Zealand firms appear to do well at creating new ideas but are poor at converting these ideas into commercial products (Wakeman & Le, 2015). There are many possible explanations for this poor performance, including the constraints and challenges in achieving efficient scale or making a return to justify investments in innovation in a small domestic market. The Commission's inquiry into *Frontier firms* will explore firm performance and innovation in New Zealand.

Management capability in New Zealand appears poor

Dynamic business environments are also associated with stronger management capability. Competition can, for instance, encourage managers to undertake productivity-raising actions that they may otherwise not. As Maré and Fabling (2019) put it, "competition acts as a discipline on firms".

A firm's management capability shapes the likely success of adopting new technology. Bloom, van Reenen and other researchers have undertaken a decades-long international programme of research to identify good management practices and their effects on productivity and other measures of firm performance. Their latest published research surveyed 35 000 US manufacturing plants in 2010 and 2015 (Bloom et al., 2019). Structured management practices accounted for 20% of the variation in productivity among plants. Together with technology and human capital, management practices accounted for 44% of the difference in productivity performance across firms.

In New Zealand, research has highlighted the importance of New Zealand firms' ability to learn (absorptive capacity) as a factor in shaping their ability to innovate and improve their productivity. Harris and Le (2018) found that the ability of New Zealand firms to make use of external knowledge was positively related to their propensity to undertake R&D, innovate and export, even after controlling for other firm characteristics (eg, foreign ownership and employee skill levels). Indeed, Fabling and Grimes (2014) found, in a sample of over 1 500 New Zealand firms surveyed in 2001 and 2005, that introducing a suite of high-performance human resource management practices (HRM) had a positive effect on firm productivity. Practices included management engagement with staff, the level of autonomy granted to employees and the attention given to the firm's HRM performance. The benefits of superior HRM performance were reflected in employee pay rather than firm profitability.

Yet New Zealand has a relatively large number of firms with poor management practices. Green and Agarwal (2011) found that management capability in New Zealand manufacturing firms was low to middling compared to better performing OECD countries. The study showed that multinational firms performed better than domestic firms; as did publicly listed firms compared to family-run firms. Understanding the reasons behind this is an important area of ongoing research (Sanderson, 2018) and will be considered in the Commission's inquiry into frontier firms in New Zealand.

3.3 A labour market that can adjust to change

Work is important for many reasons, including income and self-identity. Unemployment has significant and negative impacts on subjective wellbeing (Box 3.3).

Box 3.3 **Research commentary on the health and wellbeing impacts of unemployment**

Sage (2019, p. 206)

> The evidence base on the health and wellbeing impact of unemployment is unequivocal. Unemployment is associated with significant declines in wellbeing and physical health … Such declines often last into the long-term, with unemployed people failing to recover from drops in wellbeing and physical health, and have a 'scarring effect', with unemployment more harmful than other distressing life events such as divorce, separation and bereavement.

Winkelmann & Winkelmann (1998, p. 13)

> … unemployment has a significant and substantial negative impact on satisfaction. The non-pecuniary costs of unemployment by far exceed the pecuniary cost associated with loss of income while unemployed.

Layard et al. (2012, pp. 66–67)

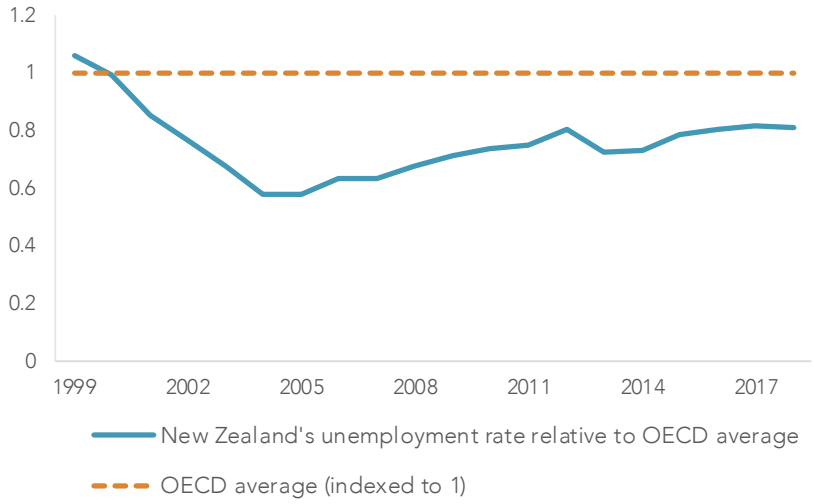
> When people become unemployed they experience sharp falls in well-being and their well-being remains at this lower level until they are re-employed … the main impact of unemployment on well-being is not through the loss of income, but rather through loss of social status, self-esteem, workplace social life, and other factors that matter.
>
> Psychologists have examined these non-pecuniary benefits of work, and they include the pre-set time structure of the working day, regularly shared experiences and contacts with people outside the family, links to goals and purposes that transcend the individual, personal status and identity, and the enforcement of activity. Unemployment is destructive due to its negative effect on these functions.
>
> High unemployment also has spillover effects not only on the families of the unemployed but also on those in work, who feel less secure in their jobs … When we total up all the well-being effects of a rise in the unemployment rate, the loss to the rest of the population (which is a large number of people) is twice as large as the loss to the unemployed themselves.

These negative impacts on wellbeing suggest that governments should go to some efforts to minimise the scale and duration of unemployment. Such efforts include sound macroeconomic management (to reduce the impacts of economic recessions), maintaining a dynamic labour market (so that people have abundant employment opportunities), and providing support for those who are displaced.

New Zealand's labour market performs well

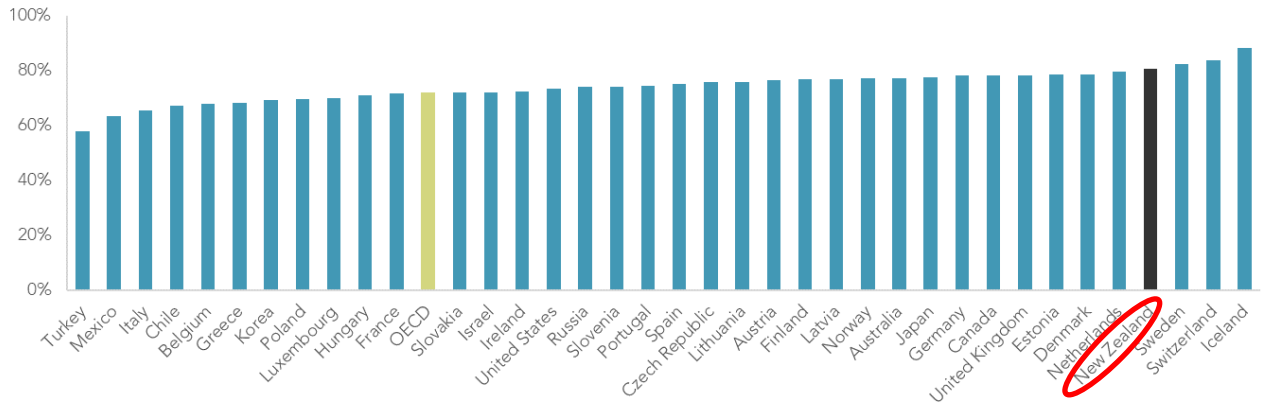
The New Zealand labour market performs well against important measures. Unemployment has been low relative to the OECD average for two decades and labour-market participation rates are high among OECD countries (Figure 3.2 and Figure 3.3), meaning that most people who wanted work could find it. Long-term unemployment rates have also been very low by OECD standards, indicating that New Zealanders have faced a lower risk of sustained disengagement from work (Figure 3.4). Under-employment has also been low and largely short-term (Erwin et al., 2019). The OECD (2018a, p. 19) highlighted New Zealand, along with Denmark, as a country "in which real median wage growth has closely tracked productivity growth [and that has] generally done well on both job quantity and inclusiveness."

Figure 3.2 New Zealand's unemployment rate relative to the OECD average, 1999–2018



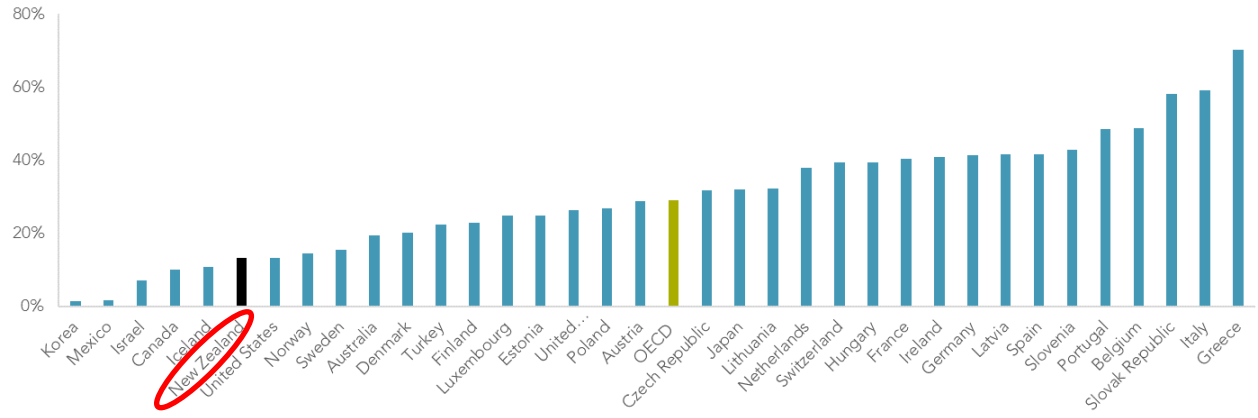
Source: OECD unemployment rate.

Figure 3.3 Labour-force participation rate, people aged 15–64, OECD countries, 2017



Source: OECD labour-force participation rate.

Figure 3.4 Unemployed for longer than one year as share of unemployed, OECD countries, 2018



Source: OECD long-term unemployment rate.

New Zealand's flexible labour market is an asset

New Zealand workers are active participants in the labour market, changing jobs from time to time to find better matches. A voluntary move from one job to another is an important way for workers to grow their

wages, because they have stronger bargaining power if already employed. Andrews et al. (2019, p. 2) explained how these job switches can also benefit workers who stay in their jobs.

> [A more fluid labour market] may improve the bargaining position of workers. If a worker has more credible outside options in more fluid labour markets, then they will be better placed to negotiate higher wages with their employer, and therefore to earn a higher share of the rent from the match.

Switching jobs and greater job mobility can be particularly beneficial for younger workers, given that the quality of early job matches can have a large bearing on a worker's career and future income. The ease of changing jobs also affects how well people can adjust to labour-market changes. New Zealand's wider policy settings support worker mobility, by ensuring that access to social assistance (eg, healthcare, retirement savings, unemployment benefits) are not linked to jobs or particular work arrangements (eg, full-time employment, as opposed to contracting).

Coleman and Zheng (2020) examined job-to-job transitions across firms, industries and regions in New Zealand. Just over 20% of employees (aged 18–64) – about 420 000 people – had a different job in March 2018 than they had a year earlier.[28] About 40% of these changes were to a new location, and nearly 60% involved switching industry. Only 20% stayed in the same industry and location.

The effect of the global financial crisis on job-to-job transitions is evident after 2007/08 in Figure 3.5. Transitions dropped and were subdued through to 2012/13. They had mostly recovered by 2017/18.

Figure 3.5 Job-to-job transition rate, New Zealand, 2001–18

Source: Coleman and Zheng (2020, fig. 3).

Notes:

1. X axis is the 12 months ending in March of the year indicated.
2. Y axis is wokers in a different job at the end of the (March) year, as a proportion of total employment at the start of that year.

Much of the strong performance of New Zealand's labour market (including low unemployment) reflects its flexibility (ie, the relatively low barriers that firms face in hiring or firing staff). OECD evidence on long-term effects of reducing hiring and firing barriers find that doing so:

- increases the employment of low-skilled workers;
- reduces the proportion of workers on temporary contracts;
- increases labour productivity and wages; and
- has no or slightly positive effects on overall employment (OECD, 2016d, 2018c).

[28] These estimates of job-to-job transitions exclude those who changed jobs but stayed employed by the same firm.

Flexibility can also help ensure that there is a range of work opportunities to meet the diverse circumstances and preferences of workers, thereby contributing to "job quality" (Box 3.4)

Box 3.4 **What about job quality?**

Some inquiry participants expressed concerns about the impact of technological change on job quality (see, eg, New Zealand Council of Trade Unions Te Kauae Kaimahi, subs. 41, DR424; New Zealand Public Service Association, sub. DR406; Auckland Regional Public Health Service, sub. DR411; Tertiary Education Union, sub. DR420). Particular concerns include that:

- workers will face greater surveillance, reducing their agency and increasing their stress; and
- work will become more precarious, with people having less security about their income.

There is not enough data to assess whether technology is being used to increase surveillance of people in New Zealand workplaces. While this is plausible (Table 2.1), it is by no means certain. And it is similarly plausible that technology is enhancing worker agency by replacing tedious tasks and increasing the importance of uniquely human attributes (eg, empathy, judgement).

Whether work has become more "precarious" depends on the definition of "precarious" adopted. Employment arrangements in New Zealand have been broadly stable in recent years, with the majority of people in permanent employment (section 2.8). In earlier research, New Zealand Council of Trade Unions (2013) estimated that 30% of the New Zealand workforce was affected by "insecure work". This calculation was based on the total number of unemployed, people in temporary employment, and permanent workers where there was a medium to high risk of job loss (as at December 2012).[29]

Such estimations are subject to economic conditions and the proportion would have been lower if assessed in 2018 or 2019. In addition, this measure implicitly assumes that much self-employed and all temporary work is insecure or undesirable. The Commission does not share these assumptions. Flexible work suits the preferences or circumstances of many people. The most recent survey of working life (December quarter 2018) showed that roughly half of temporary employees and over 90% of self-employed workers wanted to stay with their current form of work arrangement.

Defining "good work" is not simple, and many definitions and perspectives have been adopted in the research and policy literature. The Commission agrees with the UK review of "good work" that found

- What people want from a job in order to suit their needs will differ considerably;
- In taking steps to protect those who are in a vulnerable position, we should not remove important working options for others;
- There is no silver bullet to delivering better work. Any changes involve a balancing act seeking to meet as many objectives for as many people as possible. (Taylor, 2017, p. 15)

Several submitters referred to the International Labour Organisation's definition of "decent work" as a standard that governments should be aiming for in setting social and employment policy:

> It involves opportunities for work that is productive and delivers a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration, freedom for people to express their concerns, organize and participate in the decisions that affect their lives and equality of opportunity and treatment for all women and men. (International Labour Organisation, 2020)

The Commission agrees that income security, opportunities for development, and career progression and social protections are important. This underpins the Commission's recommendations for greater income smoothing, increased access to training and labour-market programmes, and more effectively targeted employment law (Chapter 4).

[29] As reported in the Stats NZ survey of working life. The CTU also classified some self-employed workers as "insecure" (eg, dependent contractors), although data was not available to the CTU on their numbers.

The flexibility of the New Zealand labour market is beneficial now and could become more important if technological progress and job churn increases in future. In such a scenario, more firms would face competitive pressures and need to make changes to their business models and more workers would experience reduced demand for their skills and possible displacement. A labour market with an abundance of job opportunities is arguably the best form of income protection and insurance available. Thus, when designing and implementing policies to assist workers and firms to adapt to technological change, the Government should foremost seek to maintain New Zealand's current high levels of labour-market flexibility.

In particular, governments should be wary of labour-market regulations that restrict firms' ability to reorganise business models to take advantage of new technology. This is because

- Firms that are less able to reorganise themselves in the face of competition from firms using new technology are more likely to fail, leading to more job losses than may have otherwise been the case.
- Adopting a technology can be a risky venture for firms, as not all investments pay off. The harder it is for a firm to back out of a failing investment (eg, by reorganising staff or business models), the less likely they are to invest in the first place.
- High barriers to firms laying off may similarly discourage them from hiring or lead to other social undesirable outcomes, such as a "dual" labour market (Box 3.5).

Box 3.5 **France's "dual" labour market**

France has one of the more heavily regulated labour markets in the developed world. Although recent reforms have eased some restrictions, France remains more regulated than the OECD average (based on the OECD's employment protection legislation index) and much more so than New Zealand. The French labour code is over 3 200 pages long, and includes detailed notification requirements for dismissals, obligations on the firm to formally assess whether the worker can be transferred to another role (including by retraining them) and regulated notice periods and severance payments, which vary based on worker tenure (Carcillo et al., 2019; Tirole, 2017).

As a result of the strict controls on how permanent and full-time employees can be fired, French employers rely on short-term temporary contracts or are wary of hiring. France has high rates of temporary employment, employment rates below the OECD average and relatively high unemployment. This "dual labour market" – with high protections for full-time employees and a heavy reliance on short-term contracts for others – especially disadvantages the young, older workers, and people from migrant communities. Nobel laureate Jean Tirole (2017, pp. 233–234) summed up the impact of France's labour-market laws:

> Saying that France's performance in matters of employment and well-being at work is less than brilliant is an understatement … The key facts are these:
>
> 1. Unemployment is much higher in France than in Northern European countries (Germany, the Netherlands, the Scandinavian countries) or the developed English-speaking countries (US, UK, Canada, Australia);
> 2. [Unemployment] affects mainly people between fifteen and twenty-four and between fifty-five and sixty-four years old;
> 3. Unemployment penalizes those with little education or training and those who live in low-income urban areas;
> 4. Long-term unemployment, which is by far the most harmful, is high and has been steadily increasing since 2007;
> 5. The French experience a serious malaise at work resulting from a lack of job mobility, conflictual relationships in the workplace, and a feeling that their jobs are not secure;
> 6. As a result, French taxpayers have to spend heavily on employment policy.[30]

[30] Tirole (2017) estimated that in 2012 France was spending 3.5–4% of GDP on passive and active employment policies and fiscal incentives.

Maintaining labour-market flexibility is not an argument for reducing employment protections. All labour markets require rules and regulations to be fair to the parties in the employment relationship and prevent abuse and exploitation. These rules should be effectively enforced.

Different countries have taken different approaches to manage power imbalances between workers and employers. In several continental European countries, unions and their employer association counterparts negotiate and agree wages, terms and conditions that apply across whole industries or the country. In other developed countries, the state plays a more active role in setting minimum standards and wages, with firms and workers negotiating pay, terms and conditions above these, either through individual or collective agreements. The regulation of New Zealand's labour market has changed considerably over the past century, traversing both centralised collective bargaining and decentralised models (Box 3.6).

Box 3.6 **The evolution of labour-market regulation in New Zealand**

New Zealand was the first country to introduce compulsory arbitration of industrial disputes in 1894. This system gave legal recognition to unions and obliged employers to negotiate with registered unions over disputes. Registration of unions was not compulsory, but registration gave unions exclusive rights to represent workers in their crafts or industry. Local conciliation boards heard disputes which, if unresolved, were referred to the national arbitration court. This was comprised of a Supreme Court judge and two assessors elected by unions and employers' associations. Court decisions were binding. Strikes or lockouts were banned while disputes were negotiated or once an agreement was reached.

The arbitration court was also empowered to set wages, and its decisions evolved into a national system of "awards", which determined wages and conditions for specific industries. Union membership became compulsory in 1936 but was relatively high prior to this. Olssen (2010) observed that by 1913

> New Zealand was one of the most unionised societies on earth. In 1921, at the peak of the voluntary unionism era, there were over 400 unions, with almost 100 000 members in total. Over 20% of the male workforce was unionised.

The overall conciliation and arbitration system was designed to promote industrial peace, and the 1966 *Encyclopedia of New Zealand* commented that in "over three-quarters of New Zealand's economic activities, strikes are almost unknown and conciliation and arbitration procedures are the recognised means of settling disputes" (McLintock, 1966).

The system began to break down in the 1960s and 1970s, as strikes began more common. Rising inflation was outstripping wages, deteriorating economic circumstances were leading to restructuring, unemployment and firm closures, and changes in the structure of the economy – especially the shift towards services – weakened some traditionally powerful unions. A greater ability for workers to pursue personal grievances directly with employers, and the introduction of a new industrial mediation service, also made the arbitration system less important. The Labour Relations Act 1987 ended compulsory arbitration, but left in place industry awards and compulsory unionism.

New legislation in 1991 dramatically changed the industrial relations landscape. The Employment Contracts Act ended compulsory unionism, national awards and the exclusive right of unions to represent workers. Its effects were significant – union density fell from 42% of the employed workforce in May 1991 to 22% in December 1995, and whereas the majority of employment contracts in 1991 were multi-employer collective agreements (MECAs), by 1995, only 10% of firms had MECAs as their predominant form of contract.

The Employment Relations Act 2000 restored unions' exclusive right to represent workers in collective bargaining, encouraged mediation of industrial disputes and required employers and unions to negotiate in "good faith". Union membership remains voluntary and, as at December 2017, stood at 17.3% (members as a share of all paid employees) (Ryall & Blumenfeld, 2019, p. 3).

Source: Derby (2016c, 2016b, 2016a); Morrison (1996); Olssen (2010b, 2010a).

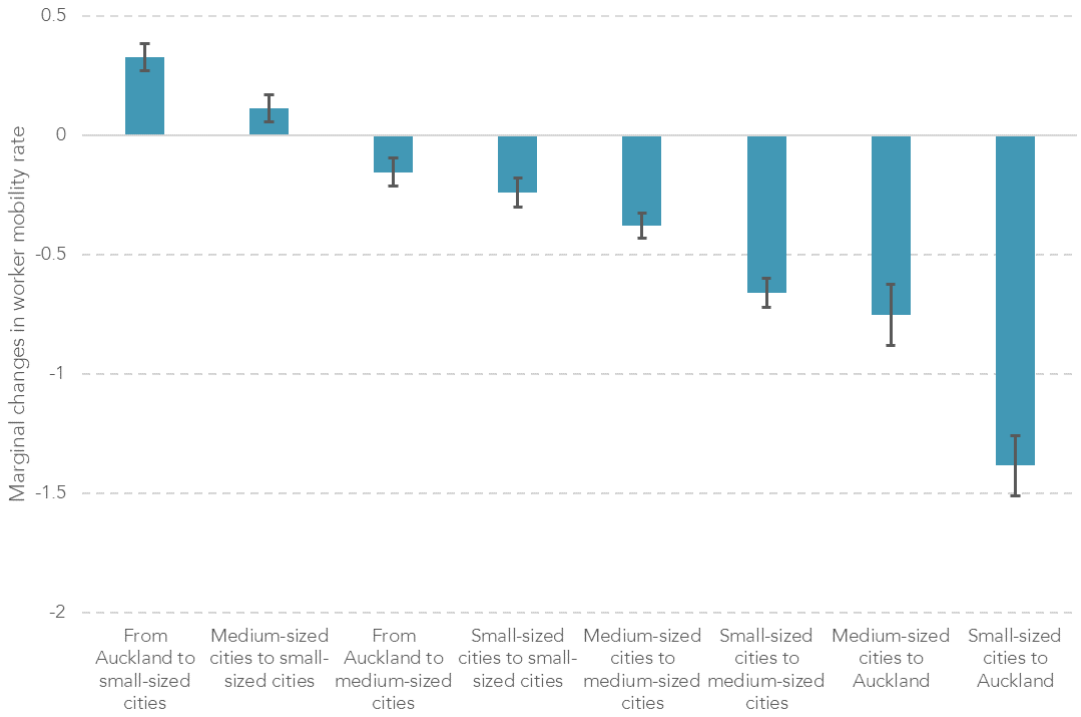
The Commission has not seen compelling evidence that reductions to current employment protections would improve the ability of New Zealand firms to adopt technology. Chapter 4 discusses actions that can be taken now to increase resilience and opportunities for today's and tomorrow's workers.

R3.1 When designing and implementing policies to assist workers and firms to adapt to technological change, the Government should broadly maintain New Zealand's current high levels of labour-market flexibility.

Housing costs are creating barriers to mobility and opportunity

High housing costs in cities can price out workers who would be more productive (and receive higher wages) if they moved to take up work opportunities in those cities (Hsieh & Moretti, 2015). Coleman and Zheng (2020) found evidence that housing costs are creating such barriers in New Zealand. They found a significant effect of house-price differences on inter-city migration. Figure 3.6 shows, for eight examples of inter-city migration, how worker mobility would change if the difference in average house prices between the source and destination cities increased by 1%.

Figure 3.6 Changes in worker mobility, if house price differences between source and destination city increase by 1%



Source: Coleman and Zheng (2020).

The impact of increased house price differentials on mobility was statistically significant and negative for workers in 7 of 18 industries: agriculture, health, manufacturing, education, construction, electricity gas and water, and retail trade (NZPC, 2020a, fig. 4.2).

New Zealand has restrictive land use regulation that increases the price of housing (NZPC, 2015b, 2017a).

F3.4 High housing prices, especially in Auckland, are creating barriers to job mobility and the efficient matching of worker skills to jobs. These barriers are particularly pronounced for workers in the agriculture, health, manufacturing, education, retail, construction and electricity, gas and water sectors.

3.4 A well-educated population

People with higher skills typically enjoy higher incomes, have more job choice and greater security from displacement, and these advantages may be increasing. As the OECD (2019d, p. 19) commented in its recent *Employment Outlook*,

> [o]ver the past decade, labour market conditions have deteriorated for young people with less than tertiary education in many countries, with a rising proportion out of work or, under-employed or low-paid if in work.

The OECD went on to note that the deterioration in labour-market conditions for young people with less than tertiary education raises significant policy challenges for many countries.

Research into the outcomes from adult education and training in New Zealand confirms that the income and employment returns from retraining are higher for those with high prior qualifications. Completion of qualifications at low levels of the New Zealand Qualifications Framework (NZQF) by working age adults provides few income benefits (Box 3.7).

New Zealand adults have high rates of skills and qualification attainment

On some measures, New Zealand's workforce has high skill levels. As part of the OECD's Programme for the International Assessment of Adult Competencies (PIAAC), the literacy, numeracy and problem-solving skills of a representative sample of adults were tested in 2014. On average, adult New Zealanders' literacy and problem-solving skills (using computers) were among the highest in the world, and their numeracy skills were above the average for the 33 countries participating.[31]

The workforce's literacy skills had improved since they were previously tested in 2006 (particularly among those younger than 45 years) (Ministry of Education & MBIE, 2016c). Broadly, adults with educational qualifications had higher skill levels than those without; and those with higher-level qualifications were more skilled on these measures than those with lower qualifications (Ministry of Education & MBIE, 2016a). Among OECD countries, a relatively high proportion of New Zealand adults aged 25–64 has a bachelor degree or higher qualification (OECD, 2019a).

New Zealander workers likely do not have a broad range of highly specialised skills of the type demanded in larger, more specialised economies (Box 3.8). However, PIAAC results show a smaller proportion of adult New Zealanders have low literacy, numeracy and problem-solving skills, than in comparator countries such as the United States, England, Canada and Australia. There are significant ethnic differences in measured skill levels in the adult population, but these differences have been reducing over time. (Ministry of Education & MBIE, 2016c).

[31] "Problem solving in technology rich environments is the ability to use computers to acquire and evaluate information, communicate with others and perform practical tasks. All tasks are completed on a computer." (Ministry of Education & MBIE, 2016c, p. 5)

Box 3.7 **Income and employment returns from education and training in New Zealand**

Lower-level education tends not to boost incomes, but can boost employment

Several studies have found that completion of qualifications at NZQF levels 1–4 provides little income benefits to graduates, but sometimes offers employment benefits.[32]

- Crichton (2009) examined the labour-market outcomes of employees who had left a programme of industry training during 2003–05. She found that gaining a qualification at NZQF level 1 or 2 or completing a limited credit programme did not improve average earnings during the 48-month period after training started. However, employment rates for this group were 3–8% higher.[33]
- Crichton and Dixon (2011) investigated the labour-market returns obtained by working adults aged 25–64, who enrolled with a tertiary education provider and completed a certificate or diploma at levels 1–6, from 2003–05. The study compared their pre- and post-study earnings with those of a matched group who did not return to tertiary education. Except for certificates in a small number of fields of study, students who completed a level 1–4 certificate generally did not increase their average earnings (relative to the comparison group) within three years of completion.
- Tumen, Dixon and Crichton (2018) found that young adults (aged 15–21) who completed a level 1–4 NZQF certificate, after previously having left school without completing National Certificate of Educational Achievement (NCEA) level 2, were more likely to be employed than those who did not complete a certificate. But they also found "no evidence that having a higher qualification led to higher levels of earnings for those with jobs" even after six years (2018, p. 41).

Higher-level certificates or diplomas provide higher, but mixed, returns

Achievement of qualifications at NZQF level 4 or higher tends to provide higher income and employment returns, although these results have varied by gender, age, and subject field.

- Crichton (2009) found that achievement of NZQF level 4 or higher qualifications improved students' earnings, with an average increase of 7% relative to the comparison group 48 months after training started. The earnings of men aged 15–24 were 11% higher, while other men saw improvements of 1–4%. The earnings of women improved by 2%.
- Crichton and Dixon (2011, p. xii) found that gaining a level 5–6 diploma was "associated with an 8 percent increase in the relative earnings of women, on average, and a 6 percent reduction in the relative earnings of men, on average." Income benefits varied by subject, with increase in relative earnings found for engineering diplomas (men) and education and commerce diplomas (both genders). Diplomas in other fields "were associated with no improvements or reductions in relative earnings" (ibid).
- Hyslop et al. (2020) found that, on average, New Zealanders aged 25–64 benefited from participating in formal education and training. The benefits were larger for women (whose earnings increased by 12%) compared to men (whose earnings increased by 5–6%). Earnings returns were higher for completing qualifications (in contrast to just undertaking study), for higher-level qualifications, and for undertaking more intense study. Women and men tend to study different subject fields and be employed in different occupations and industries, which may explain gender differences in returns to education and training.

[32] The Industry Training Federation (sub. DR415) and Building and Construction Industry Training Organisation (sub. DR412) noted that these studies group together all qualifications at levels 1–4, ranging from foundation literacy/numeracy certificates to more advanced trade certificates, The results may therefore mask significant variation in outcomes between qualifications. The studies also attribute all earnings to a person's highest qualification, potentially masking returns to vocational qualifications attained by people with a higher prior qualification.

[33] Defined as a "subset of a qualification … (typically between 20 and 40 credits) [that] does not result in the achievement of a national qualifications" (Crichton, 2009, p. 8).

Box 3.8 **Does New Zealand lack highly specialised workers compared to other countries?**

Like other small economies, New Zealand only specialises deeply in a relatively small number of areas (eg, dried milk production, kiwifruit cultivars, Hobbit movies). Outside such areas of economic specialisation, New Zealanders are unlikely to receive an earnings premium for highly specialised skills unless they go overseas to work. And even if people acquire deeply specialised skills through formal education in New Zealand, they may not have the opportunity to further develop and hone those skills in local workplaces. So, the proportion of adults in small economies with highly specialised skills is likely to be small.

Data is not readily available on highly specialised skills across countries. Even so, it is easy to think of illustrative examples – such as medical professionals providing highly specialised treatments in the United States that are not available in New Zealand.

One way that small economies can support greater specialisation (and higher productivity) is through their firms' participation in global value chains (GVCs). A "value chain" refers to "the range of activities that firms undertake to bring a product or a service from its conception to its end use by final consumers" (De Backer & Miroudot, 2014, p. 1). World trade and production have become increasingly organised in GVCs over recent decades. New technologies, falling transport and communication costs, and trade policy reforms have encouraged firms to disaggregate production processes to better use the comparative advantage of particular locations. Weta Group is a high-profile New Zealand example of a firm participating in a GVC (Bealing & Krieble, 2017).

Distance makes it difficult for firms to participate in GVCs (De Backer & Miroudot, 2014). This could mean that New Zealand is even less specialised in its goods and services than less distant small countries.

The data on export goods specialisation supports this proposition. Compared to other small countries such as Denmark, New Zealand has very few areas of specialisation in the goods that it exports (OECD, 2017c). Among a group of seven small advanced economies, New Zealand had the least complex mix of exports in 2014 (Leong, 2016).[34]

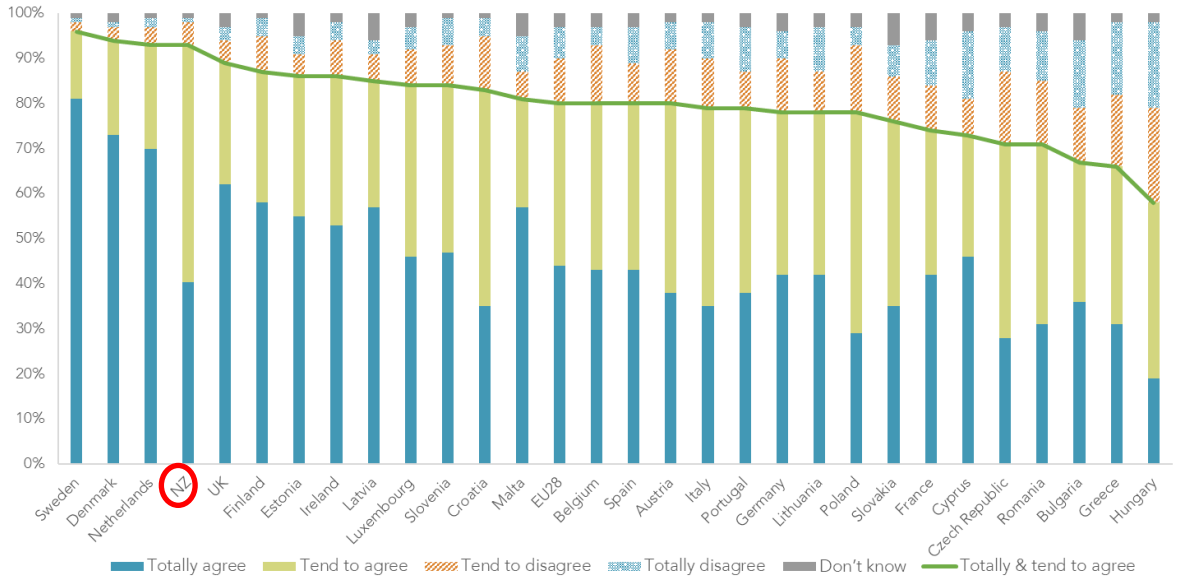
While the evidence is incomplete, the combined effects of size and distance likely means that New Zealand has fewer highly specialised workers, compared to other countries.

New Zealanders are confident about their digital skills in the workplace

In the Commission's survey of 1001 New Zealanders, 93% agreed that they were sufficiently skilled in the use of digital technologies to do their job. This is high compared with European countries (Figure 3.7).

[34] This is based on an economic complexity index constructed from data on trade in "complex products". "In general, more complex products (i) have fewer countries exporting them … and (ii) are exported by countries with more diverse export baskets" (Leong, 2016, p. 2). For a full set of country economic complexity rankings up to 2017 see OEC (2020).

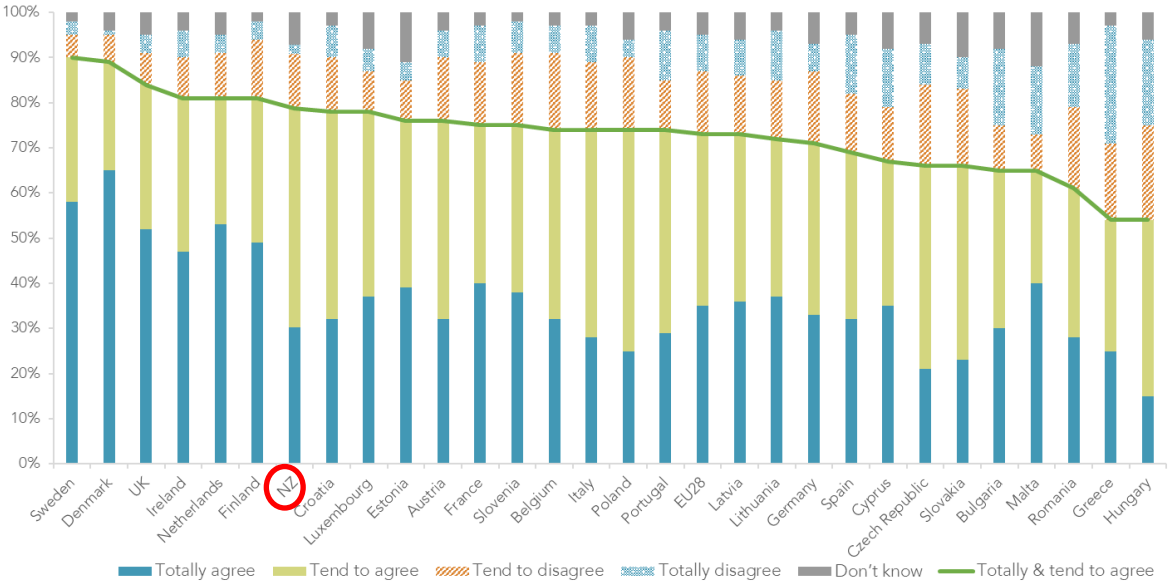
Figure 3.7 People's self-perception of having sufficient digital technology skills to do their job



Source: Heatley (2020, p. 6).

The survey asked New Zealanders about a hypothetical future job. Seventy-nine percent of New Zealanders agreed that they were sufficiently skilled in the use of digital technologies to do a future job if they were to find a job or change jobs within the next 12 months (Figure 3.8).

Figure 3.8 People's self-perception of having sufficient digital technology skills to do a future job



Source: Heatley (2020, p. 7).

These self-perception survey results are consistent with measured proficiency in 'problem solving in technology-rich environments' in the OECD's survey of adult skills (OECD, 2016b). The proportion of New Zealand adults scoring at level 3 (the highest level of proficiency) was 10.2% – higher than any other country surveyed, and almost twice the OECD average of 5.4%. About one in three New Zealand adults (34.0%) scored at or above level 2, compared with the OECD average of 25.7%.[35]

The Commission's survey found that New Zealanders' confidence in their own digital skills for their current job does not decline significantly with age. But confidence in one's own digital skills "to do a future job if

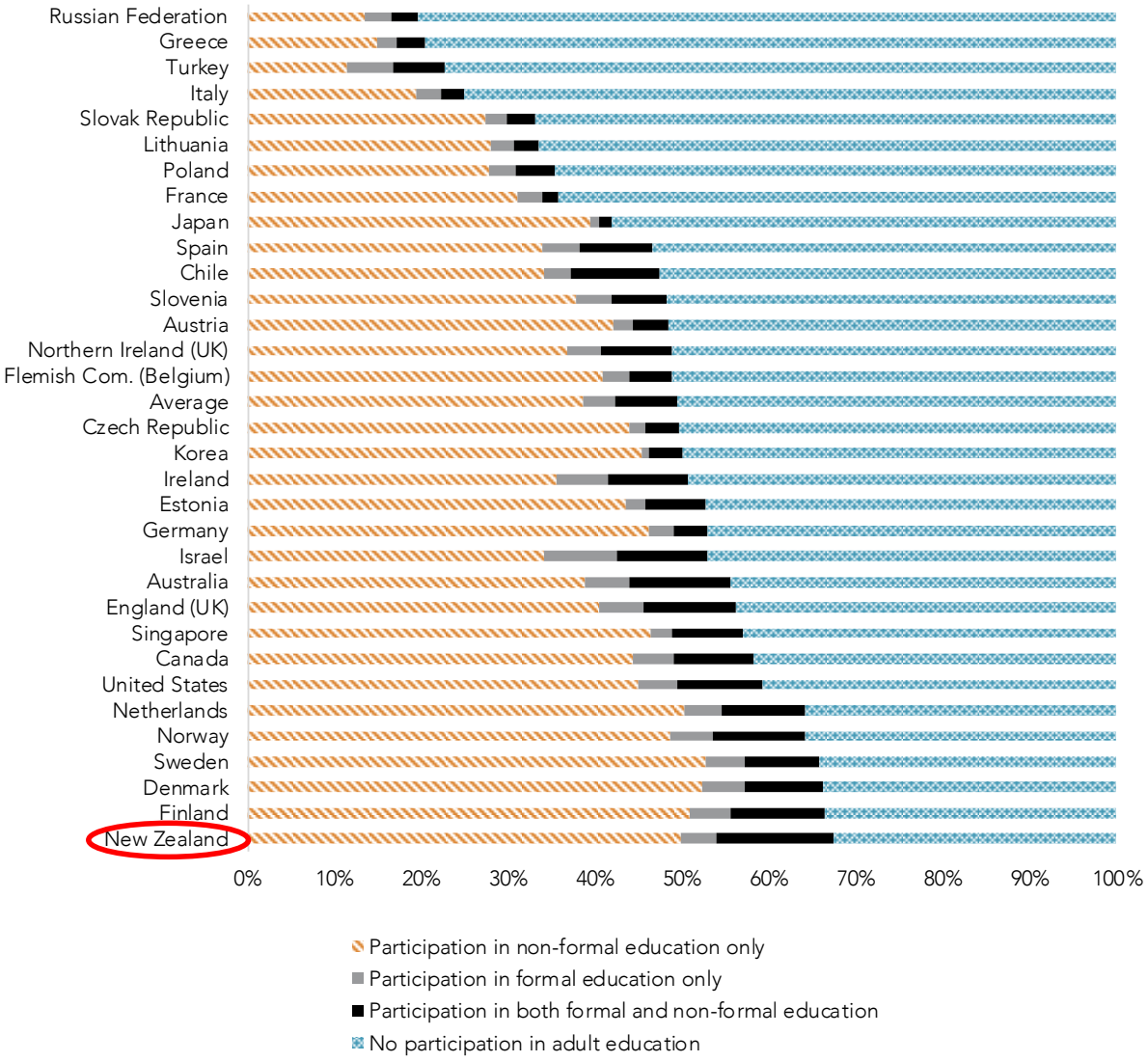
[35] Adults at level 3 can complete tasks involving multiple computer applications, a large number of steps, and the discovery and use of ad hoc commands in a novel environment. Adults at level 2 can complete problems involving a small number of computer applications, and requiring several steps and operations to reach a solution.

you were to find a job or to change jobs within the next 12 months" does decline significantly with age. This could indicate that older workers do not think their current digital skills are well matched with the demands of the labour market. Alternatively, older workers may think that younger people have much better digital skills, and older respondents expect to be competing with such people for future jobs (Heatley, 2020).

New Zealanders have high rates of participation in work-related education and training

The OECD (2019d, p. 20) argued that ongoing education and training by adults "can help prevent skills depreciation and facilitate transitions from declining jobs and sectors to those that are expanding." New Zealand has high rates of participation in work-related education and training (Figure 3.9) and is one of the better-performing countries in the OECD (along with the Nordics, Australia and the Netherlands) in terms of "ensuring more equal access to formal and informal learning opportunities for adults across age, education, skills and income" (Martin, 2018, p. 22).

Figure 3.9 Share of adults aged 25–64 that participated in formal or non-formal adult education or training for job-related reasons, 2012 or 2015



Source: NZPC (2019e, fig. 2.2); OECD (2017b, p. 316).

Notes:

1. "Formal education" is "planned education provided in the system of schools, colleges, universities and other formal educational institutions that normally constitutes a continuous 'ladder' of full-time education for children and young people". "Non-formal education" is "sustained educational activity that does not correspond exactly to the definition of formal education. Non-formal education may take place both within and outside educational institutions and cater to individuals of all age". (OECD, 2017b, p. 325)

Training uptake is skewed towards those in professional occupations

Consistent with findings in other countries, New Zealand workers in professional occupations are more likely to take part in training than those in other occupations. Professionals (71%) and community and personal service workers (68%) have the highest rates of participation in education and training. The lowest participation rates were for labourers (43%), and machinery operators and drivers (48%).[36,37] Professionals also undertook more hours of formal education and training on average, with a third undertaking more than 40 hours of education in 2015.[38]

The observed patterns of participation are consistent with evidence that adults with higher qualifications enjoy higher returns to further education and training than other adults (Box 3.7).

Workers and employers identify several barriers to ongoing education

Several surveys have investigated worker and employer views on the barriers to work-related education and training in New Zealand. Both groups cite insufficient time and costs as major barriers to education and training.[39] Even so, these reported barriers should be placed in the context that New Zealand workers' participation in education and training are already very high by international standards, and that their measured skill levels are also high. Workers and employers assess the cost of additional training against the benefits they expect to receive when deciding whether or not to pursue it.

New Zealand workers reported insufficient time as a barrier to education and training at higher rates than the OECD averages, and time barriers were particularly prominent for the self-employed (OECD, 2019d). Fifty-six percent of employers surveyed for the 2012 Industry Training Review said that cost was a "main barrier to organising further training" and 58% cited the cost of having staff away from work (Ministry of Education, 2012, p. 30).

Insufficient information about education and training, doubts about its impacts, a lack of interest from staff, and a lack of suitable, relevant or quality education and training were also cited as significant barriers by employers in responses to the 2016 business operations survey (NZPC, 2019e) and the 2012 Industry Training Review survey (Figure 3.10).

[36] Figures from Stats NZ's 2018 survey of working life.

[37] The OECD survey of adult skills (PIAAC) similarly reported that professionals (63%), and technicians and associate professionals (58%) in New Zealand have the highest rates of on-the-job learning, while skilled agricultural and fishery workers (36%) and people in elementary occupations (28%) have the lowest (Ministry of Education & MBIE, 2016b).

[38] Many professionals have continuing professional development obligations, often as part of occupational regulation schemes. This may explain part of the disparity in training uptake between professionals and other occupations.

[39] In, for example, the 2016 business operations survey, the 2015 PIAAC round, and a survey of employers conducted for the 2012 industry training review.

Figure 3.10 Barriers for firms in organising further education and training, 2012

Source: Ministry of Education (2012).

Online learning is one way to reduce the cost and time required for ongoing education and training. The Commission's survey of the attitudes towards technology of 1 001 New Zealanders found that 86% agreed that they were sufficiently skilled in the use of digital technologies to benefit from digital and online learning opportunities. This is high in international comparison, with New Zealand ranking between Sweden and the Netherlands (Heatley, 2020).

F3.5 New Zealand adults have high levels of literacy, numeracy and problem-solving skills in international comparisons, and high levels of educational attainment. There are significant ethnic differences in measured skill levels in the adult population, but these differences have been reducing over time. New Zealand adults are also relatively confident about their digital skills in the workplace, compared to adults in European countries.

F3.6 New Zealand adults participate at internationally high rates in further education and training. People in professional jobs tend to participate more in ongoing education and training and benefit more from doing so. The cost of training and of time away from the workplace are the most common barriers to additional education and training.

Preparedness for success in the labour market

New Zealand adults seem well positioned for changing workplaces, in international comparison. However, those with less education or poor skills are at higher risk of job displacement and unemployment and benefit less from retraining as an adult. This points to the importance of school-level education in preparing people for success in the labour market. Accordingly, the inquiry examined indicators of the performance of the school system.

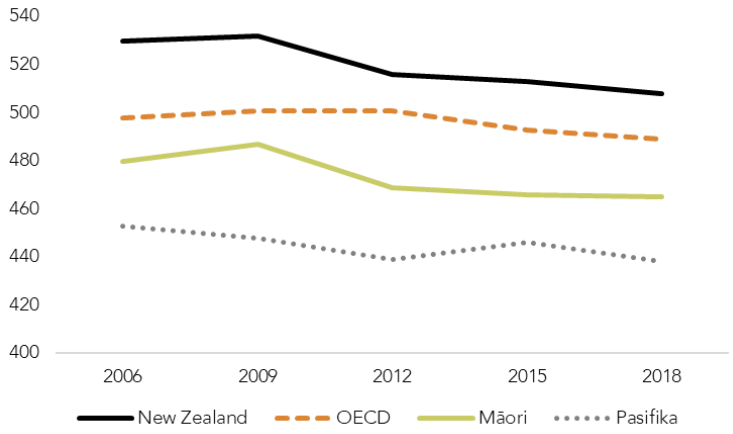
New Zealand 15-year olds' core skills are declining

Trends in school-level education paint a troubling picture. International standardised surveys such as the *Programme for International Student Assessment* (PISA), the *Trends in International Mathematics and*

Science Study (TIMSS) and the *Progress in International Reading Literacy Study* (PIRLS) indicate that while New Zealand students on average remain near or above reported international averages, their performance is declining over time. Similar adverse trends are evident in national monitoring projects such as the *National Education Monitoring Project* (NEMP) and the *National Monitoring Study of Student Achievement* (NMSSA).

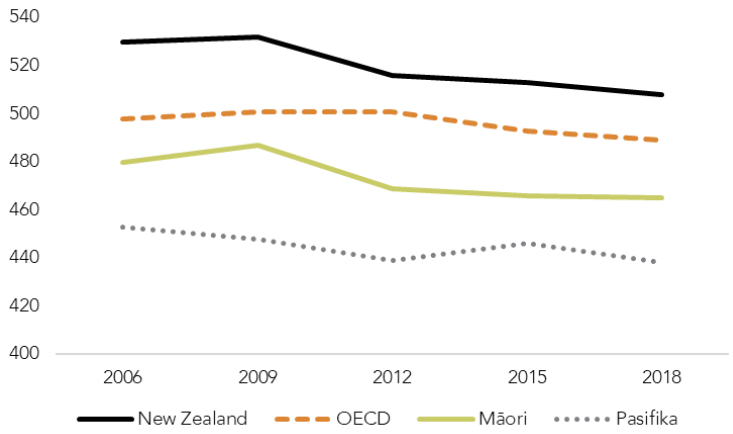
Average PISA scores have been trending down across all three subjects measured (since 2000 for reading, and since 2009 for mathematics and science) (Figure 3.11; Figure 3.12; Figure 3.13).

Figure 3.11 Average PISA scores – science, 2006–18



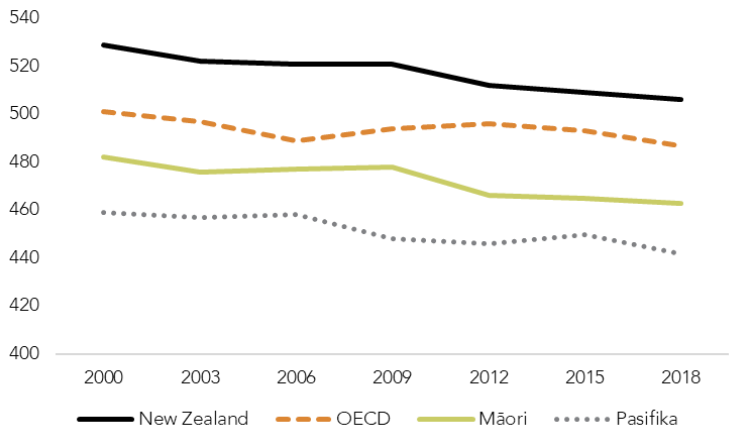
Source: May et al. (2019).

Figure 3.12 Average PISA scores – mathematics, 2003–18



Source: May et al. (2019).

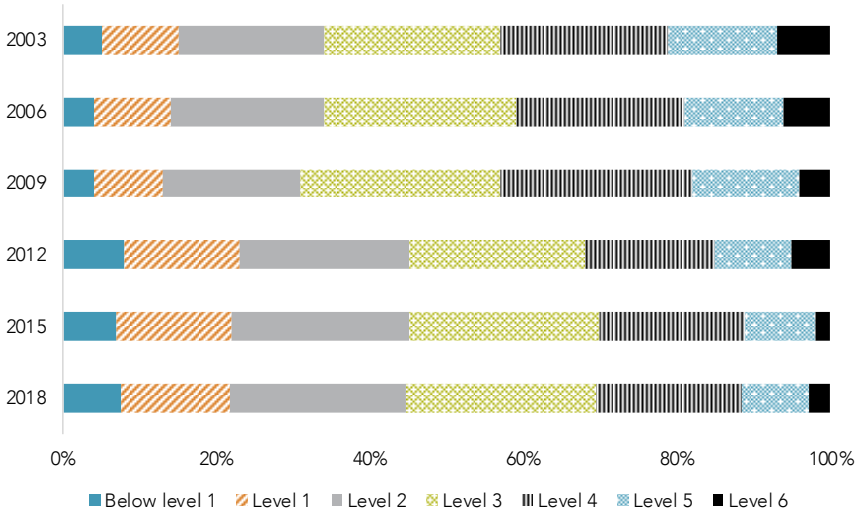
Figure 3.13 Average PISA scores – reading, 2000–18



Source: May et al. (2019).

The decline in average scores has been sharpest in mathematics, where the share of New Zealand 15-year-olds in the top two levels of proficiency (levels 5 and 6) fell by almost half (Figure 3.14).

Figure 3.14 Mathematics proficiency in PISA, by levels, New Zealand, 2003–18



Source: May et al. (2016); OECD (2019b).

Notes:

1. Higher levels denote greater proficiency.

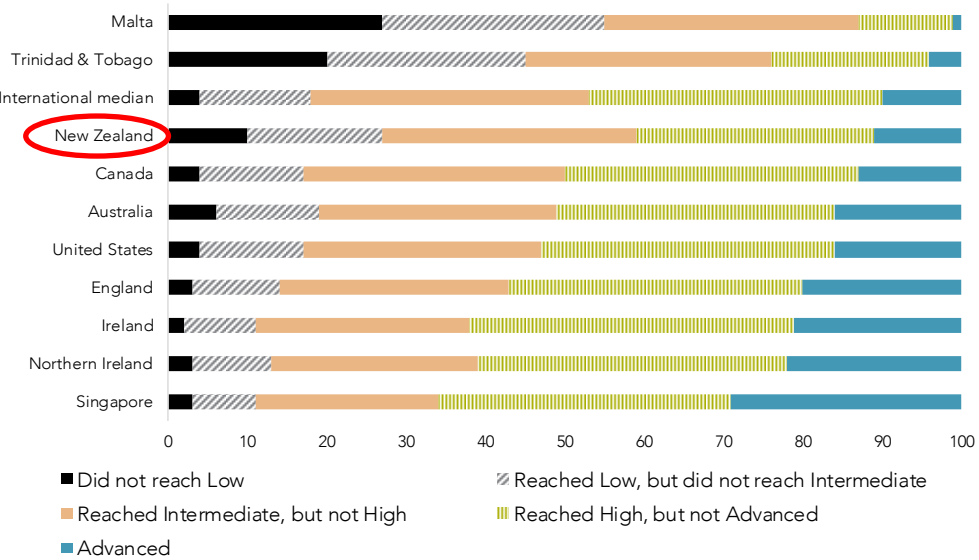
A widening gap between the highest and lowest performing students

The schooling system is also struggling to address a persistent "long tail of underachievement" between the highest and lowest performing students (Ell & Grudnoff, 2013, p. 74).

In the PISA study, compared to countries with similar average scores in both science and reading, New Zealand has a larger proportion of students at the top (advanced thinking ability) and bottom (relatively basic tasks) on each achievement scale (May et al., 2016).

In the PIRLS study, New Zealand also has a relatively large share of very poorly performing learners and a small share of students reaching more advanced benchmarks at year 5 (Figure 3.15). The NEMP and NMSSA studies show little progress in closing achievement gaps, or the available data shows a gap between achievement and expected outcomes.

Figure 3.15 Students performance against PIRLS 2016 benchmark, English-language countries



Source: Ministry of Education (2017b, p. 15).

Persistently poor outcomes for some young people

The New Zealand education system produces persistently poor outcomes for some young people, especially children in socio-economically disadvantaged backgrounds and Māori and Pasifika students:

- New Zealand students from disadvantaged backgrounds are over six times more likely than those from wealthier backgrounds to perform poorly in mathematics. Amongst OECD members, only Israel, Poland and Ireland have worse socio-economic disparities (OECD, 2016c).
- Māori and Pasifika children are less likely (68% and 75% respectively) to participate in early childhood education (ECE), compared to 82% of all five-year-olds (Ministry of Education, 2019). Mothers living in higher deprivation areas are almost twice as likely not to use an ECE service (Meissel et al., 2019).
- Despite reporting higher student wellbeing, Māori and Pasifika students perform more poorly in surveys such as PISA. For example, 30% of Māori and 44% of Pasifika students perform below level 2 in mathematics, compared to 22% across the population of all students (May et al., 2019).[40]
- Schools vary considerably in their performance for Māori and Pasifika students and students from socio-economically disadvantaged backgrounds. In particular, as a group, schools offering Maori-medium education (MME) substantially out-perform other schools in Māori students' achievement. For example, in 2018, 59.2% of Māori school leavers from MME schools achieved National Certificate of Educational Achievement (NCEA) level 3 or above, exceeding both the 34.3% achievement rate of Māori school leavers from English-medium schools, and the overall 53.7% achievement rate for all school leavers. (Ministry of Education, 2019)
- Controlling for prior school achievement, Māori students are less likely than Pākehā students to participate at the higher levels of tertiary education that deliver the best financial return.[41] When they do participate at higher levels, their educational and labour-market outcomes are persistently poorer than those of Pākehā students. Māori and Pasifika students are also much less likely to complete a bachelors degree, 52% and 49% respectively, compared to 69% for Pākehā (Meehan et al., 2017).

F3.7 New Zealand 15-year olds' skills in reading, mathematics and science are above international averages, but have been declining over time. The New Zealand education system produces persistently poor outcomes for some young people, especially children in socio-economically disadvantaged communities, and Māori and Pasifika students.

Failure to implement the national curriculum's key competencies

New Zealand's national curriculum purports to deliver the competencies and skills that young people will need to prosper in the labour market of the future. However, implementation of the key competencies within the curriculum is way behind expectations, with no primary or intermediate schools surveyed by the Education Review Office (ERO) having progressed past the early phases of maturity in weaving together the teaching of the key competencies and the teaching of knowledge and skills in particular learning areas.

The national curriculum is an umbrella term for both the *New Zealand Curriculum* (NZC, for English-medium education, published in 2007 and implemented from 2010) and *Te Marautanga o Aotearoa* (for Māori-medium education, published in 2008 and implemented from 2011). The overarching intent of the national curriculum is to help "students acquire the taste and skills for engaging in lifelong learning" with the "acquisition of a broad range of skills … meant to facilitate the development of dispositions towards lifelong learning" (Lamb et al., 2017, p. 34).

The NZC identifies five key competencies: thinking; using language, symbols, and texts; managing self; relating to others; and participating and contributing. *Te Marautanga o Aotearoa* identifies the most

[40] Noting that achievement gaps for Māori and Pasifika students are compounded by factors such as home resources (Song et al., 2014) and comparatively lower teacher expectations than for Asian and Pākehā students (Turner et al., 2015).

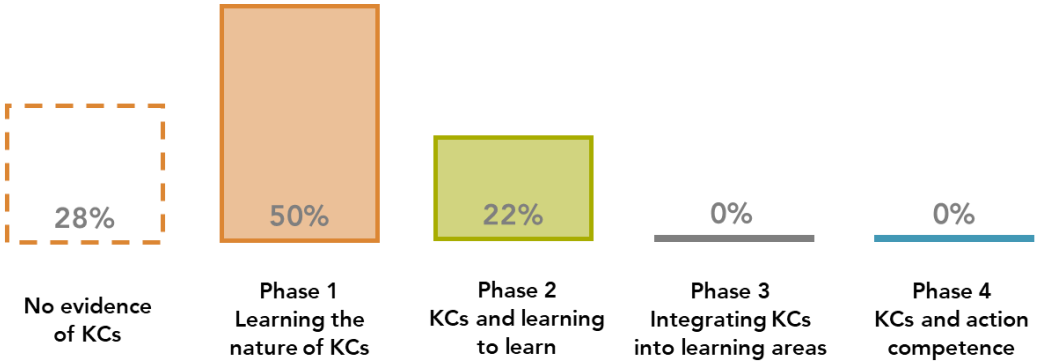
[41] Meehan at al. assigned individuals to one ethnicity using a prioritised classification. The order of prioritisation was Māori, Pasifika, Asian, Other, European. The results for those classified "European" are reported as "Pākehā" in this report.

important qualities and characteristics of a graduate of Māori-medium education as high levels of educational and socio-cultural success, a wide range of life skills, and a wide range of career choices.

Both curricula were designed to be applied locally as each individual school sees fit. Schools are encouraged to continuously revise their application of the curriculum. This approach requires sophisticated teacher capability, underpinned by well-resourced professional learning and development (PLD). Yet, in New Zealand there is evidence of highly variable teacher capability and inadequate provision of PLD.

Figure 3.16 illustrates the lack of progress in implementing the key competencies (KCs). In 2018, ERO studied 118 schools teaching year 1–8 students (ie, primary and intermediate schools). ERO rated schools' practices against a four-phase framework of increasing maturity in learning about and applying the teaching of KCs. ERO found that in the 11 years after the NZC was first published, no school had progressed beyond phase 2, half were at phase 1, and 28% were not even in phase 1 (ERO, 2019).

Figure 3.16 Schools' progress implementing the key competencies – English-medium schools teaching year 1–8 students, 2018



Source: ERO (2019); McDowall and Hipkins (2018).

F3.8

New Zealand's national curriculum purports to deliver the competences and skills that young people will need to prosper in the labour market of the future. However, more than a decade after publication of the national curriculum, implementation of the teaching of key competencies is well behind expectations. No schools in a 2019 Education Review Office study had progressed past the early phases of implementation.

3.5 Policy settings that promote openness

Firms in a small economy located far from most major markets face challenges to successfully develop or adopt new technologies. New Zealand has small domestic markets and is geographically distant from other, larger markets. This creates barriers to productivity growth because:

- small markets make it harder for some firms to reach the scale necessary to achieve efficiencies, justify specialisation or recoup the costs of investments in technology and capital;
- small markets often can only sustain a limited number of firms, leading to lower competitive pressure;
- small markets limit the pool from which firms can learn from each other (Zheng, 2016); and
- physical distance from large markets can constrain the flow of ideas and of knowledge about how new technologies can be used to raise productivity.

One way of countering these constraints on technology adoption and productivity growth is to ensure that the business environment is open and maintains flexibility for firms in adapting to changing circumstances.

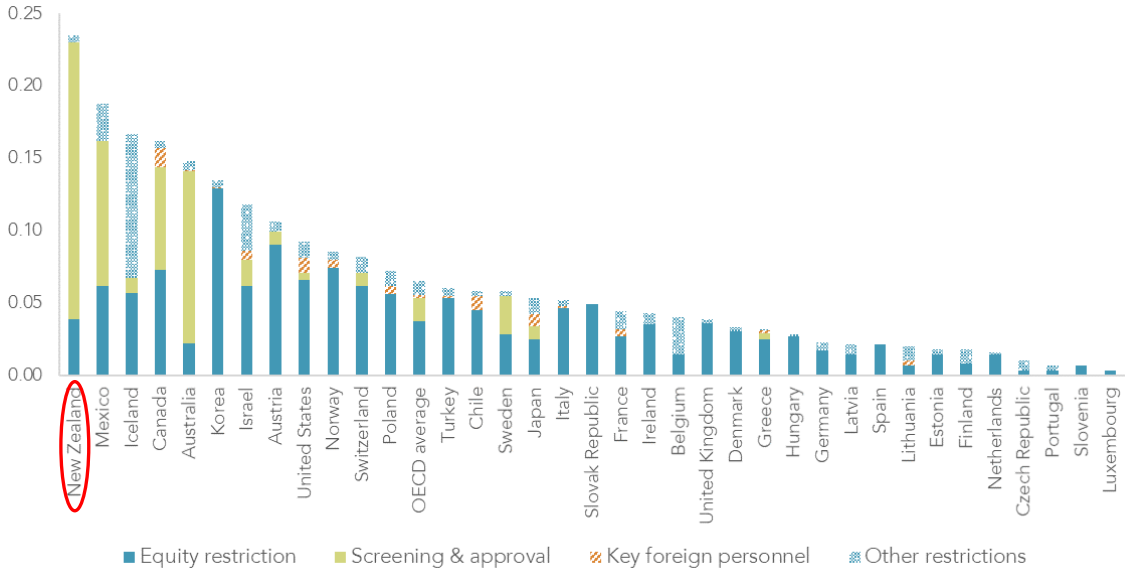
New Zealand has low regulatory barriers in most product and input markets, which should make it easier for firms and individuals to adopt new technologies, adjust their processes, or create new firms to suit.

- According to Ferracane at al. (2018), New Zealand has the lowest barriers to digital trade of 64 countries.
- New Zealand has a lower score on the OECD's services trade restrictiveness index than the average in 20 out of 22 sectors, explained by an overall favourable regulatory framework (OECD, 2018b).
- New Zealand has relatively low scores on OECD measures of regulatory restrictiveness. Even so, Conway (2011) found that its relative advantage had eroded over time.

New Zealand has high barriers to foreign direct investment

One significant exception to these patterns is openness to foreign direct investment. As assessed by the OECD, New Zealand has high barriers (Figure 3.17), reflecting the country's broad-based screening regime, and equity restrictions in some sectors (Wilkinson & Acharya, 2014). Most other OECD countries only screen investments in a few industries, usually where there is a defined national security interest.

Figure 3.17 Foreign direct investment restrictiveness index components, OECD countries, 2018



Source: Productivity Commission analysis of OECD data.

Notes:

1. Restrictiveness is measured on a 0–1 scale, where zero indicates the least restrictions and 1 the most.

New Zealand's investment screening is particularly on the purchase of "sensitive land", as defined in the Overseas Investment Act 2005. This screening is much more onerous than that for business assets. Sensitive land includes all non-urban land over five hectares, all foreshore land, and all land over 0.4 hectares that is held by conservation purposes, recreation or open space purposes, or that is subject to a heritage order or an application for registration as a historic place. More land is deemed "sensitive" simply because it is physically adjacent to land that meets these criteria. Among other effects, these controls have made it harder for New Zealand-registered companies to develop land for residential housing (NZPC, 2015b).

New Zealand's stringent overseas investment screening regime may also limit rewards for firms and opportunities for productivity growth. A Treasury (2019) consultation document on reforms to the Overseas Investment Act reported that

- applying for consent to invest in New Zealand typically involved high costs and long waiting times;
- "New Zealand attracts proportionately less, and has correspondingly lower stock of, foreign direct investment than many other small, advanced economies" (p. 8); and

- "New Zealand has also struggled to attract the most valuable forms of investment, such as greenfield investment." (p. 9).

Maintaining openness requires ongoing vigilance and the regular refreshment of policy and regulatory settings to keep them up-to-date with technological developments. There are many areas in which improved policy and regulation would help promote technology adoption (Chapter 4)

F3.9 Firms in a small economy far from most major markets, such as New Zealand's, face challenges to successfully develop or adopt new technologies. To counter this, New Zealand needs to maintain and improve its regulatory settings – to encourage firms to adopt new technologies. New Zealand generally has low barriers to trade and rates well on the OECD measures of regulatory restrictiveness. However, New Zealand has internationally high barriers to foreign direct investment, especially for investment that involves land purchases.

3.6 Summary assessment

Flexibility to adapt to change is a strength of the New Zealand labour market. The best form of income protection and insurance available in times of change (from whatever source) is a labour market with an abundance of job opportunities. Policies and interventions that assist workers to adapt to change, such as those proposed in Chapter 4, should maintain that labour-market flexibility.

New Zealanders seem less positive than Europeans about the effects of emerging technologies on the economy and on society. New Zealanders, however, seem relatively unconcerned that robots will "steal people's jobs". New Zealand's workforce is highly skilled on some measures. On average, adult New Zealanders' literacy and problem-solving skills are among the highest in the world. New Zealanders are confident of their digital skills in and out of the workplace. Adult numeracy skills are above average in the OECD. But while New Zealand 15-year olds' skills in reading, mathematics and science are above international averages, they have been declining over time. New Zealander workers tend not to have the highly specialised skills that workers in larger developed economies have. And the skills of New Zealand managers compare poorly with counterparts overseas (NZPC, 2020a).

New Zealanders also have relatively high rates of participation in work-related education and training, especially those in professional occupations. Adults participating in formal education and training increase their earnings, especially those completing higher-level qualifications.

Firms in New Zealand's small economy, far from most major markets, face challenges to successfully adopt new technologies. New Zealand generally has low barriers to trade and rates well on the OECD measures of regulatory restrictiveness. But New Zealand needs to build and retain world-class regulatory and policy settings, if it is to effectively counter the disadvantages of size and distance.

Productivity growth is the result of a dynamic business environment and occurs particularly through "reallocation" – the growth of higher-performing firms, entry of new firms and the exit of poorly performing ones. Reallocation is sluggish in New Zealand, particularly of capital.

In many respects New Zealand is well positioned to take advantage of technological change, but there are areas of weakness that can and should be addressed. Two important areas are:

- addressing persistent inequities and falling average performance in educational achievement; and
- improving the responsiveness of the vocational education and training system.

Importantly, New Zealand needs to maintain its dynamic labour market and its openness to the flow of goods, services, business investment, skills, data, ideas and technologies.

4 Improving the ability of New Zealand and New Zealanders to prosper from technology

Key points

- The Government should monitor relevant indicators of change and take steps to promote worker resilience and technology uptake. Better definition and ongoing measurement of employment arrangements and of work mediated by digital platforms would help to more effectively monitor labour-market change.
- Income-replacement rates through the tax/benefit system for displaced workers in New Zealand vary considerably, based on individual and household circumstances. For some people, income replacement rates are substantially below those of similar workers in other OECD countries. There are opportunities to improve income smoothing for displaced workers in New Zealand, but the options require further analysis and detailed design work.
- To support a dynamic labour market, the Government should extend funding to tertiary education providers for adult students who do not intend to pursue full qualifications and lift the current limit on the ability of people to borrow through the student loan scheme for short course tuition fees.
- The Tertiary Education Commission (TEC) and New Zealand Qualifications Authority should change their rules to make it easier for tertiary providers to offer micro-credentials and for learners to "stack" these short courses into larger qualifications.
- In implementing its reforms of the vocational education and training system, the Government should widen access to work-based education and training to all people legally entitled to work in New Zealand.
- The Government should strengthen the TEC's mandate and resource it sufficiently to lead development of quality careers advice and services for New Zealanders of all ages.
- The Government should use the conditions it attaches to public funding for tertiary education to encourage credit recognition and transfer systems that work in the interests of students and employers.
- The Government should modify the legal tests for employee status to focus them on the fundamental nature of the work relationship – the extent of employer control, worker autonomy and choice, and the extent of lock-in to a specific firm. Whether work is "fundamental" or "supplementary" to a firm's business should not be part of the legal test.
- The Government should explore options to give greater legal certainty to firms that wish to offer independent contractors a wider range of benefits and support.
- The Government should review and refresh regulatory settings to make sure they are adequate to deal with emerging technologies (eg, competition policy; data access and consumer data rights) and are not inhibiting technology adoption (eg, restrictions on the use of genetic modification technologies).

This chapter is advice for Government to improve the ability of New Zealand and New Zealanders to prosper from technology. This advice is in line with the inquiry's terms of reference, which invite the Commission to:

> provide recommendations for how New Zealand should manage a transition to a more technically advanced economy in relation to both technology's upside and downside risks, while still maintaining or improving incomes and wellbeing across all groups in the population, through recommendations on appropriate policy settings. (p. vi)

4.1 Take a positive stance towards technology and New Zealand's ability to adjust

Undue levels of concern that large-scale technology-driven disruption of employment is imminent may cause unnecessary stress; and may discourage firms and workers from adopting technologies that could boost productivity, incomes and wellbeing.

There are no reliable forecasts of job losses from emerging technologies – whether in aggregate or for specific regions, occupations, industries or groups in society (Chapter 2). The Government should avoid giving the impression that it endorses such forecasts, nor hinge policies on them.

Improve definitions and measures of employment arrangements

Improving official data sources will help the Government to monitor labour-market trends that may signal the effects of technological change. In particular, definitions of "gig" work, and other work arrangements that are not in the nature of an employer–employee relationship, need to be clarified and more complete measures need to be developed. As part of this inquiry, the Commission contracted Motu Economic and Public Policy Research to review international approaches to measuring gig work, and to recommend ways to improve measurement in New Zealand (Box 4.1).

Better measures are relevant to the Ministry of Business, Innovation and Employment (MBIE, as labour law regulators and labour market policy advisors) and the Inland Revenue Department (as tax collectors). Stats NZ should work with these and other interested agencies to improve measurement of work mediated by digital platforms and of other work arrangements that are not in the nature of an employer–employee relationship.

R4.1 Stats NZ should work with the Ministry of Business, Innovation and Employment and the Inland Revenue Department to improve definitions and ongoing measurement of work mediated by digital platforms and other work arrangements that are not in the nature of an employer–employee relationship.

Monitor technology and labour-market indicators closely

Government could do more to systematically monitor the impacts of technology on the economy and labour markets, in New Zealand and internationally. Section 2.8 lists indicators that should be monitored.

Changes in New Zealand are likely to lag behind changing indicators in other countries, particularly those countries that develop or rapidly adopt new technology. Monitoring will create additional time for New Zealand to identify impending changes and adjust policy, should that be necessary.

R4.2 Government should monitor relevant indicators of technology adoption and labour-market change in New Zealand and internationally.

Box 4.1 **Measuring gig work: challenges and options**

Better definitions and statistics about gig workers and the value of their work will help to detect and respond to changes in the labour market driven by platform-mediated work and other technologies. Growth in platform-mediated work could affect the accuracy of overall GDP, productivity and wellbeing measures, and it may have implications for managing the tax system (eg, GST and income tax) and for targeting government policies and services.

Policy concerns about gig work focus on platform-mediated, low-skilled, on-demand work where people rely on this as a primary income source. But gig work also includes highly skilled freelancers and contractors with good pay and longer-term contracts, and part-time or short-term work people do to supplement household incomes and smooth gaps between other jobs.

Further, gig work is not necessarily organised via digital platforms – growth in platform-mediated work may be substituting for other forms of employment or employment relationships (such as through labour hire agencies) in ways that do not show up in aggregate measures such as self-employment and casual employment rates.

Current measures of gig work can come from: household surveys (eg, Stats NZ's household labour force survey); government administrative data (eg, tax and ACC data); and private sector data (eg, from labour platforms, banks or business accounting platforms). Each source has limitations. Surveys focussed on one respondent's main job may not pick up information on all household members' gig work activity. Administrative data usually under-reports work arrangements that are not full-time or permanent employment, or both. Administrative data and surveys do not necessarily identify the same people as being self-employed. Private-sector data is generally more limited in its coverage across the population and the economy.

To improve measurement of gig work:

- existing surveys and administrative data can first be mined for better proxies and indicators of the scale and value of gig work;
- longer-term improvements should start with a taxonomy of gig work and measures that takes into account New Zealand's specific labour-market features (eg, employment status definitions and coverage of protections, entitlements and tax), while aligning with international measures; and
- gaps and opportunities for better information can then be identified and addressed with refinements and additions to existing surveys and data collections.

Measures should be multifaceted and readily (dis)aggregated. They should capture who is participating in gig work, but also the extent (hours, frequency) and value of gig work over multiple timeframes.

Source: Riggs et al. (2019).

4.2 Address school system performance

The Commission has found no evidence of imminent widespread technological disruption to work and employment. Technological change may accelerate in the future but be within New Zealand's capacity to absorb. Policies that promote resilience to such long-term structural change are worth pursuing and will have the additional benefit of making the workforce more resilient to short-term economic changes such as global recessions and trade shocks.

Preparing young people for success in adult life through schooling is a major opportunity to foster future labour-market resilience. Schooling should provide young adults with the skills, understanding and confidence that enables them to continue to learn successfully throughout their lives.

Regardless of the future pace of technological progress and adoption, people with low skills and educational achievement are more likely to fare poorly in the labour market. Core skill levels (as measured by international studies like PISA and local projects such as NMSSA) are declining. New Zealand has for decades had a comparatively large and intractable gap in outcomes between high performing and poorly performing students in international comparisons. This disparity is compounded by the over-representation of children from some communities (eg, Māori, Pasifika) among those who perform poorly on these measures.

Young adults without skills are most at risk of a difficult and disrupted working career; and have lower access to and poorer outcomes from adult education and training. The persistence of such large inequalities in schooling outcomes lowers New Zealand's resilience to cope with technological change. Education system design and policies to improve outcomes for poorly performing students is a large topic outside the scope of this inquiry. Even so, the Commission considers that the Government should give renewed and urgent attention to improving the educational achievement of students at risk of poor labour-market outcomes.

F4.1 Raising school performance to increase overall skill levels and close achievement gaps is important for young New Zealanders' participation, adaption and success in the future labour market.

4.3 Provide better access to training for people already in work

The labour market is constantly adapting to technological change and to other economic events. People already in work need to acquire new skills over time, whether they change jobs or not. New Zealand adults on average participate in education and training at internationally high rates and have high levels of measured skills (Chapter 3). To encourage workers to acquire new skills, policy adjustments should reduce the private and social costs of additional participation relative to the benefits.

A high-performing education and training system for a dynamic labour market should support not only progress up a qualifications ladder but also lateral moves to new fields, and new skills that help workers adapt to changing circumstances. People in the labour force sometimes seek particular job-specific and applied skills that are credentialled at the same level as, or at lower levels than, qualifications they already hold. But policy settings unnecessarily constrain them from taking up training that suits their needs and circumstances.

Extend funding to tertiary education providers for adult students who do not intend to pursue full qualifications

The Commission previously found that policy and funding settings, and providers' internal business models have generally been geared to favour on-campus full-time study for long qualifications by younger students (NZPC, 2017c). These business models are incentivised and reinforced by the TEC, which requires providers to enrol students in whole qualifications to receive government funding.

Building and Construction Industry Training Organisation (BCITO) submitted that current education paradigms and policies do not recognise that people's career and learning pathways are not always linear:

> … as part of the emphasis on lifelong learning there needs to be clear recognition on a policy level that people's education pathways (and credential accumulation) may not be linear; people may undertake a Level 4 Apprenticeship, and then a micro-credential at Level 3, then a Level 6 or Level 7 advanced qualification, and then another Level 3 micro-credential. (sub. 25, pp. 4–5)

TEC submitted:

> For young people and others new to tertiary education learning is seen as cumulative, progressing upwards from lower to higher qualifications as reflected in NZQF levels. These learners are expected to enrol at levels that realise their full potential, given their prior NCEA or other achievement. They are not encouraged to "churn" between qualifications at the same or lower levels. In contrast, graduates and

> older learners in the workforce may well enhance their choices and interests through lower level courses in fields different to their prior qualifications. (sub. DR428, p. 2)

In *New models of tertiary education* (NZPC, 2017c) the Commission recommended that the Government extend funding to providers for students who do not intend to pursue full qualifications (R14.10). The Commission reiterates that recommendation.

F4.2 The skills supply for a dynamic labour market needs more than just people pursuing full qualifications. People also need to be able to study to make lateral moves to new occupations, and to develop new skills as required.

R4.3 To support a dynamic labour market, the Government should extend funding to tertiary education providers for adult students who do not intend to pursue full qualifications.

Extend the student loan scheme to short programmes of part-time study

Current student loans scheme rules prevent people from borrowing to pay tuition fees if they enrol in a short programme of part-time study. People studying part-time for fewer than 32 weeks cannot borrow for fees is their study load is less than 0.25 EFTS.[42] For most polytechnic, wānanga or university programmes, this equates to 30 credits, and a typical semester-length paper is worth 15–20 credits.

This means that someone studying one course at a time must self-fund their study. This borrowing restriction is most likely to affect people with lower incomes and ongoing household costs.

There is little justification for preventing people from accessing student loans to pay tuition fees for periodic and small bursts of training, if their courses are quality-assured and meet government funding and qualification recognition requirements. As most workers who borrow to pay tuition fees for part-time study will immediately begin repaying their student loans as they earn, the costs to government of student loan interest subsidies will be limited.

F4.3 The current limit on the ability of people to borrow through the student loan scheme for short courses is a barrier to work-related education and training. It is most likely to affect those on lower incomes, who may not have the savings available to self-fund.

R4.4 The Government should allow people studying part-time and in short courses to access student loans to pay their course fees. This can be done by removing the 0.25 EFTS (equivalent full-time student) minimum course load requirement specified in the student loan eligibility rules administered by the Ministry of Social Development.

Make room for shorter courses

Micro-credentials are "short courses focused on a coherent set of competences" (Ministry of Education, sub. 48, p. 6) that offer people an opportunity to gain a qualification that recognises existing skills and competencies, or to upskill. Stone (2010) suggested that this type of credential is compatible with the workplace, especially to encourage training in small firms. Portable qualifications such as micro-credentials can help people change jobs thus facilitating labour-market dynamism.

Any industry body or other organisation can offer micro-credentials in New Zealand outside of the New Zealand Qualifications Authority (NZQA) approval framework. These may be suitable where technology is fast-moving as industry-provided micro-credentials are likely to respond more rapidly to change. However, NZQA-approved micro-credentials offer particular advantages for labour-market dynamism. For the workers

[42] EFTS is an acronym for equivalent full-time student. It is a standard measure of study workload for tertiary education programmes in New Zealand, and is the basis for provider subsidies. One EFTS = one student enrolled full time for one year (1 200 learning hours over 34 weeks).

who change industry when changing jobs, externally validated (such as NZQA-approved) micro-credentials are more likely to be recognised across industries (NZPC, 2019c).

The Commission hosted a roundtable of industry and education stakeholders with expertise in micro-credentials to inform this inquiry (NZPC, 2019c). Participants observed that despite recent changes, funding and approval rules still constrain the growth of micro-credentials accredited by NZQA (Box 4.2). The Industry Training Federation similarly commented that the "recent introduction of micro-credentials as recognized (and fundable) educational products is a good start in this regard, but it remains a prescriptive system that should be seen as a starting point, rather than a full solution" (sub. 29, p. 3).

Box 4.2 **Rules for the approval and funding of micro-credentials**

From 1 August 2017 to 30 June 2018, the New Zealand Qualifications Authority (NZQA) carried out micro-credential pilot projects with three organisations (US-based online education firm Udacity, Otago Polytechnic and the Young Enterprise Scheme). The pilots aimed to "better understand the role micro-credentials could play in New Zealand's education, training and qualification system of the future".

Following these pilots, new NZQA rules for the approval of micro-credentials required that they must:

- be "a coherent arrangement of learning or training … based on clearly linked aims, outcomes, content and assessment practices";
- demonstrate evidence of need from employers, industry and/or community;
- "typically … not duplicate current quality-assured learning approved by NZQA";
- be reviewed annually to confirm they continue to meet their intended purposes; and
- be 5–40 credits in size (NZQA, 2018a).

In 2019, the TEC issued new guidelines for funding micro-credentials, which set four criteria to assess funding applications. To be funded, micro-credentials must fit a definition, have end-user buy-in, contribute to government priorities, and complement private investment (TEC, 2019). As of mid-December 2019, NZQA have approved 73 micro-credentials, including welding, project management, and exceeding customer expectations (NZQA, 2019).

Two specific restrictions limit the provision of NZQA-approved micro-credentials: funding limits and restrictions on stacking.

Remove limits on funding of micro-credentials

The TEC limits the availability of micro-credentials by restricting the amount of short-course delivery a tertiary provider or industry training organisation (ITO) can offer to 5% of the dollar value of its provision.[43] The TEC will now "consider exceptions" to this cap (TEC, pers. comm. 4 November 2019). The cap (and the exception by application policy) appears unduly blunt and restrictive. It means that only large tertiary providers can offer these programmes, and only as peripheral to their offerings of longer qualifications. It effectively prevents specialist providers of NZQA-approved micro-credentials entering the market.

[43] "Under the funding conditions for Student Achievement Component (SAC) funding, micro-credentials are counted as training schemes. Without TEC's agreement, training schemes cannot comprise more than five percent of the total dollar value of a [tertiary education organisation's] delivery" (Tertiary Education Commission, 2019, p. 4).

F4.4 Micro-credentials can facilitate labour-market dynamism, especially those that are externally validated (such as New Zealand Qualifications Authority (NZQA) approved micro-credentials as they are more likely to be recognised across industries). Despite the recent introduction new rules for the approval of micro-credentials and Tertiary Education Commission guidelines for their funding, considerable barriers remain to the provision of NZQA-approved micro-credentials.

R4.5 The Minister of Education should, under section 159L of the Education Act 1989, issue a determination of funding mechanisms for student achievement component funding that removes the 5% cap on the delivery of micro-credentials, subject to each provider demonstrating sufficient resources, capability and internal processes. Alternatively, in implementing the current rule, the Tertiary Education Commission should not apply the 5% cap on overall delivery of micro-credentials to individual providers.

Relax restrictions on stacking micro-credentials

Micro-credentials are more useful to some students when they can be "stacked" towards larger qualifications, that is, built on each other to "achieve mastery in a larger concept" via the creation of so-called "education playlists" (Ryerse, 2017).

However, it is not easy for students to stack NZQA-approved micro-credentials. NZQA (2018b) stated that

> [w]hile it is possible to use micro-credentials to enable stackable learning, NZQA considers it important to avoid a situation where every programme currently delivered is disaggregated into its components and offered as micro-credentials. This will help to avoid duplication of learning, fragmentation of qualifications, and employer confusion.

The ability to stack micro-credentials and build a larger qualification can help facilitate labour-market dynamism. But workers may be less likely to embark on study if they believe they may be unable to build towards a larger recognised qualification over time.

Participants at the Commission's roundtable considered that the NZQA's concerns that micro-credentials would duplicate learning, fragment qualifications and cause confusion for employers are overblown. In many cases, firms prefer established qualifications, and value micro-credentials as add-ons, permitting specialisation or upskilling (NZPC, 2019b). Additionally, the Micro-credentials in Engineering Education Community of Practice contended that NZQA's concerns are "overstated and fundamentally misunderstand the potential of micro-credentials" (Mischewski, 2019).

F4.5 "Stacked" micro-credentials are valuable to workers, as they can build a qualification over time. Being unable to stack could discourage workers from embarking on study. Concerns that the stacking of micro-credentials could lead to duplication, fragmentation of qualifications, and employer confusion do not outweigh the benefits of stacked micro-credentials for workers and for labour-market dynamism.

R4.6 The New Zealand Qualifications Authority should modify its rules to permit stacking of micro-credentials.

Ensure access to work-based training

At the time of publication, the Government was implementing wide-ranging reforms to New Zealand's vocational education and training system (Box 4.3). One element of these reforms is the transfer of responsibility for arranging workplace-based industry training (apprenticeships and traineeships) from ITOs

to tertiary education providers, especially the polytechnics now merged within the New Zealand Institute of Skills and Technology.

Box 4.3 **The Government's vocational education and training reforms**

The reforms announced by the Minister of Education in August 2019 aim to create a single public vocational education system that:

- gives all learners the education and training they need for the workplace;
- gives employers greater access to a skilled, work-ready workforce across all regions; and
- ensures all regions have collaborative, flexible, innovative and sustainable providers.

Key elements of the reforms were outlined in Ministry of Education (2019d). Three elements were given effect by new legislation that came into force on 1 April 2020:

- establishing the New Zealand Institute of Skills and Technology (NZIST) from April 2020, merging the 16 institutes of technology and polytechnics into one national institution;
- phasing out ITOs, with the NZIST and other tertiary education providers taking over their role arranging work-based education and training; and
- creating six workforce development councils to oversee and approve all vocational qualifications, and 15 regional skills leadership groups to advise on local skill supply priorities.[44]

The fourth key element of the reforms is a new funding system to replace the currently separate systems for funding work-based and provider-based vocational education and training. Development of the new funding system is to be a multi-year programme.

A key challenge in bringing the workplace-based and provider-based education and training systems together is how to align their different rules about who can participate in different types of education and training, and who is eligible for public funding support.

To "give all learners better access to the education and training they need for the workplace" as the Government intends, it should align eligibility and funding rules in ways that expand access, remove barriers to mobility, and support a flexible and dynamic labour market.

Two examples of this challenge are:

- the definition of a "trainee", which is tied to employment status for workplace-based training, but not for similar programmes offered by tertiary education providers; and
- eligibility rules for immigrants and new residents, who qualify for public funding for workplace-based training, but not for tuition subsidies and student support if they enrol with a tertiary education provider.

Workplace-based training should be available to everyone in a workplace

Under the outgoing Industry Training system, a "trainee" must have a training agreement that is part of their employment agreement. A trainee must therefore be an employee, as defined by the Employment Relations Act. Legislation implementing the vocational education and training reforms retains this definition. This definition excludes nearly one in five people in New Zealand's workforce, as they work as an employer (eg, small business owners) or they are self-employed (NZPC, 2019e). It also excludes people in approximately 1.2 million volunteer roles in New Zealand (Volunteering New Zealand, 2019).

[44] The Education (Vocational Education & Training Reform) Amendment Act 2020, amended the Education Act and repealed the Industry Training and Apprenticeships Act 1992.

BCITO submitted that legal definitions:

> … legislative definitions … need to change in order to better reflect modern work arrangements. While TEC funding rules currently allow certain contractors to access publicly-funded on-job training, this is a policy 'fudge' that makes such workers reliant on agency goodwill. (sub. DR412, p. 6)

The Industry Training Federation submitted that:

> If we consider NZ's workforce to be an asset, then failure to invest in parts of that asset simply because of their current contractual arrangements is short-sighted, and will be increasingly problematic in a future work force. (sub. 415, p. 3)

The New Zealand Council of Trade Unions Te Kauae Kaimahi (CTU) (sub. DR425) and the Tertiary Education Union (sub. DR421) opposed broadening the definition of a "trainee" beyond employees. They raised concerns that this would reduce trainees' employment protections or induce employers to misclassify employees as contractors. They proposed instead that separate programmes be developed for people who are not employees:

> The solution to providing training opportunities to the self-employed lies in designing new training schemes that suit the circumstances of the self-employed (for example, expecting a much higher degree of self-guided learning) which do not place other trainees and apprentices at risk. (CTU sub. 425, pp. 5-7)

Employment protection and misclassification issues should be addressed directly as matters of employment law rather than in education law and policy. Where long-term commitments and ongoing relationships between trainees and those supervising their work and training are desirable (eg, for long programmes such as apprenticeships), this can be set out in programme requirements and quality standards.

Embedding distinctions between employees, other workers, and learners in education law and policy risks maintaining an unjustified disparity in access to education and training, and may lead to inefficient duplication of programmes that runs against the intent of the Government's reforms.[45]

The statutory definition of a trainee tied to employment status has been retained in legislation enacting the reforms. Whether this will have any actual impact on access to education and training will depend on the details of policy implementation, and on the design of the proposed new funding system.

R4.7 In implementing its reforms of the vocational education and training system, the Government should widen access to work-based education and training to all people in the workforce and to volunteers, and avoid unnecessarily restricting access based on employment status.

Ensure new immigrants have access to publicly funded work-related education and training

Migration is responsible for numerically larger effects on the size and composition of New Zealand's labour force than is the output of the school system.

The number of working-age immigrants and returning New Zealanders joining the workforce each year exceeds the number of young people completing secondary school (NZPC, 2019e). Between 2010 and 2019, about 88 000 permanent or long-term working-age migrants arrived in New Zealand each year (of which about 28% were returning New Zealand citizens).[46] By comparison, over the same period, only about 61 000 people left the school system on average each year.[47]

New immigrants are a key source of skills for New Zealand, and their education and training very important for the New Zealand economy. Access to education and training options helps immigrants to integrate into

[45] Current employment case law also constrains the ability of platform or temporary employment agencies to offer training to contractors. Section 4.8 discusses policy options to ease this restriction.

[46] NZPC analysis of Stats NZ international travel and migration data.

[47] Calculated using Ministry of Education school leaver destination data (Ministry of Education, 2020). Of this number, about 60% go into some form of tertiary study the year after leaving school rather than entering the labour force on a full-time basis (although many have jobs while they study).

the workforce, to adapt their skills and experience to their new workplaces, and boost their productivity and incomes.

The Government's vocational education and training reforms aim to more closely align the design and delivery of work-based and provider-based vocational education and training, and to fund them through a unified funding system. These two systems have in the past treated new immigrants quite differently:

- In the industry training system, any employee legally entitled to work in New Zealand can participate in work-based training arranged by an ITO, supported by government funding. Access is tied to a person's right to work, and their employer's willingness to invest in training, rather than to residency status.
- For people enrolling at a polytechnic or other tertiary provider, eligibility for public funding is more restricted, and depends on citizenship or residency status. Tuition subsidies and regulated tuition fees apply only to "domestic students": New Zealand citizens, Australians, people with residence class visas, and refugees.[48] People who do not qualify as domestic students are treated as full fee-paying international students. These restrictions reflect the substantially higher subsidy rates involved for provider-based education, and related costs of student loans and allowances for many students.

For new immigrant workers, it is not currently clear what eligibility and funding rules will apply as the Government's current vocational education and training reforms are implemented. If Industry Training and provider-based education become more "blended", will immigrant workers have access to publicly funded training based on their work rights, or will they be excluded or charged full-price fees because they do not meet the test to be considered "domestic students"?

In the third draft report for this Inquiry, the Commission recommended that the Government should ensure that people legally entitled to work in New Zealand will be eligible for both work-based and provider-based vocational education and training that is connected to their work, regardless of their visa status or length of residency (NZPC, 2019e, p. 22).

Submitters who commented on this recommendation uniformly expressed support, while some noted complexities to address such as costs to business, targeting particular visa categories, and managing risks in the international education market.

Federated Farmers (sub. DR409, p. 30) noted strong agreement, saying:

> Temporary work visa holders are critical sources of labour for the primary sector, particularly during periods of low unemployment. Providing effective training for temporary work visa holders can assist in lifting productivity and reducing the pressures faced by farmers, making employment more viable.

Several submitters advocated for more support for workplace literacy and numeracy programmes for new immigrant workers, and improved access to education and training for immigrant workers' family members. BusinessNZ submitted that:

> … families of migrant workers should be extended training opportunities. … children of people on work visas … [can be]… treated as domestic students for compulsory education, however tertiary options are limited as they are then classified as full fee-paying international students. … there appears to be a cohort of young people already in the country that could be undertaking training if it were more accessible and without high financial barriers. (sub. DR416, p. 4)

Employers and Manufacturers' Association noted that even immigrants with high English language skills can face vocational language difficulties, and called for workplace literacy funding to extend to immigrant workers (sub. DR414, p. 5). The CTU also submitted that access to work-based training for new immigrants should include access to workplace literacy and numeracy training (sub. DR425, p. 7).

[48] Student loans and allowances are further restricted. To qualify, Australians and people with residence visas must be "ordinarily resident" in New Zealand for three years. Apprentices and other industry trainees who enrol with a tertiary education provider as part of their training programme qualify as domestic students regardless of their residency status or length of residence.

The Ministry of Education (sub. DR429, para. 25) noted that:

> the move to a more blended approach to vocational education and training means this distinction will need to be reviewed, certainly by the time the unified funding system comes into effect …
>
> Visa characteristics may provide useful indicators [eg duration of employment in NZ] of the likelihood of a tuition subsidy providing a net public benefit in a given case. Risks of gaming (such as the creation of 'training-related work' to secure domestic tuition subsidies for people on study visas) would need to be considered.

The proportion of current industry trainees who do not have residency status is unknown. At 31 October 2019, there were 58 000 people in New Zealand with essential skills temporary work visas, and 38 000 people with recent residents and partnership visas (MBIE, 2019b). Approximately 40% of essential skills visa holders gain residency within three years. In 2015, only 2.7% of apprentices held temporary work visas, but the proportion of temporary visa holders in shorter industry training programmes will be substantially higher (Ministry of Education, 2017a).

R4.8

In implementing its reforms of the vocational education and training system, the Government should ensure that migrants legally entitled to work in New Zealand:

- continue to have access to publicly funded work-based vocational education and training on the same terms as other workers;
- gain improved access to workplace-based literacy, numeracy and foundation skills programmes on the same terms as other workers; and
- have access to the same benefits and opportunities that other workers may gain from the reforms to the vocational education and training system.

4.4 Provide options to switch courses and clearer educational pathways

People learn more about themselves, their interests and strengths, and about career opportunities as they progress through the education system and their working lives. The career landscape also changes over time. Especially for young people with little work experience, the education system should provide clear learning and career pathways (supported by guidance) that help people make well-informed choices, and to avoid closing off viable options inadvertently, unnecessarily or too early.

Enable secondary schools to offer better options and pathways into further education and employment

New Zealand's schooling system is explicitly designed to be flexible and responsive to student interests and preferences. However, academic, university-focused routes are the "well-lit" pathway, gaining more attention, respect and resources than others (Hipkins & Vaughan, 2019).

Some schools can and do develop alternative, work-focused pathways (ERO, 2018). However, the ability to do so depends on several factors, including community demographics, the expectations of parents and the attitudes of school staff. While many schools have abandoned explicit streaming by ability, common in earlier times, student aspirations are still being implicitly curtailed by parent and teacher perceptions of ability.

Timetabling constraints and regulatory requirements – especially those related to University Entrance (UE) (Box 4.4) – add to the difficulty of developing and maintaining alternative pathways. In focus groups commissioned for this inquiry, secondary school staff identified timetabling structures as a strong influencing factor in providing learning pathways. A timetable can

> underpin the bias towards academic, university-oriented study. The traditional timetable for the senior years tends to be clustered around groups of subjects in order to allow students to meet the

> requirements of UE. This in turn affects the ability of the school to offer viable alternative pathways. For example, with a traditional timetable, it can be difficult to accommodate students studying partly in school and partly in work-based or vocational programmes outside of school. Because they are out of school for 1 or 2 days a week, they may miss learning in key areas. (Eyre & Hipkins, 2019, pp. 5–6)

Box 4.4 **What is University Entrance?**

UE is "the minimum requirement to go to a New Zealand university" (NZQA, n.d.). To qualify, students need to achieve a package of measures, including NCEA level 3, three subjects at level 3 of 14 credits each from the list of "approved subjects", and 10 credits respectively in literacy (level 2 or above) and numeracy (level 1 or above).

Schools, teachers, the Ministry of Education or other stakeholder organisations can apply to the New Zealand Qualifications Authority (NZQA) to make changes to the list of approved subjects for UE, and NZQA conducts periodic reviews every four years to assess whether the list is still "relevant and meets the sector's expectations" (NZQA, 2018c, p. 4).

While the Education Act 1989 establishes UE and defines its role (s. 247), the Act also empowers university councils to set their own enrolment rules for any course (s. 194). So, achieving UE offers no guarantee of entrance to a university.

Other comments from these focus groups help to illustrate the problems that UE can create by acting as a barrier to learning pathways for some students.

> In a school with 440 in a cohort, it actually gets quite hard for us to make a really boutique kind of programme for all of our students. To not go, "Oh ****, you've actually cut out one of your three 14s."[49]
>
> There are those students that are going to be engineers or whatever, and universities dictate that they must be doing these subjects, and they must be getting so many credits in these subjects at Level 3 … But then there's the other bunch of kids who are not down [with] that – you know the other 80% – [we need to find a way to provide] the flexibility so that we're meeting their needs. (Eyre & Hipkins, 2019, pp. 10–11)

The importance of being able to change course in school is not a trivial concern. Several of the secondary school leaders who participated in focus groups coordinated for this inquiry "talked about the difficulty of choosing a pathway at a young age; interests and passions can change and develop over many years. Early specialisation can cut down future possibilities" (Eyre & Hipkins, 2019, p. 17).

Improve quality and access to careers information and support, and school-to-employment pathways

Quality careers information, advice and guidance is an important lubricant of a dynamic and responsive labour market. Careers information, along with learners' own confidence and self-belief, helps determine individuals' education, training and career choices. These individual choices shape the long-term supply of skills across the economy, and affect the income gains and other outcomes people achieve from investing in tertiary education and training. Well-informed choices by individual learners should be a key driver of where government tertiary education spending is directed.

Technology has the potential to reshape the business of careers information itself. Leading US tertiary education institutions such as Georgia Tech are using intelligent question-answering agents and tutoring systems. These can be applied at scale for personalised AI-enhanced careers services as well as for teaching and learning (Georgia Tech Commission on Creating the Next in Education, 2018).

Some learners are not well-placed to make effective use of information about education and career pathways and choices even when it is available (NZPC, 2017c). Learners from families and communities with

[49] To qualify for UE, students need to achieve, among other requirements, three subjects at level 3 of 14 credits each from the list of "approved subjects" (Box 4.4).

lower levels of prior educational achievement can be less well-positioned to make sense of the information with which they are presented. The availability and quality of careers guidance and support is variable – learners with disabilities (Box 4.5), school students in lower socio-economic communities, and Māori and Pacific learners are groups that have been identified as being poorly served in the past (Ministry of Education, sub. DR430; CTU, sub. DR425; Career Development Association of New Zealand, sub. DR427).

Helping learners to develop the skills and competencies that enable them to make their own decisions is likely to be the most practically useful step. This would involve helping learners to identify what information is relevant to them, to make sense of that information, and then make realistic choices to take a pathway that meets their goals and aspirations. It needs to be supported by high-quality careers information, and access to advice and guidance.

The TEC has statutory responsibilities to provide a public careers database of occupations and tertiary education and training options, and to facilitate connections between schools, employers, and tertiary education organisations. The TEC also has responsibility to lead the development of a careers system strategy, while the Ministry of Education is responsible for careers services and workforce capability in schools.

Work is ongoing to integrate careers services into TEC's broader operations, and to upgrade the careers and jobs database and related services. TEC is developing a "digital enabler" for careers planning to support effective career planning and lifelong learning for people aged from seven to 70+. Through the *Inspiring the Future* and *Drawing the Future* projects, TEC is working with schools to overcome biases associated with career choices, and to build confidence and self-belief in younger schoolchildren.

However, several submitters to this inquiry said that while the careers system strategy shows promise, progress on the strategy and on improving the quality of and access to careers services, is not yet evident (BCITO, sub. DR412; Employers and Manufacturers Association, sub. DR414; BusinessNZ, sub. DR416).

COMET Auckland submitted that

> TEC's strategy, with its clear goal for "all New Zealanders 7 to 70+ to have a personalised lifelong career plan including career options and learning pathways" is the most promising direction we have heard in this space for some years … We look forward to more coordinated action to turn around careers provision under this strategy, but we are concerned that the rhetoric may not translate into enough real support on the ground. (sub. DR431, p. 3)

With the scale of other reforms underway across the tertiary education system, especially in relation to vocational education and training, there is a risk that the TEC will struggle to execute its role in leading development of a more effective and equitable careers system. This role requires ongoing leadership, resources and mandate.

F4.6 Improving career advice and services is important for a dynamic labour market. Given current demands on the Tertiary Education Commission, it may struggle to lead development of effective careers advice and services.

R4.9 The Government should strengthen the Tertiary Education Commission's mandate and resource it sufficiently to lead development of quality careers advice and services for New Zealanders of all ages.

Box 4.5 **Technology can improve work and training options for people with disabilities**

For people with health conditions or disabilities, technology can expand their work options, offer them greater independence, improve their earnings, and allow them to enjoy other benefits from participating in work. For these benefits to be realised, the technology needs to be bundled with appropriate support.

Assistive technologies (eg, text-to-speech translation) can help people with disabilities perform tasks that would otherwise be difficult. These technologies also boost their productivity – by improving mobility and access, helping to overcome sensory and communication constraints, and enhancing comfort, health and safety at work.

To gain these benefits of technology in the workplace, people with disabilities need opportunities to find work, and to overcome barriers to sustainable employment.

Disabled New Zealanders have, on average, poorer labour-market outcomes. In the June quarter of 2019, for disabled people aged 15–64:

- the employment rate was 40.6%, just over half the rate for non-disabled people;
- the unemployment rate was 8.6%, down from 11.4% in June 2017, but over twice the rate for non-disabled people;
- the underutilisation rate was 19.3%, down 6.1 percentage points from June 2018, but nearly twice that of non-disabled people;[50]
- over a quarter of those not actively seeking or immediately available to work said they would, nonetheless, like to have a job; and
- 34.9% of disabled people aged 15–24 were not in employment, education or training (NEET) – almost four times the rate for non-disabled young people. (Stats NZ, 2019)

Employment barriers for young people with disabilities include poor qualification attainment, lack of work experience, and low expectations of their ability to work. Young people with disabilities also lack access to careers advice, and their transitions into the workforce are often poorly planned. (Ministry of Education, sub. DR430, p. 8)

The Government's *Disability Action Plan 2019–2023* (Office for Disability Issues, 2019) lists work that agencies and disability sector organisations will undertake to implement the *New Zealand Disability Strategy 2016–2026*. It includes actions in the education, social development and employment areas that may improve labour market outcomes.

These efforts are most likely to succeed in a flexible labour market with high demand for workers, low barriers to hiring, negotiable work arrangements, and appropriate support for workers with disabilities and their employers.

Make it easier for tertiary students to switch providers, courses and programmes

There are substantial barriers to changing course in tertiary education. Students "bear high costs from making initial mistakes or from changing their minds" (NZPC, 2017c, p. 368). Such changes of mind are common. While somewhat dated, a Ministry of Education study from 2008 tracking New Zealand students between 1997 and 2006 found that changing qualification and changing provider is relatively common. For example, 40% of bachelors students, 34% of diploma students and 25% of certificate students changed

[50] People are "underutilised" if they are unemployed, underemployed (working part-time but wanting more hours), or part of the potential labour force (which includes people not actively seeking work but available to work, and those actively seeking work but not currently available to work).

qualification before they completed, and 52% of students who completed a qualification and progressed to higher-level study transferred to a new provider after completing their first qualification (NZPC, 2017c).

There are funding-related incentives for tertiary providers not to recognise credit gained from other providers but instead to require students to repeat their learning. Joint delivery of programmes between institutions (which might provide the best combination of study that suits the learner) is also disincentivised, as only one provider can award the completed qualification. Both these factors mean that switching can be costly for students who want to change their study path.

Credit-transfer arrangements between tertiary institutions can be a barrier. These may be epistemological in nature, that is, institutions may teach similar topics in qualitatively different ways, making credit transfer options difficult. However, tertiary institutions may also block or stymie credit transfers to defend their own interests, providing little information about credit transfer arrangements or making it time consuming and costly for students to negotiate (NZPC, 2017c).

Improving mobility and consistency for learners is a key objective of the Government's current vocational education and training reforms. In future, learners enrolled in polytechnics or as workplace trainees should be able to move between work and study, between different jobs and around the country without facing the same barriers that they do now. No similar progress is yet apparent to improve flexibility and mobility for students between sectors (eg, polytechnic to university, university to wānanga, private training establishment to polytechnic) and between individual institutions.

The strongest levers the Government has for encouraging credit recognition and transfer are conditions attached to government funding and (for all providers except universities) rules for programme approval and quality assurance.

F4.7 Tertiary students face substantial and unnecessary barriers to changing course in tertiary education, often bearing high costs from initial mistakes or changing their mind. Tertiary education providers sometimes block credit transfers, and otherwise provide little information about credit transfer arrangements or make it time consuming and costly for students to negotiate.

R4.10 The Government should use the conditions it attaches to government funding for tertiary education to encourage credit recognition and transfer systems that work in the interests of learners and employers, rather than in the interests of tertiary education providers.

4.5 Improve worker mobility through less-restrictive land-use regulation

New Zealand has restrictive land-use regulation, which increases the price of housing (NZPC, 2015, 2017). This is limiting worker mobility to locations with better employment opportunities and reducing firms' access to labour (section 3.3). Highly detailed urban planning rules affect firms in other ways, as do slow processes for changing those rules. These limit the availability of suitable sites for firm expansion and add unnecessary delays, costs and uncertainties (NZPC, 2017). More broadly, restrictive land use regulation can constrain beneficial agglomeration, thereby limiting the ability of New Zealand cities to function effectively.

The Government is undertaking a fundamental review of the resource management system (Ministry for the Environment, 2019), which is the primary regulatory influence on the price of urban land. The review offers an opportunity to change these regulations in ways that are more conducive to firms' adoption of technology and use of other inputs.

F4.8 New Zealand's current restrictive land use regulation increases the price of housing, limiting the ability of workers to move to locations with better job matches and constraining firms' access to skilled labour.

R4.11 The Government should use the opportunity provided by the current fundamental review of the resource management system to adopt less-restrictive land use regulation

4.6 Improve income smoothing for displaced workers

Labour-market changes are financially and personally challenging, especially when change results in fear of or actual unemployment, or reduced chances of gaining employment. Government could provide better income support for people who lose their jobs, to relieve distress and better promote resilience to labour-market change from technology and other sources.

Better income support can promote more positive attitudes to technology adoption. Frey (2019) argued that many developed countries face the risk of a "technology trap", in which income and economic growth slows because public concern about the effects of new technologies acts as a brake on their introduction. Frey argued that this trap explains why, in the past, policies that eased adjustment costs for affected workers facilitated technology adoption.[51] Frey advocated, among other policies, more generous assistance (eg, tax credits, retraining grants, unemployment insurance) to help smooth transitions.

Job loss in New Zealand can cause large falls in income for some

Job loss can occur for many underlying reasons, of which technology adoption is just one. Some New Zealanders face large falls in income while unemployed following loss of their job. The scale of income loss to a household after job loss varies by prior earnings and by household type. To inform thinking on income-smoothing policy options, the Commission analysed income-replacement rates for different types of households under current policy settings (Appendix B; Mok & Nolan, forthcoming). Income-replacement rates for displaced workers in New Zealand are:

- as high as 80% for low- income households with children; and
- as low as 26% for single people and those on high incomes.

These results reflect New Zealand's position as an outlier among OECD countries in its system of support for unemployed workers. Most OECD countries have unemployment insurance (UI) systems in which eligibility (and the rate of support) is broadly tied to a person's prior income and individual contributions, which are collectively used to fund payments.

By contrast, New Zealand follows a "social assistance" approach where payments are available to any person but are means tested and funded from general taxation. As a result, displaced workers whose partners have a job may not qualify for any assistance. About two-thirds of people who reported losing a job did not receive Jobseeker Support in 2015.[52] Ineligibility due to too high partner income explained more than half of these instances. This means that some New Zealand households face unusually large falls in income by international standards when they lose a job (Table 4.1; Appendix B). Even so, the disparities with international rates reduce over time as UI payments in other countries are typically time limited.

[51] For example, the "Old Poor Law", a collection of laws passed between the 16th and 18th centuries, provided income support.

[52] Based on the Stats NZ household labour force survey, those "losing a job" are those who reported being laid off, dismissed or made redundant from a previous job within the past five years.

Table 4.1 Selected income-replacement rates (person on average wage), selected countries, 2018

	Single person without children			Couple, no children, partner average wage		
Unemployment duration (months)	2	18	30	2	18	30
Australia	28%	28%	28%	50%	50%	50%
Canada	61%	24%	24%	79%	53%	53%
Denmark	62%	62%	56%	79%	79%	55%
France	68%	68%	33%	84%	84%	55%
New Zealand	32%	32%	32%	50%	50%	50%

Source: OECD (2019e).

Notes:

1. Includes housing assistance. Replacement rates for a couple take account of the partner's earnings.

F4.9

Income-replacement rates for displaced workers in New Zealand are

- as high as 80% for low-income households with children; and
- as low as 26% for single people and those on high incomes.

For shorter durations of unemployment, income-replacement rates for some displaced New Zealanders are substantially below those of displaced workers in OECD countries that have unemployment insurance schemes.

The design of UI systems varies greatly across countries. Most countries also provide a second tier of income support – similar to New Zealand's welfare system – after UI payments run out (Fletcher, 2015). Table 4.2 sets out the typical differences between New Zealand's system of support for displaced workers and UI systems.

Table 4.2 Comparing income support for displaced workers in New Zealand with UI systems

	Income support for displaced workers in New Zealand	Unemployment insurance (most OECD countries)
Coverage	Adults in the workforce	All participants in the UI system. In most countries, participation is compulsory. In some countries, casual, part-time, and self-employed workers are not covered or required to join.
Eligibility test	Beneficiaries must have joint household income below a specified threshold. For some benefits, they must be available for and seeking work.	Employees must have worked for a specified period or made sufficient financial contributions. In some countries, payments are only available for involuntarily job loss. In others, additional causes are allowed. Recipients must be available for and seeking work.
Payment rate	Payments are at a flat rate, which abates with earnings	Payments are usually linked to previous earnings (Ireland and the United Kingdom are exceptions), although they are capped at a specified limit
Duration of payments	No time limit	Payments are time-limited (most limited to between 6 and 24 months, after which eligible people transition to some form of welfare payment)
Funding	Funded through taxes, on a pay as you go basis	Funded at least in part by employee or employer contributions

Source: Fletcher (2015); Welfare Working Group (2010).

Income-smoothing policies – what would work best?

Ideally, income-smoothing policies should:

- *effectively target* those facing, or at risk of, job loss;
- be *affordable*; for workers; firms and taxpayers;
- be *coherent*; fitting well with related policies;
- support *good job matching; labour-market dynamism and work participation*;
- be *simple* to understand, administer and interact with;
- be *neutral towards work arrangements* (eg; self-employed, casual, fixed-term, permanent); and
- *minimise the risk of perverse outcomes*, such as discouraging firms from hiring workers.

The Commission identified three options that may meet these criteria, but have different trade-offs. (Table 4.3).

Table 4.3 Income-smoothing options

Option	Features, strengths and weaknesses
Unemployment insurance (UI)	• Workers (both employees and contractors) would be entitled to a time-limited series of payments linked to their previous earnings. • Funded by compulsory employee, employer or government contributions. • Ongoing UI payments would be conditional on recipients demonstrating adequate job search efforts.
Portable individual redundancy accounts (PIRAs)	• Each worker contributes to a PIRA throughout their working life. They can withdraw funds from this account in the event of job loss and can access and remaining balance on retirement. Austria replaced mandatory redundancy payments with such a scheme in 2003, which was found to increase labour mobility. • Workers who move jobs would not lose entitlements, because the funds in their account go with them to their next job.
Adjustments to current benefit and tax credit policies	• Benefits and tax credits would be adjusted to increase income-replacement rates for those who currently face large falls in income after displacement. For example: - paying a higher, fixed rate of payment for Jobseeker Support for a limited period; - changing Jobseeker Support eligibility criteria to disregard a displaced worker's partner's income for a limited period; - a grace period for households whose total weekly working hours fall below the eligibility criteria for the In-Work and Minimum Family tax credit; and/or - creating new benefits or tax credits that applied for a limited period after job loss.

The Commission did not land on a preferred option for income smoothing, as there are several issues that require further, detailed analysis.

Fiscal costs

Each of the three options would have differing impacts on the Government's budget. Before these can be estimated, it would be necessary to determine the eligibility criteria within each option.[53] In general, the broader, the lengthier, and more generous the coverage, the higher the fiscal costs. The UI and portable

[53] For example, would workers need to make contributions for a certain period of time before they could access UI payments? At what income level should UI payments be capped?

individual redundancy account (PIRA) options are based on employer or employee contributions, yet they typically require significant government contributions to ensure equitable access and coverage.[54]

Equity impacts

These options have different effects from an equity perspective. For example, young people, and other recent entrants to the workforce, may have limited funds in their PIRAs and hence little scope for income smoothing. Workers who experience multiple job losses could quickly deplete their accounts. Further, as with KiwiSaver, self-employed people would not benefit from employer contributions. The Government could underwrite the accounts those with small balances, but this would add complexity to the system (as government agencies would need to identify who was eligible and manage any perverse incentives).

To provide the widest coverage and avoid encouraging employers to minimise costs by shifting into non-covered forms of work, policies would need to be neutral towards work arrangements (eg, employee vs contractors, permanent vs temporary).

Economic impacts

Options that involve employer or employee contributions risk creating a "wedge" between the cost of labour for the employer, and the net wage received by the worker. Increasing the cost of labour may discourage firms from hiring and encourage the adoption of labour-replacing technology.[55] Higher labour costs may also encourage firms to favour work arrangements that are not subject to the wedge, for example, contracting and offshoring. Generous income support arrangements may weaken financial incentives for unemployed people to participate in, or search for work. However, other policies (eg, strict job search obligations and time-limited payments) can reduce these effects.

Depending on their design, adjustments to current benefit and tax credit policies could increase effective marginal tax rates (EMTRs). Higher EMTRs tend to discourage labour-market participation.[56]

Wellbeing effects

Although greater income smoothing during unemployment should reduce the negative impacts of displacement on individual wellbeing, options funded through mandatory employee or employer financial contributions (ie, UI and PIRAs) may come at the cost of lower wage growth. Research into the impact of the Australian compulsory superannuation system (which, like KiwiSaver, is based on such contributions) found that "about 80 per cent of the cost of increases in compulsory super is passed to workers through lower wage rises" (Coates et al., 2020, p. 3).

Implementation issues

Establishing a UI or PIRA scheme would represent a large change to New Zealand's policy settings and would therefore take some time to fully introduced. Adjustments to current benefit and tax credit policies would build off existing programmes and could therefore be implemented faster and more easily.

UI funds and PIRAs could be implemented by a new government agency or by existing agencies (eg, the Ministry of Social Development (MSD), the Accident Compensation Corporation). Alternatively, funds could be managed and run by for-profit or not-for-profit insurers in a regulated commercial market.

What replacement rate?

Decisions about income-smoothing options also depend critically on views about what constitutes an "adequate" income-replacement rate, especially in the immediate period following displacement. New Zealand's long-term replacement rates (eg, after three years of unemployment) are close to OECD averages, but the short-term rates are much lower. If the Government determined that a replacement rate near 50% was desirable, then adjustments to current benefit and tax credit policies is the most obvious option. Sole parents and couples with children on low and average wages already achieve at least 50%

[54] For example, the OECD (2016a, p. 63) noted of Denmark's unemployment insurance scheme that "even at times of low unemployment the bulk of UI is tax-financed and the share of direct personal contributions is relatively low".

[55] Federated Farmers (sub. DR409) raised concerns about the potential cost burdens on employers and disincentives for employment.

[56] EMTRs "reflect the interaction of the personal income tax scale, main benefits and supplementary benefits. They show how a dollar increase in gross income translate to an increase in income in the hand (after taxation and the withdrawal of income-tested assistance)" (Nolan, 2018, p. 1).

income-replacement rates in the shorter term under current policy settings (Table 4.1 and Appendix B). Single people on higher incomes are the main group facing very low replacement rates. Time-limited increases to Jobseeker Support could reduce this gap.

If the Government sought a higher replacement rate, then more substantive reform – probably involving broad or universal coverage – would be required. UI or PIRAs could meet this criterion. The CTU submitted that a 50% income-replacement rate "would be wholly unacceptable, being little improvement on the status quo" and argued instead that the "ACC model of 80% is a sensible and accepted minimum" (sub. DR424, p. 15).

F4.10

Three options for income smoothing for displaced workers are:

- unemployment insurance;
- portable individual redundancy accounts; and
- adjustments to current benefit and tax credit policies.

Each has benefits and drawbacks, and further analysis is required of the fiscal costs, economic impacts and wellbeing effects. Unemployment insurance would most likely provide income replacement at rates similar those in most OECD countries in the immediate period following displacement. But relatively minor adjustments to current benefit and tax credit policies could substantially increase income replacement rates for those currently facing the largest falls.

R4.12

There would be merit in pursuing policies that would provide greater income smoothing for displaced workers.

The Ministry of Business, Innovation and Employment, Ministry of Social Development and Inland Revenue Department should conduct further design work and analysis of the fiscal costs, economic impacts and wellbeing effects of unemployment insurance, portable individual redundancy accounts, and adjustments to current benefit and tax credit policies.

Mandatory redundancy payments are a blunt means to smooth incomes

Another approach to smoothing post-displacement incomes is to require firms to make redundancy payments when they lay off staff. Governments in some countries require employers to make lump-sum redundancy payments to redundant workers, with payments based on tenure. Mandated payments do not need sophisticated administrative systems and require few public resources.

Even so, redundancy payments have notable disadvantages.

- Typically, such payments rely on the financial solvency of firms that are laying off their workers, at a time when they are likely to be least able to afford such payments. As a result, workers face delays and partial- or non-payment of redundancy (Asenjo & Pignatti, 2019).
- Redundancy payments may be less effective at providing income smoothing in thin labour markets or when large-scale layoffs occur. In both situations, it may take a long time for some workers to find another job.
- Redundancy payments increase the costs of employing workers and so may discourage firms for hiring. Firms may also avoid redundancy costs by moving to fixed-term appointment, contracting and other work arrangements that are not in the nature of an employer–employee relationship.

- Mandatory redundancy payments mean that employers cannot use voluntary redundancy provisions as a way to signal their reliability as employers.
- Mandatory redundancy payments provide a relatively blunt form of income smoothing, because payments based on tenure do not reflect the actual costs that displaced workers experience. A worker will get the same pay-out whether they start a new job the next day or after several months. A recently employed workers will get little assistance.

Holzmann and Vodopivec (2012, p. 2) noted that redundancy payments:

> … are often considered to be one of the least appropriate options for income protection: They not only provide deficient and incomplete protection but are often responsible for distorting the behavior of firms and workers, and thus imposing other efficiency costs.

F4.11 Mandatory redundancy payments provide income for displaced workers while they look for work. However, mandatory redundancy payments directly increase the cost of labour, and can encourage fixed-term appointments, contracting and other work arrangements that are not in the nature of an employer–employee relationship. Payments received do not reflect the costs that displaced workers face.

Private arrangements

Many New Zealanders make private arrangements of some type to mitigate the income effects of potential job loss. Such arrangements include having more than one person working in a household, household savings, and taking out private mortgage or income insurance. Others may draw on wider family resources or their KiwiSaver balances to deal with financial hardship.

However, the ability to "self-insure" by saving is not available to all. Rashbrooke, Rashbrooke and Molano (2017) used data from the 2008 wave of the survey of family, income and employment to estimate the value of assets held by New Zealanders. They found that people in the bottom four income deciles had "negligible" cash in the bank (p. 29).

Private income insurance is not a significant source of income security in New Zealand, and generally only used by those on high incomes. Some insurers offer redundancy cover, usually as part of an income or mortgage protection policy (Spencer, 2019). However, payments are often subject to a waiting period of 30–90 days, and self-employed workers are generally not covered. Support is typically for a limited period at 60–80% of a person's previous earnings. Private income insurance is likely to be expensive (or unavailable) for those with a high risk of job loss. It is difficult to see it playing a wider role in New Zealand.

4.7 Extend labour-market assistance for displaced workers

Losing a job is harmful for wellbeing and can have long-term negative financial impacts even after people find work.[57] The vast majority of New Zealanders who lose their jobs find new work relatively quickly and usually due to their own efforts. However, the negative wellbeing and financial impacts of unemployment typically prompt governments to take more active steps to assist those facing displacement.

Labour-market assistance can help displaced workers prepare for and find work

Many governments provide targeted assistance to those workers who have lost their jobs, are at risk of unemployment, or are seeking additional work. The OECD and other authorities commonly refer to such

[57] International studies show that periods of unemployment after involuntary job loss can result in a later reduction in earnings once a worker has re-entered employment (known as "income scarring"). Typically, in developed country studies, blue-collar workers, those less well qualified and older workers experience a greater and longer-lasting drop in earnings (OECD, 2018d). New Zealand studies have also found earnings losses as a result of job displacement (Dixon & Maré, 2013; Hyslop, 2019; Hyslop & Townsend, 2017). Hyslop (2019) found that in New Zealand workers with degree-level education have larger and more persistent relative earnings losses compared to other displaced workers. Possible explanations for income scarring include loss of firm- and industry-specific human capital and loss of union or industry wage premiums. Displaced workers may have unobserved characteristics that increase their propensity to be displaced and reduce future earnings potential. This would bias studies towards over-estimating income-scarring effects.

measures as active labour-market policies (ALMPs).[58] These policies aim to help people find or sustain employment.

In New Zealand, MSD offers "employment services" to income support recipients.[59] These services include job brokering, labour-market training, direct job creation (through job subsidies) and case management services. By OECD definitions, some of MSD's employment services are ALMPs, while others are not (NZPC, 2019b).

Some stakeholders and studies have argued that New Zealand should increase public spending on labour-market assistance as a means of promoting greater resilience and adaptability to technological and labour-market change (Carey, 2017; OECD, 2017a)

International comparisons of labour-market assistance are problematic …

One argument advanced for greater spending on labour-market assistance in New Zealand is the country's comparatively low levels of expenditure on ALMPs by international standards. By OECD measures, New Zealand's spending on ALMPs is at the lower end of that reported across OECD countries but higher than other "Anglosphere" countries – the United States, Australia and Canada.[60] Nordic countries along with Hungary and France reported the highest rates of ALMP spending (OECD, 2019e).

However, cross-country comparisons of ALMP spending should be interpreted with caution.

- Countries with higher unemployment rates (especially long-term unemployment) will tend to spend more on policies to support people into employment, other things being equal. New Zealand's ALMP spending per-unemployed-person is much closer to the OECD average (WEAG, 2019).
- Aggregate reported ALMP spending does not capture differences in programme efficiency. Higher spending does not necessarily translate into higher effectiveness.
- Countries operate and report very different mixes of ALMPs, with spending targeted to different groups of people.

Furthermore, it is not clear to what extent the OECD's reported cross-country differences reflect true spending differences, or differences in the ways that member countries classify and report their ALMPs. For instance, ALMP spending estimates exclude policies with similar objectives to ALMPs, but with broader eligibility or coverage (eg, spending on general vocational training and tertiary education). International studies typically count policies as ALMPs if they are specifically targeted at people who are unemployed or at risk of unemployment. Policies that assist with labour-market attachment, but which are available to others (eg, childcare subsidies for people on low incomes), fall outside this definition.

A comparatively low spend on programmes is not by itself a good rationale for increasing a country's spending on ALMPs. As WEAG (2019, p. 5) noted:

> … while there may be a case for higher spending, it should be based on the value to be gained from extra spending, and we should first be confident in the value delivered by the existing spending.

Conversely, high spending on ALMPs does not necessarily mean better outcomes. The OECD has recently raised questions about the value for money from Denmark's very high expenditures, commenting that "a stronger focus is needed on cost-effectiveness of these labour market policies" and recommending greater use of evaluation (2019c, p. 11).

[58] The term "active labour-market policies" (ALMPs) is used by the OECD to distinguish them from "passive labour-market policies". Passive labour-market policies primarily cover income support policies. MSD uses the term "employment services" to cover ALMPs and other similar services.

[59] MSD offers such support not just to displaced workers, but to other income support recipients who are currently unemployed. These include people who are sick or suffer a disability, sole parents and new entrants to the labour market who have not yet found a job.

[60] The OECD does not have data on spending for the United Kingdom.

… and the effectiveness of labour-market assistance depends on the context

The effectiveness of labour-market assistance appears to be highly context specific. International studies evaluating the effect of labour market assistance across countries have reported mixed results. For example:

- Card, Kluve and Weber's (2010, p. 3) meta-analysis of 199 programme evaluations (covering 26 countries) concluded that job-search assistance schemes had "generally positive impacts, especially in the short run", while subsidised public-sector employment programmes were "less likely to yield positive impacts". Training programmes were less likely to have positive results in the short run but had higher impacts after two years.
- Immervoll and Scarpetta's (2012, p. 14) review of policies in OECD countries noted that training schemes took time to have positive impacts on employment. The results tended to be "small or insignificant for men" and for basic education courses. Public-sector job creation schemes mostly had negative effects, and evaluations of private-sector job subsidies did not "give a strong indication either way".

This variety and range of results suggests that any investment in labour-market assistance need to be accompanied by robust systems to evaluate effectiveness; to redesign, retarget or close poorly performing programmes; and to move resources to better-performing alternatives. MSD – the main funder of labour-market assistance in New Zealand – has many elements of such a learning system in place (Box 4.6).

F4.12 To remain effective, labour-market assistance requires robust systems to evaluate effectiveness; to redesign, retarget or close poorly performing programmes; and to move resources to better-performing alternatives. The Ministry of Social Development – the main funder of labour-market assistance in New Zealand – is pursuing such a learning system.

Is New Zealand labour-market assistance too narrowly targeted?

Many displaced workers have limited access to labour-market assistance in New Zealand. MSD's employment services, for example, are mostly for people who are receiving a main benefit (ie, people not in employment or in limited employment, and in low-income households). About two-thirds of people who report losing a job do not receive Jobseeker Support, which limits their eligibility to MSD funded programmes.

The link between MSD's employment services and benefit receipt, and the absence of UI, means that access to such assistance is narrower in New Zealand than in most OECD countries. However, even in the higher-spending European countries, only a minority of displaced workers take up labour-market assistance. In Denmark, about 20% of UI recipients and 35–40% of social assistance (ie, benefit) recipients enrol in these programmes (OECD, 2016a, p. 54). As in New Zealand, the average period of unemployment is quite short and most displaced Danish workers find new jobs on their own.

Adjusting tax and benefit policy settings to improve income smoothing would effectively extend employment services to a wider group of New Zealand's displaced workers, by increasing the number of people who could access Jobseeker Support (section 4.6).

Even so, some displaced New Zealand workers not eligible for income support face similar levels of labour-market disadvantage as others who receive income support. There is no clear reason why such workers should not be eligible for MSD's employment services, should they wish to engage with them.

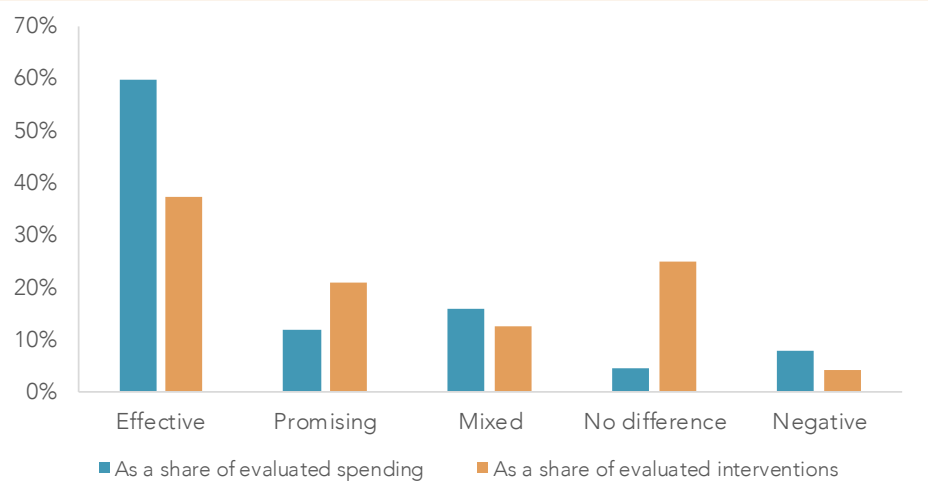
Some OECD countries offer employment services to workers who have received advance notice of displacement. Typically, these services are similar to those offered to newly registered unemployed workers – including providing information on available assistance, counselling on re-employment strategies, and documenting skills and assessing how these align with opportunities (OECD, 2018d). MSD does offer support of this sort in cases of large-scale regional redundancies (pers. comm., 18 March 2020). It would be equitable and potentially efficient to make such services available to any worker facing displacement.

Box 4.6 **Evaluation and refinement of MSD's employment services**

MSD allocates its employment services funding across specific programmes and towards specific target groups. MSD evaluates these services annually against employment, education and justice outcomes and for their cost-effectiveness in securing stable employment and so reducing future dependence on income support. MSD has access to comprehensive anonymised data on client outcomes in Stats NZ integrated data infrastructure to help evaluate and better target its services.

de Boer and Ku (2019) examined employment services delivered in New Zealand during the 2016/17 year. They evaluated 24 interventions. A further 27 interventions were not evaluated for reasons including that it was too soon to test the intervention's effectiveness, and that it was not technically feasible to do so.[61] Just under 60% of the interventions evaluated received an "effective" or "promising" rating (Figure 4.1). These interventions collectively represent about 70% of evaluated spending. A quarter of interventions were rated as making "no difference" while one intervention (the service for youth not in education, employment or training) was rated as having a "negative" impact.

Figure 4.1 Ratings for evaluated MSD employment interventions, New Zealand, 2016/17



Source: Productivity Commission; De Boer and Ku (2019).

Notes:

1. De Boer and Ku excluded case management services.
2. Evaluations were based on the impact on participant outcomes across five domains: time in employment, overall income, time in corrections services, education qualifications gained, and independence of welfare assistance. An "effective" rating means that the intervention had a positive impact on more than one domain (and no negative impact on any other domain), while "promising" means that recent trends suggest the intervention will have a significantly positive impact in the medium to long term.

MSD uses evaluation results to redesign, retarget or discontinue programmes, though it acknowledges that shifting resources to more effective programmes is sometimes difficult and takes time to occur (Ministry of Social Development, 2018).

A further question is whether people other than displaced workers would benefit from labour-market programmes. These could include, for instance, people who are currently underemployed or employed in jobs that do not make full use of their potential capability and earnings. As discussed in sections 3.4 and 4.3, New Zealand adults have wide access to further education and training opportunities, though policy refinements could improve this access. While most people can negotiate opportunities for themselves, some may benefit from better access to careers information and guidance (section 4.4). More disadvantaged adults (not receiving government income support) may receive careers assistance through non-government social services agencies (NZPC, 2015a). Even so, access to MSD's employment services for the

[61] The Childcare Subsidy was by far the largest programme not evaluated. The subsidy is a statutory entitlement. It has been in place for many decades and so no comparison group was available to help evaluate its effects.

underemployed would expand the options available and reduce the risk of workers in need of assistance "falling through the cracks".

If the Government expanded eligibility for MSD's employment services to all displaced and about-to-be displaced workers, and underemployed workers, demand for those services will likely increase. Even so, MSD would assess their risk of poor long-term labour-market and social outcomes, and their ability to benefit from particular services, and assign employment services accordingly, as it does for its existing clientele (Box 4.6). The Government should regularly review and adjust the resources it devotes to MSD's employment services, based on evidence that they continue to have net positive benefits through improving long-term outcomes for service recipients.

R4.13

The Government should extend eligibility to enrol for the Ministry of Social Development's (MSD) employment services to all displaced workers, those at risk of displacement, and underemployed workers, whether or not they are entitled to income support.

However, MSD should continue to prioritise the provision of services to those individuals assessed as being most at risk of poor long-term labour-market and social outcomes, and most likely to benefit from the services offered. Such prioritisation should not treat those receiving income support differently to those who do not.

The Government should regularly review and adjust the resources it devotes to MSD's employment services, based on evidence that the services continue to have net positive benefits through improving long-term outcomes for service recipients.

Strengthening assistance for labour-market entrants at risk of poor outcomes

New Zealand's education system produces persistently poor outcomes for some young people, and such young people are most at risk of a difficult and disrupted working career. This lowers New Zealand's resilience to cope with technological change (Chapter 3; section 4.2). While reducing disparities in schooling outcomes is a priority, strengthening assistance for those entering the labour-market with low or no skills can contribute to better outcomes in later life.

MSD introduced the Youth Service in 2012 to replace a patchy set of previous programmes aimed at improving labour-market and social outcomes for at-risk young people. Initially the Service was mostly provided by a network of non-government providers and targeted to young people aged 16–18 receiving some form of income support or otherwise not in employment, education and training.

The Service proved successful in its early years in engaging a wider group of at-risk young people in education and training, than the programmes that it replaced (NZPC, 2015a). Even so, subsequent evaluation of effects on longer-term outcomes have been disappointing. The Service did not improve participants prospect of being employed after two years and increased the probability of benefit receipt; effects on educational achievement were modest and not sustained. Moreover, the Service was poorly targeted, with providers recruiting some participants who were still enrolled at school; and many of whom had only low levels of disadvantage (Dixon & Crichton, 2016).

In response to this evaluation of outcomes, MSD reduced resourcing for, and is improving the design and targeting of the Youth Service (Box 4.6). International evidence shows that intensive support and a focus on work experience works better for young people with a weak attachment to the labour market, than an education-first approach (McGirr, 2019). Also, while most young people not in employment, education or training face future labour-market disadvantaged, so do some other young people who are only marginally engaged in such activity. When MSD finds a service design that is successful in improving longer-term outcomes for young people at risk of poor labour-market outcomes, it should consider shifting more resources back to the Youth Service.

R4.14 The Ministry of Social Development (MSD) should continue work to improve the design and targeting of the Youth Service for young people at risk of poor long-term labour-market and social outcomes. When MSD finds and successfully tests an effective service design it should consider shifting more resources back into the Youth Service.

4.8 Update, but do not overhaul, employment law

Target harms, not platforms

The rise of digital platforms has raised policy questions about New Zealand's employment law. However, these issues are generally broader in nature and reflect longstanding issues not restricted to digital platforms, such as insecure work, poor job quality, low wages and equity of opportunities. Most casual, seasonal and fixed term work, for instance, is arranged and undertaken without using digital platforms.

Digital platforms come in many types (Box 2.1). They offer benefits for both buyers and sellers.

- *Creating new opportunities for economic activity*. Lower transaction costs make new mutually beneficial opportunities for exchange possible by opening access to new markets and by reducing the cost of finding matches and arranging transactions. For example, ride-hailing service platforms have significantly expanded demand for point-to-point transport, increasing the number of drivers and hours worked.[62] Digital content platforms offer a global audience for producers of creative work with lower reliance on intermediary agents and distributors.
- *Better matching workers and skills to jobs*. Digital content platforms can speed job search for the unemployed (Kuhn & Mansour, 2014), and the process of filling jobs for employers. These platforms improve matching of people to the jobs that best use and reward their skills. Work-mediating platforms enable better matching of work to available workers and skills. They offer similar benefits used in-house to improve the deployment of a firm's employed workforce.
- *Using household resources more efficiently*. Capital and goods platforms offer income-smoothing opportunities for displaced workers and allow people to earn income from their assets (McKinsey Global Institute, 2016).
- *Offering flexibility of hours, location and other conditions of work.* By offering flexibility to organise work in new ways, work-mediating platforms create new or improved work options for workers and efficiency gains for their employers or clients. Both employees and contractors can benefit from greater flexibility in work hours, greater mobility and more efficient collaboration with peers. Flexibility can be of particular benefit to working parents, people with disabilities, new immigrants and other often-disadvantaged groups of workers (APC, 2016).[63] Flexibility of work hours can also improve access to, and affordability of, tertiary education and training by reducing the opportunity costs of study (Bouzol-Broitman et al., 2016).

In turn, these benefits contribute to:

- *increased productivity and incomes* as resources (including human resources) are allocated and used more effectively, increasing output per hour worked and incomes;
- *improved wellbeing and income security* by expanding employment opportunities and reducing the risks and costs of job loss; and

[62] A 2017 study of Uber's impact on rider demand and labour supply in three US cities found Uber's arrival was followed by a 10% increase in hours worked by wage-employed taxi drivers and a 50% increase in hours worked by self-employed drivers (Berger et al., 2018).

A 2018 New York City study found that from 2015 to 2018, following Uber and Lyft's arrival, monthly taxi rides fell by 4.4 million while Uber/Lyft rides increased by 15 million (Parrott & Reich, 2018).

[63] Tirole (2017) commented that it "is interesting to note that in France, Uber created jobs for young people from immigrant backgrounds in a country where labor market institutions have not worked well for this group" (p. 416).

- *lower prices and broader choice*, where competition and scale economies from platforms lead to lower prices that increase workers' purchasing power.

The CTU pointed to features of digital platforms that could increase the risk that people working through them will experience abuse (sub. DR424). Examples included:

- exposing New Zealand workers to competition with workers from low wage countries, so exerting downward pressure on wages and working conditions here;
- operators being located overseas and beyond the reach of New Zealand enforcement authorities; and
- heightened surveillance and monitoring of workers' performance, including the use of customer ratings.

Even so, the CTU agreed that these issues "should be addressed in a general way" (sub. DR424, p. 15).

Rules and policies that protect workers from exploitation should be rigorously enforced. The Commission considers that enforcement should be through the operation of general employment law and makes no recommendations that would impose additional constraints on digital platforms.

Policies aimed at protecting people in insecure jobs and vulnerable to exploitation should focus on:

- the nature of the work and the employment relationship, and not the technology;
- lower-skilled and lower-paid work; and
- people for whom such work is their primary source of income.

F4.13 Digital platforms create benefits for both buyers and sellers. Although some have expressed concern about the potential for the exploitation of vulnerable parties, this is a wider problem and not specific to digital platforms. As a general principle, regulation and enforcement should tackle harms to workers directly, rather than aiming to restrict how digital platforms and other technologies organise work. Regulating technologies risks reducing job creation and reducing work opportunities both for marginalised people and for highly skilled workers.

Change the tests for employment status

New Zealand employment law applies a binary model that distinguishes between employees and contractors (or, in legal terminology, "contracts of service" and "contracts for service"). Table 4.4 lays out the substantive differences between the categories. People who work on digital platforms are generally treated as contractors.

In cases where the nature of the working relationship is disputed, the courts apply a series of legal tests to determine which category the worker falls into (Box 4.7).

New Zealand's law and regulatory practice about the classification of workers as employees or contractors could be made clearer and more rational. This could improve conditions for workers, reduce risk for firms, and help ensure firms compete on quality, price and productivity. Some aspects of the "integration" test developed over time in case law and as currently applied by Employment New Zealand and the courts have strayed and include tests that are difficult to justify or apply to platform-mediated work.

The test of whether work is "fundamental" rather than "supplementary" to a firm's business makes little sense in many contexts, and for platform-mediated work in particular. Many integral "core business" tasks can be specified, commissioned, monitored, assessed and rewarded at a distance. However, the same characteristics that make a task suitable for contracting out can make it suitable for offshoring. Limiting the ability of independent contractors to undertake such tasks in New Zealand risks sending such work offshore.

Table 4.4 Employee vs contractor in New Zealand employment law

Employee	Contractor
An employee is a person employed to do any work for hire or reward under an employment agreement. The hire or reward is almost always a wage or salary. Employees have minimum employment rights under employment laws (eg, the Employment Relations Act, Minimum Wage Act 1983 and the Holidays Act 2003), including: • at least the minimum wage; • holiday and leave entitlements; and • a written employment agreement. Employees also have extra rights, including the right to take a personal grievance. The employer must keep employee records such as their employees' employment agreement, and wage, time and holidays and leave records.	Self-employed people are sometimes referred to as contractors, or independent contractors. These terms mean the same thing. A contractor is engaged by a principal (the other party) to perform services under a contract for services (commonly called an independent contractor agreement). Contractors are self-employed and earn income by invoicing the principal for their services. A contractor pays their own tax and ACC levies. Contractors are not covered by most employment-related laws. They do not get things like annual leave or sick leave, they cannot bring personal grievances, they pay their own tax, and general civil law determines most of their rights and responsibilities. Firms are not legally obliged to hold contractor records.

Source: Employment New Zealand (2019).

The legal tests to determine whether a worker is an employee or contractor should be modified to downplay or remove the integration test and focus on the fundamental nature of the work relationship – the extent of employer control, the degree of worker autonomy and choice, and the extent of lock-in to a specific firm.

Box 4.7 **New Zealand legal tests for employee vs contractor status**

Case law has developed four main tests to assess whether a working relationship is an employment or contracting arrangement.

- *The intention test*. This assesses what the parties to the relationship intended, usually from the wording of the parties' written agreement. While the stated intention is relevant, it is not decisive. The courts may also examine how the relationship operates in practice and whether it varies from the written intentions.
- *The control test*. This assesses how much control is exerted over the worker's work content, time, location, availability and methods. The greater the control, the more likely it is that the person is an employee.
- *The integration test*. This examines whether the work performed by the person is "fundamental to the employer's business (and whether they are 'part and parcel' of the organisation)" (Employment New Zealand, 2019). Work carried out by contractors is generally only a "supplementary" part of the business. Factors considered include whether the person works with their own equipment, is part of a team, is paid by results, wears a company uniform, or is reimbursed for work-related expenses (eg, travel).
- *The fundamental/economic reality test*. This looks at the totality of the work relationship to determine "whether the contracted person has been effectively working on his/her own account" (*Kamlesh Prasad v LSG Sky Chefs New Zealand Ltd* [2017] NZEmpC 150, at [37]).

R4.15 The Government should update the legal tests for employee status. The updated tests should focus on the fundamental nature of the work relationship – the extent of employer control, worker autonomy and choice, and the extent of lock-in to a specific firm. Whether work is "fundamental" or "supplementary" to a firm's business should not be part of the legal test.

Consider a "safe harbour" for firms offering contractors better conditions

Legal risks discourage firms from offering better conditions and benefits to contractors.

In applying the integration test, the courts can infer an employment relationship if workers are offered certain benefits and supports that in the past may have been offered primarily to employees. Hiring firms risk liability and disruption of their business if they offer contractors benefits such as: support for education and training; access to career advice and pastoral care support; access to group insurance/investment schemes; vaccinations and healthcare; invitations to company events; or uniforms and merchandise. Uber (sub. 27, p. 5) cited this risk:

> Uber recently announced a new Partner Support and Protection package in partnership with Chubb Insurance and Converge International in Australia, providing personal accident cover, as well as access to counselling services should something go wrong while on a trip. Elsewhere in the world, we have been able to go further. In Europe our partnership with AXA provides a range of insurance coverage including sickness, injury and maternity & paternity payments for drivers and couriers when they are on and off the Uber app.
>
> While we would like to offer a better experience and more support and benefits through our app for driver and delivery partners across New Zealand, this approach is not contemplated in the existing binary construct of employment law and could risk undermining the very flexibility that we know New Zealanders who choose to partner with Uber value.

This application of the integration test serves no clear policy purpose and may discourage firms from offering contractors better working conditions.

To give firms and workers more certainty, while strengthening incentives on firms to compete on quality and conditions of work, some form of "safe harbour" could be made available for firms wishing to offer people working with them as contractors a wider range of benefits and support.

One way to achieve this would be to build on a model proposed in France. Firms could apply to MBIE – the agency responsible for enforcing employment and labour laws – to seek certification that workers in defined roles are contractors, provided the firm's business model met specified criteria. These criteria could include:

- *non-exclusivity* (ie, contractors must be free to enter and exit the platform, and free to work with other platforms, without penalty);
- *fair and transparent termination processes* (possibly with appeals processes);
- *clear communication of changes in conditions* (eg, no sudden, unexpected changes in conditions or prices);
- *dialogue* (ie, evidence of mechanisms for contractors to provide feedback on policies and processes, and evidence that the feedback is treated seriously and influences decisions);
- *robust health and safety provisions*; and
- *development opportunities and protections* (eg, support for training, provision of parental leave or payments, contributions towards retirement savings, insurance policies).

Certification would provide a firm with protection against legal challenges about the employment status of its contractors. However, this would depend on continued compliance with the criteria.

This proposal would raise issues such as how the role of a certifying agency relates to the role of judicial bodies under the Employment Relations Act. Other ways may also be available to achieve the objective of this proposal.

F4.14

Legal risks discourage firms from offering better conditions and benefits to contractors. Clarifying the law on the employment status of workers and contractors could incentivise firms to compete on quality and conditions of work.

One way to do this would be to provide some form of regulatory "safe harbour" that offered certainty against having their employment arrangements legally challenged for firms wishing to offer benefits to their contractors such as access to group discounts, training or health support.

R4.16

The Government should explore options to give greater legal certainty to firms that wish to offer independent contractors a wider range of benefits and support. This could be in the form of a regulatory "safe harbour" that reduces the risk of legal challenge to the employment status of their contractors in receipt of such benefits and supports.

Do not introduce an intermediate category of "worker" between employee and contractor

In contrast with New Zealand, UK employment law has codified three categories of employment status – employee, worker and self-employed/contractor.[64] "Worker" sits in between the two, an intermediate category that offers greater protections and rights than does self-employed/contractor, but less than those for employees (Table 4.5). MBIE (2019a) outlined a government proposal to introduce a similar intermediate employment category in New Zealand.

Valerio De Stefano (2016) analysed gig employment conditions for the International Labour Office, and concluded that creating an intermediate category of workers between employees and independent contractors would not solve the problems identified.

> Whilst this proposal is interesting, as it challenges some of the existing boundaries to the application of labour protection, there are many potential negative implications that should not be underestimated … proposing a new legal bucket for grey-zone cases may complicate matters, rather than simplifying the issues surrounding classification. … Legal definitions … are always slippery when they are applied in practice: the real risk is shifting the grey-zone somewhere else without removing the risk of arbitrage and significant litigation in this respect, especially if the rights afforded to workers in that category afford any meaningful protection (p. 19).

A new employment status could provide greater protections for some workers. However, it would also increase the complexity of employment law, as firms will need to negotiate new boundaries and the courts will have to develop new case law to distinguish one status from another. In addition, such changes would not necessarily address the issues raised by platform work. Indeed, it may make some platform business models uneconomic, reducing opportunities for work and value creation.

R4.17

The Government should not introduce a new category of employment status between employee and contractor.

[64] UK law also makes provision for "directors" and "office holders" as further types of employment status. These cover a very small proportion of the workforce.

Table 4.5 Characteristics of the United Kingdom's three employment categories

	Employee	Worker	Self-employed/ contractor
Features	Someone who works under an employment contract	Has contract/arrangement to do work or services personally for reward Reward is for money or benefit in kind Limited right to subcontract Have to turn up for work Employer must provide work so along as contract lasts Is not doing work as part of their own company	Someone who runs their business for themselves and takes responsibility for it
Employment rights	All of the rights workers have, plus: • statutory sick pay • statutory maternity, paternity, adoption and shared parental leave • minimum notice periods • protection against unfair dismissal • right to request flexible working • time off for emergencies • statutory redundancy payments	National minimum wage Protection against unlawful wage deductions Statutory minimum level of paid holiday Statutory minimum rest break lengths Right to not work more than 48 hours per week on average Protection against unlawful discrimination Protection for whistleblowing Right not to be treated less favourably if they work part-time May qualify for statutory sick, maternity, paternity, adoption and parental pay (but not leave)	Employment law does not cover self-employed in most cases. However, they still have: • protection for health and safety, and (in some cases) against discrimination • rights and responsibilities set out in contracts with their client

Source: UK Government (n.d.).

4.9 Review and refresh regulatory settings

Individual firms are the ultimate makers of technology adoption decisions.[65] However, government policies influence their technology choices in various ways. Government-provided services and infrastructure are essential complements to firm investments. For instance, government and government agencies are major players in funding, regulating and providing training and education services for the current and future workforce (NZPC, 2019e, 2020b).

Government regulation indirectly affects the relative prices, and the perceived risks and rewards that firms face in their technology choices. There are many areas in which changes to regulatory settings would better support technology adoption and productivity growth.

This chapter has concentrated on labour-market settings and regulation, reflecting the inquiry's terms of reference. But that does not mean that the labour market is the most prospective area in which to look for regulatory changes that would encourage and support technology adoption This section offers a few examples from other areas that came to the Commission's attention over the course of this inquiry. These are worthy of further investigation.

[65] Firm decisions are, however, affected by myriad factors – including demand "pull" from consumers who expect to be able to use specific technologies (eg, secure internet purchases) in their interactions with those firms.

Refresh competition policy for the digital age

Competition policy aims to maintain enough pressure in markets to encourage innovation, dynamism, choice and put downward pressure on prices. The emergence and spread of digital goods and services may make the achievement of these goals more difficult.

- Digital firms (such as Facebook and Amazon) can exhibit network and "winner-take-most" effects, meaning that one firm can end up dominating a market. [66]
- Price-setting by algorithms could lead to anti-competitive outcomes, but may be legal under current law (as they do not involve an agreement to fix prices) (Every-Palmer, 2018).
- Data is an increasingly important business input and can be a source of market power, yet data access issues are often treated separately from competition policy (eg, through privacy laws). Traditional market-power controls and measures may not adequately reflect the importance of data in mergers.
- Digital firms have incentives to make it difficult for users to shift platforms by limiting data portability. This can support market power and discourage both entry and innovation.
- The traditional application of competition policy tools (eg, market definitions) may not capture competition from digital goods and services.

The competition issues raised by digital technologies are not necessarily new (eg, two- and multi-sided markets, zero-priced goods). It is not yet clear whether current analysis techniques and regulatory tools are adequate to deal with them. It may well be that new regulatory frameworks would promote long-term benefits for New Zealand consumers, and spur innovation by facilitating the entry or new firms or permitting innovation-enhancing mergers and other cooperative ventures.

Stephenson (2019, p. 23) examined the firm dynamics of New Zealand's digital firms, noting that they:

> … have higher death rates (low survival rates) than other firms but higher contributions to overall growth, measured by growth in employment or sales of surviving firms. And, in this comparatively new sector, growth is more highly concentrated in firms that are born small compared to non-digital (comparator) firms. These findings are consistent with the view that firm birth, death and growth involves a considerable degree of trial and error and searching for a match between firm capabilities, business ideas and market demand.

This points at a dilemma for those making competition and consumer policy for digital firms. Regulation that might, at first sight, blunt the market power of dominant firms tends to create costs that fall disproportionately on small and new firms (Goldfarb & Tucker, 2012). For example, the European Union's digital privacy regulations harm smaller firms and benefit larger ones (Castro & McQuinn, 2014; Grelf, 2018). Such regulation reduces economic dynamism, replacing Stephenson's "trial and error and searching for a match between firm capabilities, business ideas and market demand" with political and legal wrangling between large incumbent firms, regulators and governments.

The centrepieces of New Zealand competition policy are the Commerce Act 1986 and the Fair Trading Act 1986. Both Acts have received incremental changes over time. However, unlike other countries, New Zealand's competition laws have not been fundamentally reviewed to assess their suitability for the digital age.

Review limits on the use of genetic modification technology

Regulation in New Zealand tends not to restrict specific technologies, but instead focuses on achieving desired outcomes (eg, greater safety, reduced pollution). For example, the Building Act 2004 allows the use of a variety of construction materials and processes, provided they meet the functional requirements for buildings and performance criteria of the Building Code (NZPC, 2012).

[66] Network effects occur when a product or service becomes more valuable to customers as more customers choose to use it. At their more extreme end, network effects can lead to one firm dominating a market (also known as a "winner takes most" effect).

One exception to this general approach is the regulation of genetic modification (GM) technologies under the Hazardous Substances and New Organisms Act 1996 (HSNO).[67] Before any genetically modified organism can be imported, developed, field-tested or released into the environment, approval must first be sought from the Environmental Protection Authority.

New Zealand's GM regulatory regime has been the subject of considerable debate in recent years, with concerns raised about its costs, fitness-for-purpose and reduces the country's ability to innovate and adapt to challenges. Officials and academics have argued that the New Zealand regime may be creating excessive barriers to the use of GM technologies. Kershen (2015, p. 220) described the system as imposing "very costly, time-consuming, paper-intensive, and strict barriers to the field testing and the commercial introduction of plants developed by [gene editing] techniques." The Ministry for the Environment (2018, pp. 2–3) reported in advice to its Minister that the stringent approach applied through HSNO may be creating

> an unnecessarily high threshold, particularly when new technologies are being used to create organisms that are not transgenic, are indistinguishable from organisms produced from a [non-GM] technique … and in some cases could occur through slower natural processes. This may result in organisms being regulated at a level not proportionate to the risk they pose and New Zealand missing out on the benefits they could provide (such as medical treatments, crops, trees or forage with beneficial properties). Anecdotal evidence suggests the high level of regulation is discouraging potential applicants from submitting an application to the Environmental Protection Authority … for field trials in containment or a release of a GMO [genetically modified organism] as the perception is they are unlikely to be successful or it will take too much time, effort and financial backing.

A review of emerging gene editing technologies by the Royal Society of New Zealand concluded that the various regulatory regimes governing GM were too complex and inconsistent, did not adequately reflect differences in risk, focused too much on process rather than outcomes, and were out of step with international trends (Royal Society of New Zealand, 2019). The Parliamentary Commissioner for the Environment (2017) and Prime Minister's Chief Science Advisor (2017) highlighted the potential benefits for climate change adaptation, agricultural innovation, health services and pest control from the use of genetic technologies and called for a more open and enabling public and regulatory environment. Some research into promising applications of GM technologies to reduce agricultural carbon emissions has had to move offshore as a result of New Zealand's stringent regulatory regime (Box 4.8).

Box 4.8 **GM ryegrass and climate change**

New Zealand is unusual amongst developed countries in having almost half of its carbon emissions sourced from agriculture, especially from sheep and cattle. Almost three-quarters of emissions from New Zealand pastoral farms are methane produced by livestock as they digest food. There are few options currently available for New Zealand farms to make large reductions in these biological emissions while maintaining production (NZPC, 2018).

Using government and industry funding, AgResearch scientists developed a genetically modified High Metabolisable Energy (HME) ryegrass that could lead to significant reductions in livestock methane emissions, be more resistant to drought, store more energy and grow faster than conventional grasses. Early results from tests suggested that feeding animals with HME ryegrass could also lead to lower excretion of nitrogen into the environment, less nitrate leaching and lower nitrous oxide emissions (another greenhouse gas). (AgResearch, 2018)

While the initial development and early testing of the ryegrass occurred in New Zealand (at AgResearch's Palmerston North facilities), the field testing phase had to be moved to the United States, where such organisms can be more easily studied outside the laboratory (Taunton, 2018). AgResearch is exploring the feasibility of New Zealand field trials in 2021, although these will require regulatory approvals.

[67] Depending on the issue under consideration, other regulatory regimes may apply, such as the Agricultural Compounds and Veterinary Medicines Act 1997, the Animal Products Act 1999, and Biosecurity Act 1993.

The Government has an opportunity to review the current limits on the use of genetic modification technologies, to ensure they keep pace with technological change and evolving knowledge.

Accelerate open banking and consumer data rights

Regulation can create new markets, opportunities and rewards. There are opportunities to expand markets and rewards for New Zealand firms and consumers through regulatory reforms.

One area in which regulatory reform would be beneficial is in data rights and access. As the reach, quality and variety of digital goods and services has expanded, data about consumers has become an increasingly important input for firms and workers. Firms can use data to offer new and better goods and services, and some workers can use it to obtain jobs (eg, ratings and reputation data matter for platform workers).

However, there are barriers to firms and workers gaining access to consumer data. Such data is often tightly held by some firms that do not want to create openings for their competitors. Consumers may also be concerned about the ability of firms to access data about them. Reforms in Australia and the United Kingdom have sought to overcome these barriers through the creation of consumer data rights.

Consumer data rights enable individuals to access data about them and authorise its use by others. In creating rights for people to access and release information, consumer data rights aim to "support a social license for better data use economy-wide" and "underpin a new wave of competition policy." (APC, 2017, p. 191). The extension of data rights in the UK financial system is already having an impact (Box 4.9).

Box 4.9 **Open banking: how regulatory change aided ethical consumption**

Open banking is a regulatory system that allows individuals to securely share their financial information with other service providers (eg, price comparison services, payment platforms, budgeting applications). It establishes an obligation on banks to release this information, when requested by their customers. Open banking aims to encourage competition and innovation in financial services. The United Kingdom introduced open banking regulations in 2018, and Australia is currently implementing a similar system as part of its wider national consumer data right.

One beneficiary of opening banking in the United Kingdom has been the New Zealand-founded ethical consumption platform CoGo (short for "connecting good"). CoGo is an app-based service that allows members to identify their ethical priorities (eg, reducing waste, buying vegan or carbon neutral products) and then connects those members with accredited firms that meet those priorities. CoGo launched in New Zealand in 2015 and expanded into the United Kingdom in 2018.

CoGo has used open banking to offer new services to its UK members. Those members who connect their bank to the CoGo app will be able to calculate how much of their spending is with firms accredited for taking action on members' consumption priorities. The app will also be able to make recommendations for other accredited firms that are relevant, based on the member's transaction history. The aim is to allow people to make purchases that better align with the issues they care about, and reward firms for ethical practices.

Industry has led work to date on open banking in New Zealand. Progress has been slow (Faafoi, 2019). The Commerce and Consumer Affairs Minister is considering the introduction of a broader, legislative consumer data right. The introduction such a right could encourage technology adoption, innovation and productivity growth.[68] Greater progress on consumer data rights in New Zealand and harmonisation with Australia would advance the Single Economic Market agenda (APC & NZPC, 2019).

[68] Consumer data right and open banking reforms are based on *individual* rights to personal data. However, there is an ongoing policy debate about *collective* rights in the context of "indigenous data sovereignty" (Kukutai & Taylor, 2016) and the rights of indigenous groups to govern and control data about their members.

Keeping regulation up-to-date matters

The three regimes discussed above are but a few examples of regulation that may limit the ability of consumers, firms and workers to adopt new technologies. If New Zealand is to take full advantage of innovation and technological change, the Government will need to regularly and systematically review its laws and regulations to:

- remove unhelpful barriers to technology entry and adoption;
- ensure they adequately and efficiently control harms created or enabled by new technologies; and
- keep up to date with technological progress.

Findings and recommendations summary

Key

F	Finding
R	Recommendation

Chapter 2 – The scale and pace of technological change

F2.1	Technology can have many distinct effects on the labour market, and more than one effect can occur. Technology can replace human labour, augment human labour, increase the demand for labour by reducing the cost of goods and services, create new markets and occupations, and improve matching between workers and employers. These effects interact, making it difficult to predict the aggregate impact of technology on labour.
F2.2	Since the industrial revolution in the 19th century, new technologies have had changing effects on the demand and reward for skills. Current rewards for skills emphasise the importance of a well-educated population for meeting the challenges of technological change. The effects of technological change on the demand and rewards for specific types of skills in the future is unknown.
F2.3	There are inherent difficulties in predicting the labour market effects of technological change. There are many "jobs at risk from automation" models. Each model makes many assumptions about whether (and when) emerging technologies will be successfully commercialised and diffused and what the labour-market effects will be.
F2.4	The rate of technological change cannot be measured directly, as there is no systematic way to measure the relative importance of different technologies. Productivity growth is a useful proxy indicator of the long-run rate of technological change.
F2.5	Measured productivity growth is a good indicator of long-run technological change, and recent weak productivity growth across the developed world is consistent with a slow rate of technological change. However, current measured productivity growth can fail to capture technological change that could turn out to be transformative in the future. Accordingly, this indicator should not be relied on in isolation.
F2.6	Local and international data shows slowing business dynamism over recent decades. This does not support claims of an accelerating rate of technological change.

F2.7 Low unemployment rates and high participation rates in New Zealand, Australia and the United States are not consistent with expectations of technological unemployment or increased frictional employment that might result from an accelerating rate of technological change.

F2.8 Data from New Zealand, Australia and the United States shows declining occupational churn, and an increasingly older workforce. Data from Australia and the United States shows increasing average length of job tenure. This data does not support claims of accelerating technological change.

F2.9 Data from New Zealand shows that the proportion of temporary and casual work has remained broadly stable over the past decade. Self-employment rates have also been stable or have declined in New Zealand, and trends in other countries have been mixed. This data does not support claims that New Zealand's employment arrangements are being significantly affected by technological change.

F2.10 Technological change – as measured by productivity growth, business dynamism and labour-market change – is static or slowing. While no single indicator on its own provides strong support for this conclusion, together the evidence is strong.

F2.11 Predictions of the effects of technological change on particular groups of people (by, for example, region, industry, ethnicity or gender) are not reliable.

F2.12 Under the likely futures envisaged in this inquiry, the best stance for the Government is to adopt policy settings that encourage technology adoption and support New Zealanders to take advantage of technological change. Importantly, adopting new technology and improving economic performance will help New Zealanders deal with shocks – from whatever source.

Chapter 3 – Is New Zealand well positioned to take advantage of technological change?

F3.1 Countries that are successful adopters of technology tend to have the most favourable attitudes to technology in population surveys. New Zealanders seem less positive than Europeans about the effects of emerging technologies on the economy and on society. Even so, New Zealanders are relatively unconcerned that robots will "steal peoples' jobs". New Zealanders with incomes below $50 000 show less favourable attitudes to digital technologies than those on higher incomes.

F3.2

Aggregate productivity growth in the market sector is the combined result of individual firm decisions. When investors, entrepreneurs and managers make decisions and take actions, they can contribute to productivity growth through four "sources":

- productivity improves within firms;
- higher-productivity firms gain market share at the expense of low-productivity firms;
- new firms with better than average productivity enter the market; and
- low-productivity firms cease business.

Within-firm improvements are a less important source of overall productivity growth than reallocation – the growth of stronger firms, entry of new firms and the exit of poorly performing ones. Reallocation is an important means by which new technologies are diffused in an economy.

F3.3

Available information suggests capital is not moving efficiently towards New Zealand's most productive firms. As capital is needed to adopt new technology, this could be indicative of slow rates of technology adoption by those firms, and a misallocation of capital.

R3.1

When designing and implementing policies to assist workers and firms to adapt to technological change, the Government should broadly maintain New Zealand's current high levels of labour-market flexibility.

F3.4

High housing prices, especially in Auckland, are creating barriers to job mobility and the efficient matching of worker skills to jobs. These barriers are particularly pronounced for workers in the agriculture, health, manufacturing, education, retail, construction and electricity, gas and water sectors.

F3.5

New Zealand adults have high levels of literacy, numeracy and problem-solving skills in international comparisons, and high levels of educational attainment. There are significant ethnic differences in measured skill levels in the adult population, but these differences have been reducing over time. New Zealand adults are also relatively confident about their digital skills in the workplace, compared to adults in European countries.

F3.6

New Zealand adults participate at internationally high rates in further education and training. People in professional jobs tend to participate more in ongoing education and training and benefit more from doing so. The cost of training and of time away from the workplace are the most common barriers to additional education and training.

F3.7

New Zealand 15-year olds' skills in reading, mathematics and science are above international averages, but have been declining over time. The New Zealand education system produces persistently poor outcomes for some young people, especially children in socio-economically disadvantaged communities, and Māori and Pasifika students.

F3.8 New Zealand's national curriculum purports to deliver the competences and skills that young people will need to prosper in the labour market of the future. However, more than a decade after publication of the national curriculum, implementation of the teaching of key competencies is well behind expectations. No schools in a 2019 Education Review Office study had progressed past the early phases of implementation.

F3.9 Firms in a small economy far from most major markets, such as New Zealand's, face challenges to successfully develop or adopt new technologies. To counter this, New Zealand needs to maintain and improve its regulatory settings – to encourage firms to adopt new technologies. New Zealand generally has low barriers to trade and rates well on the OECD measures of regulatory restrictiveness. However, New Zealand has internationally high barriers to foreign direct investment, especially for investment that involves land purchases.

Chapter 4 – Improving the ability of New Zealand and New Zealanders to prosper from technology

R4.1 Stats NZ should work with the Ministry of Business, Innovation and Employment and the Inland Revenue Department to improve definitions and ongoing measurement of work mediated by digital platforms and other work arrangements that are not in the nature of an employer–employee relationship.

R4.2 Government should monitor relevant indicators of technology adoption and labour-market change in New Zealand and internationally.

F4.1 Raising school performance to increase overall skill levels and close achievement gaps is important for young New Zealanders' participation, adaption and success in the future labour market.

F4.2 The supply of skills for a dynamic labour market needs more than people pursuing full qualifications. People also need to be able to study to make lateral moves to new occupations, and to develop new skills as required.

R4.3 To support a dynamic labour market, the Government should extend funding to tertiary education providers for adult students who do not intend to pursue full qualifications.

F4.3 The current limit on the ability of people to borrow through the student loan scheme for short courses is a barrier to work-related education and training. It is most likely to affect those on lower incomes, who may not have the savings available to self-fund.

R4.4 The Government should allow people studying part-time and in short courses to access student loans to pay their course fees. This can be done by removing the 0.25 EFTS (equivalent full-time student) minimum course load requirement specified in the student loan eligibility rules administered by the Ministry of Social Development.

F4.4 Micro-credentials can facilitate labour-market dynamism, especially those that are externally validated (such as New Zealand Qualifications Authority (NZQA) approved micro-credentials as they are more likely to be recognised across industries). Despite the recent introduction new rules for the approval of micro-credentials and Tertiary Education Commission guidelines for their funding, considerable barriers remain to the provision of NZQA-approved micro-credentials.

R4.5 The Minister of Education should, under section 159L of the Education Act 1989, issue a determination of funding mechanisms for student achievement component funding that removes the 5% cap on the delivery of micro-credentials, subject to each provider demonstrating sufficient resources, capability and internal processes. Alternatively, in implementing the current rule, the Tertiary Education Commission should not apply the 5% cap on overall delivery of micro-credentials to individual providers.

F4.5 "Stacked" micro-credentials are valuable to workers, as they can build a qualification over time. Being unable to stack could discourage workers from embarking on study. Concerns that the stacking of micro-credentials could lead to duplication, fragmentation of qualifications, and employer confusion do not outweigh the benefits of stacked micro-credentials for workers and for labour-market dynamism.

R4.6 The New Zealand Qualifications Authority should modify its rules to permit stacking of micro-credentials.

R4.7 In implementing its reforms of the vocational education and training system, the Government should widen access to work-based education and training to all people in the workforce and to volunteers, and avoid unnecessarily restricting access based on employment status.

R4.8 In implementing its reforms of the vocational education and training system, the Government should ensure that migrants legally entitled to work in New Zealand:

- continue to have access to publicly funded work-based vocational education and training on the same terms as other workers;
- gain improved access to workplace-based literacy, numeracy and foundation skills programmes on the same terms as other workers; and
- have access to the same benefits and opportunities that other workers may gain from the reforms to the vocational education and training system.

F4.6 Improving career advice and services is important for a dynamic labour market. Given current demands on the Tertiary Education Commission, it may struggle to lead development of effective careers advice and services.

R4.9 The Government should strengthen the Tertiary Education Commission's mandate and resource it sufficiently to lead development of quality careers advice and services for New Zealanders of all ages.

F4.7 Tertiary students face substantial and unnecessary barriers to changing course in tertiary education, often bearing high costs from initial mistakes or changing their mind. Tertiary education providers sometimes block credit transfers, and otherwise provide little information about credit transfer arrangements or make it time consuming and costly for students to negotiate.

R4.10 The Government should use the conditions it attaches to government funding for tertiary education to encourage credit recognition and transfer systems that work in the interests of learners and employers, rather than in the interests of tertiary education providers.

F4.8 New Zealand's current restrictive land use regulation increases the price of housing, limiting the ability of workers to move to locations with better job matches and constraining firms' access to skilled labour.

R4.11 The Government should use the opportunity provided by the current fundamental review of the resource management system to adopt less-restrictive land use regulation

F4.9 Income-replacement rates for displaced workers in New Zealand are

- as high as 80% for low-income households with children; and
- as low as 26% for single people and those on high incomes.

For shorter durations of unemployment, income-replacement rates for some displaced New Zealanders are substantially below those of displaced workers in OECD countries that have unemployment insurance schemes.

F4.10

Three options for income smoothing for displaced workers are:

- unemployment insurance;
- portable individual redundancy accounts; and
- adjustments to current benefit and tax credit policies.

Each has benefits and drawbacks, and further analysis is required of the fiscal costs, economic impacts and wellbeing effects. Unemployment insurance would most likely provide income replacement at rates similar those in most OECD countries in the immediate period following displacement. But relatively minor adjustments to current benefit and tax credit policies could substantially increase income replacement rates for those currently facing the largest falls.

R4.12

There would be merit in pursuing policies that would provide greater income smoothing for displaced workers.

The Ministry of Business, Innovation and Employment, Ministry of Social Development and Inland Revenue Department should conduct further design work and analysis of the fiscal costs, economic impacts and wellbeing effects of unemployment insurance, portable individual redundancy accounts, and adjustments to current benefit and tax credit policies.

F4.11

Mandatory redundancy payments provide income for displaced workers while they look for work. However, mandatory redundancy payments directly increase the cost of labour, and can encourage fixed-term appointments, contracting and other work arrangements that are not in the nature of an employer–employee relationship. Payments received do not reflect the costs that displaced workers face.

F4.12

To remain effective, labour-market assistance requires robust systems to evaluate effectiveness; to redesign, retarget or close poorly performing programmes; and to move resources to better-performing alternatives. The Ministry of Social Development – the main funder of labour-market assistance in New Zealand – is pursuing such a learning system.

R4.13

The Government should extend eligibility to enrol for the Ministry of Social Development's (MSD) employment services to all displaced workers, those at risk of displacement, and underemployed workers, whether or not they are entitled to income support.

However, MSD should continue to prioritise the provision of services to those individuals assessed as being most at risk of poor long-term labour-market and social outcomes, and most likely to benefit from the services offered. Such prioritisation should not treat those receiving income support differently to those who do not.

The Government should regularly review and adjust the resources it devotes to MSD's employment services, based on evidence that the services continue to have net positive benefits through improving long-term outcomes for service recipients.

R4.14 The Ministry of Social Development (MSD) should continue work to improve the design and targeting of the Youth Service for young people at risk of poor long-term labour-market and social outcomes. When MSD finds and successfully tests an effective service design it should consider shifting more resources back into the Youth Service.

F4.13 Digital platforms create benefits for both buyers and sellers. Although some have expressed concern about the potential for the exploitation of vulnerable parties, this is a wider problem and not specific to digital platforms. As a general principle, regulation and enforcement should tackle harms to workers directly, rather than aiming to restrict how digital platforms and other technologies organise work. Regulating technologies risks reducing job creation and reducing work opportunities both for marginalised people and for highly skilled workers.

R4.15 The Government should update the legal tests for employee status. The updated tests should focus on the fundamental nature of the work relationship – the extent of employer control, worker autonomy and choice, and the extent of lock-in to a specific firm. Whether work is "fundamental" or "supplementary" to a firm's business should not be part of the legal test.

F4.14 Legal risks discourage firms from offering better conditions and benefits to contractors. Clarifying the law on the employment status of workers and contractors could incentivise firms to compete on quality and conditions of work.

One way to do this would be to provide some form of regulatory "safe harbour" that offered certainty against having their employment arrangements legally challenged for firms wishing to offer benefits to their contractors such as access to group discounts, training or health support.

R4.16 The Government should explore options to give greater legal certainty to firms that wish to offer independent contractors a wider range of benefits and support. This could be in the form of a regulatory "safe harbour" that reduces the risk of legal challenge to the employment status of their contractors in receipt of such benefits and supports.

R4.17 The Government should not introduce a new category of employment status between employee and contractor.

Appendix A Public consultation

Submissions

Individual or organisation	Submission number
Adult and Community Education (ACE) Aotearoa	DR407
AI Forum New Zealand	010
Alexia Hilbertidou	1
Auckland Regional Public Health Service	DR411
Basic Income New Zealand	DR403
Blind Foundation	17
Brendon Harre	DR405
Building and Construction Industry Training Organisation	25, DR412
Business Hawke's Bay	21
BusinessNZ	DR416
Career Development Association of New Zealand	35, DR427
Chartered Accountants Australia and New Zealand	15, DR417
COMET Auckland	DR431
Counties Power Consumer Trust	12
DairyNZ	20
Dunedin City Council	DR401
Economic Development New Zealand	28
EdTech New Zealand	13
Energy Trusts of New Zealand Inc	18
Engineering Leadership Forum	30
Engineering New Zealand	47
Federated Farmers of New Zealand	37, DR409
Geoff and Esther Meadows	34
Göran Roos	46
Grant White	44
Greg van Paassen	7
Hospitality New Zealand	DR302
Individual	DR301
Individual	DR419
Industry Training Federation	29, DR415
Institute of Directors	4
InternetNZ	24
Jeanette Thorne	14
Kim Stevenson	45
Marlborough District Council	8
Methodist Mission Southern	DR201
Microsoft	43
Ministry of Education	48
Ministry of Education – draft report 3	DR429
Ministry of Education – draft report 4	DR430
Motor Trade Association	31, DR422
National Council of Women of New Zealand	22
National Library of New Zealand	36
New Zealand Air Line Pilots' Association	DR413

New Zealand Council of Trade Unions Te Kauae Kaimahi	41
New Zealand Council of Trade Unions Te Kauae Kaimahi – draft reports 1 and 2	DR424
New Zealand Council of Trade Unions Te Kauae Kaimahi – draft reports 3, 4 and 5	DR425
New Zealand Nurses Organisation	26
New Zealand Public Service Association	33, DR406
New Zealand Qualifications Authority	39
NGO Health + Disability Network	6
NZEI Te Riu Roa	DR426
Perce Harpham	2
Powerco	32
Red Owl Consulting Ltd	DR202
Scott Baker	DR204
Sharon Pells	DR402
Stephen Beban	DR410
Stuart Dillon-Roberts	DR404
Tertiary Education Commission	DR42
Tertiary Education Commission – draft report 3	DR428
Tertiary Education Union – draft reports 1 and 2	DR420
Tertiary Education Union – draft reports 3, 4 and 5	DR421
The Employers and Manufacturers Association	5, DR414
The Northland Innovation Centre	3
Uber	27
Unboxed Performance	38
Victoria MacLennan	23
Volunteering New Zealand	DR423
Water New Zealand	19, DR408
Watercare Services Limited	16
WeCreate Incorporated	9
Works Futures Otago Group	DR101
Xero	DR203, DR418
Young Enterprise Trust	11

Engagement meetings

Alan Hucks
Angela Natali
Artificial Intelligence Forum of New Zealand
Australian Productivity Commission
Bay of Plenty Freight Logistics Action Group
Building and Construction Industry Training Organisation
BERL
BusinessNZ
Code Avengers
Creative HQ
Deloitte
Department of Internal Affairs
Digital Inclusion Alliance Aotearoa
EdTechNZ
Education Review Office
Freight Logistics Action Group

Fusion Networks
Future Work Studio
Professor Gordon Anderson
The Icehouse
Inland Revenue Department
IT Professionals New Zealand
Kinley Salmon
Mandy McGirr
Marco Paccagnella
Professor Michael Witbrock
Ministry of Business, Innovation & Employment
Ministry of Education
Motor Industry Association
New Zealand Council of Trade Unions Te Kauae Kaimahi
New Zealand Kiwifruit Growers Incorporated
New Zealand Treasury
NSW Innovation and Productivity Council
NZ Game Developers Association
OECD – Structural Policy Analysis Division
Potentia
Rail and Maritime Transport Union
Skills Development Scotland
Spark
Tech Futures Lab
Tertiary Education Commission
Think Beyond
Tom Haig
Transpower New Zealand Limited
Uber
Xero
Zespri International

USA meetings

American Enterprise Institute	Washington DC, 2019
MBIE International Science Partnerships	Washington DC, 2019
SRI International	Washington DC, 2019
Syracuse University School of Information Studies	Syracuse, NY, 2019
Third Way	Washington DC, 2019
Wellesley College Department of Economics	Boston, MA, 2019

Inquiry workshops

Digital divide workshop	Wellington, 2019
Micro-credentials workshop	Wellington, 2019

Conferences and forums

AI Day 2019	Auckland, 2019
Australia New Zealand Leadership Forum	Auckland, 2019
Autonomous Systems and their Policy, Law and Governance Implications	Syracuse, NY, 2019
Commerce Commission	Wellington, 2019
Data Summit 18	Wellington, 2018
Education Leaders Forum 2019 – Digital Divides, Dividends and Dangers	Dunedin, 2019
Freight Logistics Action Group	Tauranga, 2019
Future of Work Officials Network	Wellington, 2020
Future of Work Tripartite Forum	Wellington, 2019 & 2020
Future of Work Workshop – Bankwest Curtin Economics	Perth, 2020
ITx Rutherford	Nelson, 2019
OECD Global Forum on Productivity	Sydney, 2019
Pacific Skills Summit	Fiji, 2019
PwC Herald Talks – The Gig Economy: Future of Work	Auckland, 2019
Society of Labour Economists 24th Annual Meeting	Washington DC, 2019
The future of work in Aotearoa New Zealand: what future for the young?	Auckland, 2019
Uber Workshop on Work	Sydney, 2019

Appendix B Income-replacement rates in New Zealand & OECD countries

New Zealand is unusual among OECD countries in not having an unemployment insurance scheme to smooth the incomes of displaced workers.[69] Instead, New Zealand has a "social assistance" approach, which is means tested and based on household circumstances. Many displaced workers are not eligible for assistance and face sudden losses in income.

To better understand income-smoothing options, the Commission analysed income-replacement rates for different types of households under New Zealand's current policy settings (Mok & Nolan, forthcoming). Mok and Nolan selected a set of households that represent the majority of those in the labour force. These households vary by partnered status, incomes, accommodation costs and number of children (Table B.1). Rents paid are based on Auckland prices. The median and minimum wages are those for 2019.

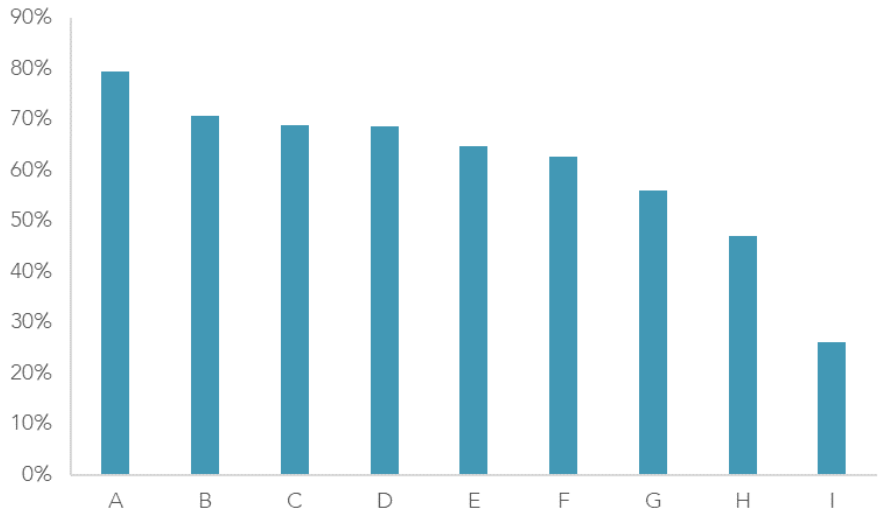
Table B.1 Modelled households and their characteristics

Household	Characteristics and scenario	Weekly rent paid
A	Sole parent with 2 children. Parent works part time (20 hours a week) for the median wage ($25.50/hour). The parent loses their job	$560
B	Couple with a new-born. One parent works full time (40 hours) for the median wage, the other parent is at home. The earning parent loses their job.	$560
C	Couple with 2 children. One parent works full time, the other part time. Both earn the minimum wage ($18/hour). Both parents lose their jobs.	$560
D	Sole parent with 2 children. Parent works part time for a high wage ($50/hour). The parent loses their job	$560
E	Couple without children, both working 30 hours a week for the median wage. One person loses their job.	$560
F	Couple with 2 children. One parent works full time, the other part time. Both earn the median wage. Both parents lose their jobs	$560
G	Single person, who works full time for the minimum wage. They lose their job.	$375
H	Couple with 2 children. One parent works full time, the other part time. The first has a high income ($50/hour) and the second earns the median wage. Both parents lose their jobs	$560
I	Single person, who works full time for a high wage ($50/hour). They lose their job.	$375

Figure B.1 shows the impacts of displacement on household income. Replacement rates are higher for those with children and low to median incomes; and lower for single people and those on higher incomes. This reflects the current targeting of benefits and tax credits towards lower-income people and families.

[69] Australia and Mexico are the other two OECD countries without UI schemes.

Figure B.1 Income-replacement rates by household type



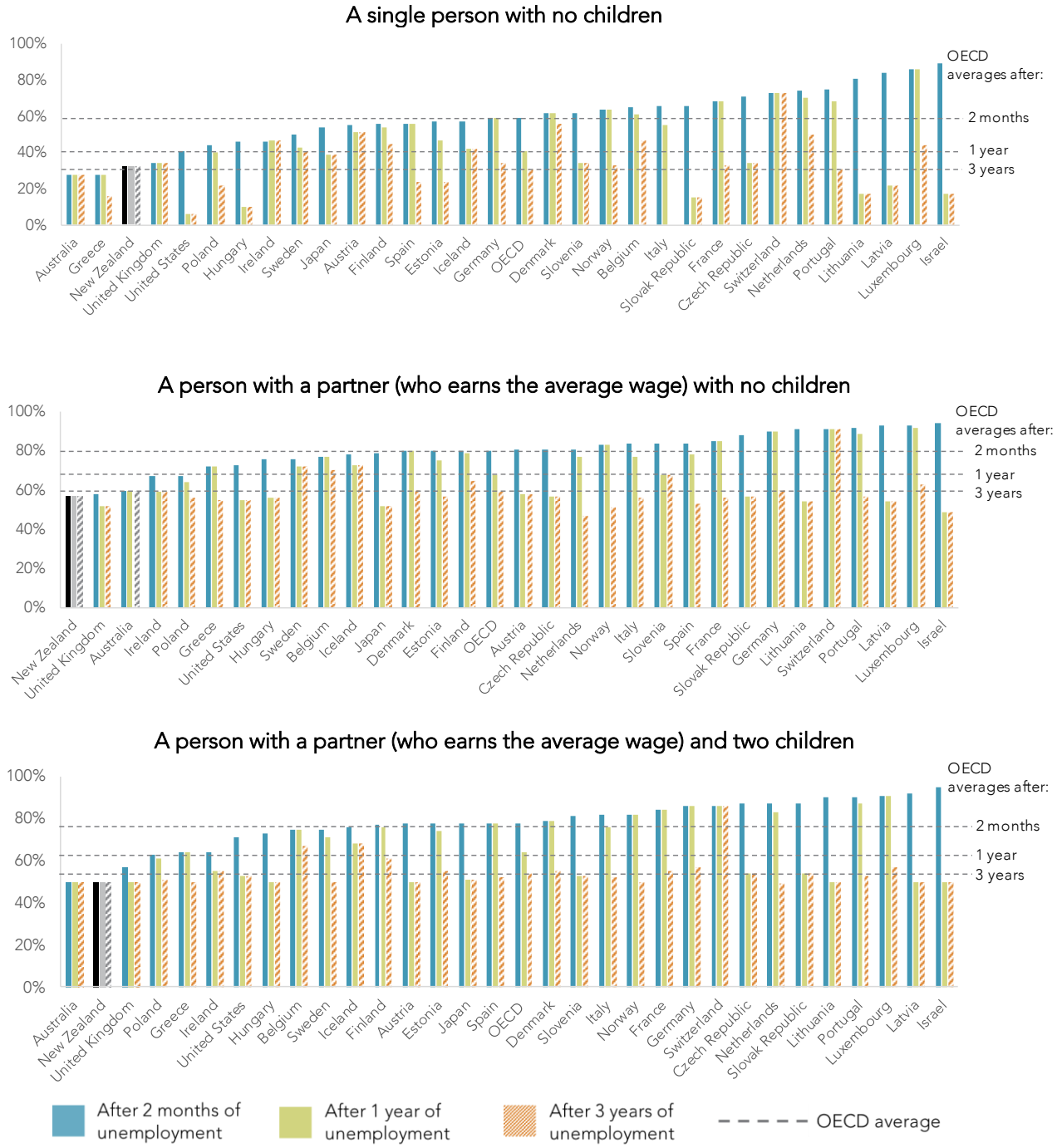
Source: Mok and Nolan (forthcoming).

Notes:

1. The information supporting this graph has been provided by the New Zealand Treasury's non-behavioural micro-simulation model. Any analysis and conclusions are solely those of the authors.

The OECD provides information on income, replacement rates across member countries, by different types of households and by different durations of unemployment (Figure B.2). The disparities between New Zealand and other countries are greatest for single people with no children, and at lower durations of unemployment.

Figure B.2 Income-replacement rate, person previously earning the average wage, OECD countries, 2018



Source: OECD (2019f).

Notes:

1. The replacement rate is a person's household income (including partner income) when unemployed as a proportion of their household income when employed. Figure B.2 assumes that the person is a 40-year old male worker with an uninterrupted employment record since the age of 19 who is earning the average wage. The average wage used for New Zealand was $59 970.
2. Disposable income for an unemployed person includes UI payments (where relevant) and guaranteed minimum sources of income, such as unemployment and social assistance benefits, housing benefits (eg, the Accommodation Supplement in New Zealand) and family benefits (eg, Working for Families tax credits in New Zealand).
3. Housing benefits are calculated assuming a household renting privately, paying rent equal to 20% of the average wage. The assumptions on rental expenditure are arguably low relative to actual rent cost in New Zealand. As a result, the estimates of support from the Accommodation Supplement (and therefore overall replacement) for New Zealand are artificially low (Fletcher, 2015).
4. The duration and rate of unemployment benefits in some countries, such as the United States and Canada, vary across states. In these cases, the OECD uses the replacement rate from a representative state (eg, Michigan for the United States).
5. Calculations based on the OECD tax-benefit model. See OECD (2019b) for more detail.

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