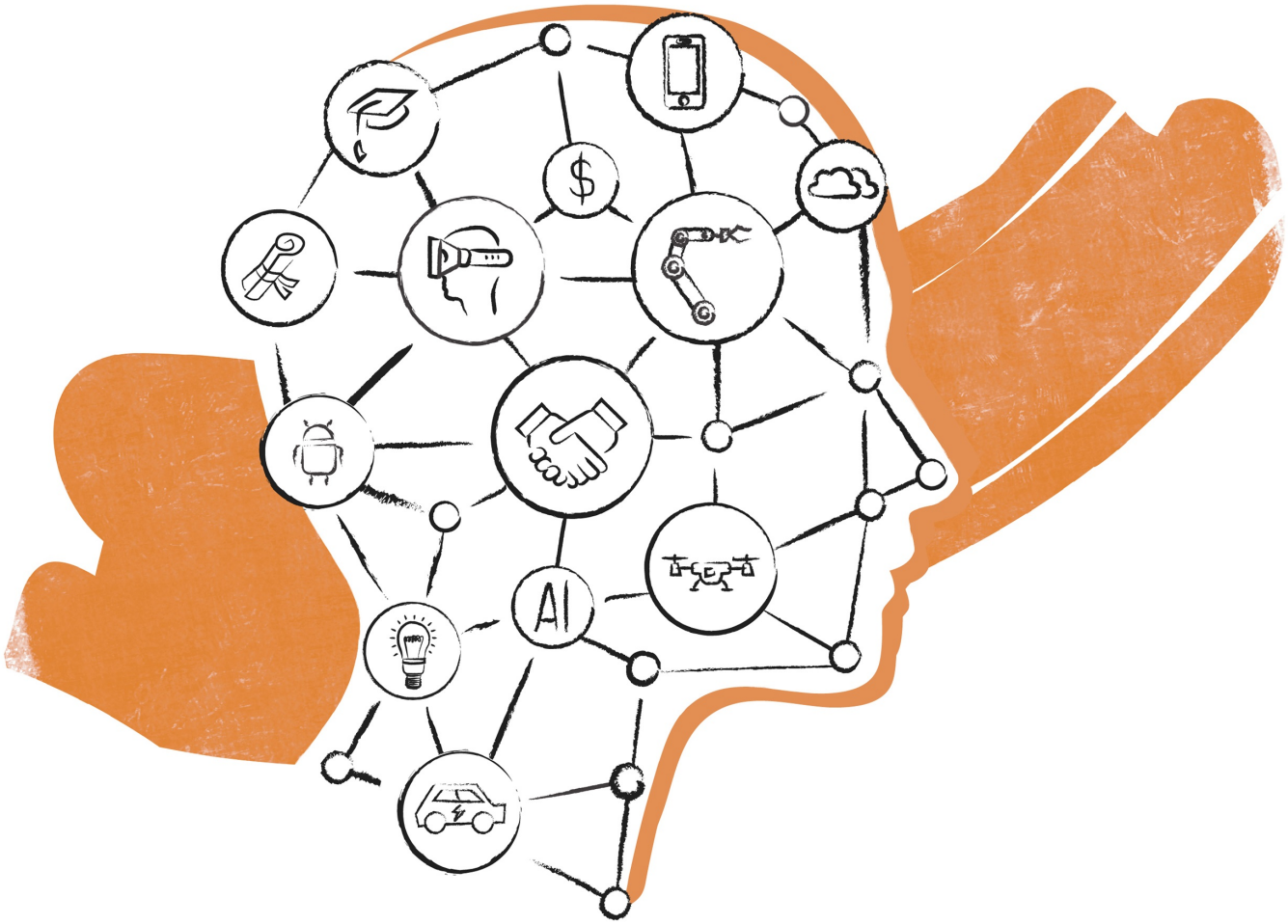
NEW ZEALAND
PRODUCTIVITY COMMISSION
Te Kōmihana Whai Hua o Aotearoa



Technological change and the future of work

Issues paper
April 2019

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. We want to gather ideas, opinions, evidence and information to ensure that this inquiry is well-informed and relevant. The Commission is seeking submissions on the questions contained in this paper by 5 June 2019.

Technological change and the future of work

Issues paper – April 2019

The New Zealand Productivity Commission

Te Kōmihana Whai Hua o Aotearoa[1]

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

You can find information on the Commission at www.productivity.govt.nz or by calling +64 4 903 5150.

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[1] The Commission that pursues abundance for New Zealand

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The issues paper

This issues paper aims to assist individuals and organisations to participate in the inquiry. It outlines the background to the inquiry, the Commission's intended approach, and the matters about which the Commission is seeking comment and information.

This paper contains specific questions to which responses are invited. Participants should choose which questions are relevant to them. The questions are not intended to limit comment. The Commission welcomes information and comment on all issues that participants consider relevant to the inquiry's terms of reference.

Key inquiry dates

Due date for submissions on issues paper:	5 June 2019
Release of draft reports:	August – November 2019
Submissions on draft reports:	December 2019
Final report to Government:	31 March 2020

Contacts

For further information about inquiry contacts, please see page ii.

Making a submission

The Commission aims to provide insightful, well-informed and accessible advice that leads to the best possible improvement in the wellbeing of New Zealanders. Submissions help the Commission to gather ideas, opinions and information to ensure that inquiries are well-informed and that its advice is relevant, credible and workable.

Submissions will help shape the nature and focus of this inquiry. Inquiry reports may cite or directly incorporate relevant information from submissions. There will be an opportunity to make further submissions in response to subsequent reports published throughout the duration of this inquiry.

Anyone can make a submission. It may be in written, electronic or audio format. A submission can range from a short note on a single issue to a more substantial document covering many issues. Please provide supporting facts, figures, data, examples and documentation where possible. Every submission is welcome; however, identical submissions will not carry any more weight than the merits of the arguments presented. Submissions may incorporate relevant material provided to other reviews or inquiries.

Submissions may be lodged at www.productivity.govt.nz/make-a-submission. A searchable PDF format is preferred. Submissions should include the submitter's name and contact details, and the details of any organisation represented. The Commission will not accept submissions that, in its opinion, contain inappropriate or defamatory content.

What the Commission will do with submissions

The Commission seeks to have as much information as possible on the public record. Submissions will become publicly available documents on the Commission's website shortly after receipt unless accompanied by a request to delay release for a short period.

The Commission is subject to the Official Information Act 1982 and can accept material in confidence only under special circumstances. Please contact the Commission before submitting such material.

Other ways to participate

The Commission welcomes engagement on its inquiries. Please telephone or send an email to arrange a meeting with inquiry staff.

1 Approach to the inquiry

The Government has asked the Productivity Commission to conduct 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.

Box 1 **Technological change and disruption: definitions**

Technological change is the overall process of invention, innovation and diffusion of technology or processes.

Technological disruption is "the advent of a new or existing technology that is used and/or created in such a way that it renders the incumbent firm obsolete, over years or decades. Often it is the business model, rather than the technology itself disturbing the existing market or value network, creating new markets in its wake" (Sullivan 2015). Rapid or widespread disruptive change is likely to impose significant adjustment costs for many firms, for their employees, for households and the entire economy.

Technological change, productivity and living standards

Technology adoption drives growth in productivity and living standards

By improving the efficiency and effectiveness through which goods and services are produced and by creating new and better options, technological change:

> has been one of the most potent forces in history in that has provided society with what economists call a 'free lunch', that is, an increase in output that is not commensurate with the increase in effort and cost necessary to bring it about. (Mokyr 1992, p. 3)

One important result of rapidly growing output has been increasing incomes for workers and their families. In New Zealand, real per-capita incomes increased around fourfold between 1916 and 2016 (Figure 1.1).

In addition to increasing output and incomes, technological change has freed people from onerous or physically-demanding work, especially in agriculture. And, across the developed world, technological improvements in agriculture (eg, fertiliser, tractors, selective breeding, cropping methods) led to dramatic falls in the share of the workforce employed in the primary sector, while production grew. This share of the workforce in New Zealand fell from 36% in 1901 to 7% in 2013. Over time, workers moved to new and expanding opportunities in other sectors, particularly services (Figure 1.2).

Figure 1.1 Real per-capita incomes in New Zealand, 1859-2018

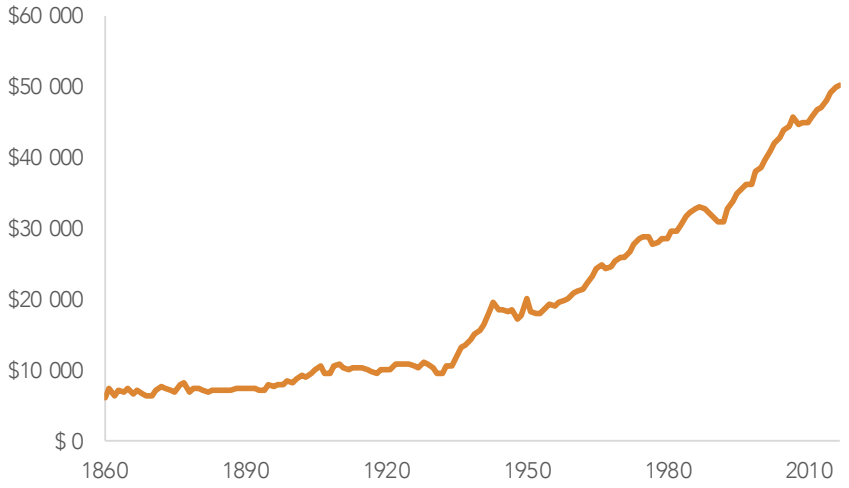
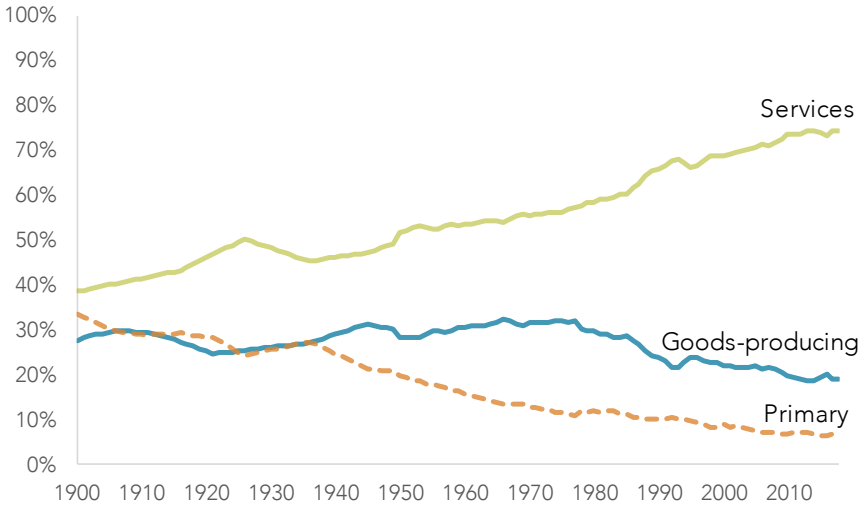


Figure 1.2 Composition of the New Zealand workforce, 1900-2018



Source: NZIER (2018) based on Stats NZ data.

Change creates costs for some

While technological change brings significant overall benefits, it also creates frictions and costs for particular groups in society. As Acemoglu and Robinson note, "sustained economic growth requires innovation, and innovation cannot be decoupled from creative destruction, which replaces the old with the new in the economic realm" (2013, p. 430). This 'replacement of the old' involves the devaluation of prior investments in machinery and skills, leaving the owners of older equipment and workers who used it worse off. For some, these costs can be severe.

Successful societies manage these transitions well

Sustaining innovation and productivity growth depends on managing the costs of transitions on individuals and their families, and ensuring that people are not left behind by technological change. Governments have choices in the policy settings they adopt to manage these costs. In

setting these policies it is important to be aware of both current and possible future impacts of technological change. These include

- the pace of technological change and the nature of its impact on work – eg, ongoing and incremental or radical and disruptive;
- what the next step in New Zealand's economic path might be, after the bulk of economic activity and employment has shifted progressively towards the services sector; and
- how the benefits of technological improvements can be best distributed.

Two broad questions for the inquiry

The inquiry Terms of Reference (TOR) pose two broad questions for this 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?

In examining the first question, the Commission is conscious that it is very difficult to predict how technology will develop, even in the short-term, and believes that it would not be useful to predict a single future and offer corresponding policy advice. Rather, this inquiry will develop illustrative scenarios that could play out in the near future.

To address the second question, the Commission will examine policies designed to address concerns about the availability and nature of work, and other policies that better position New Zealand to take advantage of innovation and technological change. The Commission will assess policies against each scenario. Policies that work in all scenarios might be unconditionally recommended, while others might be conditional on a particular scenario eventuating.

How the Commission can add value

The Commission has just over a year to conduct this inquiry. This timeframe affords the opportunity to consult widely, to consider a diverse range of issues relevant to the future of work, and to develop recommendations that will help New Zealand navigate an uncertain future.

The inquiry will draw on a substantial amount of research, both in New Zealand and internationally, on technological change and its impact on work. The TOR notes that this inquiry should build on previous work undertaken by the Commission, as well as other policy work being undertaken by groups such as the AI Forum and the OECD. Box 2 provides a summary of some current New Zealand policy initiatives relevant to technological change and the future of work.

Box 2 **Recent research and policy initiatives in New Zealand**

The **Future of Work Tripartite Forum** is composed of the Government, Business New Zealand, and the Council of Trade Unions. It aims to jointly shape the policies needed to equip workers and business for a rapidly changing nature of work. The Forum's work

programme covers 'just transitions' (eg, to a low-emissions economy); learning for life; technology adoption; and workplace productivity (Future of Work Tripartite Forum 2018).

The **Fair Pay Agreement Working Group** was set up in June 2018 to make recommendations on the design of a sector-level bargaining system. It recommended that workers and their union representatives should be able to initiate sector-level bargaining provided that one of two trigger-points is met, with all workers in the defined sector or occupation covered by the agreement (Fair Pay Agreement Working Group 2018).

The **Welfare Expert Advisory Group** was established in 2018 to undertake a broad-ranging review of the welfare system and to deliver advice to the Government to ensure people have an adequate income and are able to participate meaningfully in their communities (Sepuloni 2018). As at April 2019, the Advisory Group's report was being considered by the Government.

The proposed **Reform of Vocational Education** recommends merging New Zealand's 16 Institutes of Technology and Polytechnics into a single provider. It also proposes the establishment of 'Industry Skills Bodies', which would set skill standards that providers must meet and provide advice on industry needs (Ministry of Education 2019).

The **review of Tomorrow's Schools** is examining the governance, administration and management of the schooling system. The review proposes major changes including a re-orientation of the role of school boards of trustees, and the introduction of 'Education Hubs' – Crown Entities that would assume some responsibilities currently held by school boards (Tomorrow's Schools Independent Taskforce and Ministry of Education 2018).

The **AI Forum** is a non-government organisation that seeks to raise the level of awareness and capabilities of AI in New Zealand. The Forum (2018, p. 15) did not support the view that AI will have a major negative impact on jobs at the aggregate level, but noted the importance of appropriate supports for displaced workers:

> Widespread adoption of AI could take 20–40 years until it is expected to fully impact employment patterns. During that time natural changes in the labour market will be significantly larger than any expected impact from AI and existing labour market support policies should be able to cope … However, we anticipate significant impacts … for the individual workers affected. Government and industry must collaborate to maintain support structures for technologically displaced workers.

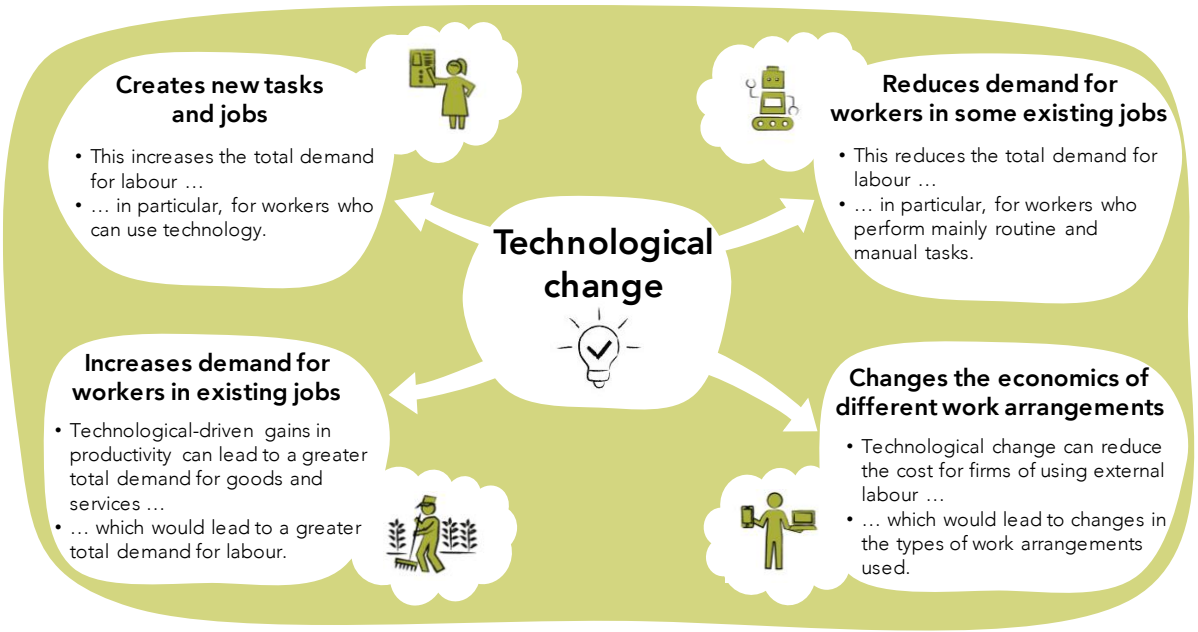
Drawing on feedback from inquiry participants, the Commission plans to publish an initial report in mid-2019 that will examine the process by which technology diffuses through the New Zealand economy and how it can affect and change the labour market. The report will also consider how government has responded to technological change in the past and discuss the broad approach government should adopt in preparing for an uncertain future. This will be followed later in the year by three short reports covering important policy areas: labour market policy settings; education and training; and firm and economy-wide policies for innovation. There will be opportunity for interested parties to provide feedback on these reports, either individually or collectively, before the Commission delivers a final report to referring Ministers in March 2020.

2 Technology and the labour market

How does technological change affect the labour market?

Technological change has major implications for the labour market (Figure 2.1). It affects the volume of work available, the nature of work, and pay rates for different workers, and it can be very disruptive.

Figure 2.1 How technological change can affect the labour market



The impacts of technological change can be complex to disentangle, for several reasons. First, more than one impact can occur at once. A single technology could both replace labour *and* make existing labour more productive within an industry, firm or even with a single job. For example, the introduction of computer programs replaced the manual preparation of spreadsheets by accountants or bookkeepers. However, it increased the demand for spreadsheet-based financial analysis and for people who were able to use the computer programs (Kestenbaum and Goldstein nd).

Second, technological change can occur as the result of both consumer and firm decisions and can have second- and third-order effects. For example, the widespread adoption of smartphones by consumers has changed the way firms market their products, process orders and deliver their goods and services. Other technological change has led to the transfer of some tasks from workers to consumers, such as ringing up shopping items at self-service-checkout machines (Dellot, Mason and Wallace-Stephens 2019). These have flow-on effects for the tasks that workers carry out, and the sorts of skills that firms look for in employees.

Third, technological change can create tasks "that were never done previously by a human; more work is done, but no human work is displaced" (Dellot, Mason and Wallace-Stephens 2019, p. 21). One recent example is aquaculture image recognition software, which can spot salmon infected with sea lice.

As a result, the full set of labour market and social impacts of technological change are not always obvious. The rest of this section describes the various impacts.

Technological change could create new tasks and jobs …

Technological improvements can lead to the creation of new goods and services, which in turn could lead firms to demand new forms of labour. For example, firms' adoption of websites and other online tools has created demand for social media managers, coders and web developers.

Technological change has certainly created new jobs in New Zealand. For example, since 1999, the number of jobs classified as 'Computer systems design and related services' has increased from 8 700 to 32 600.

McKinsey noted that because of the new tasks created by technology, the net effect of new technologies can be to increase the total number of jobs.

> One third of new jobs created in the United States in the past 25 years were types that did not exist, or barely existed, in areas including IT development, hardware manufacturing, app creation, and IT systems management. The net impact of new technologies on employment can be strongly positive. (McKinsey Global Institute 2017, p. 3)

… and create greater demand for workers in existing jobs

Technology may reduce the cost of producing an existing good or service, which in turn may raise demand and grow jobs. Where competition is strong, adopting a cost-reducing technology can allow a firm to increase its market share by lowering its prices. Competitors then face pressure to lower their prices to keep pace. Lower prices typically lead consumers to purchase more of that good or service, spurring growth in employment to meet the increased demand.

Van Reenen (2018) described this dynamic as the 'Uber effect', citing the case of ridesharing services such as Uber and Lyft, which provided a cheaper alternative to taxis. While the number of traditional taxi trips in New York city fell between 2015–2018, this reduction was more than offset by a dramatic increase in trips using ridesharing apps.

Technology-induced reductions in the prices of goods and services could also free up consumer income that can be spent on other products, creating labour demand elsewhere in the economy. Van Reenen (2018) dubbed this the 'Walmart effect', referring to the low-cost retail giant in the United States, which achieved significant productivity improvements and price reductions that gave consumers more disposable income for other goods and services in the late 1990s and early 2000s.

Variants of this effect are business-to-business transactions, where technological improvements in the production of goods that are used by other firms leads to employment growth in the 'downstream' firms. Van Reenan (2018) cited the steel industry, where productivity improvements over 1980–2017 reduced costs and prices, thereby boosting jobs in 'metal using' sectors such as manufacturing, machinery, motor vehicle and aerospace production.

But technological change may reduce the demand for workers in some existing jobs …

Improvements in technology can reduce the demand for some types of jobs. This happens when technological improvements dramatically improve the capability of capital equipment, leading firms to invest more in equipment rather than jobs.

Technology introduced in shipping and ports has both reduced the number of jobs, and significantly altered the nature of remaining jobs. In the early 1960s, nearly 27 000 people were employed as "waterside workers and related freight handlers" in New Zealand. The widespread adoption of containerisation and other technology that has enabled the automation of ports has seen the number employed in "water transport support services" reduce to fewer than 6 000, while the volume of freight handled has increased dramatically (NZPC 2012).

In some cases, investments in capital can completely replace some jobs. One well documented example is the near-disappearance of typists as an occupation following the widespread adoption of personal computers. The 1981 New Zealand census recorded nearly 35 000 people employed as "stenographers, typists and card and tape punching machine operators".

… and create more demand for workers who can use technology

Technologically driven improvements in the quality of capital equipment may also lead a firm to invest more and also hire more staff with the skills required to operate the new assets. These types of improvements are known as 'skill-biased' technological changes. This 'skill-biased' dynamic has been cited in some countries as an explanation for the growing divergence between wages for higher-skilled workers (who are more able to use computers) and their less-qualified counterparts (Krueger 1993; Mincer 1991).

Technology can change the economics of different work arrangements

Firms face a decision between employing staff directly and using contracted suppliers (outsourcing). They will prefer employees when the transaction costs for incentivising and monitoring staff are lower than those for contracted suppliers (Coase 1937). But technological change is one factor that can shift the relative size of these costs.

A recent manifestation of this effect is the growth of internet platforms that facilitate short-term work arrangements – often referred to as 'gig' work (Box 3). Although internet-enabled gig work has attracted considerable attention in recent years, on-demand and piece-work labour arrangements are nothing new. They were once common practice in the construction and dock industries, and remain so for many creative tasks (eg, editing, modelling and photography).

Box 3 **The 'gig' economy**

Internet-based platforms such as Uber, Freelancer and Airtasker enable firms to break some jobs down into specific tasks and buy in these services from on-demand labour. Stanford identifies five features of this gig work:

1. Work is performed on an on-demand or as-needed basis. Producers only work when their services are immediately required, and there is no guarantee of ongoing engagement …

2. Producers are paid for each discrete task or unit of output, not for their time.

3. Producers are required to supply their own capital equipment. This typically includes providing the place where work occurs (home, car, etc.), as well as any tools and equipment utilised directly in production. Because individual workers' financial capacity is limited, the capital requirements of platform work (at least capital used directly by workers) are typically relatively small (although these assets can be significant in the lives of the workers who must purchase and maintain them).

4. The entity organising the work is distinct from the end-user or final consumer of the output, implying a triangular relationship between the producer, the end-user and the intermediary.

5. Some form of digital intermediation is utilised to commission the work, supervise it, deliver it to the final customer, and facilitate payment. (2017, p. 384)

The rapid emergence of these platforms has led to concerns that they will undermine the standard model of full-time, permanent employment, with its associated entitlements and legal protections. Information on the extent of 'gig' work is limited. Available research tends to find that 'gig' work has grown over the past two decades, but still remains a relatively small part of the overall labour force.

Technology-led changes to work arrangements do not inevitably mean more outsourcing or gig-style labour. Tirole (2017, p. 419) cited the case of truckers in the United States, who are typically independent contractors who own their own trucks because of "moral hazard" problems, that is, "an employer needs to worry about the driver not being careful with the vehicle, whereas the independent trucker has every incentive to take good care of it". Tirole (2017) noted that computerization can alleviate this problem, allowing companies to monitor drivers using onboard computers, and reducing barriers to their hiring drivers as salaried employees.

Such technological developments, however, may increase the ability of employers to control their staff, and reduce workers' autonomy. One recent example is a bracelet developed by Amazon for its warehouse staff that can "precisely track where warehouse employees are placing their hands and use vibrations to nudge them in a different direction" (Solon 2018).

Technological change leads to the reallocation of labour

Technological change brings about a process of "creative destruction" – the failure of some firms and the disappearance of some goods and services, as alternatives emerge that are cheaper, more effective or preferred by consumers for some other reason. Where firms fail, their employees need to find work elsewhere. Technological change often involves labour displacement. But even in the normal course of events, firms are constantly being born, grow and die. Meehan and Zheng (2015) refer to these dynamics as a "perpetual motion machine". When firms shrink and die, jobs are destroyed but they also give way to new firms and new jobs.

Moreover, every year thousands of New Zealanders move jobs in search of better opportunities and more suitable matches to their skills, interests and circumstances. Looking at job mobility in the early 2000s, Maloney (2007, p. 301) found that:

> [b]etween 7.8 and 9.0 per cent of [New Zealand] workers as of March in each year had held their jobs for less than three months. Just under one-third of workers had been in their jobs for less than one year, and nearly one-half had been in their jobs for less than two years.

The rate of these job-to-job transitions tends to fall as people age. And overall rates have fallen across the developed world (including in New Zealand) following the global financial crisis (Haltiwanger, Hyatt and McEntarfer 2015; Maré 2018).

Technological change benefits many, but not all

Technological change can have a hugely positive impact on the wellbeing of New Zealanders. The development and adoption of technologies is a fundamental driver of productivity growth, which in turn can lead to higher wages and living standards. But the benefits from technology are not necessarily shared evenly throughout society. For some, technological change can be disruptive and make them worse off.

An obvious example of people who are vulnerable to technological change are those who are displaced from their job due to automation. For instance, many New Zealanders, particularly in low to medium skill occupations, involuntarily lost their jobs during the past few decades in part because of advances in technology. Workers who get made redundant may struggle to cope mentally and financially and face diminished future job prospects and earnings.

But technological change can also affect workers and work in other ways. Examples include people who take time out of the workforce but struggle to re-gain employment as the types of skills in demand have changed, or those who invest in learning the skills for a profession but find it difficult to gain a job because the demand for that profession has diminished.

The impact of technological change can also differ across skill levels …

By changing the demand for different types of skills and jobs, some types of technological change tend to increase income inequality. Autor (2019) concluded that in the United States the changes "in the nature of work – many of which are technological in origin – have been more disruptive and less beneficial for non-college than college workers." Since 1970, the average weekly earnings for US workers with graduate degrees rose markedly, while earnings for high school graduates or drop-outs stayed relatively constant in real terms. And the share of middle-skill jobs – production, clerical, administrative and sales jobs – saw a dramatic decline. This was accompanied by a significant increase in the share of low-skill jobs. In New Zealand, despite a rise in demand for high-skilled workers (relative to other workers), wage growth over the past thirty years seems to have been more evenly distributed across skill levels compared with the United States. The median wage for a university graduate has been rising slightly more slowly, in percentage terms, compared with workers without a degree (Ministry of Education 2018).

Technological improvements that reduce the costs of finding the right people for a job (eg, by providing platforms for potential workers and employers to become aware of each other, or through the use of computer programs to screen job applicants), could also affect income inequality. While better matching between workers and firms is beneficial for those involved, it could see larger income disparities open up between 'superstar' firms and workers and the rest,

and between large cities and regional areas (Autor 2019; Card, Heining and Kline 2013). Conversely, technology that complements labour may have negative impacts in future for some higher-skilled jobs, especially where it lowers the barriers to entry into scarce and highly esteemed roles (Dellot, Mason and Wallace-Stephens 2019).

… and across different locations

Households and firms may experience differing impacts from technological change depending on where they are located. For example, workers and firms in smaller, more remote towns may find it more difficult to adjust to technological change (eg, by workers re-training or workers and firms relocating). Studying the impacts of two freezing works closures in the 1980s, Grimes and Young (2009) found that the unemployment effects of the closure on Whakatu were mainly temporary, reflecting its proximity to a larger city (Hastings). By contrast, the isolated town of Patea experienced a more lasting employment shock, with an overall loss of workers and increase in the number of people not in the labour force. That said, workers in cities are not immune to disruption – the 'hollowing out' of middle skill jobs and rise in low skill work in the United States has occurred much more acutely in denser urban areas compared with smaller towns (Autor 2019).

Technology-driven falls in the costs of transporting goods and services to customers could result in more centralised production of some goods and services. This could lead to fewer firms and fewer jobs being available in smaller cities and regional centres. Alternatively, lower transport and communication costs could result in some redistribution of work away from larger cities to smaller and regional areas. In the recent past, New Zealand has seen a shift of many economic activities out of smaller centres (Coleman and Zheng 2019) and there has been little change in the share of people working remotely or from home.

The impacts of technology depend on choices and capabilities

Technology is not an external force that hits society and the economy. The speed and extent to which technology is adopted and changes existing production processes depends on investment decisions taken by firms. This, in turn, depends on the capabilities of firms and the nature of the business environment; both of which are affected by government policy settings.

Firms that are willing to innovate or operate in a competitive environment are more likely to create or take up new technologies. Firms with strong management capabilities are more likely to effectively implement those technologies, respond effectively to competition, achieve productivity gains and use the skills of their workforces. Conversely, less-capable firms may be late to identify emerging technological competition or respond abruptly, with potentially negative impacts for themselves and their workers.

Firm capability levels, the business environment and government policies that affect these are therefore relevant to how technology affects the future of work. Chapter 6 explores these issues in more detail.

3 Looking to the future

The TOR ask the Commission to consider the likely future impacts of technological change and disruption on the future of work, the workforce, labour markets, productivity and wellbeing.

Predicting the impact of technology on the future of work

Past predictions of technological impacts

Predictions that technology might take away jobs are not new. Aristotle mused in 350 BC that if "the shuttle would weave and the plectrum touch the lyre without a hand to guide them, chief workmen would not want servants, nor masters slaves". And in 1978, the Australian historian Ian Turner predicted that the world was about to enter a period of significant change and that at least a quarter of the Australian workforce would be replaced by machines over the following decade (Borland and Coelli 2017).

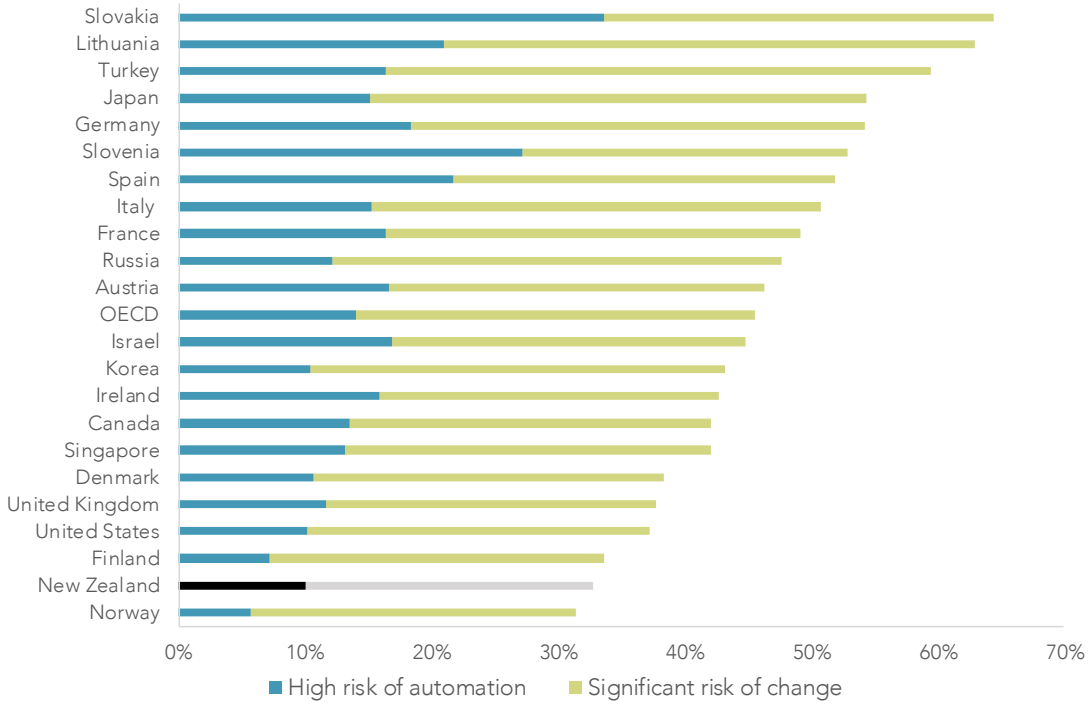
More recently, due to a growing concern about the potential impacts of emerging technologies (eg, artificial intelligence, machine learning and big data) on the labour market, several studies have emerged that try to forecast these future impacts. One of the most prominent was conducted by Frey and Osborne (2013), who estimated that about 47% of total employment in the United States was at high risk of automation and that those jobs were expected to be "automated relatively soon, perhaps over the next decade or two" (p. 44).

Replications of Frey and Osborne's methodology in the New Zealand context produced similar predictions, with 46% of work deemed at high risk of automation (Kubiak and Drew 2015). The categories of employment with the greatest risk of automation (with over 70% of jobs at high risk) were labourers, machinery operators and drivers, and clerical and administrative workers.

More recent analysis by Nedelkoska and Quintini (2018) (Figure 3.1) indicated a small share of jobs in New Zealand were susceptible to automation, relative to other countries. An explanation is that New Zealand experienced a sharp rise in occupations that are less susceptible to automation, such as professional occupations (since the early 1990s) and managerial occupations (since 2010). Countries with a higher risk of job automation tend to have a relatively larger share of jobs in manufacturing.

Predictions, like any other analysis, entails making assumptions. These could be over-simplistic or incorrect. For example, critiques of Frey and Osborne's studies have highlighted how focusing on whole occupations rather than tasks may overplay the potential threat from automation. Using a task-based rather than occupation-based approach, Arntz, Gregory and Zierahn (2016) found that in the United States only 9% of jobs face a high risk of automation. Others have argued that predictions of technology displacing occupations or tasks underestimate the extent to which the set of tasks that a worker carries out are complementary (eg, Gorlich 2010).

Figure 3.1 Share of jobs at risk of automation or significant change, selected OECD countries (2016)



Source: Nedelkoska & Quintini (2018).

Note: High risk – more than 70% probability of automation; risk of significant change – between 50 and 70% probability.

Recent New Zealand data does not suggest increasing disruption …

While technological change has impacts (and can be disruptive) for individual workers and firms, New Zealand's relatively low unemployment rate, frequent reports of labour shortages and growing labour market participation rates suggest that the overall availability of work is not a serious issue at present – although not all see the available work options as attractive in terms of pay and conditions. Available data on the share of non-permanent work (eg, gig work) does not show a growing trend (Maddock and Genet 2019).

This is not to say that the current situation will continue, nor that emerging (and future) technologies will not have disruptive impacts on the labour market as they are adopted. As discussed in Chapter 2, newer technologies, such as artificial intelligence and machine learning, may have a more dominant labour-replacing effect than earlier technologies, and result in net job losses. They may also disrupt existing work arrangements in unprecedented ways.

… and the future adoption and impacts of technology are uncertain

Anticipating the adoption of technology requires much more than an understanding of its technical viability. It also requires knowledge of the decision-making processes of firms and how and when they choose to implement new technologies. Successfully adopting new technologies often requires firms to make complementary changes to business process, skills and access to capital (Bloom, Sadun and Van Reenen 2012; Brynjolfsson and Hitt 2000; Gali, Gretton and

Parham 2004; Pilat 2004). The process of technological adoption and its subsequent flow-on effects for workers can take many years.

Box 4 describes how the pace of technological change can be very difficult to pin down in advance, using the example of driverless vehicles.

Box 4 **Predicting the uptake of driverless vehicles**

In 2004, researchers concluded driving in traffic would remain a human task for the foreseeable future (Brynjolfsson and McAfee 2014). Ten years later, Brynjolfsson and McAfee (2014, p. 14) suggested that self-driving cars had gone from "being the stuff of science fiction to on-the-road reality in a few short years". But as at 2019 commentators are reporting that progress in the development of fully autonomous vehicles is taking longer than previously thought, noting that the "optimism that surrounded driverless cars only a few years ago has been tempered by a slew of persistent technological challenges and big questions about near-term business models" (Naughton 2019).

The impact of other factors on the future of work is uncertain

Technological change is just one of the factors that will affect the future of work. Others include:

- *Net migration* which directly affects labour supply. Government places few limits on the free movement of New Zealanders into and out of New Zealand. However, immigration policy can affect the demographic profile of the country and its skills mix, and this aspect of immigration policy is within the scope of this inquiry.
- *Natural demographic change and changing preferences* for work and leisure will also affect labour supply but are largely outside the control of government policy.
- *Responses to climate change* by households and firms. Responses are likely to be heavily influenced by government climate change policy and goals. Policies are likely to affect the adoption of certain technologies, employment in some sectors of the economy, and travel for work. Specific technologies, and government climate change policies, are outside the scope of this inquiry.
- *Changing opportunities for, and barriers to, global trade* will likely affect the opportunities for business in New Zealand and thus the amount and type of work available. Trade policy is outside the scope of this inquiry.
- *Variation in the business cycle* affects both the rate of technology adoption and available work, but business cycles are not a specific focus of this inquiry.

These factors have their own uncertainties. They will interact with technological change to determine the actual future of work experienced by New Zealanders.

Studies of the possible effects of technology change on labour markets to date have mostly used US data. This issues paper cites many such studies, but the Commission is mindful that they may not generalise well to other countries. New Zealand is a small country, distant from its trading partners but with relatively open borders. Though innovative in some areas, it is more of a technology taker than a technology leader (APC & NZPC, 2019). It currently has low

unemployment and high labour market participation but is suffering from an extended period of low productivity growth (Conway 2018). This context is important: it should not be assumed that what is happening or predicted to happen in other countries also applies to New Zealand. Nor should it be presumed that a policy prescription designed for another country would be ideal, or even positive, should it be adopted here.

Scenarios are a useful tool for dealing with uncertainty

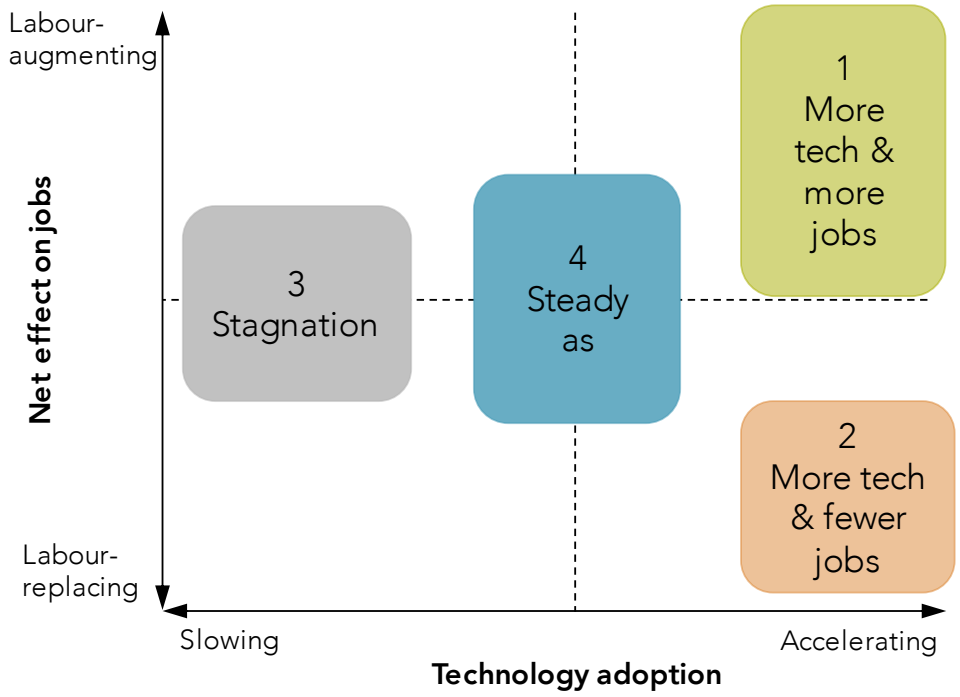
The Commission proposes four scenarios against which policies and institutions can be examined for their suitability and effectiveness. Scenarios are useful for laying out the possible choices that individuals, firms and governments may face in the future. They can illustrate which policy responses can be beneficial and improve outcomes under all scenarios; and which can be beneficial under some scenarios and detrimental under others.

Scenarios are a practical tool for dealing with uncertainty. They are most useful when they vary the drivers of change that are most uncertain. In preliminary analysis, the two drivers that best fit these criteria are:

- the rate of adoption of new technology; and
- its net effect on jobs – the degree to which the technology adopted is, overall, labour augmenting or labour replacing.

Figure 3.2 depicts these drivers and the four scenarios in relation to each other.

Figure 3.2 Drivers of the four scenarios



Notes:

1. The dotted lines describe the present day, and the steady as scenario covers the range of variation over the past one-to-two decades. The other scenarios thus fall outside recent experience with technology adoption.

The four scenarios

This section explains how the drivers interact to shape each scenario, and some of the expected consequences. In particular, it examines likely consequential changes of capital and labour productivity, wages, unemployment, income inequality and, more speculatively, working arrangements. Each scenario is described relative to average conditions in the present day in New Zealand.

Scenario 1: More tech & more jobs

Technology adoption accelerates in this scenario, and the technologies adopted create more jobs than they replace.

Both capital and labour productivity rise in this scenario, perhaps substantially. Capital productivity rises because the quality-adjusted price of technology falls (which is what drives accelerating adoption), and because firms only adopt those technologies that they expect will improve their productivity. Labour productivity rises because to extract those productivity improvements firms also need skilled and specialised labour.

Such an economy will tend towards high levels of employment. But one concern is that disparities in wage incomes may increase. Low-skilled labour may attract low or stagnant wages while the wages of those with skills in demand may soar. On the plus side, in such an economy there are more resources, in total, to enable redistribution of the benefits.

Higher levels of job churn are likely in such a labour market. This might lead to increased demand for mid-career retraining. Jobs likely to be lost are those that are routine, and thus more amenable to automation. Job gains will be those that are more complex, deal with unusual or unpredictable situations, or require essentially human elements such as judgement and compassion.

There will likely be greater demand for education and training, including from displaced workers and those in employment, and a greater need for flexible delivery options for training. More frequent and widespread displacement may create financial pressure for affected households, increasing calls for wider income support measures, including for those undertaking retraining.

Scenario 2: More tech & fewer jobs

This scenario, in common with the More tech & more jobs scenario, is driven by accelerating technology adoption. However, it differs in that the technology adopted is, overall, labour-replacing.

Capital productivity rises substantially in this scenario, as firms increasingly adopt productivity-enhancing technologies. Labour productivity might also rise, as lower-skilled roles are increasingly automated.

An expected consequence of this combination of drivers is widespread unemployment. While workers losing jobs would contribute to job churn, overall job scarcity might encourage those with jobs to hold onto them for longer. Average wages might fall over time as labour supply would exceed available jobs. Wage inequality for those still in employment might fall as a consequence. However, income differences between the employed and unemployed could drive an increase in overall rates of inequality.

With higher rates of unemployment, a much larger share of households will face financial pressures, and there may be calls for more generous income support. There may also be calls for:

- direct taxation of technology (sometimes referred to as 'robot taxes'), to fund income support programmes and other interventions, and to discourage the replacement of labour;
- increased regulation of technology, to limit its introduction and spread;
- greater sharing of existing jobs (eg, through voluntary arrangements or compulsory measures such as maximum working hours rules); and
- increased employment protection for those in work.

Scenario 3: Stagnation

In this scenario, the pace of technological adoption slows. This could be due to declining innovation, as technological bottlenecks prove harder to overcome than expected. Alternatively, slower change could occur as technology adoption by firms slows – perhaps because newer technologies are less productivity enhancing for firms than those of the past (Gordon 2014, 2018).

In this scenario, there will be less change in the volume, churn and nature of work, and income and productivity growth will slow. There could be reduced opportunities for people to find jobs that are well matched with their skills, preferences and circumstances. Slower technological change may prompt calls for more government intervention to encourage firms to undertake research and development (R&D) and innovate.

Scenario 4: Steady as

In this scenario, the technological drivers of labour market change over the next one-to-two decades stay within the bounds of New Zealand experience over the past one-to-two decades.

This future offers ongoing change, but the rate of that change is roughly that which New Zealanders are familiar with. The past two decades introduced technology including the smartphone, eCommerce and social media. No doubt the near future will offer further innovations.

This scenario includes the continuation of slow productivity growth and generally slow technology adoption by New Zealand firms (though consumer technology adoption may stay high).

This scenario is compatible with full employment and stable levels of income inequality. Actual outcomes will vary, as other drivers of labour market change – such as variation in the business cycle or demographic change – are likely to predominate.

Q1 **Are the scenarios developed by the Commission useful for considering the future labour market effects of technological change? How could they be improved?**

Q2 **What other consequences might be expected under each scenario?**

How might the impact of each scenario vary for different groups of people?

The Commission is interested in how the impacts for each scenario might vary across different groups in society. For example:

- Are there specific groups that might be most susceptible to job loss under the More tech & fewer jobs scenario?
- Are there groups of people that stand to benefit under each future scenario? For example, the More tech & more jobs scenario might provide new employment opportunities for older people and those with disabilities.
- In the low-employment scenarios (More tech & fewer jobs and Stagnation) would unemployment be concentrated in particular locations?

Where future scenarios create obstacles or advantages for particular groups, the Commission is interested in what, if any, specific forms of support should be considered.

Q3 **How might the impacts of each scenario vary across different groups in society or across different locations in New Zealand?**

Changing the nature of work

Technology adoption may lead to changes to working arrangements that do not link specifically to these scenarios.

Advances in technology could enable more jobs to be 'unbundled' into specific tasks that can be bought from independent contractors. This could mean that a much smaller share of labour is supplied through standard, permanent employment in any of the future scenarios. Those without standard employment may need to make their own arrangements for parental leave and holidays and juggle multiple contracts to make ends meet. For some people – especially those with skills in high demand – a growth in freelance and independent work may bring greater choice and flexibility, and high incomes. Others, however, may find things difficult, especially if they have little bargaining power or other ability to affect their wages. They may also struggle to make financial provision for their retirement or emergencies.

Greater reliance on independent work and multiple, individual contracts may make it difficult for people to demonstrate their eligibility for income support. The need to maintain a constant flow of work may also make it harder for some freelancers to retrain or upgrade their skills.

Keeping options open

The most suitable approach to addressing a public policy problem differs depending on how much is known about the future.

For a reasonably certain future, it makes sense to pursue a well-formulated plan with explicit goals, scheduled actions, clear assignment of responsibility, risk mitigation, cost-benefit analysis and stakeholder support.

But dealing with an uncertain future calls for a different approach, characterised by keeping options open, collecting and monitoring information, engaging with stakeholders, delaying difficult-to-reverse decisions, real-options analysis, building flexible institutions and taking action just-in-time.

The Commission's initial view is that the second approach is better suited to the subject of this inquiry. This leads to further questions, including what changes or impacts should be monitored, who should be responsible for monitoring, and what are the triggers for action?

Q4 **How should government monitor the impacts of technological change on the labour market?**

Policy goals for wellbeing and the future of work

Given the dynamic nature of the labour market and the difficulty of predicting how technological change will affect employment, what labour market goals should government pursue for the wellbeing of New Zealanders? This section posits six broad goals and seeks submitters' views on their relative importance and priority.

Resilience, adaptability and smooth transitions for workers

Policy areas that may assist in building resilience and preparing for change include:

- a strong educational base, as it matters for the ability to gain new skills in future;
- a wide range of learning options that reflect the needs of a diverse workforce; and
- labour market policy and interventions geared toward supporting affected people to find work that suits their skills and circumstances and toward reducing the harms caused by displacement.

Protections against abuse and power imbalances

Legal protections serve two purposes. The first purpose is to reflect community expectations. As the Australian Productivity Commission (2015) commented, labour "is not just an ordinary input. There are ethical and community norms about the way in which a country treats its employees" (p. 2). Protections for workers set standards for appropriate conduct.

The second purpose is to offset power imbalances. In the absence of regulation, employees may lack the bargaining power to gain desirable terms and conditions or may be exposed to onerous or dangerous working environments.

Flexible working conditions

Policies that allow for employers and employee to negotiate flexible working hours and conditions can lead to better outcomes for both, and open up work opportunities for more people, including some currently unable to participate in the labour market.

Low barriers to participation and mobility

Labour market and other policies can be designed to minimise barriers to people shifting jobs and to new entrants (or re-entrants) seeking work. This would most likely benefit those who are young, lack previous experience or have taken time out of the workforce. The ability of young people to enter the labour force, and the job options available to them, can have significant long-term effects. The OECD (2015b) concluded that, across the developed world, "[l]ife-term earnings differentials are largely determined in the first ten years of workers' careers" (p. 169).

Barriers to participation and mobility include:

- regulatory barriers that discourage employers from taking on additional workers;
- discrimination by employers against certain groups of people;
- lack of provision for people to take time out of work (eg, for raising children); and
- impediments to workers changing where they live (eg, housing costs); and
- entry barriers to occupations (eg, barriers to reskilling and occupational regulation that is unduly restrictive).

A dynamic and productive economy that rewards innovation

Policies that facilitate a dynamic economy can contribute to the wellbeing of New Zealanders through increasing productivity, creating new jobs and by further contributing to the tax base that funds wider social policies.

Incomes that allow all to participate in society

If the future involves more frequent and widespread career changes, policies could be geared towards greater income support for individuals and families facing those changes. Alternatively, for a future that involves large-scale substitution of labour by technology, policies such as a "robot tax" to fund income support have been mooted (Porter 2019).

Q5 **What policy objectives should governments pursue for the labour market of the future?**

Q6 **What are the potential tensions between different policy goals? How might such tensions be best addressed?**

4 Labour market policies and institutions

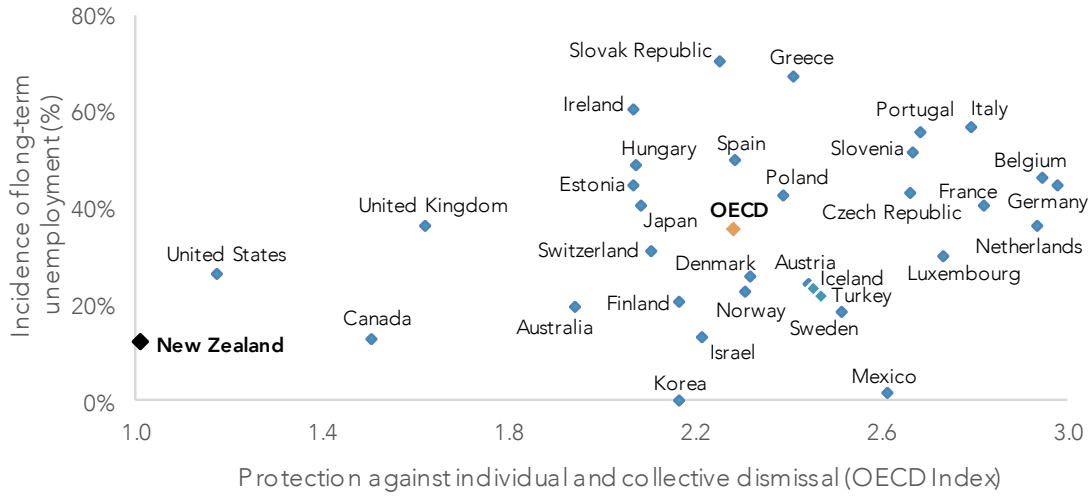
Labour market policies and institutions affect the ease with which people can gain and re-gain employment, the incentives for firms to hire people, and the impacts of job loss on individual and household wellbeing. This section describes some of New Zealand's current labour market policies, and policies common in other countries, and poses questions about their fitness for future scenarios of technological change.

Employment protections

Low levels of employment protection and high-rates of re-employment

OECD data suggests that New Zealand's labour market has comparatively few barriers to either hiring or firing workers. And while this offers relatively weak employment protections, it seems to help unemployed New Zealanders gain employment relatively quickly (Figure 4.1). New Zealand has one of the highest re-employment rates (the share of unemployed people that find work each quarter) among developed countries and low levels of long-term unemployment (OECD 2017a).

Figure 4.1 Strictness of employment protection vs long-term unemployment, 2013



Source: OECD (2017a).

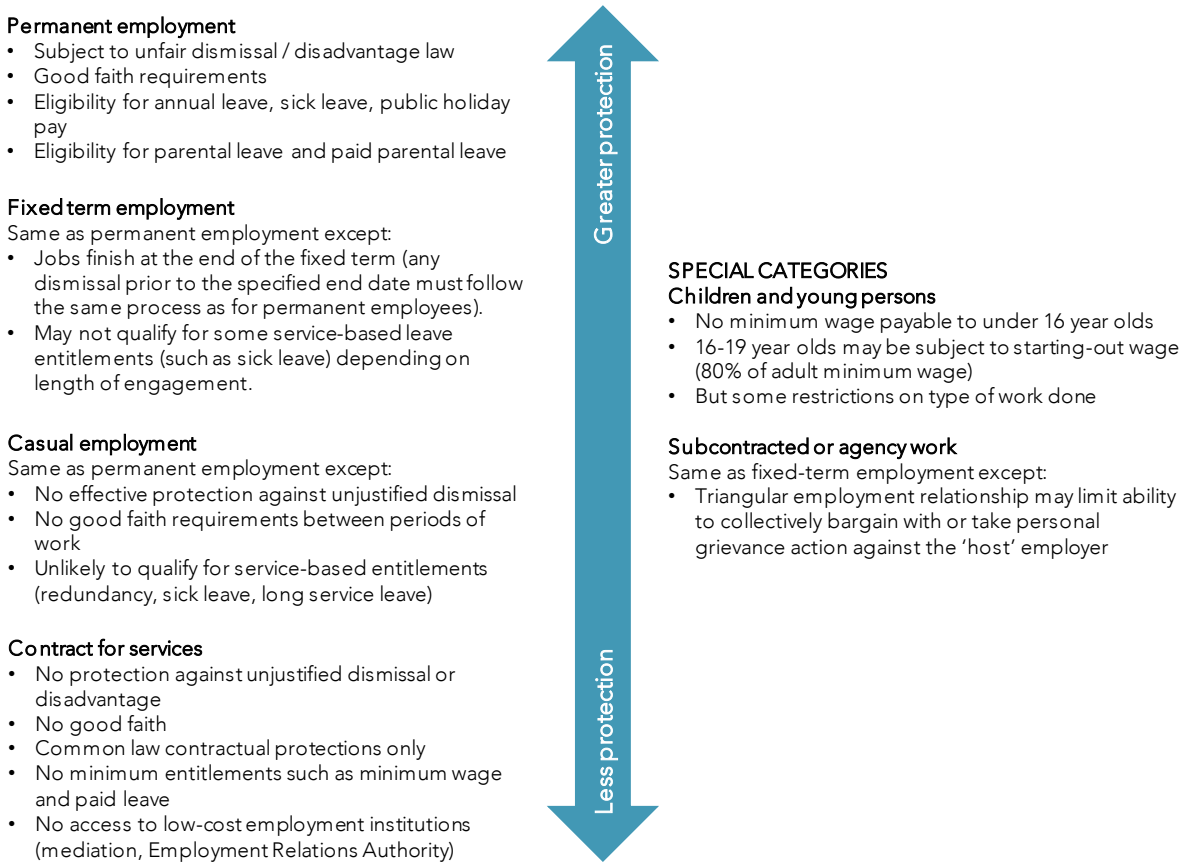
Notes:

1. The vertical axis refers to the share of unemployed who have been unemployed for 12 months or longer.
2. The OECD's employment protection index measure how stringently national laws limit worker dismissals on a seven-point scale, with zero indicating the least restrictive environment and six indicating the most restrictive.

People in permanent employment have a wider range of legal protections and rights than other types of workers in New Zealand. Figure 4.2 summarises some of these differences. Additionally, firms with fewer than 20 employees can 'trial' new employees for a period of up to 90 days,

during which they can dismiss them without having to provide a reason. Research focused on the previous version of the 90-day trial policy that included larger firms, found that the policy had not achieved its objective of encouraging firms to take on more employees (Chappell and Sin 2016).

Figure 4.2 Legal protections for different types of workers in New Zealand



Source: New Zealand Council of Trade Unions (2013) and Ministry of Business, Innovation and Employment (n.d.).

Legal protections in a future with large changes in work arrangements

Lower levels of legal protections for 'contract for service' arrangements may create challenges in future, if technological changes encourage firms to make greater use of independent contractor labour. The legal status and protection of gig workers has already been the subject of considerable debate. For some of these workers, increasing employment protection could come at the expense of flexibility benefits (Box 5).

Box 5 Trading off between flexibility and protection – the case of Uber

In New Zealand, workers are classified as either an employee or an independent contractor (ie, self-employed). Uber drivers are currently the latter classification. As such, they have minimal legal protections but have autonomy in choosing if, when and where they work (Hall and Fussey 2018). The extent that Uber can offer normal protections (eg, sick leave) to drivers without triggering a reclassification of their employment status is unclear.

While minimal protections risk the exploitation of workers, they also can provide Uber drivers with greater flexibility. A recent study of Uber drivers in Australia showed differing preferences for the trade-off between protections and flexibility:

> Uber's survey of driver-partners showed that most driver-partners (61%) believe the flexibility to determine their own working hours is more important than having guaranteed pay and entitlements. However, there is also a cohort of driver-partners (39%) who place less value on flexibility relative to those benefits and protections. These driver-partners still value flexibility but they would prefer not to have to forego the income security that comes through benefits and protections (AlphaBeta 2019, p. 14).

There are various ways in which employment protection policy could respond to a growing incidence of independent contract labour.

One option would be to more tightly regulate 'contract for service' models, such as limiting the circumstances in which they can be used or requiring firms to provide more generous terms. Australian employment law prohibits 'sham contracting', which involves employer actions such as misrepresenting an employment relationship as independent contracting and dismissing or threatening to dismiss an employee for the purpose of engaging them as an independent contractor (Australian Productivity Commission 2015). Tighter regulation could prevent firms from shifting work from standard employment contracts to contract models, but in doing so, could reduce the overall supply of employment and make some innovative business models unviable.

Another option would be to create new legal categories suited to gig workers and contractors. The United Kingdom has established a new legal category of worker, between 'employee' and independent contractor. This intermediate category of 'worker' provides additional protections above those offered to contractors (eg, minimum wage, sick leave), but fewer than are available to employees (eg, no redundancy or unfair dismissal rights). In a landmark ruling in 2017, a UK employment tribunal concluded that Uber drivers were 'workers' rather than independent contractors. This judgment is currently being appealed.

This approach may create incentives for firms to shift from standard employment models to less-protected alternatives. It may also create legal uncertainty at the boundaries between the categories and be difficult to enforce. The courts in New Zealand have already indicated a willingness to look through contracting arrangements to protect vulnerable workers, within the current 'binary' model. For example, in *Prasad v LSG Sky Chiefs New Zealand Ltd* [2017] NZEmpC 150, the Employment Court decided that the independent contractors hired by labour company Solutions Personnel Ltd were employees of the client LSG Sky Chefs.

An alternative and more far-reaching approach would be to link protections and entitlements to *work* rather than *employment*, or reconsider the concept of an 'employer'.

- Citing the example of Australia's health and safety regime (which regulates regardless of the form of the working relationship), Stewart and Stanford (2017) suggested abandoning "employment status entirely as the trigger for regulating work, and apply[ing] appropriate protections to anyone performing 'work'" (p. 430). This would entail moving to a 'law of work' or regulation of 'personal work contracts' but could also require redesign of existing rights

and protections (eg, minimum wage, paid leave and superannuation contributions) to fit different types of work.

- Prassl and Risak (2016) noted that law in many countries has come to recognise five distinct functions of an employer – inception and termination of the employment relationship, receiving labour and its fruits, providing work and pay, managing the firm's 'internal market', and managing the firm's 'external market'. Some internet-based platforms fulfil all five functions, while others only carry out some. The authors argued that more clearly distinguishing these functions in employment law could provide greater clarity and certainty about firm obligations and worker rights in different work arrangements.

Q7 **For each of the future scenarios, what policies would provide the best mix of worker protections and low barriers to workforce participation?**

Q8 **What are the likely consequences of a large-scale increase in the proportion of independent contractors in the workforce? How should government respond to any negative consequences?**

In addition to the potential for greater numbers of workers to be employed in gig work or as independent contractors, the Commission is also interested in submitters' views about other new work arrangements that are emerging, or that might emerge in the near future. For example, as noted above, one emerging trend in some workplaces is that advances in technology are increasing the ability of employers to monitor and control their staff or contractors. This may have positive impacts for firm profitability or productivity, and provide added protections for some employees (eg, body cameras for police officers). However, it could also have negative implications for workers' sense of autonomy and wellbeing. The application of artificial intelligence to employment (eg, screening of job applications) may also require closer regulatory scrutiny in future to ensure such practices are not discriminatory.

Q9 **What types of worker protections might be required where technology provides employers with a growing ability to monitor staff or discriminate against some people?**

Q10 **Apart from a potential increase in gig work, what other new work arrangements are emerging, or are likely to emerge in the near-future? What are the implications of these work arrangements, and what response from government might be required?**

Wage protections

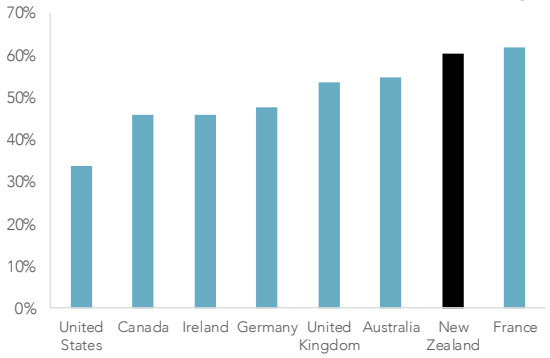
New Zealand has three minimum wage rates – the adult rate, starting out rate and training rate. The adult rate as a percentage of the median full-time wage is relatively high in international comparison (Figure 4.3). Due to regular increases in the minimum wage and low inflation, the real purchasing power of the minimum wage has steadily risen since the early 2000s. The

Government has announced its intention to progressively increase the adult minimum wage to $20 per hour by 2021. As of April 2019, the rate is $17.70 per hour.

A longstanding view in economics was that minimum wages reduced aggregate employment, especially for younger and lower-skilled workers (Brown, Gilroy and Kohen 1982; Stigler 1946). However, more recent research has challenged some of these conclusions, with several studies finding little to no impact on overall employment (Allegretto, Dube and Reich 2011; Card and Krueger 2016; Dube, Lester and Reich 2010).

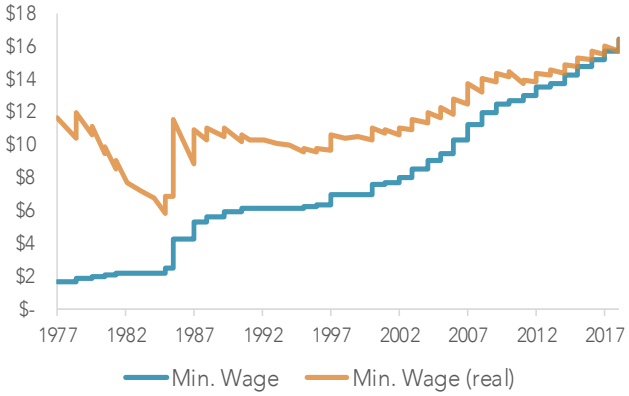
A recent development in the policy debate has been a concern that minimum wages increases might encourage firms to automate lower-skill jobs at a faster rate. Lordan and Neumark (2017) found that minimum wage increases in the United States over 1980–2015 significantly reduced the share of automatable or routine employment carried out by low-skilled workers, particularly in manufacturing and for older workers.

Figure 4.3 Minimum wage as a ratio of median full-time wages



Source: OECD (2017c)

Figure 4.4 Adult minimum wage, real and nominal, 1977–2018



Source: NZLII (2019); Stats NZ (2019c)

Q11 **How might minimum wage settings affect incentives on firms to adopt labour-replacing technologies? What changes to minimum wage policy might be appropriate under each of the future scenarios?**

Notice periods

New Zealand employment law does not specify minimum notice periods for terminating jobs. Notice periods are usually specified in employment contracts, but if no provision is made in contract, "reasonable notice" is required. What counts as "reasonable" depends on factors including the reason for the redundancy, length of the employee's tenure, and their seniority (OECD 2017a).

The OECD (2017) has recommended the introduction of minimum statutory notice periods to generate more equality among workers; reduce displacement costs for affected workers and their families; and to improve the ability of workers to prepare. Greater ability to prepare and find alternative employment could be of particular benefit in the More tech & more jobs scenario, where a larger share of the workforce could be expected to experience displacement.

Q12 **What changes might be required to minimum notice periods under each of the future scenarios?**

Income support

Labour market changes, including those resulting from technological change, can lead to negative consequences for people both in and out of the workforce. Income support is an important mechanism for ensuring that these individuals and households are not without adequate means. This section covers income support for people who involuntarily lose their job, and others who are unemployed and seeking employment.

Job loss can have persistent negative impacts for New Zealanders

Although re-employment rates are high in New Zealand, involuntary job loss can still have a high financial cost as well as severe impacts on wider wellbeing, especially for those who experience longer periods of joblessness. The OECD (2017a) noted that the financial costs of involuntary job loss persist even after workers regain employment:

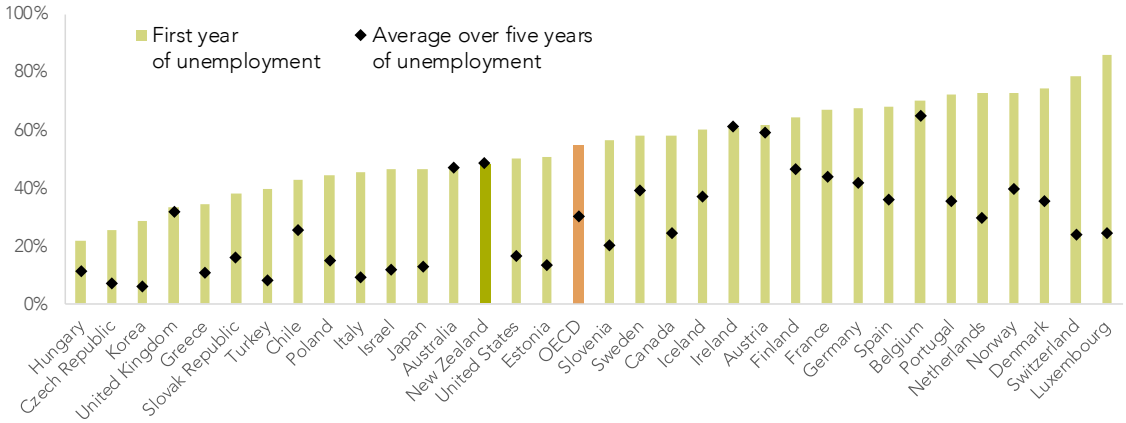
> wage losses for re-employed displaced workers [in New Zealand] reach 12% in the first year after displacement, compared with negligible wage effects in Germany and the United Kingdom and a loss of 6% in the United States and Portugal. (p. 14)

Involuntary job loss also has an impact on future employment. Hyslop and Townsend (2017) matched people who had lost work in New Zealand over 2001–10 with employees that had similar characteristics but did not lose their jobs. They found that displaced workers had an employment rate that was "20–25% lower in the year following displacement and, although their employment gradually improved, was still 8–12% lower five years later" (p. ii).

The current income support system for unemployed people

New Zealand's unemployment assistance is based on means-tested social assistance benefits, which pay a flat rate and do not have a time limit. This is unusual internationally – most OECD countries have a mandatory unemployment insurance (UI) programme, for which benefits are time-limited, linked to previous earnings and are not income or asset tested (Fletcher 2015).

Figure 4.5 Unemployment assistance as a percentage of an average income, 2012



Source: OECD (2015a).

Note: Calculations are based on a 40-year old worker with a long and uninterrupted employment record. Average income includes cash incomes, income taxes and social security contributions paid by employees.

Consequently, New Zealanders who lose their jobs face a sharper financial penalty in the short term than those in many other developed countries (Figure 4.5). Over the long term, however, New Zealand's unemployment assistance is comparatively generous, though most people in New Zealand are not unemployed for longer than one year (Figure 4.1).

Box 6 sets out some common features of unemployment insurance programmes in other OECD countries. The Danish system, in particular, provides generous levels of income support with strict requirements for searching for work, along with relatively loose employment protections (Kahn 2010). This combination of policies is commonly referred to as 'flexicurity'.

Box 6 Common features of unemployment insurance programmes

Contribution- or tenure-based support: to qualify for UI, employees must work for a specified period of time, or make financial contributions toward the scheme, or both. In some schemes, employers pay contributions as well.

Compulsory membership: to avoid problems of adverse selection, employee participation in UI schemes is generally compulsory. However, in some countries, casual employees, part-time workers and the self-employed are not covered or required to join.

Payment linked to previous earnings: in most UI schemes, unemployment payments are linked to previous earning levels, ranging from 40% in Turkey to 90% in Denmark. UI schemes often pay an initial high rate, which then falls to a lower proportion of previous earnings after a set period of time (Fletcher 2015).

Time-limited payments: according to Fletcher, the maximum UI "entitlement periods vary between 5 and 36 months, with most being between 9 and 24 months" (2015, p. 4). Depending on the jurisdiction, individuals who are still unemployed when their UI entitlement ends either fall back on more basic social assistance payments or are left to their own devices.

Payment determined on an individual basis: unlike social assistance benefits, eligibility for UI payments or the level of payments is not affected by the income received by other household members.

Payment linked to work-readiness: to receive UI payments, recipients are typically obliged to actively search for work and accept suitable offers of employment.

Outside of a narrowly defined set of employees[2], there is also no statutory requirement in New Zealand for employers to make redundancy payments to workers who lose their job. Hence, redundancy provisions are mostly a matter of negotiation between employers and employees.

Of the roughly 20% of New Zealand employees covered by collective agreements, the vast majority are entitled to redundancy compensation (OECD 2017a). While information on provisions in individual employment agreements (IEAs) is more limited, research conducted in

[2] Part 6A of the *Employment Relations Act* (ERA) provides additional protections for employees who provide cleaning services, food catering services, and caretaking or laundry services in the education, health and residential care sectors. According to the Act, these workers were selected because restructuring of businesses occurs frequently in their sectors, employee terms and conditions "tend to be undermined" by restructuring, and they have "little bargaining power" (section 69A, ERA 2000).

2008 found that only 20% of staff employed in small to medium-sized enterprises on IEAs were entitled to redundancy compensation (Public Advisory Group on Restructuring and Redundancy 2008). Lower-skilled workers, younger workers and those with shorter tenure periods are less likely to receive redundancy payments, and the median amount paid tends to increase with tenure and seniority (OECD 2017a).

Coverage of income support

The current reliance on means-tested unemployment benefits (and absence of a legal requirement for redundancy compensation) means that many unemployed people may receive little to no income support. For instance, the OECD (2017a) noted that the "majority of displaced workers do not receive or are not covered by welfare benefits in New Zealand" (p. 69). Much of this ineligibility is due to the partners of these workers being employed, though this does not explain all of the coverage gap. Other possible explanations include displaced workers returning to study, poor information on benefit eligibility, under-reporting of benefit receipt in household surveys and the stigma attached to welfare.

While income taxes are levied on each individual worker, access to income benefits (eg, job-seeker benefit) depends on overall household income. This makes it much more difficult for people who are unemployed and have a working partner to access income support. Of the roughly 290 000 recipients of benefits in 2017, only 7.7% were couples. Fletcher (2018) argued that linking benefit eligibility to household incomes has become increasingly out of step with how New Zealanders live and work and an increasing source of problems for those in need of social assistance" (p .2).

It is also not clear whether the eligibility criteria for the income support system is appropriate for people who rely on non-permanent work. The Welfare Expert Advisory Group (2018) argued that "the welfare system assumes a labour market based on a permanent 40 hour a week job. This is outdated in a world where many people have jobs which are part time, casual, seasonal or uncertain" (p. 1). This would become particularly important in a future where there is a significant increase in the share of independent contract-based work.

Q13 **How effective is the income support system in assisting different groups of people? What specific challenges might arise under the future scenarios? What changes to the system might be needed to address these challenges?**

Some policy options for future scenarios

To reduce the impact of displacement for workers, Carey (2017) and the Public Advisory Group on Restructuring and Redundancy (2008) recommended that policy makers in New Zealand consider some form of unemployment insurance (UI). A similar option, recommended by the OECD (2017a) is a levy-based redundancy compensation (LRC) system, where firms would contribute an amount based on their payroll towards a national fund that could be used to compensate workers if they are made redundant. Both approaches would have the advantage of guaranteeing redundancy payments to employees in the case of firm bankruptcy, which may become more common if the rate of technology change accelerates in the future (ie, in the More tech & fewer jobs and More tech & more jobs scenarios).

However, the future viability of these policies would depend on the nature of the labour market.

- If technological progress sees a large share of labour replaced by capital (More tech & fewer jobs scenario), the overall and per-employee cost of a UI or LRC scheme would be high and could act as a further disincentive for firms to hire workers.
- If the size of the 'independent contractor' share of the workforce increases, this would either require some mechanism to collect UI or LRC contributions from contractors (as currently occurs with ACC levies) or would leave a large share of the workforce without coverage.

Additionally, if technological change leads to replacement of labour with capital on a large scale (More tech & fewer jobs scenario), more radical change to the welfare system could be needed. For instance, some have argued for the introduction of a Universal Basic Income (UBI) to assist large numbers of workers displaced by automation in accessing their basic needs (Box 6).

Box 7 **Universal Basic Income**

UBI refers to unconditional payments made to people without means tests or obligations to seek work or carry out other activities. The idea of a UBI is not new – for instance, UK Labour Party member Dennis Milner proposed an unconditional weekly allowance paid to every individual near the end of World War One (Arthur 2016). The Australian Productivity Commission (2016) listed some potential benefits of a UBI:

> - eliminates poverty traps that low income earners may fall into due to the conditions and inflexibility of welfare payments
> - provides persistent and predictable wage support, an arrangement that would suit those involved in the gig economy or other intermittent work
> - has the potential to improve work incentives as it lowers the effective marginal tax rate associated with the loss of welfare payments as wages increase
> - is relatively inexpensive to oversee and administer compared to means-tested programs. (p. 79)

Yet, a comprehensive UBI would also have large fiscal implications (a UBI of $200 a week for each New Zealander aged 18–65 would cost roughly $30 billion per year). Also, its impacts on employment are not clear. Preliminary results from a recent UBI trial in Finland where 2000 unemployed people were given a monthly payment of €560 suggest that "recipients were no better or worse at finding employment than those in the control group" but they also had "significantly fewer problems related to health, stress and ability to concentrate" (Kangas et al. 2019, pp. 29–30).

New Zealand already has a UBI for people aged 65 and over, more commonly known as New Zealand Superannuation. A UBI covering all New Zealand adults could presumably replace some existing forms of income support with the possible benefit of reducing the stigma of receiving those supports. Though, as realistic levels of a UBI are relatively low (ie, probably lower than current levels of job-seeker support or New Zealand Superannuation), many existing welfare recipients would likely need top-up payments from other programmes.

Q14 **What are the advantages and disadvantages of the following policies under each of the future scenarios – universal basic income, unemployment insurance and redundancy compensation schemes? What other income support policies are worth considering?**

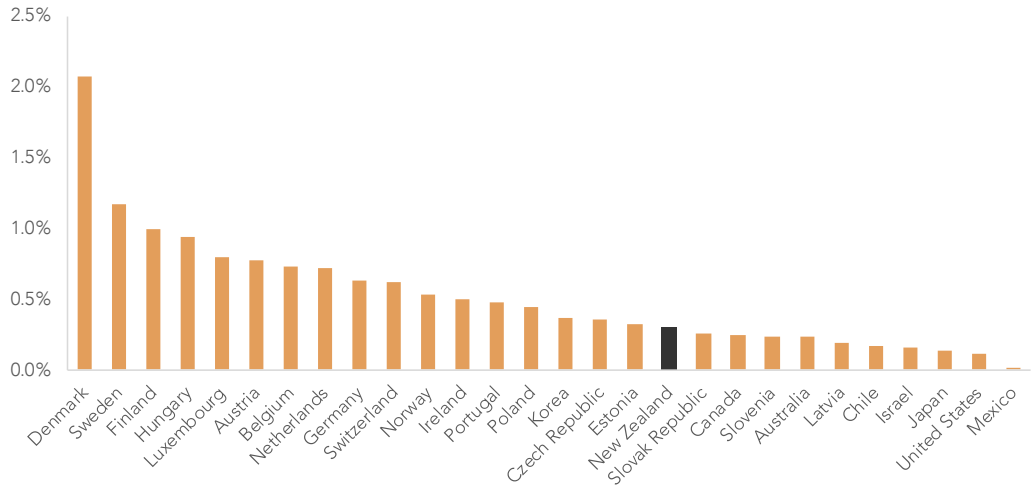
Active labour market policies

The TOR asks the Commission to look at how active labour market policies (ALMPs) can "assist (or hinder) displaced workers to transition to different types of work and work places" (p. 4). The primary aims of ALMPs are assisting people into work and reducing barriers to entering the workforce. Examples include training programmes, wage subsidies and placement services.

Current expenditure on ALMPs is low by international standards …

Public expenditure on ALMPs as a share of gross domestic product (GDP) in New Zealand is comparatively low by OECD standards (Figure 4.6). The resources committed to these programmes have been falling over time "despite a significant increase in the number of participants in active labour market programmes [since the global financial crisis]" (OECD 2017a, p. 16).

Figure 4.6 Public expenditure on ALMPs as a share of GDP, 2016



Source: OECD (2017d).

A high proportion of New Zealand's ALMP spending goes towards training programmes and employment services, compared with other OECD countries. A comparatively small proportion is spent on direct job creation (ie, offering temporary work, often in the public sector, to people who are unemployed) and start-up initiatives.

Most ALMPs in New Zealand are delivered through, or on behalf of, Work and Income – a delivery arm of the Ministry of Social Development (MSD). MSD runs several programmes with industry and employers to help those unemployed to find work, while other projects target specific high-needs groups such as youth, Māori, sole parents or people with health conditions or disabilities. Box 8 describes two examples of current programmes.

Box 8 **Examples of current ALMPs**

- Skills for Industry is one example of the programmes that MSD runs with industry and employers in an effort to find jobs for their clients. MSD states that the programme:

  > allows us to work with employers to address their skill and labour requirements, while maximising outcomes for our clients. Of the 110 clients we contracted to Accor Hotels, 74 percent were off benefit within eight weeks of completing the programme; and of the 90 we contracted to Downer (New Zealand) Ltd, 77 percent were off benefit within eight weeks of completing the programme. (2018, p. 60)

- The $3k to Work scheme offers people on a main benefit (eg, job-seeker benefit) a lump-sum payment of $3000 to support them in moving location for full-time work. In 2015/16, 301 people received grants (MSD 2016). Analysis by Taylor Fry (2017) "found that 68% of grant recipients were still off benefit after four quarters. This is higher than 48% for matched sample of clients with similar backgrounds who did not receive the grant" (p. 4).

… but there are mixed messages about their effectiveness and efficiency

ALMPs differ across jurisdictions, and evaluations have found 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, and 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".
- Crichton and Maré (2013, p. iii) found that wage subsidies led to "significant employment and earning benefits for assisted jobseekers [in New Zealand] over several years". Subsidised workers were "disproportionately hired into expanding firms", although the authors could not determine whether this would have occurred without the subsidy.

Since 2011, MSD has annually evaluated the effectiveness of its employment assistance programmes and case management services, to inform purchase decisions. In its most recent report, the Ministry found that 72% of expenditure on these services in 2016/17 went to programmes rated as "effective or promising" (de Boer and Ku 2019).

The effectiveness of ALMPs could change under future scenarios. Under the More tech & more jobs scenario with greater job churn and changes in the nature of work, ALMPs may be more beneficial, as they can assist unemployed workers in finding, or gaining the necessary skills for, work. In the More tech & fewer jobs scenario, government could consider using ALMPs to encourage or facilitate job sharing (eg, by imposing limits on the number of hours a person works) to maximise opportunities for people to participate in work.

Q15 **How might the effectiveness of active labour market policies change under the future scenarios? What changes would be needed to the design of active labour market policies under each scenario? What other active labour market policies might be needed?**

Occupational regulation

People are more able to adjust to technological disruption and find suitable employment if they are able to change their occupation. In some cases, the design of occupational regulations can influence how easy or difficult it is for workers to make this transition. According to Greenwood and Menclova (2018), 28% of workers' "primary occupations" are affected by occupational regulation in New Zealand (p. 21). This is lower than comparable figures in the United States (35%) but in line with numbers reported for the United Kingdom.

When well-designed and implemented, occupational regulation can serve many beneficial ends, such as incentivising higher-quality service and protecting the public from harm. However, such regulation can create wider economic costs and barriers to entering occupations. An Obama White House policy report (2015) estimated that in the United States, licensing restrictions cost millions of jobs nationwide and raised consumer expenses by over one hundred billion dollars. The report suggested that barriers imposed by licensing can prevent workers from succeeding in the best job for them which makes the labour market less efficient. It also noted that occupational regulation may struggle to keep pace with technology-driven changes to the nature of work and education, such as telework and distance learning.

The Commission has heard that occupational regulation can create employment barriers to people who have had time out of employment. For example, in their submission to the tertiary education inquiry, the New Zealand Union of Students' Associations said that the cost of re-registering as a teacher "represents a real barrier".

> [The] process of becoming re-registered as a teacher following time without a permanent position was a significant cost and 'frankly anti-women'. Teachers whose registration lapses are required to pay $4 000 to undertake a course to be deemed competent. This $4 000 is unable to be funded by the SLS [Student Loan Scheme] as it is not a qualification (sub. DR139, New models of tertiary education, p. 9)

Barriers to entry created by occupational regulation could be particularly problematic in the More tech & more jobs scenario, where there is faster depreciation of human capital and a greater need for people to change occupations mid-career. As technology complements workers in this scenario, the inclusion of provisions for workers to update their skills within occupational regulation would be important. The More tech & fewer jobs scenario, where a greater share of labour tasks are automated, may also invite regulation that specifies who can perform a job (eg, a qualified person, a robot or a lower-skilled person with the aid of technology).

Q16 **Are there particular areas where occupational regulation makes it harder for people to shift jobs or adjust to technological change? Would this change under each of the future scenarios?**

5 Education and skills supply

Whatever the future may hold, the skills of workers and managers are important for employee adaptability, firm productivity and economic growth. Recent experience suggests that ongoing technological change is likely to favour higher-skilled workers and tasks that are not routine or easily automatable (Carey 2017; World Bank 2019). And as digital technology becomes more pervasive in society, having the skills to effectively access, use and create digital content (referred to as 'digital literacy') is assuming increasing importance.

How well are New Zealand's current education and wider labour market policies supporting the acquisition of skills that are needed to succeed in New Zealand's workforce? And how well positioned is the education system to respond to new demands brought about by future technological change and new work environments, or for a future where people seek to develop skills to compete in a world where growth is stagnant?

Outcomes and performance of New Zealand's skills system

Secondary education

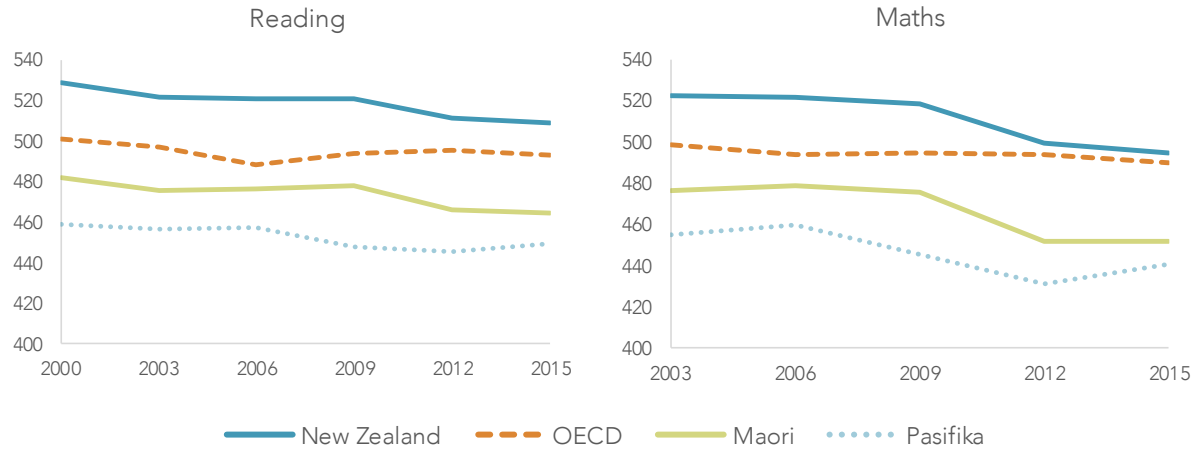
Participation in education among 15 to 19-year-olds is below the OECD average (OECD, 2018). However a relatively large share of young people not in education are employed and the share of 18 to 24 year-olds not in employment, education or training is well below the OECD average (Norgrove and Scott 2017).

In 2016, 83% of 25 to 34-year-olds had attained education equivalent to a National Certificate of Educational Achievement (NCEA) Level 2 qualification or higher. NCEA Level 2 is the New Zealand equivalent of 'upper secondary' attainment, and this is generally considered a minimum level needed to equip citizens and societies to do well. New Zealand is slightly below the OECD average of 85% on this measure. However, attainment rates for 25 to 34-year-olds will not fully reflect recent gains in achievement recorded among school leavers (Norgrove and Scott 2017).

Static or declining achievement in core skills

The competence of 15-year-old New Zealanders on standardised tests of literacy, numeracy (Figure 5.1) and science has declined over time. Although New Zealand's mean scores on the OECD's Programme for International Student Assessment (PISA) tests remain above OECD averages, this gap has closed in recent years. Large differences persist between the mean scores of different groups of students in New Zealand.

Figure 5.1 PISA scores in reading and maths

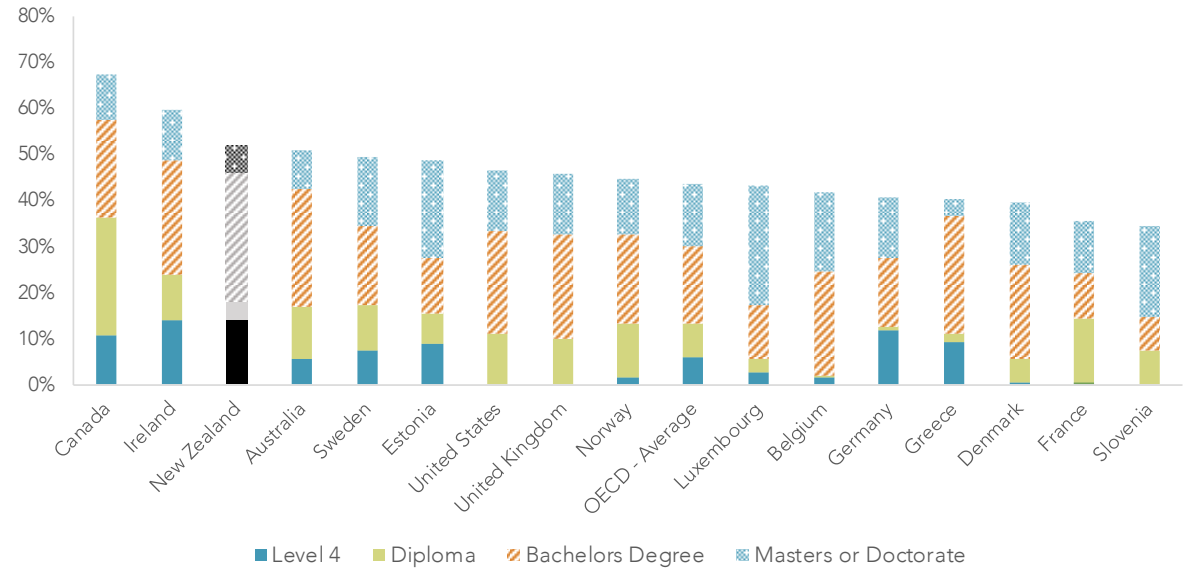


Source: May, Flockton and Kirkham (2016).

Tertiary education

The overall level of tertiary attainment in the New Zealand adult population is high relative to other OECD countries. This is largely due to the relatively high share of the population with a Level 4 tertiary qualification.[3]

Figure 5.2 Tertiary education attainment rates in selected OECD countries, 2016



Source: OECD (2018)].

Note: Qualification groupings are based on the approach used by Norgrove and Scott (2017).

[3] Level 4 qualifications are certificates that typically require one year of full-time study. Graduates are expected to gain broad operational or theoretical knowledge in a field of work or study.

High levels of ongoing learning

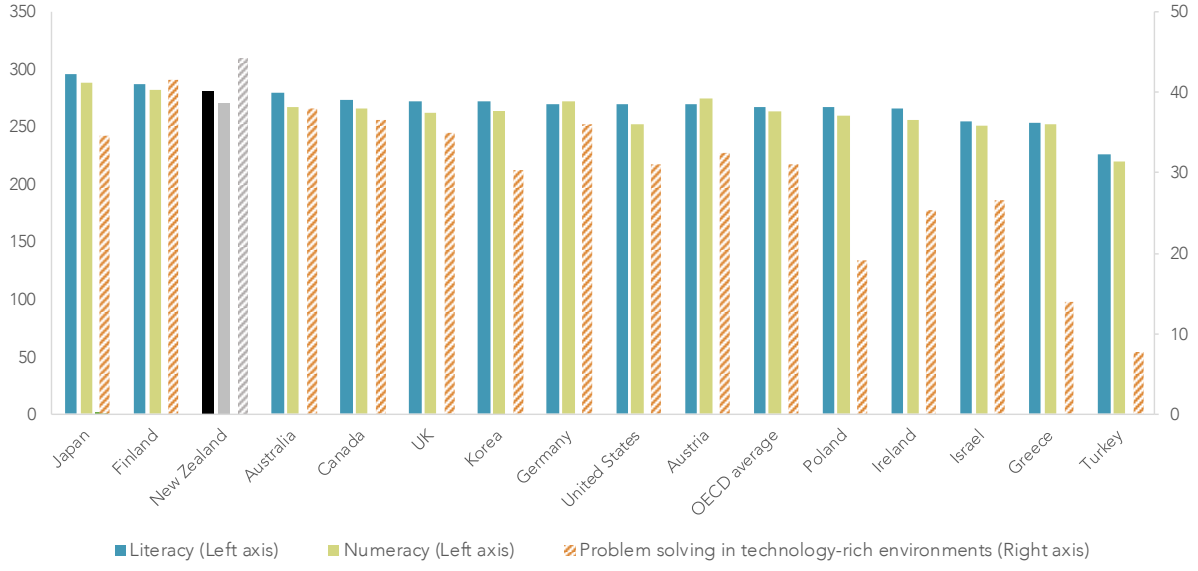
In the past decade, policy settings have oriented the tertiary system toward school leavers studying full-time, and the share of students in this demographic has grown (NZPC 2017). Nevertheless, participation rates among adults are high. In 2015:

- 4% participated in formal education (eg, a programme of study at a university or other formal education institution);
- 50% participated in non-formal education (any sustained education activity outside the above definition of formal education, such as a privately arranged on-the-job training session); and
- 14% participated in both formal and non-formal education (OECD 2017b).

Despite high levels of participation, 38% of adults in New Zealand stated that they wanted to participate in more learning activities but were unable to – much higher than the OECD average of 24%. As with most other OECD countries, the main barrier to further participation in education (raised by 30% of New Zealanders) was being too busy at work. Family responsibilities or child care were also reported as a barrier to further participation with 19% giving this reason compared with the OECD average of 15% (Norgrove and Scott 2017, pp. 34–35).

New Zealand adults also have higher average literacy, numeracy and problem solving skills compared with those in the OECD or other "Anglo" countries (Figure 5.3).

Figure 5.3 Adult proficiency in key information-processing skills selected OECD countries, 2013 and 2015



Source: OECD (2016b).

Note: The figure shows mean proficiency scores of 16–65 year-olds in literacy and numeracy, and the percentage of 16–65 year-olds scoring at Level 2 or 3 in problem solving in technology-rich environments.

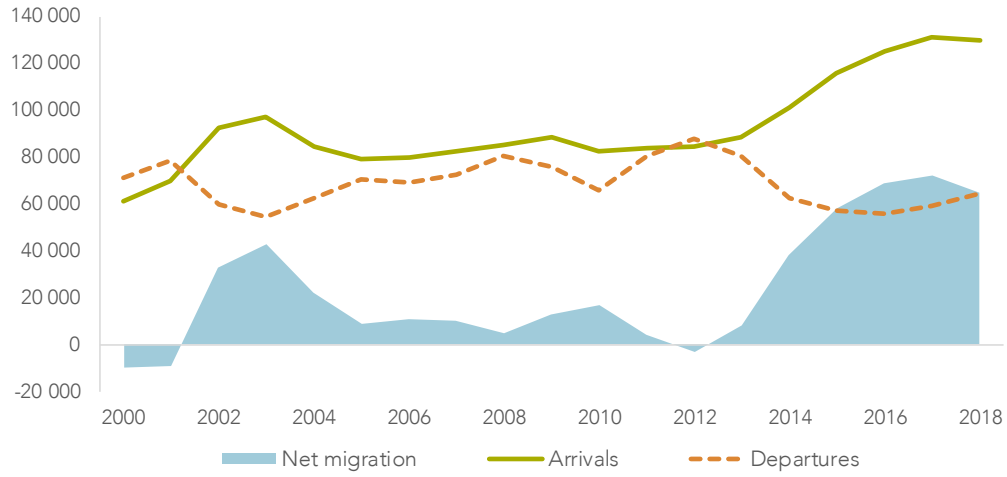
Q17 **How well do the current outcomes from the education and skills system position New Zealand to respond to changing technology and different future scenarios?**

Skills supply from immigration

While the domestic education and skills system is very important in equipping people to excel in the labour market, New Zealand also gains (and loses) skills through immigration. Historically, inward and outward migration have tracked reasonably closely. However, over the past five years a significant gap has opened where inward migration has significantly outpaced outward migration (Figure 5.4).

In 2018, well over 100 000 migrants (not including many temporary workers) joined New Zealand's working age population. This is roughly double the yearly number of domestic New Zealand residents turning 15 (and therefore becoming part of the working age population of the future).

Figure 5.4 Arrivals, departures and net migration, 1990–2018



Source: Stats NZ (2018).

Migrants can bring valuable skills to the workforce. For instance, migrants can temporarily fill gaps in specific skills under New Zealand's Essential Skills Policy. High-skilled migrants can increase the skill composition of the workforce. When matched with the right job, they can also encourage technological diffusion by improving firm exports and innovation (Conway 2016). Yet, while survey data suggests that New Zealand's overseas-born population is more skilled than those in other OECD countries, the average migrant worker in New Zealand is less skilled than the average domestic worker, and many migrants appear to be engaged in low to medium skill work.

The impacts of future technological change may call for government to adjust New Zealand's approach to immigration. For example, in the More tech & fewer jobs scenario, where much labour is replaced with capital leading to higher unemployment, there could be pressure on government to limit immigration. Alternatively, under the More tech & more jobs scenario, where there is rapid technological change but lots of new types of jobs, high-skilled immigration may be particularly useful in industries or occupations where there are emerging skill shortages.

Q18 **What changes to immigration policy to address skills needs might be required under different future scenarios?**

People with very low skills

While New Zealand ranks relatively well in measures of adult skills, a sizeable share of adults surveyed in the OECD's Survey of Adult Skills had very low skills. About 20% of adults scored at or below Level 1 in either literacy, numeracy, or both. Adults at this level can successfully complete reading tasks that involve only short and simple texts, and mathematics tasks involving only basic operations.

This group are likely at a high risk of being marginalised in terms of both labour market outcomes and broader participation in society, irrespective of the extent of future technological change. Also, the OECD note that higher levels of literacy and numeracy facilitate further learning, creating a virtuous cycle of further upskilling for adults with high proficiency. However, lower-skilled adults risk getting trapped in a vicious cycle where "they rarely benefit from adult learning, and their skills remain weak or deteriorate over time" (OECD 2013, p. 17).

Improving adult literacy and numeracy is listed as a priority in the 2014–2019 *Tertiary Education Strategy*. The Tertiary Education Commission (TEC) is the main government agency that funds interventions designed to improve adult literacy and numeracy. Examples include the Intensive Literacy and Numeracy Fund ($12.6 million allocated in 2018) and the Workplace Literacy and Numeracy Employer-led funding ($21.2 million in 2018) (TEC 2018b).

Q19 **What, if any, further measures are needed to improve skills among adults with low proficiency to enable them to successfully participate in any future labour market?**

Those without digital skills are also likely to struggle

Related to the broader issue of very low skills, is the question of how New Zealand can address digital divides. The term 'digital divide' has generally been used to refer to variability in the ability of different groups to access and use the internet and other technology. Related terms include 'digital literacy' which emphasises the skills required to use the internet and ICT, and 'digital inclusion' which emphasises access and skills, along with motivation to use the internet and trust in online services (Digital Inclusion Research Group 2017).

Digital skills are increasingly important as nearly all forms of work are becoming more digitalised. One American study examined how computer use in occupations has changed over the past 15 years. Almost all occupations saw increasing use of computers, including many traditionally viewed as low-digital such as home health aides and heavy truck drivers. The study noted that "dramatic task change is occurring among some of the most traditionally accessible occupations that have historically allowed new or less-skilled or -educated workers to find decent employment" (Muro et al. 2017, p. 17).

Similar trends are evident in New Zealand, with increasing digital skill requirements in occupations, such as dairy farming, that traditionally may have been viewed as low-skilled or non-digital. The dairy farming industry strategy 2017–2025 noted that technology features just as much as manual labour in modern dairy farming, and that further development of technical expertise is essential to the success of the dairy farming sector (Dairy New Zealand, 2017).

The Digital Inclusion Research Group (2017) noted that unlike some other countries, New Zealand does little to measure digital inclusion or online engagement. However, available data points toward rapid growth in availability, uptake and use of the internet.

- Improvements to the telecommunications network are being delivered through the Government's ultra-fast broadband programme (UFB). UFB aims to bring fibre broadband access to 87% of the population by 2022, while the Rural Broadband and Mobile Black Spots initiatives are improving wireless coverage in rural areas not covered by UFB. Together, these will provide coverage to 99.8% of the population (Crown Infrastructure Partners 2018).
- Household internet access is also increasing, from 37% in 2001 to 77% in 2013 – figures for 2018 will be available when the results of the 2018 census are released (Stats NZ 2019a).
- Broadband data consumption increased from 13 000 terabytes in June 2011 to 292 000 terabytes in June 2018 (Stats NZ 2018b), although it is unclear how evenly use is distributed across households and firms. 96% of firms used the internet in 2014, up from 93% in 2008 (Stats NZ 2019b).

Despite increases in the availability and uptake of the internet and other digital technologies, Lips (2015) argued that New Zealand continues to experience divides between digital-rich and digital-poor people. The most digitally excluded groups were identified as adults with disabilities, children with special needs, Pasifika, Māori, senior citizens, people from low socio-economic backgrounds and those living in regions or communities with low internet uptake rates. Underlying drivers of digital exclusion include cost of access, lack of knowledge or skills (leading to low confidence and trust when using the internet), and unwillingness to provide personal details via online channels (Lips 2015).

The Commission is aware of several initiatives aimed to reduce digital divides (Box 9) but is interested in further information on the scale of digital divides in New Zealand, its consequences – particularly for labour market participation – and how any divide can be closed.

Box 9 **Examples of initiatives to close digital divides**

Rata Street School access pilot

Rata Street School in Lower Hutt estimates that half of its students do not have internet access at home. Te Awakairangi Access Trust is leading an initiative to give students access to the same internet they get at school (the Managed Network) using devices supplied by the school. The initiative is supported by Hutt City Council, the Ministry of Education, Rata Street School, Network for Learning (N4L) and Chorus (Education Central 2018).

Manaiakalani Education Trust

Manaiakalani is an education programme achieving significant improvement in student achievement outcomes for 12 low-decile schools in the Tamaki Basin, Auckland (Digital Inclusion Research Group 2017). The Trust supports parents to buy a digital device for each learner, facilitates internet access, and enables families to engage more closely in their children's learning (Hipkins, Whatman and MacDonald nd). Manaiakalani has developed its own digital pedagogy and has training processes in place to upskill existing teachers and new graduates in how to teach in digital learning environments.

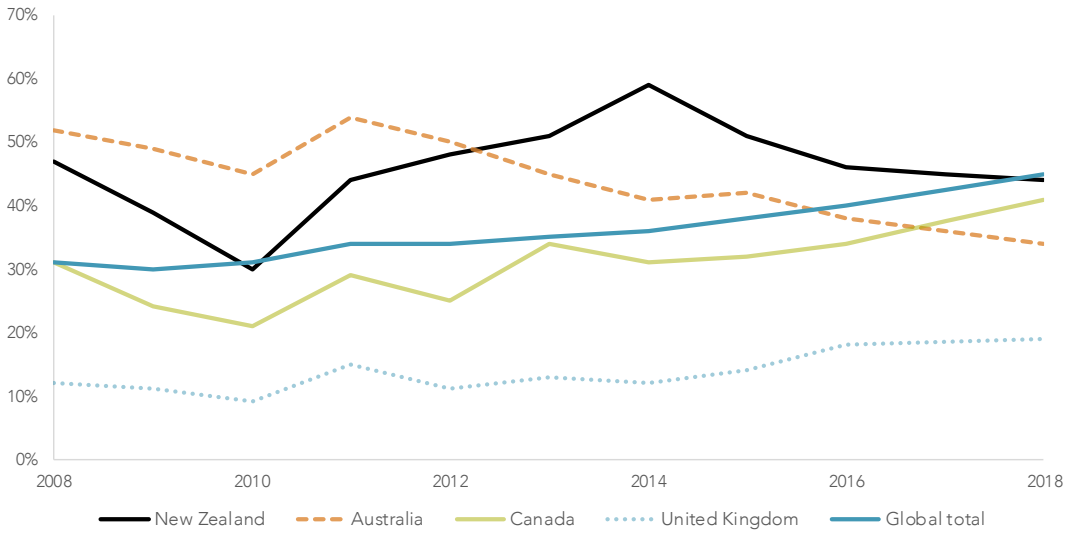
Q20 **What evidence is there of digital divides in New Zealand? What are the consequences for labour market participation and which groups are most disadvantaged?**

Q21 **What, if any, further measures are needed to address any digital divides in New Zealand?**

Disjunct between education and employment

Good matches that meet both the needs of workers and employers boost productivity, by ensuring that workers' skills fit well with the requirements of their roles. But available data on the current supply and matching of skilled workers suggests that New Zealand's education and training system is not as well-aligned with the world of work as it could be. For example, managers of New Zealand firms with 10 or more employees reported relatively high levels of skills shortages compared with other Anglo countries (Figure 5.5).

Figure 5.5 Percentage of firms reporting difficulties filling vacancies, 2006–2018



Source: OECD (2016); ManpowerGroup (2018).

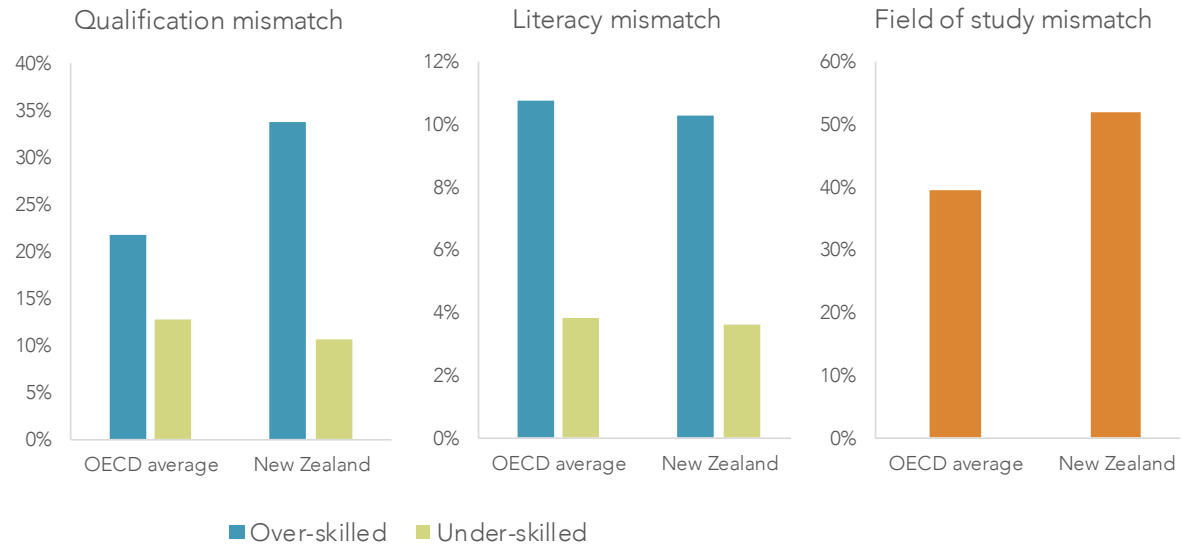
However, in contrast to reported shortages in skilled workers, data recently collected through the OECD's Survey of Adult Skills shows that New Zealand workers report being over-qualified for their job at a high rate relative to other countries.

The survey asked workers what would be the usual qualifications, if any, "that someone would need to get (their) type of job if applying today" (OECD, 2016c). 34% of New Zealand workers reported holding higher qualifications than required to get their jobs (compared with an average of 22% among participating countries). 11% reported they have lower qualifications than required to get their jobs (compared with an average of 13%) (OECD 2016b).

The survey also measured the match between workers' literacy skills and those required in their work, and how closely workers' qualifications matched their occupation in terms of field of

specialisation. New Zealand has a relatively high mismatch in terms of field of study, while results for literacy matching are similar to the OECD average (OECD 2016b).

Figure 5.6 Qualification, literacy and field of study mismatch



Source: OECD (2016b).

Carey (2017) suggested that the major driver of New Zealand's relatively high rates of over-qualification is the preponderance of very small firms (1–10 employees). Relatively fewer people are employed in larger firms, which typically are better at screening candidates and at understanding how over-qualification may affect job satisfaction and productivity. Larger firms may also present greater opportunity for workers to move to better-matched jobs within the firm.

Carey (2017) also suggested that New Zealand's relatively high incidence of part-time work contributes to field-of-study mismatch and over-skilling. He noted that part-time roles may attract overqualified or field-of-study mismatched candidates because these jobs are more compatible with family responsibilities or are preferred over unemployment.

This suggests that future changes to work arrangements in New Zealand could have important implications for skills matching. For example, flexible working environments might enable workers to find employment that is compatible with both their skills and their family and other commitments.

Q22 **What factors underpin New Zealand's apparently poor matching of skills with jobs? To what extent are mismatches a problem?**

Q23 **What future scenarios are most likely to accentuate poor matching? What policy options are available to improve matching in the New Zealand labour market?**

Weak links between employers and education providers

In its inquiry into new models of tertiary education, the Commission (2017) found multiple avenues by which employers can influence what is offered by tertiary providers. These include engagement with curriculum development and NZQA quality assurance processes, and education providers conducting surveys of local firms.

In addition, the industry training system provides a formalised approach to learning in the workplace. Industry training is overseen and arranged by 11 Industry Training Organisations (ITOs), involves a mix of on-the-job training and off-job provision, and includes apprenticeships and shorter bursts of training. The design of the industry training system encourages close links between ITOs and employers and training is part-funded by industry.

But despite these mechanisms to facilitate employer input into the education system, there is a long-standing perception that many parts of the tertiary education system are poorly connected to industry. The Commission identified two significant incentives contributing to this issue:

- employers had "muted" incentives to engage with education providers, because of relatively easy access to skilled migrants (in recent years, immigration has been a much larger source of new skills to the labour market than local population growth), and
- providers lacked incentives to respond to employer input "as the majority of their revenue comes from government" (NZPC, 2017, p. 91).

Q24 **How well does New Zealand's education and training system reflect the changing skill needs of industry? Is the education and training system able to effectively respond to changing technology and different future scenarios?**

Retraining and preparation for changing job requirements

Many submitters to the Commission's inquiry into new models of tertiary education noted that technological change will increasingly require workers to retrain and upskill throughout the course of their life. This idea, which is sometimes referred to as 'lifelong learning', is not new. In the late 1980s, a major education review set an expectation that New Zealand's tertiary system should have an increasing role in lifelong learning where workers "maintain their skill level, acquire new skills to modernise methods and practices in line with technological and social change, and retrain …" (Hawke, 1988, p. 16).

Despite widespread agreement that lifelong learning is already important, and will likely take on even greater importance in the future, the Commission identified several barriers to mid-career retraining. These included funding and regulatory settings for tertiary education that focus on younger, full-time learners completing full qualifications, restrictions on the provision of short programmes of study, the design of the student support system, and funding rules that make recognition of prior learning difficult.

One recent change designed to address these shortcomings is NZQA's introduction of a micro-credential system as part of New Zealand's regulated education and training system. Micro-credentials are smaller than qualifications and focus on skill development opportunities not currently catered for in the tertiary education system, and for which there is strong evidence of

need by industry, employers, iwi and community. One purpose of the micro-credential system is to "help ensure that the New Zealand education and training system remains relevant in a period of fast paced social, economic and technological changes" (NZQA 2018).

The Commission is interested to learn more about the availability and effectiveness of any education programmes designed to upskill, retrain, or adapt to changing technology. More broadly, the Commission is interested in feedback as to how the education and skills system might respond to a significant increase in demand for mid-career training.

Q25 **What programmes exist to support people to retrain, upskill or adapt to changing technology, and how effective are they?**

Q26 **How well equipped is New Zealand's education and skills system to support people to adapt to technological change over the course of their careers?**

The Commission is also interested in the role of firms in upskilling staff through on-the-job training and professional development opportunities. In particular, the Commission is interested in how the incentives for firms to invest in staff training might change under each of the future scenarios. For example, under the More tech & more jobs scenario, higher job churn may reduce incentives for employers to invest in upskilling staff, meaning that the costs of upskilling increasingly fall on the individual and the state.

Q27 **How might the incentives for firms to invest in staff training change under each of the Commission's future scenarios? Under which scenarios would there be a case for greater government investment in firm-based training?**

Advice about careers and education

Quality information and careers advice is one factor that can improve matching and the linkages between the education and training system, and employment. The Commission has previously identified widespread concern about how well school leavers transition into tertiary education and how well the compulsory education system prepares them for further learning. Concerns have also been raised about careers advice at schools, and beyond.

> We need to help young people and those within the tertiary education system itself develop capabilities – skills, attitudes, knowledge, values – to enable lifelong and lifewide management of work and learning. We think career management competencies would be most effective woven throughout the school and its activities, including subject classes (ie, not confined to the school careers department activities). (NZCER 2016, p. 1)

> The need to refocus our system back to its earlier lifelong learning goals also means this guidance must be available throughout adulthood. (Tertiary Education Union 2016, p. 4)

The TEC (whose legislative functions expanded in 2017 to include the functions and services of Careers New Zealand) has been designing a new strategy for the whole careers system. The TEC noted that traditionally, "career services in New Zealand have prioritised supporting young

people to transition from secondary to tertiary education or into the workplace" (2018a, p. 18). The TEC's new careers strategy recognises that "people will increasingly need the confidence, resilience and skills to steer their careers through periods of technological disruption" (2018a, p. 18).

Q28 **What changes are needed to provide prospective students, including adults and those already part-way through a career, with the skills needed to make informed decisions about education and careers?**

Other impacts of future scenarios on skills supply and demand

The Commission has previously found that, despite the presence of many innovative teachers and groups of teachers, the tertiary education system lacks the dynamism necessary for innovative approaches to scale up and transform education delivery. This stemmed largely from the pervasive control that government exerts over the tertiary system through funding and regulatory rules. These combine to constrain the ability of providers to innovate, drive homogeneity in provision, and limit the flexibility and responsiveness of the system as a whole (NZPC 2017).

This diagnosis is concerning given that changes in skill demand are likely in future scenarios. As noted above, many people already believe that the tertiary system is too heavily geared toward 'front-loading' skills and more retraining and upskilling models are needed. This issue would likely amplify in the More tech & more jobs scenario.

By contrast, the Stagnation scenario, where technological change slows and income growth stagnates, might signal a need for greater investment in a model of education where individuals complete compulsory education and then undertake qualifications with a particular occupation in mind. Upskilling and retraining might assume less importance.

In the More tech & fewer jobs scenario, where a much larger share of jobs are replaced by technology, people might increasingly view education (particularly tertiary education) as an end in itself, rather than a something that is undertaken with a specific career in mind. Accordingly, the types of qualifications and programmes of study available would need to change to accommodate larger numbers pursuing their personal interests and government might consider allocating larger amounts of funding toward subject areas with minimal employment prospects.

Alternatively, a rising degree of automation may lead some people to pursue ever-higher levels of education to distinguish themselves from others and compete for a limited number of available jobs.

6 Firm and economic policies

The impact of technological change on New Zealand's labour market and wider society is not pre-determined. As discussed in the previous chapters, governments have choices over the policies and rules they set for the labour market, income support and education system. Governments also have choices about the wider economic policies they set to encourage the creation and adoption of new technologies, and maximise opportunities for New Zealanders.

Having a vibrant and innovative private sector matters for New Zealand's productivity and income growth, and for the range and quality of jobs, services and experiences it provides to workers and consumers in the future. Greater participation in global markets also provides more opportunities to earn incomes, allowing a small open economy like New Zealand to better manage the transitions resulting from technological change. This section examines what is known about innovation, technology uptake and firm capability in New Zealand, outlines some possible grounds for New Zealand's poor performance and asks questions about future policy settings.

Innovation and capability levels within New Zealand firms

Many New Zealand firms are using technology to add value and grow. A few examples are outlined in Box 10.

Box 10 **Some leading New Zealand technology firms and their services**

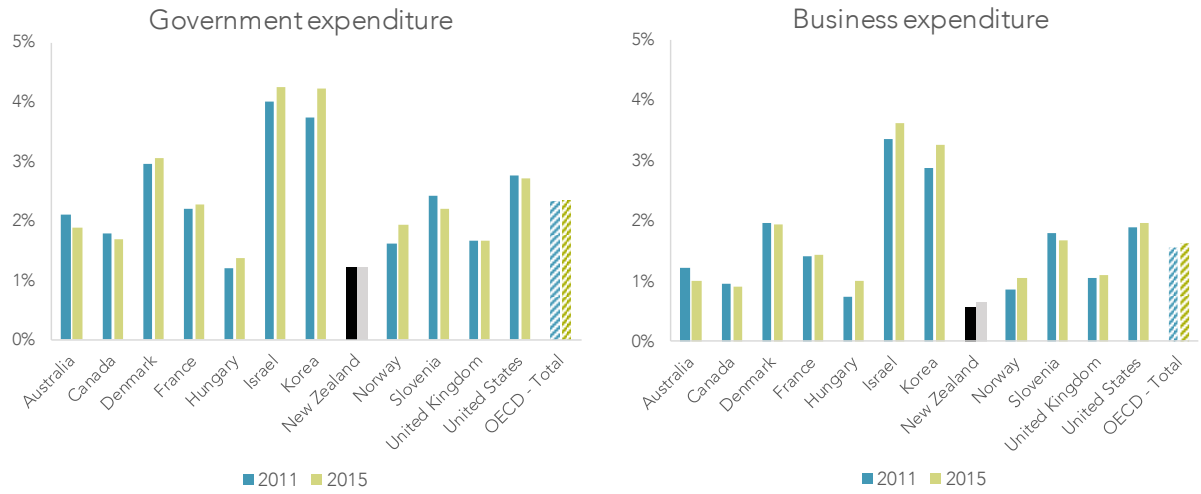
- Aider is an Auckland-based artificial intelligence firm, which has developed a digital assistant for small firms. The assistant connects to cloud services such as Xero, Google Analytics, Facebook and staff timetables and payroll applications. Clients can talk or have text conversations with Aider about any aspects of their business and its performance and can organise a range of activities – such as paying invoices, scheduling tasks, tracking and analysing sales and expenses and rostering staff.
- Jade Software developed a chatbot (called 'Alfred') for Australian life insurance comparison service Lifebroker. Alfred collects real-time information from clients in a conversational manner and can provide quotes for life insurance cover within five minutes of messaging, 24 hours a day. Another Jade Software program used a machine learning algorithm to identify tertiary education students at risk of dropping out, allowing educators to intervene and support those students pro-actively.
- Scott Technology is a Dunedin-based advanced automation and robotics company, providing products and services for materials handling, processing, packaging and logistics. It has grown rapidly over the past decade with annual revenue increasing from $31 million in 2009 to $184 million in 2018, and has expanded overseas with production bases in the US, Germany, France, Czech Republic, Belgium, China and Australia.

However, based on currently available aggregate statistics, New Zealand firms appear to exhibit low to middling levels of innovation and capability, as measured by indicators such as R&D, new methods of operating and management practices.

Low levels of R&D

One frequently used measure of business innovation is expenditure on R&D as a share of GDP. By international standards, government and business both spend relatively little on R&D (Figure 6.1).

Figure 6.1 Government and business expenditure on R&D as a share of GDP, 2011 and 2015 (selected OECD countries)



Source: OECD (n.d.).

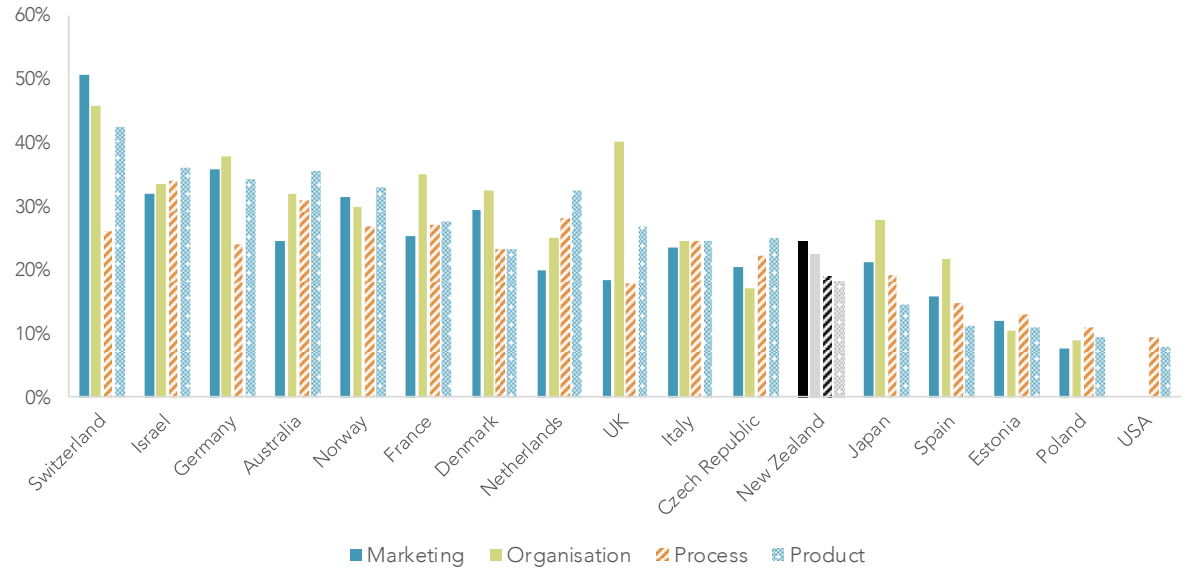
Moderate uptake of new ways of operating

Another way of assessing innovation levels in firms is to measure their uptake of new ways of operating. The OECD outlines four types of firm-level innovation.

> *Product innovation:* the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses.
>
> *Process innovation:* the implementation of a new or significantly improved production or delivery method. This includes changes in techniques, equipment and/or software.
>
> *Marketing innovation*: the implementation of a new marketing method involving changes in product design or packaging, product placement, product promotion or pricing.
>
> *Organisational innovation:* the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations. (OECD 2017e, p. 154)

New Zealand firms perform relatively poorly on these types (Figure 6.2).

Figure 6.2 Percentage of total firms exhibiting innovation, by type (2017, selected OECD countries)



Source: OECD (n.d.).

Widespread use of high-performance workplace practices

The way in which firms organise their internal processes and staff can affect their productivity. High-performance workplace practices (HPWP) refers to a set of techniques that include:

> aspects of work organisation – team work, autonomy, task discretion, mentoring, job rotation, applying new learning – and management practices – employee participation, incentive pay, training practices and flexibility in working hours. (OECD 2016a, p. 79)

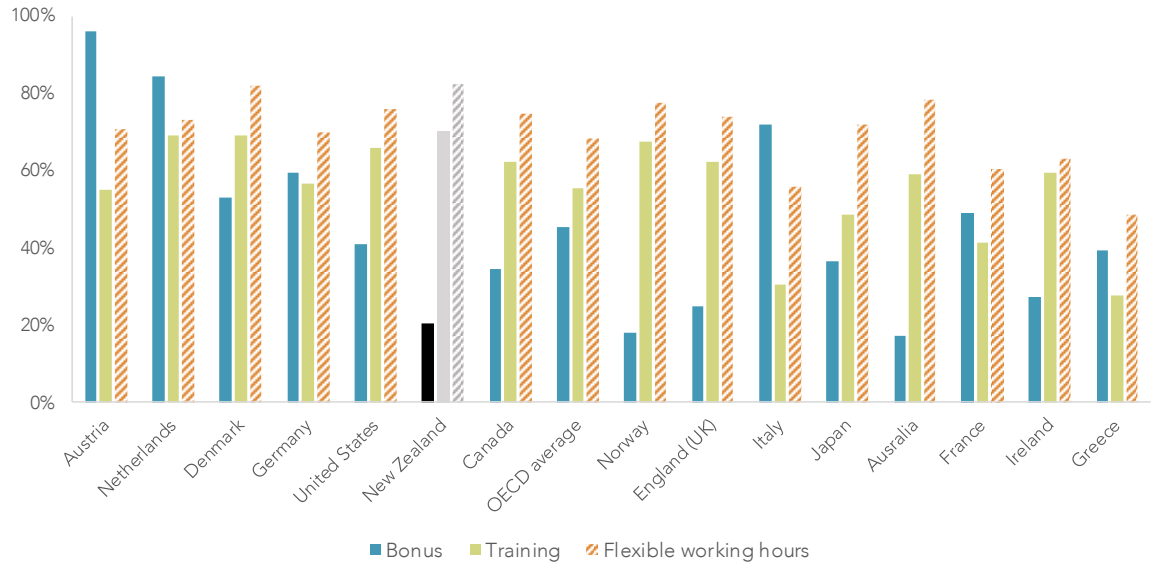
Internationally, the prevalence of HPWP varies by industry, occupation, hours worked and type of employment contract. It is more common amongst managers and professionals, full-time and permanent workers and in information-based industries (OECD 2016a).

According to the OECD (2016a) and Carey (2017), 31% of New Zealand workers are in jobs where high-performance work practices are applied at least once per week, the 7th highest frequency of 29 OECD countries. Most high-performance work practices in New Zealand relate to training and flexible working hours, with bonuses being relatively uncommon (Figure 6.3).

Research into high-performance workplace practices in New Zealand firms suggests that they can increase employee retention, firm productivity and market share (Fabling and Grimes 2010; Guthrie 2001), but reached mixed conclusions about its impact on firm profitability.[4] In line with international literature, the uptake and impact of these HPW practices was found to vary by sector, firm size and age (Fabling and Grimes 2010, 2014).

[4] Fabling and Grimes (2010) found a link between high performance work practices on firm profitability, but did not in later work (2014). They attributed the lack of an effect on profitability in their 2014 research in part to "the adoption of performance pay systems [which] raises average wages in the firm" (p. 1095)

Figure 6.3 Prevalence of high-performance work practices, by type (selected OECD countries)



Source: OECD (2016).

Note: Countries are sorted from highest to lowest adoption of HPWP, based on the sum of the three practices.

The differential uptake and impact of HPWP may make it difficult to design and target policies to encourage their diffusion. Several authors have cautioned against applying 'one-size-fits-all' policy approaches (eg, Fabling & Grimes 2010), noting that in some cases, external market factors were the key factor in the adoption of HPWP (Johnston and Hawke 2002). The Government is currently considering how it can "best support employers and unions" to implement HPWP in their workplaces (Future of Work Tripartite Forum 2018).

Weak management capability and practice

Management skill and practices have also been linked to productivity and innovation, in a similar manner to HPWP. New Zealand firms score poorly in international comparisons of management practice, although the available – and limited – information is drawn largely from the manufacturing sector. Based on surveys of mid-sized manufacturing firms of their use of specified management practices,[5] Bloom et al. (2012) ranked New Zealand firms' overall management as below average. Using the same survey framework as Bloom et al., Green and Agarwal (2011, p. 22) noted that New Zealand firms scored particularly poorly on the 'people management' practices, with "its practices around addressing poor performers, promoting and retaining high performers trail[ing] the most in terms of global ranking".

Firm size and ownership, and staff skill levels mattered for New Zealand firms' assessed performance. Larger, foreign-owned and publicly listed firms and firms with higher-educated staff achieved higher management scores (Green and Agarwal 2011). Internationally, Bloom et al. (2012, p. 14) also found that "tough product market competition is associated with better management practices, within both the private and public sectors". New Zealand tends to have low levels of competitive intensity.

[5] These practices included performance tracking and review, consequence management, managing human capital, rewarding high performance, removing poor performance, attracting and retaining human capital.

A growing gap between the stars and the rest

Productivity growth is driven, at least in part, by the diffusion of new technologies from the leading 'frontier' innovative firms into the rest of the economy (Conway 2016). Where technologies diffuse broadly and rapidly, productivity growth is faster. This process of diffusion appears to have largely broken down in New Zealand.

This 'breakdown' has two elements. First, New Zealand's leading firms lag behind their equivalent international frontier firms in terms of productivity. Conway (2016) found that the labour productivity levels of leading New Zealand firms are about one-third lower than the top foreign firms. This suggests that world-leading technologies and practices are not being taken up as quickly in New Zealand as they could be. Second, diffusion of technologies within New Zealand appears to be slow. Zheng (2016) found that productivity growth in New Zealand's 'national frontier firms' over 2000–12 was 2.2 times faster than 'laggards', leading to an increasing productivity gap. This suggests barriers to the transmission of ideas and technology and the reallocation of resources from low-productivity to higher-productivity firms.

What might account for these results?

A growing body of local evidence, much of it drawing off micro- and firm-level data, lays out some of the reasons for the poor productivity and innovation performance of New Zealand firms. New Zealand's small size, geographic distance from other markets and the preponderance of small firms in its economy are recognised as contributing factors.

Low tradability

Tradability refers to the "distance between where a product is produced and where it is purchased" (Conway and Zheng 2014, p. 1). Higher levels of tradability are associated with greater productivity growth, due to the scope for agglomeration benefits from co-location with other firms in the same industry, and the "greater potential for increased scale and … more intense competition from rival producers situated in other domestic and international locations".

Tradability in New Zealand is highest in the primary sectors, followed by the goods-producing and services sectors. Conway and Zheng (2014, p. 22) noted that the growing role of services in the economy, and the fact that many of these firms "still produce output that is difficult to trade over distance and export to a much smaller extent" than firms in other sectors, may have "negative implications for scale and specialisation". Conway, Meehan and Zheng (2015) similarly found that firms in parts of the services sector were taking longer to catch up to leading firms at the frontier than firms in other sectors. Part of this slowness may be due to the fact that tradable firms have stronger incentives to adopt technologies from nationally leading firms, whereas non-tradable firms tend to draw their examples from a smaller, local pool of experience (Zheng 2016).

Low returns to innovation

Wakeman and Conway (2017) explored the impact of innovation activities on the performance of New Zealand firms to test whether such activities pay off (eg, in employment, value-added and productivity). They found that, on average, while product innovating firms grew at a faster rate than non-innovators, they did not experience productivity gains.[6] This result contrasted with similar studies conducted in Europe and Australia. Although the authors noted that methodological differences meant that it was not possible to be conclusive, they observed that

[6] That said, younger firms, manufacturing firms and firms with international connections (exporting or foreign ownership) had higher returns.

their results suggested "that the returns to (product) innovation for New Zealand firms are relatively low, and so provide a potential explanation for why New Zealand firms invest relatively little in R&D" (2017, p. 26).

Limited international connections

International connections can support greater innovation and productivity through several avenues. Firms that export face greater competitive pressures and hence stronger incentives to innovate. Exporters also have a larger market over which to spread the costs of innovation. Finally, foreign-owned firms may also have better access to leading-edge technologies and knowledge from leading global firms, and to the capital to fund innovations (NZPC et al. 2018).

The share of New Zealand firms that export is low by international standards, as is trade exposure in the services sectors. New Zealand firms also tend not to participate in global value chains; as Conway commented, "the share of value add in New Zealand gross exports that comes from foreign firms in the form of intermediate inputs is among the lowest and slowest growing in the OECD" (2016, p. 28). Outward direct investment levels are low, and inward foreign investment has been broadly constant over 2000–12.

Limited absorptive capacity

Absorptive capacity refers to the ability of a firm to "understand external knowledge, to assimilate it, to transform it, and to apply it" (Harris and Le 2018, p. 5). If the absorptive capacity of firms is low, "then new strategies or technology designed to help firms become more productive are likely to have only limited impact" (2018, p. 1). Conversely, higher levels of absorptive capacity are associated with a greater propensity to export, innovate and undertake R&D and with higher overall productivity. Drawing off the New Zealand Business Operations Survey, Harris and Le found that absorptive capacity was highest amongst larger and foreign-owned firms and lowest among domestic firms. They also found a "considerable degree of stability", with firms tending "to remain with high (low) absorptive capacity for long periods" (2018, p. 16)

Capital shallowness

Finally, New Zealand firms have low levels of capital compared with Australian and British firms in similar industries (Mason 2013; Mason and Osborne 2007). This limits productivity growth, and may constrain the ability of firms to specialise and export. High real long-run interest rates and expensive investment goods are partial causes of low capital intensity (Conway 2016), although others have argued New Zealand's low levels of multifactor productivity and a limited suite of investment opportunities may also be contributors (New Zealand Treasury, 2008). There is not a consensus on the causes of New Zealand's high real interest rates, although possible explanations include excess demand pressures caused by high net migration (Reddell 2013) and low national savings levels (New Zealand Treasury, 2010).

What could be done to boost innovation levels in NZ firms?

Although action to lift innovation and productivity levels may be particularly important under the Stagnation scenario, efforts to improve innovation amongst New Zealand firms will be important under all the scenarios considered in this inquiry. Previous work by the Commission and other scholars has identified five main areas for possible action.

Reduce barriers to competition

The level of competition within an economy matters for productivity growth, technology adoption and diffusion, the quality of firm management and keeping living costs under control. In 2014, the Commission found that service industries in New Zealand face lower levels of competition than goods-producing and primary sectors, and that this is particularly the case in the finance and insurance, rental, hiring and real estate, retail and professional, scientific and technical industries. MBIE (2016) reached broadly similar conclusions, finding that the finance and insurance and wholesale trade sectors faced the lowest levels of competitive intensity.

The Commission (2014) recommended easing barriers to competition and market entry, including sector-specific regulation and occupational regulation. Data portability, common data standards and minimal barriers to digital trade could also support greater levels of competition and innovation in New Zealand markets, especially in services industries (APC and NZPC 2019).

Q29 **Which barriers to competition and investment should be priorities for reform in a government innovation strategy?**

Consider the impact of regulation on innovation

Regulation can either stimulate or hinder innovation and the uptake of new technologies. For example, in their recent joint report on growing the digital trans-Tasman economy, the Australian and New Zealand Productivity Commissions (2019) highlighted how obsolete intellectual property laws could inhibit the development of artificial intelligence in the two countries. The Commission has also heard from the motor industry that New Zealand's land transport laws will need to change to accommodate technological improvements in cars that could improve safety (eg, replacing wing mirrors on vehicles with cameras). On the other hand, regulation can also act as a spur to innovation. Porter and Linde (1995) cite several environmental regulations that reduced the production and release of harmful materials but also increased product quality and lowered production costs.

The impacts of regulation on incentives to innovate vary by area, and the impacts can differ over time periods. In his meta-survey into the impacts of regulation, Blind (2012, pp. 1–2) concluded that:

- economic regulation (eg, competition policy, monopoly regulation and price controls) encourages firms to "realise process innovations in order to succeed in price competition and to successfully introduce new products and services into the market in order to escape from fierce competitive pressure", although impacts vary by sector, firm and innovation type;
- studies of social regulation (product and consumer safety, health and safety, environmental laws) initially had ambivalent results, but more recently found mainly positive impacts;
- very few studies of institutional regulations (eg, liability law, bankruptcy and intellectual property rights) "provide evidence of stronger incentives for innovation activities"; and
- short-term impacts of regulation on innovation may be negative (as firms adjust), while the longer-term impacts tend to be more positive.

Q30 **Are there particular regulations or areas of regulation that will need to be updated to maximise the benefits from technological change? Do these areas differ, depending on the future scenario?**

Enhance returns for innovation

Another area for possible action is policies to boost the return for firms from innovation. This could be achieved by reducing the cost of innovation to firms, or increasing the likelihood and scale of any returns. On the first issue, the Government currently provides (or is planning to provide) a wide array of assistance for innovation and research activities.

- There are many industry-led research support schemes funded or part-funded by the Government that aim to lift innovation levels in specific sectors or solve specific problems, such as the Primary Growth Partnership, New Zealand Agriculture Greenhouse Gas Research Centre, National Science Challenges and Strategic Science Investment Fund.
- Callaghan Innovation (a Crown entity that provides innovation support to selected firms) provides targeted grants, which meet up to 40% of a recipient firm's R&D costs, and research and technical services for advanced manufacturing, biotechnology, advanced materials and the Internet of Things and data solutions. According to Callaghan Innovation (2018, p. 3), 63% of its customers "stated that the service they received … contributed to their ability to undertake R&D" and grant recipients were 2.5 times "more likely to have maintained their R&D investment".
- The Government is currently introducing a tax credit to strengthen incentives for firms to carry out R&D. The planned scheme will provide a 15% credit on a firm's annual eligible expenditure of at least $50 000, capped at $120 million. Once the R&D tax credit is in place, some of Callaghan's targeted research grants will be phased out.

The second issue (increasing the likelihood and scale of the impact of innovation) implies building stronger firm absorptive capacity (discussed below), closer links between research organisations and firms, and refinement of R&D assistance programmes. Assessments of current assistance programmes show mixed, but broadly positive, results.

- The Ministry of Economic Development (2011) concluded that firms that receive Capability Building assistance show significantly higher employment growth and a significant impact on multifactor productivity four years after first assistance (compared with matched unassisted firms). But no overall additional impacts were identified for firms that received Project Funding (assistance for R&D projects that is provided to firms with potential for high growth).
- Jaffe and Le (2015) found that receipt of an R&D grant significantly increases the probability that a firm applied for a patent during 2005–2009, but found no positive impact on the probability of applying for a trademark. Receiving a grant almost doubled the probability that a firm introduces new goods and services to the world while its effects on process innovation and any product innovation were much weaker.
- Wakeman (2017) found similar results in that grant recipients are more likely to patent, to innovate in their marketing approach and to introduce new products (but not to engage in process innovation). Wakeman (2017) also found that in the 2–3 years after receiving a grant, recipients experience faster employment and labour productivity growth than non-recipients.

But consistent with Ministry of Economic Development (2011), receiving a grant does not have a positive impact on multifactor productivity.

Q31 **What changes, including to government funding for R&D, might be needed to improve the returns to firms from innovation?**

Enhance knowledge transfer and absorptive capacity

One response that has been considered previously by the Commission and others are greater efforts to boost the transfer of knowledge and technology across and within New Zealand's borders, and enhance the ability of firms to understand and effectively absorb that knowledge. Several government agencies may already support better knowledge transfer and absorptive capacity.

- Callaghan Innovation provides training and capability development programmes to firms aimed at enhancing their efficiency and innovativeness, such as Better by Lean, start-up incubator schemes, intellectual property advice, support for firms to introduce high performance workplace practices and assistance for software firms in accelerating product delivery. Callaghan Innovation (2018, p. 3) report that 84% of their customers said the Crown entity's services "directly contributed to the innovations they introduced in the last year".
- The Ministry of Business, Innovation and Employment leads a programme called 'Innovative partnerships', which encourages innovative overseas firms to undertake research and development in New Zealand.
- New Zealand Trade and Enterprise (NZTE) provides services aimed at helping firms to grow internationally or find the right investment opportunities. Although they are primarily focused on internationalisation, these services (eg, design thinking and governance and strategic leadership training) may also support greater absorptive capacity.

However, the reach of these services is limited, as both agencies target their assistance to a small number of firms and focus their assistance largely on exporting and product innovation goals. Drawing on the work of Teece (2017), Harris and Le (2018) argued that current support is too narrow and should be broadened to build firms' "dynamic capabilities"; that is, the skills and abilities of firms' leaders to "profitably build and renew resources, reconfiguring them as needed to innovate and respond to (or bring about) changes in the market and in the business environment more generally" (Teece 2017, p. 698).

Another option would be to establish a dedicated institution that scans internationally for technologies to import and adapt in New Zealand firms and industries. The Commission (2018) discussed this option in its inquiry into the low emissions economy and cited Fundación Chile, a non-profit corporation whose mission "is to introduce innovations and to develop human capital in the Chilean economy's key clusters through technology management, in alliance with local and global knowledge networks" (World Bank 2014, p. 3). Conway proposed a targeted approach that would "focus on connecting to the global frontier in subsets of the product space where firms have already demonstrated strengths and have global visibility" (2016, p. 61). This model combines technology transfer with implementation assistance to firms, reflecting the fact that "firms are unlikely to fully gain and benefit from external knowledge generated by networks and collaboration unless they have sufficient absorptive capacity" (Harris and Le 2018, p. 30).

However, there are questions about how such an institution could be designed and governed, and where it would sit in the landscape of government support for firms.

Some countries explicitly target specific sectors or technologies for government assistance to boost innovation. For example, the United Kingdom government has announced a series of 'Sector Deal' partnerships, aimed at moving sectors and technologies towards desired outcomes.[7] In Singapore, the Government and industry have developed sectoral manpower plans to identify future skill needs in specific sectors and develop policies to meet those needs. Such approaches may lead to interventions that are well-grounded in the realities of firms and sectors, but may encourage lobbying and distract firms from developing their own responses.

Q32 **What steps should be taken to promote technology transfer and build absorptive capacity in New Zealand firms?**

Strengthen international connections

The Government provides some assistance with international connections, primarily through the Ministry of Foreign Affairs and Trade (MFAT) and NZTE. MFAT negotiates international trade agreements and assists services firms facing non-tariff barriers that unfairly disadvantage them in foreign markets.[8] As noted above, NZTE provides assistance, training and support to a small set of 'high growth' firms aimed at improving their propensity to export and success in international markets. Given the role that lack of market knowledge and experience play as barriers to firms commencing exporting (Sanderson 2017), there may be a case for broader information provision and assistance to other firms interested in expanding overseas.[9]

Exchange rate volatility affects export revenues and the propensity to export (Fabling and Sanderson 2015). There are existing products in the market (eg, financial hedges) that can be used to manage this volatility, but these may not be easily accessible to smaller and less-experienced firms. Higher national savings rates and/or lower net migration levels may also ease upward pressures on the exchange rate.

New Zealand has comparatively high barriers to foreign direct investment (FDI) (OECD 2019) and according to Conway (2016, p. 60), the current screening regime is "increasingly opaque and subject to increased scope for ministerial discretion, which adds uncertainty and cost". The Commission (2014, 2015) has previously found that barriers to foreign investment limit competition, the entry of new goods and services and may unnecessarily increase the cost of essential products, such as housing.

Q33 **What steps should be taken to strengthen the international connections of New Zealand firms?**

[7] UK Sector Deals have been announced in aerospace, artificial intelligence, automotive, construction, creative industries, life sciences, nuclear, offshore wind and rail.

[8] The Ministry of Primary Industries is the lead agency for primary sector non-tariff barriers, and the Ministry of Business, Innovation and Employment has the lead for manufacturing and procurement barriers.

[9] Sanderson (2017) noted that "entry propensity" amongst non-exporters was highest amongst firms "which stated that their interest was motivated by having reached the potential of the domestic market and those which believed that new contracts or alliances had opened up new market opportunities" (p.iii)

Summary of questions

Q1	Are the scenarios developed by the Commission useful for considering the future labour market effects of technological change? How could they be improved?
Q2	What other consequences might be expected under each scenario?
Q3	How might the impacts of each scenario vary across different groups in society or across different locations in New Zealand?
Q4	How should government monitor the impacts of technological change on the labour market?
Q5	What policy objectives should governments pursue for the labour market of the future?
Q6	What are the potential tensions between different policy goals? How might such tensions be best addressed?
Q7	For each of the future scenarios, what policies would provide the best mix of worker protections and low barriers to workforce participation?
Q8	What are the likely consequences of a large-scale increase in the proportion of independent contractors in the workforce? How should government respond to any negative consequences?
Q9	What types of worker protections might be required where technology provides employers with a growing ability to monitor staff or discriminate against some people?

Q10 Apart from a potential increase in gig work, what other new work arrangements are emerging, or are likely to emerge in the near-future? What are the implications of these work arrangements, and what response from government might be required?

Q11 How might minimum wage settings affect incentives on firms to adopt labour-replacing technologies? What changes to minimum wage policy might be appropriate under each of the future scenarios?

Q12 What changes might be required to minimum notice periods under each of the future scenarios?

Q13 How effective is the income support system set up to assist different groups of people? What specific challenges might arise under the future scenarios? What changes to the system might be needed to address these challenges?

Q14 What are the advantages and disadvantages of the following policies under each of the future scenarios – universal basic income, unemployment insurance, and redundancy compensation schemes? What other income support policies are worth considering?

Q15 How might the effectiveness of active labour market policies change under the future scenarios? What changes would be needed to the design of active labour market policies under each scenario? What other active labour market policies might be needed?

Q16 Are there particular areas where occupational regulation makes it harder for people to shift jobs or adjust to technological change? Would this change under each of the future scenarios?

Q17 How well do the current outcomes from the education and skills system position New Zealand to respond to changing technology and different future scenarios?

Q18 What changes to immigration policy to address skills needs might be required under different future scenarios?

Q19	What, if any, further measures are needed to improve skills among adults with low proficiency to enable them to successfully participate in any future labour market?
Q20	What evidence is there of digital divides in New Zealand? What are the consequences for labour market participation and which groups are most disadvantaged?
Q21	What, if any, further measures are needed to address any digital divides in New Zealand?
Q22	What factors underpin New Zealand's apparently poor matching of skills with jobs? To what extent are mismatches a problem?
Q23	What future scenarios are most likely to accentuate poor matching? What policy options are available to improve matching in the New Zealand labour market?
Q24	How well does New Zealand's education and training system reflect the changing skill needs of industry? Is the education and training system able to effectively respond to changing technology and different future scenarios?
Q25	What programmes exist to support people to retrain, upskill or adapt to changing technology, and how effective are they?
Q26	How well equipped is New Zealand's education and skills system to support people to adapt to technological change over the course of their careers?
Q27	How might the incentives for firms to invest in staff training change under each of the Commission's future scenarios? Under which scenarios would there be a case for greater government investment in firm-based training?

Q28 What changes are needed to provide prospective students, including adults and those already part-way through a career, with the skills needed to make informed decisions about education and careers?

Q29 Which barriers to competition and investment should be priorities for reform in a government innovation strategy?

Q30 Are there particular regulations or areas of regulation that will need to be updated to maximise the benefits from technological change? Do these areas differ, depending on the future scenario?

Q31 What changes, including to government funding for R&D, might be needed to improve the returns to firms from innovation?

Q32 What steps should be taken to promote technology transfer and build absorptive capacity in New Zealand firms?

Q33 What steps should be taken to strengthen the international connections of New Zealand firms?

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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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