NEW ZEALAND
PRODUCTIVITY COMMISSION
Te Kōmihana Whai Hua o Aotearoa

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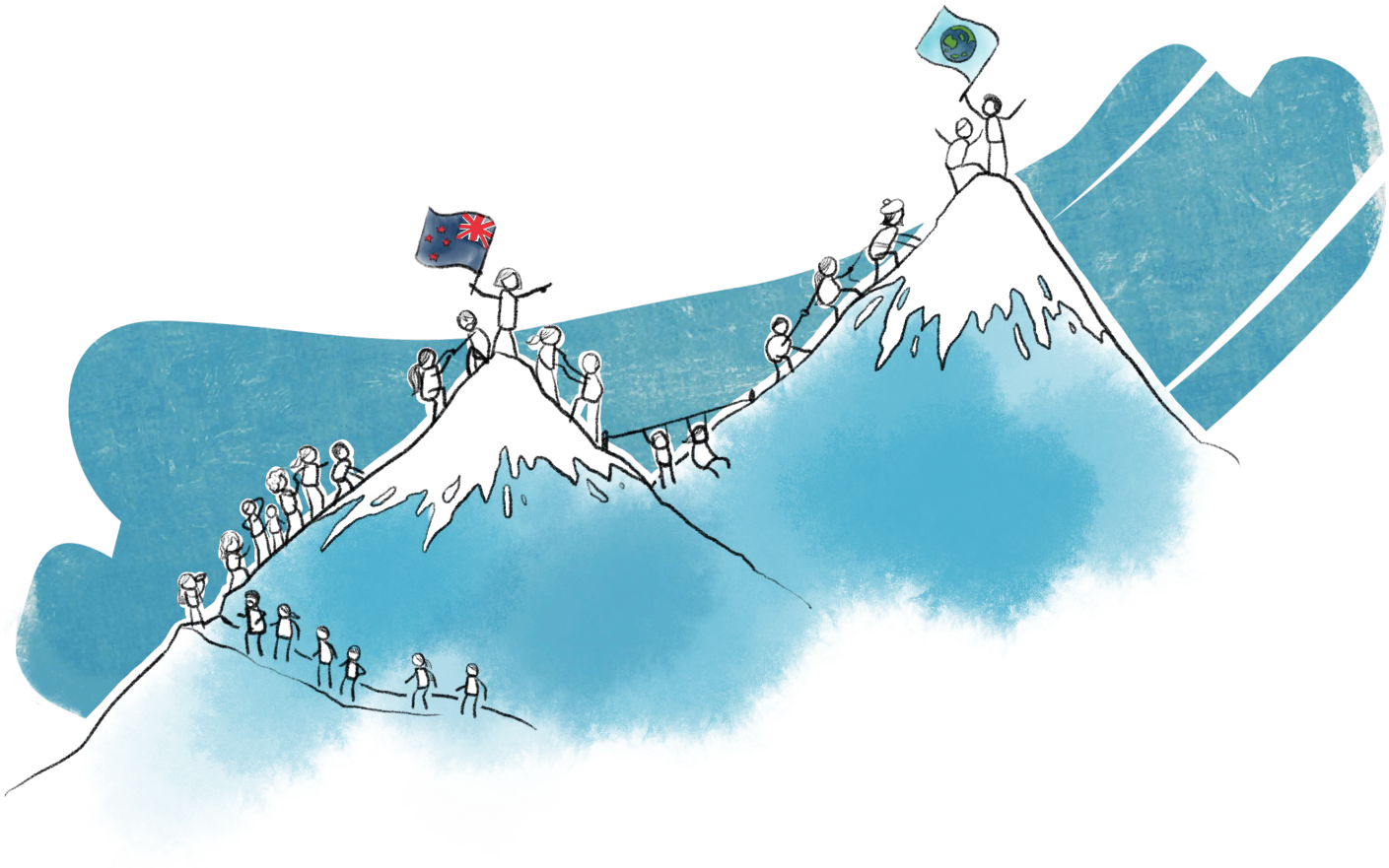

New Zealand firms: Reaching for the frontier

Draft report

December 2020

The Productivity Commission aims to provide insightful, well-informed and accessible advice that leads to the best possible improvement in the wellbeing of New Zealanders. We wish to gather ideas, opinions, evidence and information to ensure that our inquiries are well-informed and relevant. The Commission is seeking submissions on the draft findings and recommendations and the questions contained in this report by 5 February 2021.

New Zealand firms: Reaching for the frontier

Draft report

December 2020

The New Zealand Productivity Commission

Te Kōmihana Whai Hua o Aotearoa[1]

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

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

Terms of reference

New Zealand Productivity Commission inquiry into maximising the economic contribution of New Zealand's frontier firms

Issued by the Ministers of Finance, of Economic Development and of Trade and Export Growth. 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 maximising the economic contribution of New Zealand's frontier firms.

Context

While aspects of New Zealand's recent economic performance have been strong, productivity growth is persistently weak and a significant drag on living standards and well-being.

This inquiry focusses on a central aspect of New Zealand's productivity performance - the economic contribution of New Zealand's frontier firms. Frontier firms are the most productive firms in the domestic economy within their industry. These firms play an important role in shaping aggregate productivity performance, both through their own performance and through the way they diffuse new technologies and business practices into the New Zealand economy.

While New Zealand has some world-leading firms, on average our frontier firms are not performing as well as their international peers, and the diffusion of innovations from the domestic frontier to other domestic firms seems slow.

The purpose of this inquiry is to identify policies and interventions that could maximise the performance and contribution to the economy of New Zealand's frontier firms through:

- improving the performance of the frontier firms themselves; and
- helping innovations diffuse more effectively from frontier firms to other New Zealand firms.

This requires using the Productivity Commission's high quality independent analytical capacity, and its links with OECD research and analysis, to accurately characterise the New Zealand situation and identify and evaluate relevant policies and interventions.

As the final report will be delivered in the year that New Zealand is hosting APEC, its substance could inform discussions through the Economic Committees.

Scope

Having regard to the context outlined above, the referring Ministers request that the Commission undertake an inquiry into maximising the contribution of New Zealand's frontier firms to aggregate productivity growth through their own performance and through the diffusion of innovations from frontier firms to other domestic firms.

For the purposes of the inquiry the Commission should:

- establish a coherent and measurable classification of what constitutes a frontier firm, and what the distribution of New Zealand firms looks like behind the productivity frontier. This could include benchmarking the performance of New Zealand's firms with international peers.
- building on research from New Zealand and elsewhere, investigate the internal or external characteristics of New Zealand's frontier firms that correlate with productivity performance, and where possible make observations about likely causation. Relevant characteristics could include:

- organisational form;
- access to I use of capital (including type of capital and support received, and whether foreign or domestic);
- level of competition;
- location;
- export status;
- staff skill / governance and management capability levels (including whether migration flows are used to acquire these skills);
- distribution across sectors at an aggregate and more detailed level;
- firm age; and
- rate of growth and expansion.

- drawing on the above analysis, identify factors that could be inhibiting the performance of New Zealand's frontier firms, and the interventions available to government that will (or will not) effectively lift their performance.
- identify factors that contribute to or detract from diffusion of knowledge and technology in the New Zealand economy, particularly from frontier firms to other firms. Identify the mechanisms by which this diffusion occurs and interventions available to government to improve this diffusion.
- investigate the economic contribution of Maori frontier firms. In particular, the Commission should consider, having consulted with Maori firms:
  - what challenges / constraints, and what resources / opportunities, are unique or greater for Maori firms at the frontier; and
  - how the diffusion of technology or practices from Maori frontier firms may be different from other frontier firms.
- use its focus on public engagement, and links with the OECD and other international agencies, to recommend responses and policies that are actionable and implementable.

Consultation Requirements

In undertaking this inquiry, the Commission should:

- consult with key interest groups and affected parties (including firms, their employees, trade unions and industry peak bodies);
- engage with relevant government departments; and
- draw from international perspectives and experience.

Timeframe

The Commission must publish a draft report and/or discussion paper(s) on the inquiry for public comment, followed by a final report or reports, which must be submitted to each of the referring Ministers by 31 March 2021. The Commission is also encouraged to produce any additional outputs that may facilitate public understanding or enhance the impact of their work as they see fit.

About this draft report

This draft report 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 draft report contains the Commission's draft findings and recommendations. It also contains four questions to which responses are invited. The Commission welcomes information and comment on any part of this report and on any issues that participants consider relevant to the inquiry's terms of reference.

Register your interest

The Commission seeks your help in gathering ideas, opinions and information to ensure this inquiry is well informed and relevant. The Commission will keep registered participants informed as the inquiry progresses. You can register for updates at www.productivity.govt.nz/have your say/subscribe or by emailing your contact details to info@productivity.govt.nz.

Make a submission by 5 February 2021

The Commission is interested in hearing comments, feedback and other evidence on this draft report. Submissions provide information to the inquiry and help shape the Commission's recommendations in the final report to the Government. The Commission will quote or refer to relevant information from submissions.

The due date for submissions is Friday 5 February 2021. Late submissions will be accepted, but lateness may limit the Commission's ability to consider them fully.

Anyone can make a submission. Your submission may be written or in electronic or audio format. A submission may be a short note on one issue or a substantial response covering multiple issues. Please provide relevant facts, figures, data, examples and documents where possible to support your views. Multiple, identical submissions will not carry more weight than the merits of your arguments. Your submission may incorporate relevant material provided to other reviews or inquiries. Your submission should include your name and contact details and the details of any organisation you represent. The Commission will not accept submissions that, in its opinion, contain inappropriate or defamatory content.

Sending in your submission

The Commission appreciates receiving submissions in a searchable PDF format. Please make a submission via www.productivty.govt.nz/have-your-say/make-a-submission.

What the Commission will do with the 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. This will occur shortly after receipt, unless your submission is marked "in confidence" or you wish to delay its release for a short time. Please contact the Commission before submitting "in confidence" material.

Other ways you can participate

The Commission welcomes feedback about its inquiry. Please email your feedback to info@productivity.govt.nz or contact the Commission to arrange a meeting with inquiry staff.

Final report in March 2021

The Commission will deliver a final report to the Government at the end of March 2021 bringing together participant feedback from the draft report and its final findings and recommendations.

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Overview

New Zealand's disappointing productivity performance is a handbrake on higher living standards

New Zealand's disappointing productivity performance has held back its standard of living for many years. This fact is widely documented and acknowledged. In simple terms, productivity can be thought of as working "smarter" rather than "harder". For the last 25 years or more New Zealand's income per person has stayed at about 70% of that in countries in the top half of the OECD. New Zealand's position among OECD countries would be even weaker if not for the relatively long hours (on average) that people in New Zealand work. Improvements in labour productivity (output per hour worked) have made only a weak contribution to aggregate economic growth. In short, New Zealand has been working harder rather than smarter.

This position has puzzled many, because New Zealand follows good practice in most widely accepted policy fundamentals. It mostly has good institutions and laws, a well-educated population, low levels of corruption, and is making progress in achieving a bi-cultural partnership between its indigenous and settler communities. Factors such as the ease of doing business, and the quality of regulations all compare well internationally. Given that policy makers attended to these fundamentals in the 1980s and 1990s, many expected New Zealand would catch up with its competitors. While New Zealand has had broadly similar growth in income per head to high-income OECD countries, there has been no evidence of this "catch up" to them.

This inquiry focuses on a central aspect of New Zealand's productivity performance – the economic contribution of its most productive (or "frontier") firms. Lifting the performance of New Zealand's frontier firms is a key part of turning around New Zealand's aggregate productivity performance. If frontier firms are large enough, they can lift the economy's performance directly. Frontier firms can also influence firms behind the frontier by setting benchmarks in technology, business methods, and marketing, and by setting standards in quality and efficiency in the inputs they purchase from other firms.

Improving productivity isn't a silver bullet. New Zealand has problems with housing affordability and inequality, and must take on the challenge of dramatically lowering its greenhouse gas emissions. This inquiry acknowledges these are serious issues and work on them must continue. However, lifting New Zealand's productivity will make solving these problems easier. Maximising the contribution from frontier firms is central to that vision.

The disadvantages of a small domestic market and geographic distance

A significant part of the explanation for New Zealand's weak productivity performance and underperforming frontier firms is the small size of its domestic market and its distant location from large international markets. Weak international flows in trade, capital and knowledge, and "soft" competition in domestic markets are symptoms of these disadvantages. Other troubling symptoms of New Zealand's underpowered economic performance are that businesses are typically capital shallow (ie, workers have limited equipment and other capital goods to work with) and not enough businesses produce innovative goods and services that command a premium in export markets.

These symptoms partly reflect the high upfront costs and risks of expanding into overseas markets. Entering international markets can involve many years of research and planning, including work to understand target markets, develop supply chains, build in-country partnerships and tailor product offerings. And because of the small size of the domestic market, New Zealand firms that wish to grow beyond domestic borders must begin exporting when they are still small firms by international standards. This makes expanding overseas even more difficult, expensive and risky.

Together with New Zealand's remote location, these high fixed costs partly explain why New Zealand has relatively few large, established and successful exporting firms. Distance from international markets also

makes it difficult and therefore quite rare for New Zealand firms to participate in high-value-added parts of global supply chains. This contributes to the absence of distinctive and specialised products in New Zealand's export mix and to a low overall level of exports to GDP.

Geography is not destiny: New Zealand can do better

However, the Commission does not accept that geography is a life sentence condemning New Zealanders to lower living standards. An opportunity exists for New Zealand to change key aspects of the status quo and lift performance. It is not about tearing things down and starting again. In many ways New Zealand is already an innovative place, but it needs to get much better at turning those good ideas into world-leading firms.

Learning from other small advanced economies

Other small advanced economies (SAEs) also face the constraints of small domestic markets and some are relatively remote. Successful SAEs can therefore provide more relevant lessons for New Zealand than larger economies. SAEs are different. They are not just scaled-down versions of larger economies, but have specific characteristics that shape their performance. For SAEs, the standard policy prescription is necessary, but not sufficient for success.

Successful SAEs are located mostly in Europe (eg, Sweden, Denmark, Ireland, Netherlands) but also in the Middle East and Asia (eg, Israel and Singapore). When benchmarked against other SAEs, New Zealand's frontier firms are (on average) less likely to be world class in their respective sectors than those from successful SAEs. While New Zealand does have examples of world-leading firms, it does not have enough of them. Successful SAEs also have a much greater proportion of specialised, distinctive products in their export mix and higher ratios of exports to GDP, compared to New Zealand. It is timely for New Zealand to learn from other SAEs.

Exporting at scale is the way to reach for the global frontier

The SAEs of Europe mostly have some large firms with outstanding records of exporting specialised and distinctive goods and services. Their frontier firms operate at the global frontier; in other words, they are world leading. Around each of them exists an ecosystem of many smaller businesses supplying complementary products or specialised inputs. Supporting them are researchers and innovators in both public and private employment, a pipeline of highly educated graduates and post-graduates, investment in enabling infrastructure and regulations, and investors with deep knowledge and understanding of the industry.

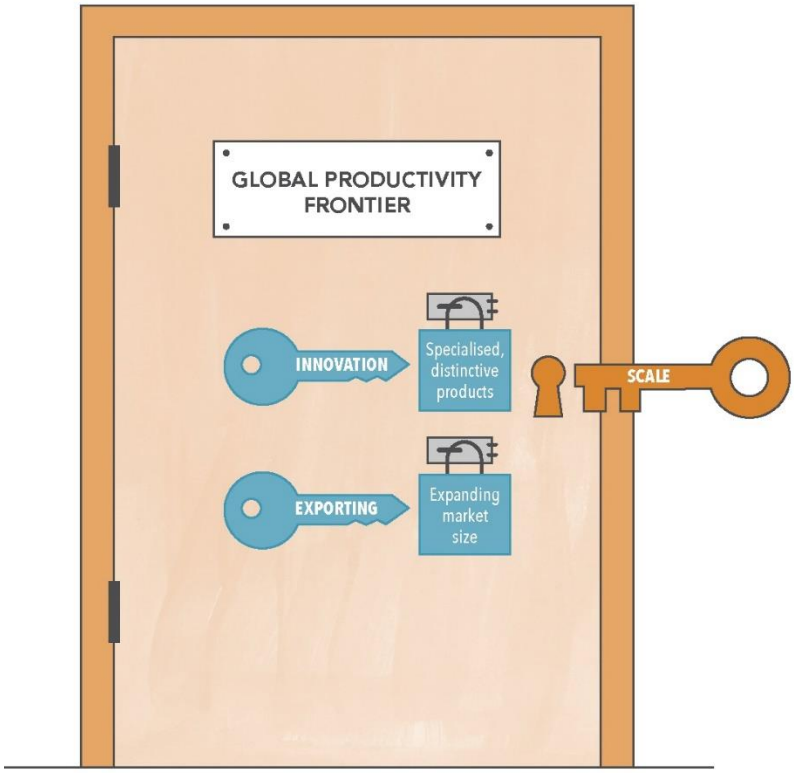
A major finding of this inquiry is that New Zealand should seek to have more frontier firms of this type to boost its economic performance. Fundamental to the success of any developed economy – unless it is richly endowed with natural resources that can be easily sold for good prices – is innovation that produces specialised and distinctive internationally tradeable goods and services. For a long time, New Zealand has grown by increasing the volume of products made from its natural resources; but, given environmental limits, that path to growth cannot continue.

Therefore, innovation is essential to New Zealand's economic future. With it, a country has a chance to gain and retain a world-leading competitive advantage in some markets. Without it, products and production processes become standardised, widely understood and therefore open to competing production in lower-wage economies. Such competition is a natural, market-led phenomenon that benefits living standards in emerging economies. But it puts pressure on developed countries to play to their competitive advantage – which is their ability to innovate, and bring together highly skilled people and specialised technologies in ways that are hard to replicate.

Innovative, knowledge-intensive products typically have high upfront development costs, followed by low marginal costs once the products are fully developed. This creates strong scale economies – meaning that increasing the scale of production drives down unit costs and increases productivity. The high fixed costs of expanding into overseas markets reinforces the need for scale.

The Commission therefore believes that having more frontier firms that export at scale can provide disproportionate benefits in terms of raising New Zealand's standard of living.

Exporting innovative products at scale is key to success



Increasing the rate and extent of innovation will lift performance

Innovation is complex, cumulative, risky and path dependent

Firms, and frontier firms in particular, play a leading role in innovation. Yet an individual firm may not invest in innovation unless other firms and the government make complementary investments. Turning this around, a firm that tries something new in an economy is carrying out an experiment that has valuable learnings for others. Unless this is recognised and rewarded, the outcome will be too little innovation for the country's good.

The outcomes of innovation effort are uncertain and risky. These features increase the benefits of collaboration across firms and researchers to spread the risk; and increase the potential value of government support in helping to get the ball rolling.

Successful innovation involves much more than a firm applying a bright idea or piece of research to produce a new good or service, or an existing product at lower cost. This is just one aspect of innovation that is interrelated with many others, such as branding, marketing, distribution, and supply chains.

Government support helps capture the wider benefits of knowledge spillovers

An innovation ecosystem includes the capabilities that are held by individual firms, workers and researchers, and reflected in the network of relations among firms (including international links), and with research centres. Governments also have a role in innovation ecosystems. They contribute to innovation capabilities through:

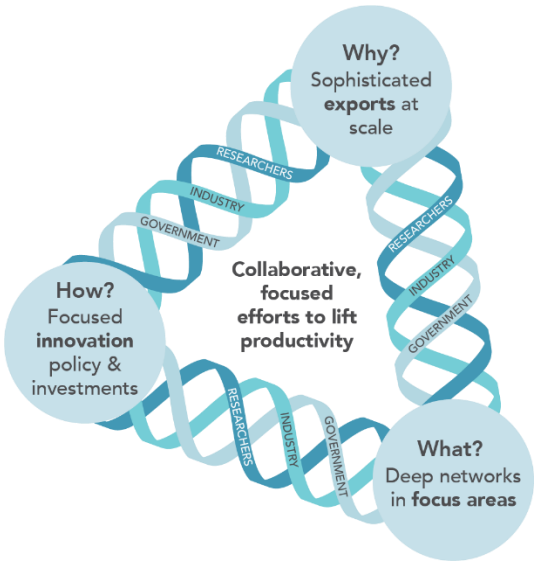
- direct support to incentivise and enable innovation – such as funding for basic and applied research and development, business R&D tax credits, intellectual property regulation, and governance and ownership of key research bodies;
- indirect support – such as building workforce skills (through education and training, and migration policy), providing physical and digital infrastructure, and regulating the business environment and financial system; and

- broader policy settings for society to realise and share the benefits of innovation – such as health services and income redistribution (which influence the health and wellbeing of workers and their families).

Direct government supports for innovation should be targeted at activities and investments that have the clear potential to provide knowledge spillovers and demonstration effects, or to solve coordination problems that are holding back collaboration.

The evidence considered by the Commission shows that New Zealand's innovation ecosystem is not currently working well for actual and potential frontier firms. The Government must develop a clear innovation strategy and take deliberate policy steps to upgrade New Zealand's innovation ecosystem. The private sector, researchers and government must be effective partners on the journey.

Collaborative, focused efforts are needed to lift productivity



Government should focus on areas of the economy with rich possibilities for innovation

Small economies are "doomed to choose", as they will have only a limited number of areas that can get to critical mass and support sustained world-class competitive performance. As a complement to broad-based innovation policies, finite government resources need to be deliberately focused on a small number of high-potential areas rather than being thinly spread in what Skilling terms "sub-therapeutic doses". These areas should reflect existing and emerging strengths and capabilities. They may not reflect standard industry classifications; but may instead involve particular technologies with broad application (eg, digital technologies), or a set of diverse technologies that focus in a particular area of production (eg, agritech).

In target areas, the Government should also take a more proactive and targeted approach to attracting multinational corporations (MNCs) that are knowledge-intensive, oriented to exporting and a source of spillover benefits. The approach should seek both to create conditions that act as a magnet for MNCs and to develop and action attraction programmes to directly attract MNCs, similar to those used successfully in some SAEs.

Focusing on particular areas of the economy is not a matter of the Government "picking winners". Rather, it is about coordinating investments to "back winners" by getting behind sectors that are demonstrating promise – the aim being to get the ball rolling faster and overcome bottlenecks and barriers.

Implementing focused innovation policy

Many efforts have been made to lift innovation and economic performance in New Zealand. The country has a history of small-scale, sector-focused initiatives that often fade away without any clear idea of what they have achieved. While the Government has an ambitious draft research, science and innovation (RSI) strategy,

this strategy gives little indication of how it will be implemented and on what scale the various initiatives will be resourced. Further, the areas of focus for innovation policy are not consistently defined. The current initiatives risk meeting a similar fate to previous efforts.

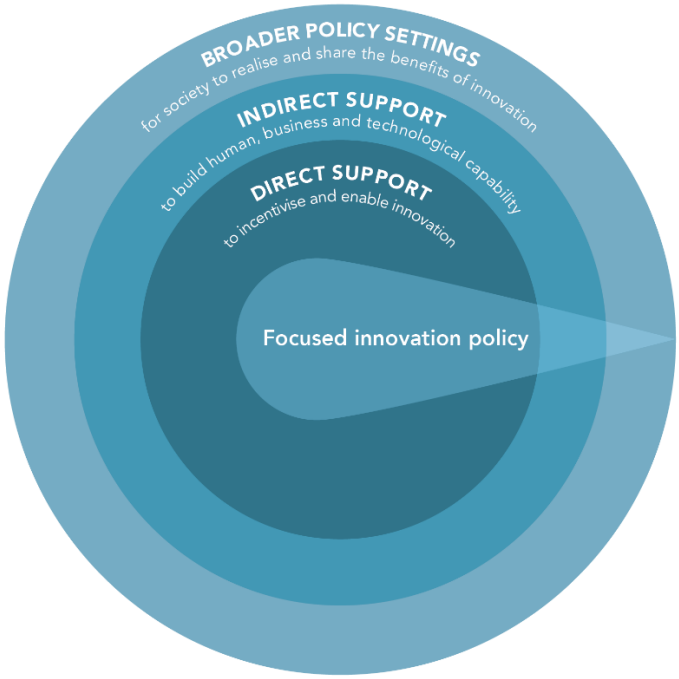
The Government has an important role in supporting firms, through facilitating and co-funding innovation processes. To make progress, the right materiality of investment is required. The Government will need to make significant investments in infrastructure, research and people, in a small number of focus areas, to complement the efforts and investments of the business sector. It will also need to be patient and stay the course, as innovative effort requires time to play out and demonstrate success. It will be a long road, but one that will reward persistence and the right vision.

Smart strategies alone will not be sufficient; execution is critical. The Government should partner with other stakeholders to put in place effective arrangements for governance, resourcing, implementation, monitoring and evaluation to provide confidence that the strategy will deliver on its objectives. Governance and implementation arrangements need to have a life beyond an electoral cycle, consistent with the long timeframes often needed for successful innovation in specialised exporting.

Senior political leadership is required, to unlock resources from across government agencies. Government contributions to innovative investments should be guided by where private firms are prepared to risk their own investments. Transparency in the extent and destination of government support reduces incentives and opportunities for unproductive rent-seeking.

Innovation policy needs to have a relentless focus on supporting world-leading ecosystems of firms. This requires an adaptive approach with a tolerance for experimentation and failure (another reason for insulating its operation from day-to-day political decision making). At the same time, the Government and its partners need to discontinue clearly unsuccessful initiatives. This requires rigorous, independent and transparent monitoring and evaluation. Arrangements and funding for monitoring and evaluation should be built into investments from the outset.

The Government must make significant investments in focus areas



Other priority government actions for supporting innovation

Implementing policy targeted at a few areas requires more than just funding for R&D. It requires coordinated effort across government – ranging from regulation and procurement to skills and infrastructure. In the course of this inquiry, the Commission undertook a series of case studies, to explore the performance of some significant New Zealand industries where productivity improvements could materially help to lift New Zealand's overall productivity performance. The Commission selected four exporting industries of

significant size, and/or with high-growth potential: dairy (both farming and processing), horticulture (with a focus on kiwifruit and wine), health technology (healthtech) and software products and services. As part of these case studies, examples came to light of regulatory or policy changes that are needed to unlock productivity gains in these important industries and more broadly across the economy.

Refocus migration policy settings

Over time, successive changes to New Zealand's migration policy settings have seen the skill levels of permanent migrants fall, and the skills of temporary migrants increasingly at or below the New Zealand average. This has encouraged firms to continue to rely on low-cost migrant labour and inhibited productivity-boosting investment in capital and innovation. The current border closures due to Covid-19 present an opportunity to review and reset migration policy. The Government should focus migration policy more on lifting productivity, by having a principle of primarily accepting only highly-skilled migrants, and over time reducing the inflows of low-cost temporary workers. The Government will need to work with those industries currently reliant on low-cost migrant labour, to consider the transition path away from reliance on such labour and the role of government in supporting that transition.

Improve competition in the dairy industry

The Dairy Industry Restructuring Act 2001 (DIRA) permitted the creation of the dominant Fonterra dairy cooperative, which initially purchased 96% of the milk supply from New Zealand farmers. DIRA regulated Fonterra's monopsony power by guaranteeing the fair rights of farmers to enter and exit supply contracts with Fonterra, and by regulating the supply of milk to other processors and manufacturers. The act has opened dairy processing to greater competition and freedoms to innovate in products, supply chains, international connections, ownership, corporate form and business models.

However, the July 2020 amendment to DIRA removes the right of farmer-shareholders of Fonterra to leave the cooperative and return on similar terms. By removing this right, Fonterra's power to deter farmers from leaving will increase. This change risks detrimental effects on competition when Fonterra is still dominant. It will likely deter new entry and innovation in dairy processing, at a time when these are needed more than ever in the face of environmental limits to further expansion of land in dairy. The Government should reverse this feature of the July 2020 amendment.

Provide a consumer data right

In the modern economy, consumer data is a valuable asset in its own right. Yet consumers cannot access their data from data holders such as banks, and power and telecommunication utilities. Access to this data and the right to transfer it would give consumers greater choice and control. This in turn would open opportunities for innovative digital businesses to devise new products and services that can lift productivity and enhance consumer wellbeing.

The Government should introduce a consumer data right that would enable consumers and businesses to access their data from a variety of data holders and transfer it at their discretion to trusted third parties. The regulation should be consistent with Australia's sectoral-designation regime. Banking should be one of the initially designated sectors, to facilitate the development of efficient and effective open banking in New Zealand.

Review the regulatory restrictions on genetic modification

New Zealand's regulation of genetic modification (GM) is more than 20 years old. Then, the country chose to regulate it strictly, but the science has come a long way since then. Developments like gene editing are more precise than early-generation GM and can produce changes that are indistinguishable from naturally occurring processes, and from techniques that are exempt from regulation. Many trading partners are evolving their rules around new techniques like these, on the basis that they pose no greater risks than conventional breeding techniques.

GM research is an important pathway to innovation in New Zealand, particularly in its biological economy. It offers opportunities for lifting productivity, reducing biosecurity threats and responding to climate-change risks effectively and efficiently. The Government should review the regulation of GM, in order to bring the

legislation up to date and enable New Zealand to grasp the opportunities from new GM technologies in a safe and timely manner.

Improve the incentives on DHBs to participate in the healthtech ecosystem

District Health Boards (DHBs) are hugely important in and to New Zealand's health system, yet most are inactive in supporting healthtech innovation. As a result, opportunities for mutual benefits for the healthtech sector and productivity and accessibility of the health system are being lost. The main reasons for DHBs' lack of support are their lack of mandate to participate in innovation, the lack of targeted innovation funding, and rigidities in their procurement processes. Also, the centre provides no coherent strategy on innovation and learning to guide DHBs. The ensuing variety of independent approaches raises a further barrier for healthtech firms.

The final report of the health and disability system review, published in March 2020, recommended major reforms to the health system. In pursuing any major reform, the Government should improve the mandate, funding and incentives for DHBs to work collaboratively with healthtech companies as part of their innovation ecosystem.

Fostering and learning from Māori frontier firms

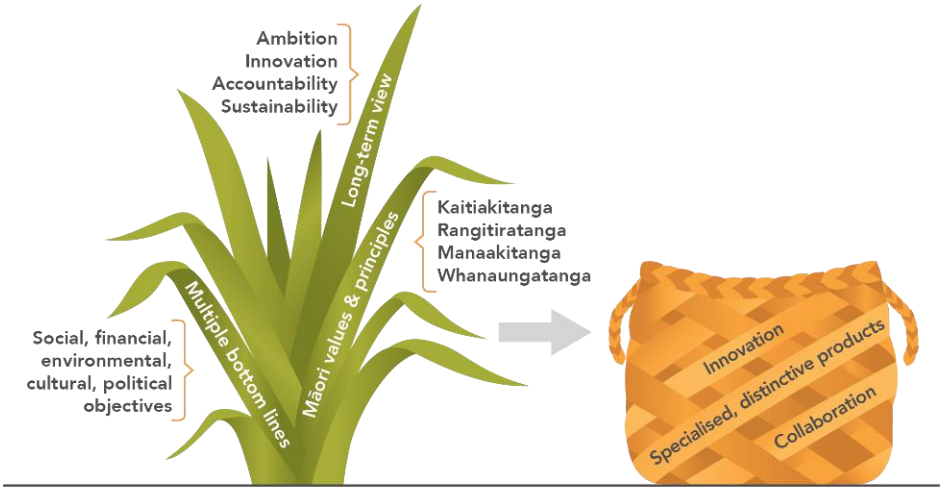
Many of the distinctive features and characteristics of Māori firms present both challenges and opportunities. Examples of leading Māori firms show that these entities have been able to turn challenges into strengths and opportunities, as they find ways to work around them or use them to their advantage.

For example, the desire to serve multiple bottom lines (such as commercial, environmental, social and cultural objectives) can be a strong driver of ambition, which can also flow through to expectations on suppliers. Further, high shareholder ambition, together with a long-term view, can spur innovation and experimentation, provided the underlying assets are not put at risk. This appetite for innovation is reflected in statistics which show that rates of innovation and R&D are higher for Māori firms, compared to all New Zealand firms.

The governors of Māori firms managing collectively-owned assets are accountable to multiple owners and shareholders. Governors in these entities do not necessarily see multiple ownership as detrimental to the strategy, objectives or innovation in their business. Rather, they may see multiple ownership as a strength because it drives transparency around decision-making and the impact of decisions.

Māori cultural values help differentiate Māori goods and services and provide added brand value overseas. The values also closely align with the growth in consumer demand for products with strong environmental and social credentials. This presents growth opportunities for kaupapa Māori firms. Common values and features also help bring Māori firms together around shared goals. Formal and informal networks among Māori firms are important mechanisms for diffusing knowledge, exploring innovations and enabling collaboration.

Features of Māori firms can help spur innovation



The successes of Māori frontier firms build the confidence and ambition of these firms, and can help light the way for other Māori firms. Māori firms also offer valuable lessons for other New Zealand firms. Taking a long-term view and managing multiple bottom lines do not need to be seen as trade-offs to innovation and productivity. Rather, they are complementary. Long investment horizons are important for supporting experimentation and innovation, and long-term value creation. This contrasts with a short-term focus on financial performance and shareholder returns that can dominate the focus of company boards and management. Further, innovation is key to serving multiple bottom lines, as innovative solutions are required to solve many of the environmental and social challenges facing New Zealand.

Building dynamic leadership capabilities

Firms with more strategic ability – "dynamic capabilities" – are able to identify areas of competitive advantage and then seize opportunities in these areas by innovating while identifying and effectively managing risks. Dynamic capabilities foster radical innovations that can push out the productivity frontier. These include innovations in business models, structures and processes, distribution channels, branding and marketing, as well as product offerings.

Firms primarily, but supported by government, will need to deploy dynamic capabilities to identify areas of competitive advantage for New Zealand, understand risk, and drive innovation to push out the productivity frontier. Building the entrepreneurial and leadership capability in management and boards is therefore critical for lifting the performance of New Zealand's frontier firms.

For example, boards with strong dynamic capabilities can spur innovation, through supporting calculated risk-taking, and bringing a long-term view to strategic investments. Directors with international commercial experience can help firms avoid common missteps when expanding overseas. Commercially experienced directors can also help firms access needed capital.

Many of the dynamic capabilities needed for effective leadership are built through commercial experience rather than formal training. If New Zealand is able to grow or attract more large, internationally focused firms, then over time this will assist the development of dynamic capabilities through on-the-job experience and the movement of these skilled people between firms. Another way for New Zealand firms to access these skills, as well as build links into international markets, is to tap into the global Kiwi diaspora. Both these routes also grow the opportunities for upskilling through coaching and mentoring. The accelerated uptake and normalisation of digital communication technologies due to Covid-19 can help firms access knowledge and skills, and build networks in destination markets. This is removing some of the disadvantages of distance, but may require greater investment in skills and management to allow businesses to make the most of these technologies.

Supporting inclusive and sustainable economic growth and recovery

Maximising the contribution of New Zealand's frontier firms will involve growing or attracting large exporting firms that can generate the necessary scale to deliver aggregate productivity gains. Innovation is key to gaining and retaining a competitive advantage in the selected focus areas. The evidence considered by the Commission shows that New Zealand's innovation ecosystem is not currently working well for New Zealand's actual and potential frontier firms. The Commission's recommendations for change are consistent with supporting sustainable and inclusive economic growth and recovery from Covid-19. Innovation-led productivity improvements will be key to delivering inclusive prosperity and making the transition to a low-emissions economy.

1 What this inquiry is about

Key points

- The importance of productivity for living standards has been understood for many years. New Zealand's productivity performance has, however, continued to lag despite various significant policy efforts, which highlights how hard a challenge it is to lift productivity in New Zealand. It's a decades-old problem that has persisted through large structural changes in the economy.
- This inquiry focuses on a central but relatively underexplored aspect of New Zealand's productivity performance – the economic contribution of its most productive firms. These "frontier" firms contribute both directly and by acting as a channel to spread technology and good practice to other firms.
- New Zealand is not a "standard OECD country" and faces an unusual set of challenges and opportunities. New Zealand is unusual in its combination of distance from international partners, small domestic markets, industry structure, and lack of large firms.
- The Commission has used several frameworks and sources of evidence to deepen its understanding of New Zealand frontier firms and their impact on the rest of the economy.
- Firm performance can be measured in several ways. Firms often measure their own performance based on revenue, profits, or return on assets. Yet productivity remains an important measure of firm performance as well as a key driver of economic growth and higher living standards.
- New Zealand has experienced a very significant economic shock from the spread of Covid-19, associated lockdown measures, and the impact of downturn in economies globally. The initial response has rightly been on how governments can temporarily support businesses and workers in the face of deteriorating economic conditions. Yet, as critical as this is, it is important to keep to considering longer-term structural issues that drive business success, such as productivity. This consideration will help the economy not only return to its previous best, but to come back stronger than before.

1.1 What the Commission has been asked to do and why

This inquiry focuses on a central aspect of New Zealand's productivity performance – the economic contribution of its most productive firms. The Terms of Reference (ToR) for this inquiry are included at the front of this draft report. The Government has asked the Commission to investigate how the economic contribution of frontier firms can be maximised, through policies and interventions aimed at:

- improving the performance of frontier firms themselves; and
- helping new technologies, efficient business practices, and other productivity-enhancing innovations diffuse more effectively to other New Zealand firms.

What is at stake?

While aspects of New Zealand's recent economic performance have been strong over the last several decades, productivity growth has been persistently weak and a significant drag on the living standards and wellbeing of New Zealanders. This inquiry is motivated by a conjecture that this weak productivity performance is associated with New Zealand's frontier firms generally underperforming relative to their international peers, particularly those in other small advanced economies (SAEs).

Productivity refers to how well people or organisations (public, private for-profit, and private not-for-profit) or countries convert inputs such as labour and capital into valuable goods and services. Improvements in

productivity allow a given quantity of goods and services to be produced using fewer resources; or allow more (or more valuable) goods and services to be produced from the same resource base. This is often done using new technologies or innovative practices. Changing how firms are organised, governed and managed can also improve productivity.

Productivity growth is necessary, but not sufficient to lift living standards sustainably. Lifting living standards also requires allocating the additional output to produce things that matter, such as health and education services, housing, and infrastructure – as well as goods and services for private consumption distributed equitably across households.

Yet lifting productivity must be at the heart of any strategy to lift the wellbeing of New Zealanders. It can help the country earn a living from the rest of the world while protecting the natural environment. It can lead to faster growth in real wages, meaning families have decent incomes without having to work longer hours. It underpins the provision of state services to vulnerable groups.

Creating opportunities to participate in the economy and society is also important. The Government's aspiration for an economy that is productive, sustainable and inclusive sums all this up well.

Improved productivity can support social and cultural wellbeing. Improving the productivity of Māori firms, for example, can provide benefits to Māori and the wider New Zealand economy, across multiple dimensions.

> Growing a more productive, innovative and internationally connected Māori economic sector will deliver prosperity to Māori, and resilience and growth to the national economy. This will be achieved by lifting per capita income and improving export performance, which will lift the Māori contribution to the New Zealand economy and improve quality of life for Māori and all New Zealanders. (Māori Economic Development Panel, 2012, p. 6)

New Zealand faces the major challenge of transitioning to net-zero greenhouse gas emissions by 2050. To achieve this goal while maintaining acceptable living standards will require productivity growth. The transition will mean profound and widespread changes in every part of the economy – including in production methods, technology, energy systems, land use, regulatory frameworks, and business and political culture. Governments, businesses and households will all need to play a part.

Many previous attempts to lift New Zealand's productivity

The importance of productivity has been understood for many years. Over the last four decades, governments and policy analysts have regularly attempted to shift New Zealand's productivity into a higher gear.

- Closer Economic Relations with Australia in 1982 was the first big step to open the economy and break with protectionism.
- The substantial reforms of the late 1980s and early 1990s were intended to sharpen incentives for greater efficiency in business, induce structural shifts in the economy, and establish a more stable and predictable macroeconomic framework.
- The early 2000s saw the knowledge wave conferences, and the language of "economic transformation" to a knowledge-based, high-skill economy. These years also saw significant reforms to savings and capital markets in the form of KiwiSaver, the New Zealand Venture Investment Fund and the New Zealand Superfund.
- The years 2009-2015, following the Global Financial Crisis (GFC), were dominated by recovery – maintaining and expanding employment and getting the government budget back into surplus.

Some key government initiatives aimed at lifting economic growth and productivity over the last 20 years are summarised in Box 1.1.

Box 1.1 **Government strategies for lifting economic growth and productivity**

Since the late 1990s, successive governments have pursued economic strategies aimed at lifting economic prosperity through boosting innovation, diversifying the economy, and shifting economic activity up the value chain. Common threads have included building a skilled workforce, increasing international connections, supporting research and science, deepening capital markets, and investing in infrastructure. This has resulted in ongoing initiatives to foster and underpin innovation.

- The New Zealand Venture Investment Fund was established in 2002 to deepen the early-stage capital market. Now New Zealand Capital Growth Partners, it received a $300 million boost in Budget 2019.
- The telecommunications sector has been restructured and reformed, and its infrastructure upgraded through the rollout of ultra-fast broadband.
- Callaghan Innovation was established in 2013, to partner with businesses by providing a range of research and development (R&D) services, and to improve the operation of the innovation ecosystem.
- An R&D tax incentive was introduced in 2019.

Further, the approach to supporting economic development has evolved over time and across governments.

- In 1999, the then-new Labour-led Government established the Economic Development portfolio and created Industry New Zealand to support regional and sectorial economic growth. In 2003, the domestically focused Industry New Zealand was merged with Trade NZ, to form New Zealand Trade and Enterprise (NZTE), which assists New Zealand firms to grow internationally.
- The 2001 Knowledge Wave conference looked at ways to generate high-value industries, and the subsequent Growth and Innovation Framework (GIF) focused on supporting the ICT, biotech, screen production and design sectors.
- In 2006 the GIF was replaced with the Economic Transformation Agenda (ET). ET retained the emphasis on innovation, but its five themes included a focus on environmental sustainability, as well as building Auckland as an internationally competitive city.
- In 2012 the fifth National-led Government launched its Business Growth Agenda (BGA). Faced with a post-GFC environment, the BGA included microeconomic reforms to support business recovery and economic growth. Initiatives included investment in infrastructure, innovation (Callaghan Innovation and the Primary Growth Partnership), and increasing exports through trade agreements.
- In 2013 He kai kei aku ringa, the Crown-Māori Economic Development Strategy, was launched, providing a vision and accompanying action plan for a more productive, innovative, internationally connected and export-oriented Māori economy. Focus areas include lifting educational achievement, supporting more productive use of natural resources, and developing new commercial opportunities and export markets by building on Māori points of difference ("Māori Inc.").
- In 2018 the Ministry for Pacific Peoples published Pacific Aotearoa Lalanga Fou, which emphasised a need to develop more successful and sustainable Pacific entrepreneurs and Pacific-owned businesses.
- In 2019 the Labour-led Government issued its Economic Plan for a productive, sustainable and inclusive economy. Priorities include sharing the benefits of growth more widely (reducing inequalities) and transitioning to a low-emissions economy. The Treasury used its "Living standards framework" to help the Government introduce a "Wellbeing Budget".

Source: Vitalis (2008); Māori Economic Development Panel (2012); New Zealand Government (2017); New Zealand Government (2019a); New Zealand Government (2019b).

The fact that New Zealand's productivity has continued to lag in the face of these efforts has been described as a paradox, as this has occurred despite policy settings in many important areas appearing at or close to best practice – at least when "viewed through the long-range telescopes of the OECD and World Bank" (Conway, 2018, p. 52).

Yet rather than being a paradox, this inquiry takes the view that New Zealand is not a "standard OECD country". It faces an unusual set of challenges and opportunities (Conway, 2018). The challenges mean it is more difficult, but not impossible, to lift productivity in New Zealand. The path to success is likely to be different from that of larger or more centrally located economies. Studying other SAEs in a structured way therefore can provide key insights and lessons, although even among this group the challenges New Zealand faces are unusual.

1.2 The evidence base

To conduct this inquiry, the Commission has undertaken internal research, commissioned research and reports from others, drawn on submissions to its Issues Paper, and learnt much from its many engagements with stakeholders and other interested parties. It has also drawn on substantial published research – both international and New Zealand.

The internal research includes statistical work using firm-level data, four industry case studies, and qualitative research such as in-depth interviews with company directors (in conjunction with the Institute of Directors).

The key themes of submissions have been summarised in a companion note to this report. Table 1.1 lists the internal and external research undertaken for the inquiry. Views expressed in external papers do not necessarily reflect those of the Commission. The reports are, or will be, available on the Commission's website.

Table 1.1 Inquiry research reports

Author	External	Title
Barry and Pattullo (2020)	Yes	*The dairy sector in New Zealand: Extending the boundaries*, TDB Advisory
Crawford (forthcoming)	No	*Modern industry policy: How is it relevant to New Zealand?*, NZPC working paper
Deloitte Access Economics (2020)	Yes	*Analysis of the Top 200 firms and Top 10 Māori businesses*
Fabling (forthcoming)	Yes	*Characteristics of New Zealand's frontier firms*, NZPC working paper
Fry and Wilson (2020)	Yes	*Could do better: Migration and New Zealand's frontier firms*, NZIER
Haar (2020)	Yes	*The performance of Māori firms: A strategic management approach*, New Zealand Work Research Institute
Lewis et al. (forthcoming)	No	*Frontier firms: Four industry case studies,* NZPC working paper
Mill & Millin (forthcoming)	Yes	*Insights from Māori frontier firms*
New Zealand Productivity Commission (2020a)	No	*New Zealand firms: Reaching for the frontier – summary of submissions on the issues paper*
Skilling (2020)	Yes	*Frontier firms: An international small advanced economy perspective*, Landfall Strategy Group
Smith and Garden (2020)	No	*New Zealand boards and frontier firms*, NZPC working paper
Teece and Brown (2020)	Yes	*New Zealand frontier firms: A capabilities-based perspective*, Berkeley Research Group Institute
Sim and Bull (forthcoming)	Yes	*Export actions and challenges: A text analysis of data on F700 firms*
Zheng and Hoang (forthcoming)	No	*Benchmarking New Zealand's frontier firms*, NZPC working paper

1.3 Frameworks used in this report

As well as the standard concepts and tools for studying economic growth, the Commission has applied several other lenses to help it understand the New Zealand economy and make recommendations to improve its performance.

- Small advanced economies – comparing New Zealand with other small advanced economies[2] is useful for several reasons (Skilling, 2020). Although every small economy is distinctive, looking across this group can illustrate common themes and key differences. Most are high performing, generating strong economic and social outcomes. But they also face the constraints of small domestic markets, and some are relatively remote. These economies can provide more relevant lessons for New Zealand than larger economies. As Skilling (2020) notes, small advanced economies are not just scaled-down versions of larger economies, but have specific characteristics that shape their performance.
- The OECD model of frontier firms – technologies and best practices diffuse from a global frontier of best-performing firms globally to national frontier firms (the most productive firms in each country), and eventually to firms below the national frontier. Overall productivity increases through both effective diffusion and resources reallocating from lower-productivity firms to those with higher productivity. (Chapter 3)
- Micro-data on businesses – the access to linked administrative and survey data for individual firms (microdata) that is now available can provide new and deeper insights into New Zealand's productivity performance. This is one of the most significant analytical developments in recent years. It means that the OECD model of frontier firms can be investigated empirically. (Chapter 3)
- Dynamic capabilities – which involve sensing areas of competitive advantage, then seizing the opportunities in these areas by innovating while identifying and effectively managing risk. This framework provides important insights into the "black box" of firm leadership and performance, and how government policy in areas such as innovation, firm governance and regulation could be improved (Teece & Brown, 2020). (Chapter 8)
- Economic complexity – researchers have created measures of economic complexity that capture the sophistication of a country's exports and the extent to which the export mix conveys difficult-to-imitate competitive advantage. They have also developed detailed maps of goods exports that show areas of economic activity where countries are most likely to discover opportunities for further innovation (Hidalgo et al., 2009). (Chapters 2, 5 and 6)

[2] Following the approach of David Skilling, small advanced economies are defined as IMF advanced economies with populations between 1 million and 20 million and with per capita incomes above USD30 000 (Skilling, 2020). This gives a group of 13 small advanced economies: Austria, Belgium, Denmark, Finland, Hong Kong, Ireland, Israel, New Zealand, Netherlands, Norway, Singapore, Sweden, Switzerland.

1.4 A guide to this report

Table 1.2 outlines the structure of this report.

Table 1.2 Report structure

Chapter	Content
Chapter 2	Describes the challenges that the New Zealand economy faces, and the Commission's view of the broad path the country needs to follow to tackle these challenges successfully.
Chapter 3	Has key findings from the Commission's empirical research about frontier and non-frontier firms in New Zealand and five European small advanced economies. It compares the productivity of frontier firms and the width of productivity distributions across countries.
Chapter 4	Contains insights about Māori frontier firms, their features, opportunities, the challenges they face, and lessons they offer.
Chapter 5	Examines the close relationship between innovation and exporting in a small advanced economy like New Zealand. It describes the challenges that exporters face and why a supportive innovation ecosystem is important for success.
Chapter 6	Drills into the nature of innovation ecosystems. It examines what governments in several successful small advanced economies have done to foster successful ecosystems, and the case for a focused approach to innovation.
Chapter 7	Compares the innovation performance of New Zealand with other small advanced economies, and considers the contribution of government policies, institutions and processes to this performance. It makes recommendations for improving New Zealand's innovation ecosystem.
Chapter 8	Covers the importance of talent and leadership to business success. It examines the scope to improve post-graduate domestic talent, management and governance, international people connections, and migration policy settings.
Chapter 9	Describes several examples of the importance of designing regulations that support innovation rather than acting as a barrier. The examples are drawn from case studies in dairy, horticulture, software products and services, and health technology.
Chapter 10	Outlines the agenda for implementing the Commission's recommendations, summarising the priorities for action and the gains they can deliver.

1.5 Key definitions and concepts

Productivity

Productivity as a broad concept is defined in section 1.1 under "What is at stake?". Since this inquiry has a focus on firm performance, it covers below what this means, and the application of productivity concepts to firms.

What is meant by firm performance?

Firm performance is measured in different ways for different purposes. Firms often measure their own performance based on revenue, profits or return on assets.[3] Some firms, such as some Māori businesses, may also operate "more than a triple bottom line, balancing many competing demands, namely: cultural, political, environmental, social development and commercial imperatives" (Te Puni Kōkiri & Federation of Māori Authorities, 2006, p. 10).

Productivity is the most important measure of economic performance for living standards over the medium to long term, yet firms and shareholders focus more on profit than productivity. Box 1.2 explains the differences between them and why both measures are important.

[3] Firms may also monitor "softer" measures of performance, like customer satisfaction or staff retention.

Box 1.2 **Productivity, profitability and wellbeing**

Productivity is about how much "real" economic value is added per unit of input. The value added is real in the sense of actual goods and services that firms produce such as milk powder, life-saving drugs, houses or haircuts. The type and quality of each product needs to be specified. Inputs are "real" too – such as an hour of labour or an hour's use of a combine harvester. When a business produces more than one output, it is necessary to derive a composite output measure by combining the outputs into a single "output bundle". Businesses use at least two inputs – labour and capital services – and many use more than two. Productivity is defined relative to either a single input (eg, labour productivity) or a group of inputs treated as a bundle.

A firm's profit is the revenue it earns from selling its outputs less the cost of its inputs. This is not the same as its productivity – if the price of its output goes up but nothing else changes, its profits will increase but its productivity will not change. Owners of firms care about profit because it is the income they earn from their investment in owning the firm.

If a business becomes more productive, several effects can follow.

- The business may be able to achieve higher profits because it can produce more outputs with the same inputs (such as hours of work), or the same level of outputs with fewer inputs. This higher profitability may then prompt the owners and managers to expand output.
- If other similar businesses also become more productive and profitable, and they all expand their outputs, then prices are likely to drop, benefiting consumers (but not necessarily the firms, since with falling prices their profitability may return to "normal").
- If higher productivity is achieved by the input of a scarce skill, piece of knowledge or other input that the businesses must buy, their increased demand will drive up the price of the skill or knowledge and the gains will go to those who own these scarce resources.

The latter two cases show that higher productivity doesn't necessarily mean higher profitability. But higher productivity always enables higher living standards for some group in the economy. Indeed, higher productivity is necessary for a sustained lift in living standards. Even at the level of an individual business, choices exist from higher productivity. The business could reward its shareholders, pay higher wages, or invest in staff wellbeing by giving them the time and space to have a better work-life balance.

Neither do higher profits necessarily mean higher productivity. This is because a business with some monopoly power may be able simply to put up its prices and earn higher revenue without improving its productivity. Yet, in a competitive economy, the *pursuit of profit* by firms motivates them to innovate and be efficient (ie, be more productive). As noted, this leads to higher living standards. Even if a competitor manages to earn a generous profit in the short run, over a longer time period competition will tend to pare it back to normal. Through the competitive process, consumers are better off. This illustrates the importance of effective competition law and enforcement.

In one important case only, citizens of a small country can enjoy higher living standards without higher productivity. If no activity within the country raises its productivity, yet prices of the country's exports go up, or the prices of its imports go down, at least some citizens will be better off. Such changes are termed favourable shifts in the country's "terms of trade". Welcome as such changes might be, they are outside a country's control. Further, the prices can move the other way and so make people worse off. Such changes are simply an inevitable positive or negative risk faced by small trading nations.

Two measures of firm performance based on productivity are common:

- A firm's **productivity growth**. This measure captures how productivity changes over time. Productivity growth rates are normally calculated by comparing the growth of a firm's outputs with the growth of its inputs.
- A firm's **productivity level**. This is a measure of the firm's level of productivity in a particular year. It is more difficult to measure productivity levels than growth rates because it is often easier to measure *changes* in economic quantities and values than their absolute levels. But measures of levels enable comparisons across firms, highlighting differences in productivity between firms in the same industry either within New Zealand or compared with firms in other countries.

When comparing a firm's outputs with its inputs, the two most common methods are *labour productivity* and *multifactor productivity* (MFP).

- **Labour productivity** is the output of a firm divided by the number of hours of work that are needed to produce the output. Labour productivity can vary across time and across countries, depending on how labour is combined with other inputs (such as capital) to produce output. For example, adding a wheelbarrow to a person with a shovel – an activity described as raising capital intensity (or capital deepening) – results in the person being able to shift more dirt from point A to point B for a given input of labour hours.
- **MFP** is a measure of the additional (or "residual") output produced compared to the output expected from a "unit bundle" of the inputs (or "factors") that the firm uses. The two most common inputs are labour and capital, but firms also use other inputs such as unimproved land and the "intermediate" goods and services that they buy from other firms, such as raw materials and engineering services. So MFP represents the increase in output that cannot be attributed to the measured inputs. It is the contribution to output from new technologies, advances in knowledge, scale economies, and improvements in management, worker skills or production processes. Often these improvements come together – for example, a new IT system not only provides workers with more advanced technology, but also enables improved work processes (Conway, 2016).

What is meant by frontier firms and a productivity frontier?

Given the Terms of Reference describe New Zealand's *frontier firms* as "the most productive firms in the economy within their industry", the Commission follows the OECD by defining frontier firms as those in the top 10% of the productivity distribution of firms in an industry. The *industry productivity frontier* is defined as the productivity of the firm with the lowest productivity within the top 10%. This is the productivity of the firm at the 90th percentile in the productivity ranking.

The idea of an industry frontier can then be extended to a *national productivity frontier* (by taking a weighted average of a country's industry frontiers) and a *global frontier* for the highest-productivity firms in the world. There is nothing sacrosanct about 10%. Some studies use a 5% or top-quartile cut-off to define frontier firms.

Frontier firms are those in the frontier group at a point in time. It is important to note that the composition of this group typically changes over time, with some firms moving into it and others exiting.

Non-frontier firms are all those firms not in the frontier group. This, of course, includes a wide range – from firms just behind the frontier to those whose productivity is at the lowest end of the range.

The productivity distribution is sometimes broken into ten "deciles", and sometimes into 100 finer divisions called "percentiles". The *first* decile consists of the 10% of firms with the lowest productivity and the *tenth* decile consists of the 10% of firms with the highest productivity – the frontier firms. The firms in the first decile are called *laggard* firms (referred to sometimes by economists as "zombie" firms because they continue to use resources that could be better deployed elsewhere).

Chapter 3 discusses the concept and definition of frontier firms in more depth, including different and/or broader ways of defining them.

1.6 The Covid-19 backdrop to the inquiry

New Zealand has experienced a very significant economic shock from the spread of Covid-19. Initial focus was rightly on how governments can provide immediate support to businesses and workers in the face of deteriorating economic conditions. Yet, as critical as this is, it is important to keep considering longer-term structural issues that drive business success, such as productivity.

Box 1.3 **Covid-19 and the inquiry**

The world is facing a significant economic shock due to the economic impacts of Covid-19. The magnitude and duration of the impending global recession will depend on the success of efforts to contain the virus and how much economic output is sacrificed in the process.

The size of the shock is still unclear. But it will be worldwide and have implications for globalisation. The economic impacts will be long-lasting, and are likely to get more severe as the international economy weakens further. For New Zealand, the risk is that this could lead to policymakers and firms putting less emphasis on global markets, but this would be a mistake (Skilling, 2020). New Zealand's international relationships may well change, but they will be no less important. Also, as Conway (2020) has noted, the pandemic has created opportunities for New Zealand businesses to better engage with overseas markets, given the increased uptake of digital technologies.

Covid-19 has not only increased the importance of the inquiry's questions, but has also required the Commission to tailor its approach to the evolving circumstances. Recognising the significant demands on firms at this time, the Commission has taken a targeted approach to engagement, for example through case studies, and online communications. However, the Commission welcomes wider engagement before it finalises its inquiry report. It is particularly keen to hear from a broader range of firms, including Māori enterprises, as well as representatives of employee and shareholder interests. The Commission encourages anyone with an interest in the inquiry to get in touch to share their views.

One of the lessons of the 2008 GFC is that economic shocks can have ongoing effects that hold back productivity and living standards for years (Coleman & Zheng, 2020). This is especially important for New Zealand since, as noted, slow productivity growth has been a stubborn problem for decades.

After the GFC, New Zealand's slow productivity growth deteriorated even further, and remains lower than before the GFC (Nolan et al., 2019). Many OECD economies also experienced a slowdown in their productivity growth following the GFC. While New Zealand's productivity growth rate is comparable to that of some other economies, most of these are well ahead in their *level* of productivity compared to New Zealand.

This failure to grow productivity "faster from behind" is the reason that GDP per capita in New Zealand remains 30% below the average of the top half of the OECD. The country has supported household incomes through high labour force participation rates and long hours of work, not productivity growth. Lifting New Zealand's productivity must be central to efforts to help the economy not only return to its previous state, but come back stronger than it was before.

2 New Zealand's productivity challenge

Key points

- New Zealand's disappointing productivity performance has held back its standard of living for many years.
- New Zealand's poor productivity performance occurs despite many of its framework policy settings and institutions rating quite well in international comparisons. Improvements are always possible, and New Zealand should aim to be close to the policy frontier in order to offset its disadvantages. Yet the relative quality of its framework policies does not explain New Zealand's substantial productivity performance gap.
- On some other dimensions, New Zealand's policy performance is weak – such as government investment in R&D, certain areas of regulation, the evaluation of regulatory regimes, and incentivising close relationships between researchers and business.
- Some explanations for why New Zealand's productivity performance has been poor are:
  - small size of domestic markets associated with weak intensity of competition;
  - distant location associated with weak international connections;
  - low investment in R&D, knowledge-based capital and innovation;
  - low economic complexity in its export mix and low participation in global value chains;
  - very few globally competitive large firms with outstanding records of exporting sophisticated and distinctive goods and services;
  - firms' limited ability to learn (especially reflecting management and governance practices); and
  - capital shallowness – relatively low levels of plant and equipment that can lift output per worker.
- To overcome its productivity challenge, New Zealand must develop smart strategies that deal with its remote location and make the most of its circumstances. It must succeed in internationally tradeable goods and services, using innovation to gain and retain a competitive advantage.
- In the Commission's view, the most promising path for New Zealand to lift its productivity is to take inspiration from successful small advanced economies (SAEs) such as the Netherlands, Singapore and Sweden – while duly acknowledging the country's starting point and distinctive circumstances.
- To become a successful SAE, the Government should take deliberate steps to upgrade New Zealand's innovation ecosystem. The private sector, research sector and government must be effective partners on the journey.
- Most, but not all, possibilities for successful innovation and exporting for a country build on its existing set of capabilities. These include technical skills and knowhow, research capability, supply and distribution networks, knowledge of markets, and institutional and regulatory arrangements that support the production and commercialisation of specialised, knowledge-intensive goods and services.
- Businesses primarily, supported by government, will need to deploy dynamic capabilities to identify areas of competitive advantage for New Zealand, understand risk, and drive innovation that will push out the productivity frontier. Dynamic capabilities involve sensing areas of potential competitive advantage, then seizing the opportunities in these areas by innovating while identifying and effectively managing risk.

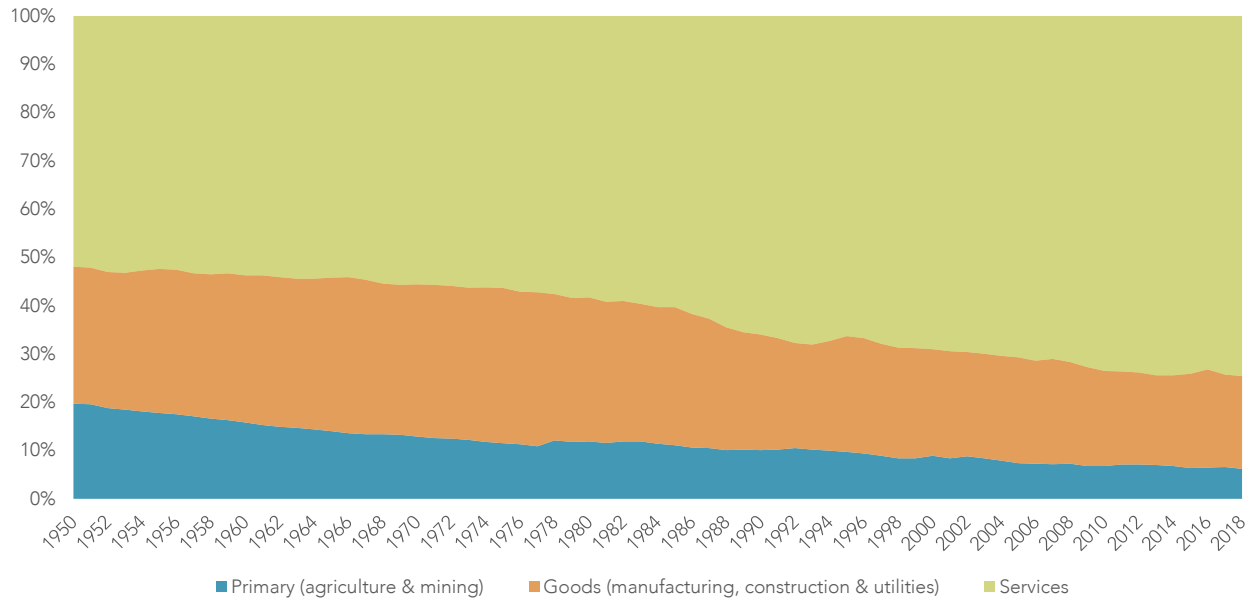
This chapter sets the scene for the rest of the report. It notes New Zealand's weakness in productivity performance and describes the Commission's diagnosis of symptoms and causes. Not everything in the diagnosis is conclusive, but it is evident that New Zealand has much to learn from high-performing small advanced economies (SAEs) with successful large innovative firms that export at scale.

2.1 New Zealand's productivity performance and challenges

Structure of the New Zealand economy

Like other SAEs, New Zealand has become a predominantly services economy. The services sector produced about 70% of GDP, and accounted for more than 75% of employment in 2018 (Figure 2.1). The sector is extremely varied – ranging from low-skill services to high-skill professional services and high-tech digital services. The goods sector accounted for 19% of employment and the primary sector 6% (NZIER, 2020). Given the scale of the services sector, the productivity of services is critical to any closing of New Zealand's aggregate productivity gap with leading OECD countries. Lifting the performance of frontier firms can lift the productivity of services directly (where they are traded) and indirectly (as a result of diffusion of innovation from frontier firms).

Figure 2.1 Employment by industry sector, 1950-2018



Source: NZIER (2020).

New Zealand's exports stand at 27% of GDP (Infometrics, n.d.), a level that has stayed relatively stable since the 1980s. Since trade barriers were removed in the 1980s New Zealand has added more value to its exports, although, more than ever, these exports are based on primary produce rather than manufacturing. Dairy and wood exports have grown significantly, at the expense of sheep and cropping (Lattimore, 2019). In recent years New Zealand's exports have become increasingly reliant on dairy exports to China (van Rensburg, 2019). In terms of companies, Fonterra dominates New Zealand's exports, generating around 23% of total exports by the top 10 000 exporting firms. For comparison, the next nine largest firms together export 14% (MBIE, 2014).

Exports from services such as international tourism have grown in recent decades. Tourism overtook dairy as the top export in 2016 but dropped back for obvious reasons in 2020. It is also important to note that when service inputs to merchandise exports are included, services make up over half of the value of total exports (NZPC, 2014a). In the decade up to 2019, export sales of software and services by the ICT sector quadrupled, overtaking wine and reaching $2.1 billion (Cox, 2020).

New Zealand has a low level and growth rate of productivity

New Zealand's disappointing productivity performance has held back its standard of living for many years. This fact is widely documented and acknowledged.

For the last 25 years or more, New Zealand's GDP per head has remained around 70% of the GDP per head that prevails in countries in the top half of the OECD (Nolan et al., 2019).

Improvements in labour productivity (GDP per hour worked) have made only a weak contribution to aggregate economic growth (Skilling, 2020). "New Zealand is … just one of a small number of OECD countries who have had both low levels and growth of labour productivity since 1996" (Nolan et al., 2019, p. 4). New Zealand's slow labour productivity growth relative to other OECD countries has continued after the GFC. While labour productivity growth slowed across the OECD to an average of 0.9% a year over 2010 to 2017, New Zealand's fell to 0.5% a year (OECD, 2019).

According to the economic-growth concept of "convergence", countries at lower levels of productivity will tend to grow faster relative to high-productivity countries as they learn, and adopt and adapt knowledge, techniques and practices from the advanced group. New Zealand is unusual in not fulfilling this expectation. It is "keeping up, but not catching up" in its growth in GDP per head but even keeping up is due to its high labour-force participation and long hours worked rather than growth in labour productivity (Conway, 2016).

New Zealand's low labour productivity growth since the GFC should be seen in the widely noted context of a fall in labour productivity growth rates across a broad swath of OECD economies from the mid-2000s to the present. As Brynjolfsson et al. (2017) note:

> …aggregate labor productivity growth in the U.S. averaged only 1.3% per year from 2005 to 2016, less than half of the 2.8% annual growth rate sustained from 1995 to 2004. Fully 28 of 29 other countries for which the OECD has compiled productivity growth data saw similar decelerations. The unweighted average annual labor productivity growth rates across these countries was 2.3% from 1995 to 2004 but only 1.1% from 2005 to 2015. (p. 4)

The reasons for this widespread slowdown are hotly debated among economists and not yet fully understood. Candidate explanations include the drying up of opportunities for further marked increases in living standards (Gordon, 2017), mismeasurement (Syverson, 2017), and lags between recent radical innovations, such as AI and machine learning, and their full diffusion and implementation (Brynjolfsson et al., 2017).

Even so, this context cannot illuminate why New Zealand's productivity performance has compared poorly with so many other countries for such a long period.

Plausible explanations for New Zealand's poor productivity performance

New Zealand's current policy settings provide some clues

How well suited are New Zealand's current policy settings to meeting its productivity challenges? Can they help explain its poor performance? The top section of Table 2.1 shows rankings for some of New Zealand's framework policy settings. It ranks near the top of the OECD on these measures, which include its institutions and governance practices, low levels of corruption, and micro-policy settings that affect the ease of doing business (eg, starting a business, flexible labour and capital markets).

While not shown in Table 2.1, New Zealand also scores well on the quality of its fiscal and monetary policy settings. Most New Zealand policies are not contingent on the size or form of firms. Such policies can distort incentives to adopt the optimal size and form of firms. New Zealand has a well-educated workforce, and workers continue to undertake further education and training at high rates (NZPC, 2020b).

Although improvements are always possible, and New Zealand should aim to be close to the policy frontier in order to offset other disadvantages, the relatively high quality of its framework policies does not explain New Zealand's substantial negative productivity performance gap.

Table 2.1 How New Zealand's policy settings rate – selected international rankings

	Measure	NZ ranking	Source
Measures on which NZ ranks high	Ease of doing business	1/190	World Bank Ease of Doing Business Index 2019
	Lack of corruption	1=/180	Transparency International Corruption Perceptions Index 2019
	Flexibility of labour market regulations: • individual and collective dismissals (permanent workers); and • individual dismissals (permanent workers).	 1/34 4/34	OECD Employment Protection Legislation 2013
	Ease of starting up a business (administrative burden)	7/34	OECD Product Market Regulation Indicators 2018
	Product market regulations (overall indicator)	12/34	OECD Product Market Regulation Indicators 2018
Measures on which NZ ranks low	Government expenditure on R&D as a percentage of GDP	20/35	OECD Science and Technology Indicators 2017[2]
	Simplification and evaluation of regulations	24/34	OECD Product Market Regulation Indicators 2018
	Regulation of Foreign Direct Investment (FDI)	34/34	OECD Product Market Regulation Indicators 2018

Notes:

1. For OECD employment protection and product market regulation indicators, lower ranking = more restrictive/burdensome; higher ranking = less restrictive/burdensome. So New Zealand has among the least restrictive employment protection legislation (representing a flexible labour market), but the most restrictive FDI regulations in the OECD.
2. Direct government expenditure (gross) does not include indirect support such as R&D tax incentives. A lower ranking indicates less generous government support.

New Zealand's productivity gap is more likely to be associated with its lower-ranked policy settings and performance around R&D, broader innovation, exporting, FDI, Outward Direct Investment (ODI), some domains of regulation, and the evaluation of regulations (Table 2.1 and Box 2.1). These features seem likely to be either contributing to, or reflective of, New Zealand's weak productivity performance and its relative lack of successful frontier firms. This inquiry has therefore focused on these features and firms to better understand the challenges that New Zealand firms face in developing competitive advantage in global markets.

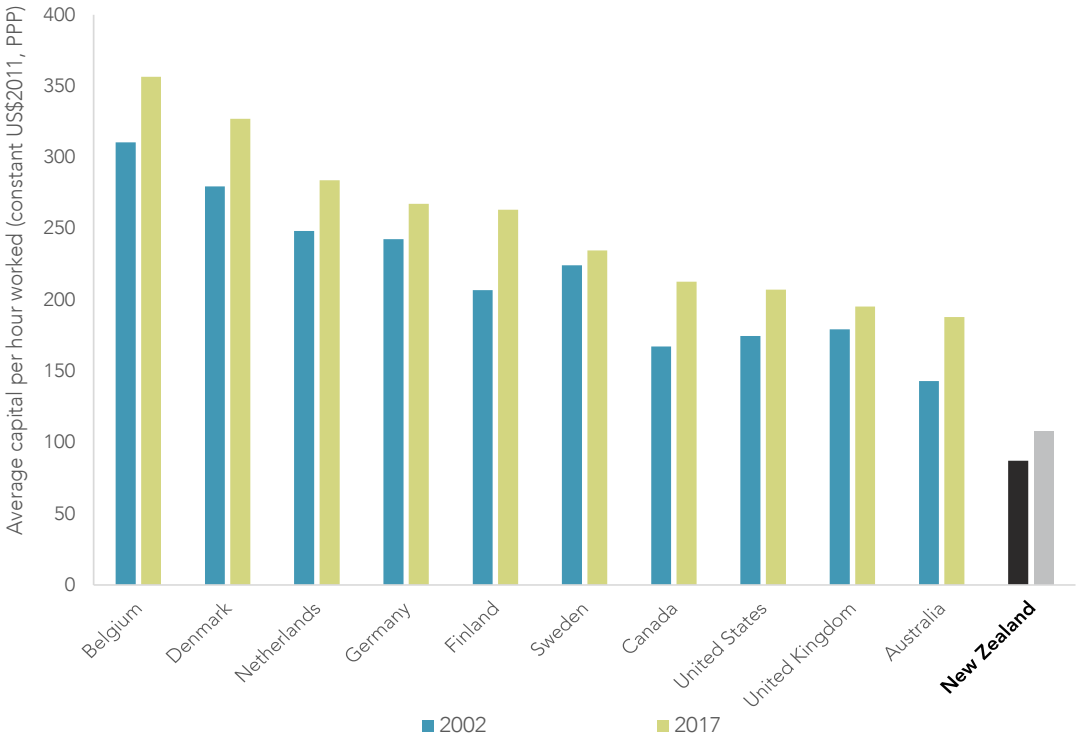
F2.1 Many of New Zealand's framework policy settings rate well in international comparisons. These include its fiscal and monetary policy frameworks, the quality of its institutions, its low levels of corruption, and its settings relating to the ease of doing business. However, the quality of these settings, while helpful, has not by itself motivated enough innovation and investment to lift New Zealand's productivity to the next level.

F2.2 New Zealand's lower rankings and performance in R&D, broader innovation, exporting, Foreign Direct Investment, Outward Direct Investment and some domains of regulation are likely to be both contributing to and reflective of its weak productivity performance and relative absence of successful frontier firms.

New Zealand businesses tend to be capital-shallow

Aggregate data (Figure 2.2) show that New Zealand businesses are typically capital-shallow (ie, workers have limited equipment and other capital goods to work with) and this has depressed labour productivity.

Figure 2.2 Capital intensity – New Zealand and other countries, 2002 and 2017



Source: Groningen Growth and Development Centre (2020).

Note:

1. Capital intensity is measured by capital stock per hour worked.

The reasons for capital-shallowness are complex. As well as the likely impact of size and distance in lowering investment returns, the high off-the-shelf cost of capital goods in New Zealand, a long period of high real interest rates, and, for the last two decades, fast population growth (Nolan et al., 2018) have all likely contributed. The ready availability of labour at modest or low wages (eg, through immigration policies that allow rising levels of low-skill migration) has not helped either, because it has reduced firms' incentives to invest in labour-saving and productivity-enhancing equipment (discussed further in Chapter 8).

F2.3

New Zealand businesses are typically capital-shallow (ie, workers have limited equipment and other capital goods to work with) and this has depressed labour productivity. Historically, this has been partly explained by the high off-the-shelf cost of capital goods, past periods of high long-term real interest rates, and fast population growth. Low returns to investment, low wages and ready access to low-cost immigrant labour are also contributing factors.

Small size and distant location are handicaps and linked to weak international connections

Some of the explanation for New Zealand's weak labour productivity performance is the small size of its domestic market and its distant location from large international markets (Boulhol et al., 2008; Conway, 2018; McCann, 2009). These disadvantages are associated with weak international flows in trade, capital and knowledge, and weak domestic competition in non-tradeable industries (Box 2.1).

Box 2.1 **New Zealand's international performance**

In small economies, access to international markets – via trade, investment and flows of people and ideas – allows productive firms to grow and benefit from scale and specialisation, while at the same time maintaining or even increasing pressure on competitors. International connections also act as key channels for technology diffusion. Yet, although the New Zealand economy is relatively open on paper, there is concern that it is not well connected internationally (Conway, 2016).

- Low trade intensity: At 28% of GDP, New Zealand's export share of GDP is much lower than the average of 59% across the small advanced economy group (even after stripping out the outliers of hub economies like Hong Kong, Singapore and Ireland). New Zealand's low rate of exporting partly reflects the significant risks for its firms of launching into exporting to a distant market from a small domestic base.
- Flat export growth: New Zealand's export share of GDP has not changed meaningfully over the past few decades, and it remains at the same level as in the early 1980s. This contrasts with most other advanced economies where the export share has increased, particularly in the 15 years prior to the global financial crisis.
- Lack of complexity of exports: In the 10 years to 2018, New Zealand's ranking in the Economic Complexity Index (ECI) fell due to a lack of diversification of exports into areas where it has a sustained competitive advantage. There have been some successes (eg, growth in digital products and shifts within the primary sector), but the scale of the transformation in New Zealand pales in comparison to that of some other small advanced economies (Skilling, 2020).
- Low participation in global value chains (GVCs): New Zealand has low rates of participation of both "forward participation" (exports of intermediates used in other countries' exports) and "backwards participation" (imported inputs used in exports) in GVCs.
- Weak outward direct investment (ODI): New Zealand has the lowest outward direct investment shares of GDP of all the small advanced economies. At 8% of GDP, this compares with an average of 84% across the small advanced economy group (Skilling, 2020). The profitability of some major ODI ventures by prominent New Zealand firms has been low or negative.
- Reducing inflows of FDI and limited benefits from it: After a strong inflow in the 1990s, the stock of FDI as a share of GDP in New Zealand has grown more slowly than the OECD average and is now around the level of the OECD median (Wilkinson & Acharya, 2014). Even during the 1990s inflow, the FDI was mostly not of the type that sought to innovate and export from a New Zealand base. Rather, it invested in service industries or utilities to sell to the domestic market, or in the primary sector's natural resource base.

Distance from other markets makes it difficult and therefore quite rare for New Zealand firms to participate in global value chains (GVCs). A "value chain" refers to "the range of activities that firms undertake to bring a product or a service from its conception to its end use by final consumers" (De Backer & Miroudot, 2014, p. 1). The form and point of participation in GVCs can of course vary, with some activities having greater specialisation and value-added than others. The following discussion assumes that participation is at the higher end of the range. GVC participation is typically measured by "forward participation" (exports of intermediate goods used in other countries' exports) and "backwards participation" (imported inputs used in exports). New Zealand has low rates of participation on both measures (Figure 2.3). Distance makes it difficult for firms to participate in GVCs (De Backer & Miroudot, 2014).

Low participation in GVCs contributes to the absence of distinctive and specialised products in New Zealand's export mix, and to a low overall level of exports to GDP. Such features contrast with successful small advanced economies, located mostly in Europe (eg, Sweden, Denmark, Ireland, the Netherlands), but also including Singapore (Skilling, 2020).

Yet geography is not destiny. New Zealand has a few very high performing businesses that are likely to be at or close to the global frontier in their fields – think of Fisher & Paykel Healthcare in the niche area of medical ventilator humidification and, at an earlier stage of development, the accounting software company Xero. These examples show that being world-class from a New Zealand base is possible. The problem is that New Zealand has very few such companies.

New Zealand lacks large exporting firms, unlike high-performing small advanced economies

Unlike New Zealand, high-performing small advanced economies mostly have several large firms with outstanding records of exporting sophisticated and distinctive goods and services (Figure 2.4). Around these large businesses exists an ecosystem of many smaller businesses supplying complementary products or specialised inputs. Supporting them are researchers and innovators in both public and private employment, a pipeline of highly educated graduates, investment in enabling infrastructure and regulations, and investors with deep knowledge and understanding of the particular industry. Box 2.2 describes examples of such ecosystems in Denmark and Switzerland.

Box 2.2 **Large and outward-facing firms attract diverse ecosystems**

Large firms play an important role in breaking into international markets and are frequently embedded in deep clusters. For example, Denmark has well-established large firms in shipping (Maersk), pharma (Novo Nordisk), renewable energy (Vestas), brewing (Carlsberg), as well as Lego, Grundfos, and others. A similar story is true in Finland, Sweden, the Netherlands, and Switzerland (Skilling, 2020).

Across small advanced economies, international engagement and productivity performance come disproportionately from such large firms and the clusters of smaller firms around them.

In Denmark, the large pharmaceutical firm Novo Nordisk is the largest company in one of Europe's strongest biopharma clusters. In 2014, there were 83 companies in the cluster; it employed approximately 20 000 people, and invested around DKK10 billion (around NZD$2.25 billion) annually in research and development in Denmark. Net exports make up the largest share of production value in the pharmaceutical industry. The firm has strong research links: more than a third of its researchers work closely with Danish research institutions. As part of these links, when foreign researchers come to Denmark to work at Novo Nordisk, Danish universities also benefit (Novo Nordisk, 2014).

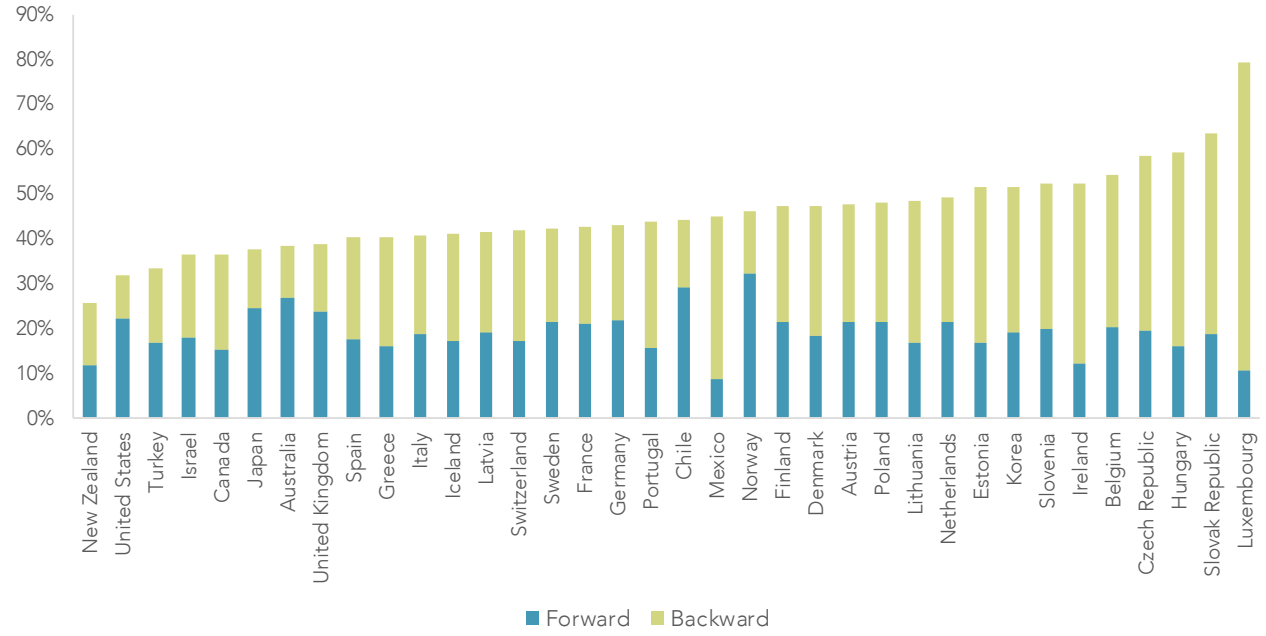
The Novo Nordisk Foundation awards research grants to independent researchers and public research institutions, and to activities that support early engagement of students and educators in the STEM disciplines (Novo Nordisk Foundation, 2020).

The skills and knowledge developed within a cluster can be shared across large firms in different industries too. A study of the career paths of Danish workers at Novo Nordisk (Shih & Chai, 2015) found that out of 89 individuals who had expertise in "fermentation", 56 previously worked at industrial enzyme specialist Novozymes, 28 at contract manufacturer CMC Biologics, 27 at food ingredient specialist Chr. Hansen, 84 at medical devices company Coloplast, and 9 at the large brewing company Carlsberg. The authors found that these companies collaborated with neighbours in different sectors to foster knowledge-sharing without loss of proprietary advantage or violating competition law.

Large firms in clusters can contribute skills and knowledge beyond the expertise they are most renowned for. In Switzerland, luxury watchmaker Swatch has attracted an ecosystem across the watchmaking value chain (R&D, production, retail), and is also part of a larger precision engineering cluster. Swatch has one of the largest R&D budgets within the Swiss precision engineering sector (Deunk, 2014).

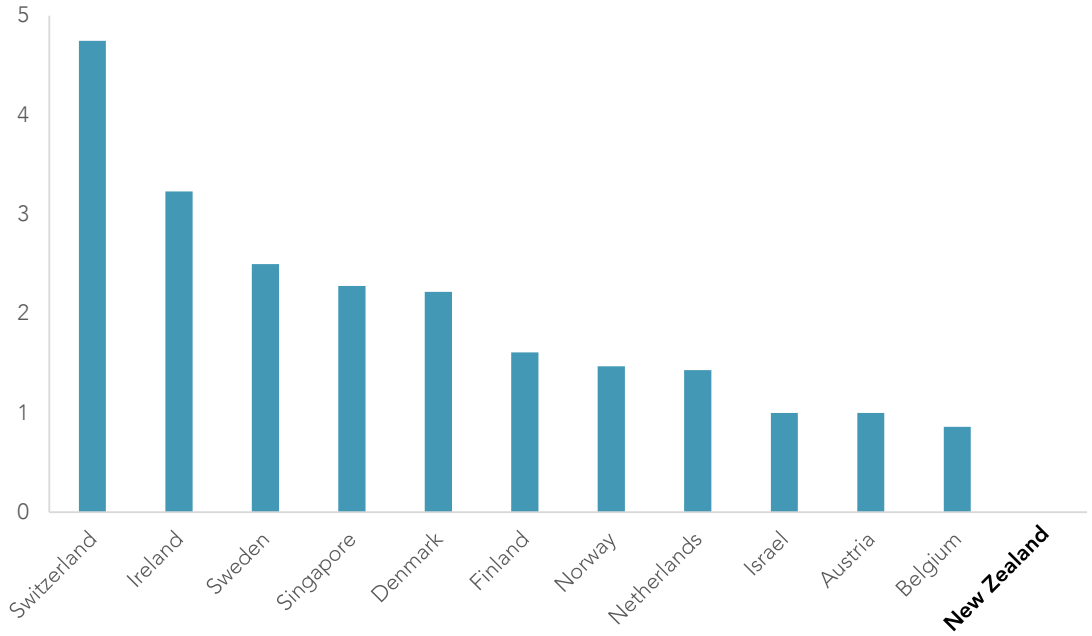
The Swiss precision industry extends beyond watchmaking, to machine-building, the electrical and metal industries, and nanotechnology. In the canton of Bern, the precision industry is highly export-oriented, with exports accounting for over 80% of its production (Bern Economic Development Agency, 2016).

Figure 2.3 Global value chain participation (% of gross exports), OECD countries, 2015



Source: Productivity Commission analysis of OECD data.

Figure 2.4 Forbes Global 2000 companies per million population, 2019



Source: Skilling (2020), based on *Forbes Magazine* Global 2000, 2019.

Note:

1. New Zealand has zero Forbes Global 2000 companies.

F2.4

Part of the explanation for New Zealand's weak labour productivity performance is the combination of the small size of its domestic market and its distance from international markets. These disadvantages are associated with:

- weak international flows in trade, capital and knowledge;
- higher risks and lower returns to investments in exporting;
- low participation in global value chains;
- lack of distinctive and specialised products in New Zealand's export mix; and
- weak competition in domestic markets insulated from international trade.

New Zealand's low rate of exporting partly reflects the significant risks for its firms of launching into exports to distant markets from a small domestic base.

F2.5

Geography is not destiny. The existence of a few New Zealand firms at or close to the global frontier shows that it is possible to overcome the disadvantages of a small domestic market and distant location.

F2.6

Unlike high-performing small advanced economies, New Zealand has few, if any, large globally competitive firms with outstanding records of exporting sophisticated and distinctive goods and services. Around these large businesses exist ecosystems of complementary firms, researchers and innovators, pipelines of highly educated graduates, investments in enabling infrastructure and regulations, and investors with deep knowledge and understanding of the particular industry.

2.2 Increasing the rate and extent of innovation and exporting to lift performance

For a small developed economy to succeed in internationally tradeable goods and services, innovation is fundamental. Innovation is about new or better ways of creating value for society, business and individuals. It is far broader than developing new products or new production technologies. It includes changes in supply chains, distribution networks, marketing and markets. A key component of an innovation ecosystem is the productive network of relationships among researchers, firms, government agencies and other economic actors (Chapter 6).

Innovation is essential to gain and retain a competitive advantage. Without it, products and production processes become standardised, widely understood, and therefore open to competing production in lower-wage economies.

Competition from emerging economies is a natural market-led phenomenon that benefits their living standards. But it puts pressure on developed countries to play to their competitive advantage – which is their ability to innovate.

Producing at scale is also essential – to earn high returns in export markets to cover the large initial (fixed) costs of both innovation and exporting, yet leave a good margin of income for higher living standards.

The Commission believes that New Zealand can learn important lessons from high-performing SAEs – about how to lift its productivity performance while duly acknowledging the country's starting point and distinctive circumstances.

To become a successful SAE, the Government must develop a clear overall strategy and take deliberate steps (with the help of business, workers, educators, researchers and others) to upgrade New Zealand's innovation ecosystem. The Government will need to make significant investments in infrastructure, research and people, and stay the course. It will be a long road but one that will reward persistence and the right vision. The private sector, researchers and the Government must be effective partners on the journey.

F2.7

Fundamental to success in any developed economy is innovation in its internationally tradeable goods and services. Innovation is essential to gain and retain a competitive advantage.

Producing at scale is also essential to earn high returns in export markets, to cover the large initial (fixed) costs of both innovation and exporting, and leave a good margin of earnings for higher living standards.

Some technologies provide more opportunities for productivity-enhancing innovation than others

Countries raise their productivity through firms finding new areas of specialisation that give them a competitive advantage. For small countries, this necessarily involves expanding into export market niches to achieve economies of scale in development and production. Successful countries develop a basket of highly specialised products. The number of these products, and the scale at which a country's firms successfully produce and sell them, are a major influence on average incomes in the country.

The basket of specialised products that a country exports reflects its existing set of productive capabilities. This includes technical knowhow, research capability, supply and distribution networks, knowledge of markets, and institutional and regulatory arrangements that support efficient production. By and large, the possibilities for successful innovation build on the existing set of capabilities. This may involve adapting and recombining existing capabilities in new ways, or adding new capabilities to the existing set (Hausmann et al., 2014; Hidalgo et al., 2009). Box 3.3 in Chapter 3 about the history of Fisher & Paykel Healthcare describes a good example of adapting and combining existing capabilities to create a stream of successful innovation.

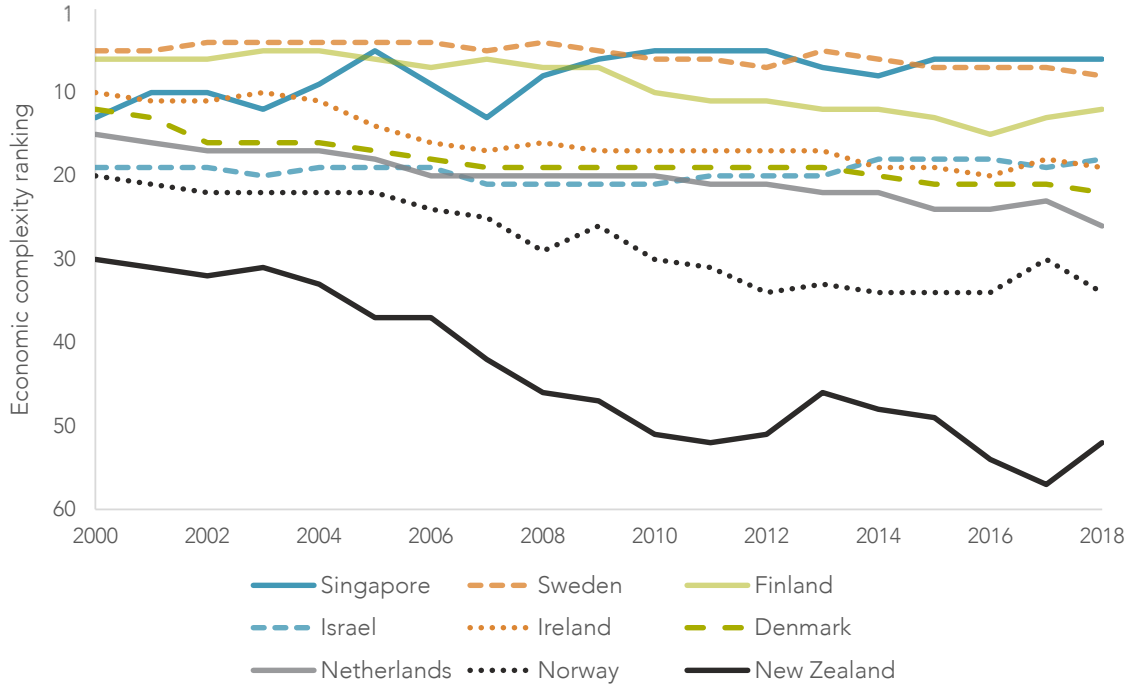
Along with its natural endowments, every economy has its own set of capabilities that make innovation more likely to happen around some products than others. This suggests a rationale for innovation policy to focus on areas associated with these capabilities. This rationale is explored in depth in Chapter 6.

Researchers have created measures of economic complexity that capture the sophistication of a country's exports and the extent to which the export mix conveys a difficult-to-imitate competitive advantage (Hausmann et al., 2014). They have developed detailed maps of goods exports that identify areas where countries are most likely to discover opportunities for further innovation.

However, on the measures of economic complexity mentioned above, New Zealand has not done well in recent years (Figure 2.5). If anything, the complexity of its goods exports has declined slightly, and its rankings have fallen compared to most other small advanced economies (while other larger developing countries such China, India and even Vietnam have overtaken New Zealand) (Observatory of Economic Complexity, 2020). This indicates a large task ahead, but also the potential for improvement.

Norway's ranking is also falling, reflecting that oil, a commodity, is an important part of its export mix. Although not shown, Australia's ranking is actually lower than New Zealand's because of the dominance of commodities in its export mix. Contrastingly, Singapore's ranking has been rising, reflecting its increasingly sophisticated export mix.

Figure 2.5 Small-advanced-economy economic complexity rankings 2000-18



Source: Observatory of Economic Complexity (2020).

Notes:

1. The economic complexity index (ECI) is based on the 4-digit HS96 classification for export goods for the period 1998-2018.
2. The ECI rankings are influenced by the addition or removal of some countries over time. Analysis of data restricted to those countries with complete data for the period 2000-2018 shows that this does not materially alter the overall trend in rankings, particularly for New Zealand.

F2.8 Every economy has its own set of capabilities that makes innovation more likely to happen around some products than others. Measures of economic complexity capture the sophistication of a country's exports and the extent to which the export mix conveys a difficult-to-imitate competitive advantage. New Zealand has lower economic complexity than other small advanced economies.

Developing solutions for New Zealand

New Zealand's size and distance, combined with its low population density and unusual export mix, pose unique challenges. The country needs tailored policy settings. Much of the heavy lifting will fall to successful firms, their workers and the researchers who collaborate with them, but Government can help or hinder by its actions. Policy makers must determine which policy settings matter the most, and what interventions offer the largest impact, within the New Zealand context.

As noted above, the Commission believes that New Zealand ought to learn from the successes and failures of other SAEs. But it will need to tailor its approach to New Zealand's starting point and distinctive circumstances. To do this, the Government should develop a clear overall strategy and take deliberate steps (with the help of business, workers, educators, researchers and others) to upgrade New Zealand's innovation ecosystem. Chapters 6 and 7 take up this story. They lay out the support for this view, describe the main planks of a strategy, and analyse where the gaps lie in current policy initiatives and their implementation.

Businesses primarily, supported by government, will need to deploy dynamic capabilities to identify areas of competitive advantage for New Zealand, understand risk, and drive innovation that will push out the country's productivity frontier. Dynamic capabilities involve sensing areas of competitive advantage, then seizing the opportunities in these areas by innovating – including by transforming business models and processes – while identifying risk and effectively managing it.

F2.9

The most promising path for New Zealand to lift the productivity of its frontier firms is to learn from the successes and failures of high-performing small advanced economies – while duly tailoring its approach to the country's starting point and distinctive circumstances.

Businesses primarily, supported by government, will need to deploy dynamic capabilities to identify areas of competitive advantage in export markets and drive innovation that will push out the productivity frontier. Dynamic capabilities involve sensing areas of competitive advantage, then seizing the opportunities in these areas by innovating – including in business models and processes – while identifying risk and effectively managing it.

R2.1

The Government should develop a clear overall strategy and take deliberate steps (in collaboration with business, workers, educators and researchers) to upgrade New Zealand's innovation ecosystem and support the export, at scale, of goods and services with a difficult-to-imitate competitive advantage.

3 Frontier firms: analysis and comparisons

Key points

- There is no single definition of a frontier firm. For statistical analysis, including international benchmarking, frontier firms within an industry are usually defined as those firms at the top of the industry productivity distribution. Often this covers the top 10% of firms, but other thresholds have been used.
- This definition can fail to capture firms which are still in a development phase and whose current measures of productivity and profitability are not high. These firms can be an important source of innovation and future performance. The Commission has mostly followed the usual approach, but has sometimes taken a broader, pragmatic approach to what constitutes a frontier firm.
- To make comparisons, productivity at the 90th percentile of the labour productivity distribution of firms in each industry is defined as the industry frontier in each of several European small advanced economies (SAEs) - Belgium, Denmark, Finland, the Netherlands and Sweden and New Zealand. The average of the best three of these industry frontiers is defined to be the SAE frontier. New Zealand's productivity level at its national frontier is well behind this benchmark.
- According to estimates, the New Zealand frontier declined from 59% to 46% of the SAE frontier over 2003-2016, with all of the decline occurring before 2010.
- The within-country productivity gap between frontier and non-frontier firms widened over 2003-2016 in Denmark, Finland, the Netherlands, Sweden, and especially Belgium. The width of the New Zealand distribution remained stable over this period, and it is narrower than the distributions in these comparator countries.
- One interpretation of this narrow distribution is that the diffusion of influences on productivity from frontier to non-frontier firms in New Zealand is happening quite effectively. Yet the explanation could also be that non-frontier firms can keep up more easily given the relatively low level and slow growth of the New Zealand frontier.
- The allocation of labour and capital across firms is important for productivity performance. In New Zealand, labour appears to be well allocated towards the most productive firms – similar to the allocation in European small advanced economies. The allocation of capital is also quite well allocated, but less so than in the European economies.
- Looking across New Zealand firms more generally, a striking feature is the low number of large firms. Only a small number of firms are internationally engaged at scale. In 2019, just 33 firms accounted for over 50% of New Zealand's exports of goods and services.

3.1 Frontier firms can be defined in several ways

The Terms of Reference for this inquiry ask the Commission to "establish a coherent and measurable classification of what constitutes a frontier firm, and what the distribution of New Zealand firms looks like behind the productivity frontier".

The topic of firms at or "behind" a productivity frontier points to a definition of a frontier firm as one that scores at the highest level on a measure of productivity. This measure is most naturally a measure of the *level* of productivity, but it could also be a measure of the *growth rate* of productivity.

The OECD's work, based on data on firm-level productivity, defines frontier firms as those in the top 10% of the productivity distribution either among firms globally or among firms within a country. There is nothing sacrosanct about 10%. Some studies use a 5% or top-quartile cut-off to define frontier firms.

Non-frontier firms are all those firms not in the frontier group. This, of course, includes a wide range – from firms just behind the frontier to those whose productivity is at the lowest end of the range.

Researchers generally look at the productivity distribution of firms in the same industry. The benefit of comparing firms' productivity within the same industry is that it isolates differences in firm performance from underlying differences across industries. For example, the labour productivity of workers in electricity generation is many times higher than workers in hairdressing, because electricity generation is very capital-intensive whereas hairdressing is labour-intensive. The pace of technological change is another influence. For instance, rapid technological change in mobile telephony has supported strong productivity growth in that industry, whereas the technologies supporting restaurant services have stayed relatively constant.

However, industries can be classified at various levels of detail, ranging from level 1 (which breaks the New Zealand economy down into 16 industries) to level 4 (more than 100 industries). Researchers commonly study industries at level 2, and some studies look more finely at levels 3 and 4.[4] The level chosen will clearly influence which firms are classified as frontier firms.

The definition of frontier firms in terms of productivity is useful for some purposes, such as making international comparisons or comparisons with other research findings that use a similar definition. But for other purposes, the definition is not so useful.

For this reason, the Commission has taken a broader pragmatic approach to what constitutes a frontier firm. Some highly successful firms could be still in a development phase in which their profitability and productivity are currently not high. For instance, the highly regarded accounting software company Xero only recently achieved a positive cash flow. Some such firms may be regarded as leading-edge and successful, but standard measures of productivity will not yet count them as part of the frontier.

Several other measures (beyond productivity) could be used to identify highly performing New Zealand businesses. Possible criteria include export success, return on assets, revenue, or revenue growth, a preponderance of highly skilled employees, and the use or development of advanced technology. The impact that firms have on the natural environment and the community, along with how they treat their workers, are also important considerations. Section 3.5 explores insights from some of these other measures.

3.2 Using microdata to look beyond the average firm

In the past, productivity researchers have had to rely on data that show the performance of industries or the economy as a whole. While this can be useful for illustrating wider trends (providing a broader picture), it masks how different firms within the same industry can have different levels of performance. Also, changes in industry productivity are a complex mix of changes in the productivity of individual existing firms, the movement of resources between firms, the entry of new firms, and some firms exiting the industry. Industry-level measures cannot reveal these different sources of change (Mai & Warmke, 2012).

The access that is now available to linked administrative and survey data for individual firms (microdata) can provide new and deeper insights into New Zealand's productivity performance. This is one of the most significant analytical developments in recent years. Box 3.1 describes the microdata on individual firms that the Commission used in its research.

[4] Typical level 2 industries in the New Zealand Standard Industrial Output Categories are "Retail trade" and "Accommodation and food services". At level 3, "Retail trade" splits into "Motor vehicle and motor vehicle parts and fuel retailing", "Supermarket, grocery story and specialised food retailing" and "Other store-based retailing and non-store retailing". Level 4 splits the first level 3 category into "Motor vehicle and parts retailing" and "Fuel retailing".

Box 3.1 **Sources of firm-level microdata**

The OECD firm-level framework (described below) highlights the importance of having good information on frontier and non-frontier firms to understand their contribution to productivity performance.

- The Commission and other researchers have access to a rich and comprehensive set of linked administrative and survey data on almost all individual firms in New Zealand. This data source is known as the Longitudinal Business Database (LBD). The LBD provides a detailed view of firms' behaviour and performance across a broad range of topics (Fabling & Sanderson, 2016).
- For international comparisons, datasets such as the CompNet and OECD's MultiProd are useful. They enable comparisons across countries that have firm-level data, like the LBD in New Zealand and the Business Longitudinal Analysis Data Environment (BLADE) in Australia.

This inquiry draws on the CompNet dataset. It covers many of the small advanced economies with which the Commission wishes to make comparisons. It covers nine broad industries: manufacturing, construction, wholesale and retail trade, transport and warehousing, hospitality, information and communications, real estate and rental services, professional services, and administrative services. A downside is that the dataset does not include the primary sector (eg, farming), but it does include food processing (as part of manufacturing). Likewise, the dataset does not include utilities or financial services. But the latter omission is desirable because it is difficult to measure the productivity of financial services firms.

To make the most of the availability of firm-level data, this inquiry employs an OECD framework that has two key productivity frontiers: global and national. The global frontier is made up of the most productive firms in the world. The national frontier is made up of the most productive firms within a country. In the stylised picture (Figure 3.1) there is a gap between the global and national frontiers. In practice, of course, some New Zealand firms will be at the global frontier – and so, in some industries, the global and national frontiers will be the same.

All the other firms in a country can then be arranged by their distance (close or far) from the national frontier (giving a distribution of performance). Research has revealed that the distributions of productivity across firms, even within narrowly defined industries, are typically wide. It also shows that the distribution of firms tends to be skewed to the left (ie, large numbers of firms tend to have low productivity).

The OECD framework highlights three broad drivers of aggregate productivity growth:

- Innovation – the process of creating new knowledge and translating it into growth of the global and national productivity frontiers;
- Diffusion – the spread of technology, ideas and practices between firms; and
- Reallocation – the movement of resources between firms.

The role played by each of these drivers is shown in the stylised picture in Figure 3.1.

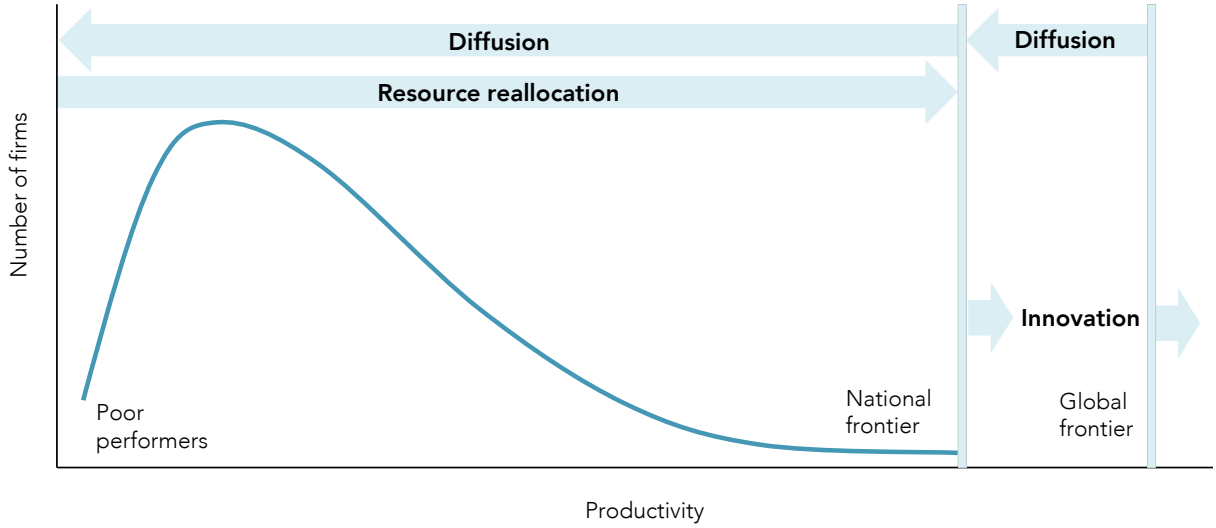
Of course, this stylised picture does not fully represent reality. Here are some examples of subtleties not well captured.

- Innovation can and does often happen in firms behind the national frontier.
- Diffusion can happen through an employee moving from a higher-productivity firm to a firm which, at the time of the move, has lower productivity. As a result of the employee transferring ideas and skills, the latter firm improves its productivity.

- The movement of labour resources in reallocation is different in that employees move in the opposite direction from lower to higher-productivity firms. The expansion of activity in the higher-productivity firm and contraction of activity in the lower-productivity firm causes overall productivity to rise.

These complexities do not mean a stylised picture is not useful. The purpose of models is to abstract from the complexity of the real world to highlight where researchers should focus (to identify "persons of interest"). Given the focus in this inquiry on the performance of frontier firms, this OECD model is a useful starting point.

Figure 3.1 A stylised model of firms' productivity distribution



Source: OECD (2015b), Conway (2016), and Allan (2018). The shape of the distribution is based on Di Mauro and Hoang (2018).

A notable discovery using this framework is that, since the early 2000s, the productivity growth of firms at the global frontier has continued at a good pace despite overall productivity growth slowing down. So the productivity gap between global frontier firms and non-frontier firms has widened (Box 3.2).

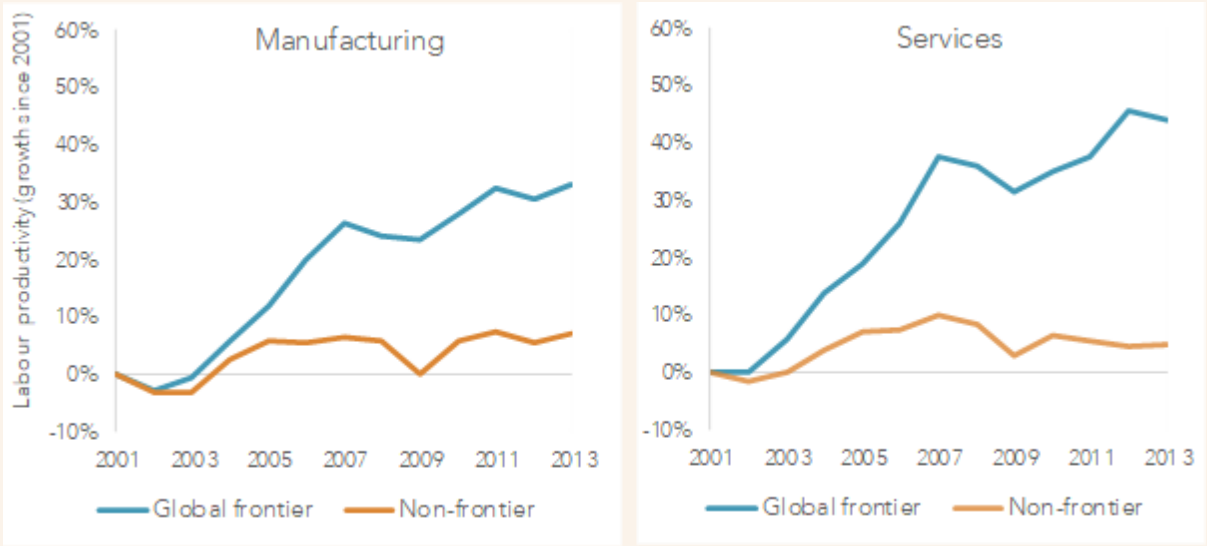
OECD research suggests that one plausible explanation for this widening is higher barriers to technology adoption and knowledge diffusion. Non-frontier firms, particularly in digital and skill-intensive industries, may struggle to catch up, as they do not have enough absorptive capacity to learn from the frontier firms (Andrews et al., 2016a; Berlingieri et al., 2020). Yet some evidence suggests another possible cause: in some sectors at least, there has been a concentration of resources in the top firms, a slowdown in entry to the frontier group, and a rise in "winner takes all/most" dynamics. This is consistent with the emergence of digital platforms and giant tech companies such as Google and Facebook, and Amazon's growth in retail (Haskel & Westlake, 2018). Business dynamism appears to have been declining across the board (less entry of new firms and slower reallocation of resource across firms). Also, wage inequality appears to be rising and the share of labour income declining (Berlingieri et al., 2017).

Box 3.2 **The growing gap between frontier and non-frontier firms across the OECD**

For OECD countries, the productivity growth of firms at the global productivity frontier has outpaced that of firms behind the frontier since early this century, although the GFC slowed the productivity growth of both groups of firms. So the productivity gap has widened between firms at the frontier and those behind the frontier. This is sometimes taken as indicating a breakdown in the "productivity diffusion machine". OECD work points to this growing gap in both manufacturing and services, but a larger gap in services.

It is important to note that the graphs below show only the *growth rates* (and not the levels) of productivity of each of the two groups of firms – frontier and non-frontier. They show by how much the productivity of each group has grown since 2001. The graphs are set to start at the same point of 0% in 2001. This does not mean the productivity levels of the two groups of firms were the same in 2001. In fact, the levels were quite different: firms at the frontier were on average around three to four times more productive than non-frontier firms (Andrews et al., 2016b).

Figure 3.2 A widening productivity gap between global frontier and non-frontier firms in manufacturing and services sectors



Source: Andrews et al. (2016b).

Notes:

1. The global frontier is the average of the top 5% of firms with highest labour productivity (value added) within each two-digit industry in a global dataset of firms. Non-frontier is the average labour productivity of all the other firms in the industry and in the dataset.
2. Services refer to non-financial business services.

3.3 A statistical picture of New Zealand's productivity frontier

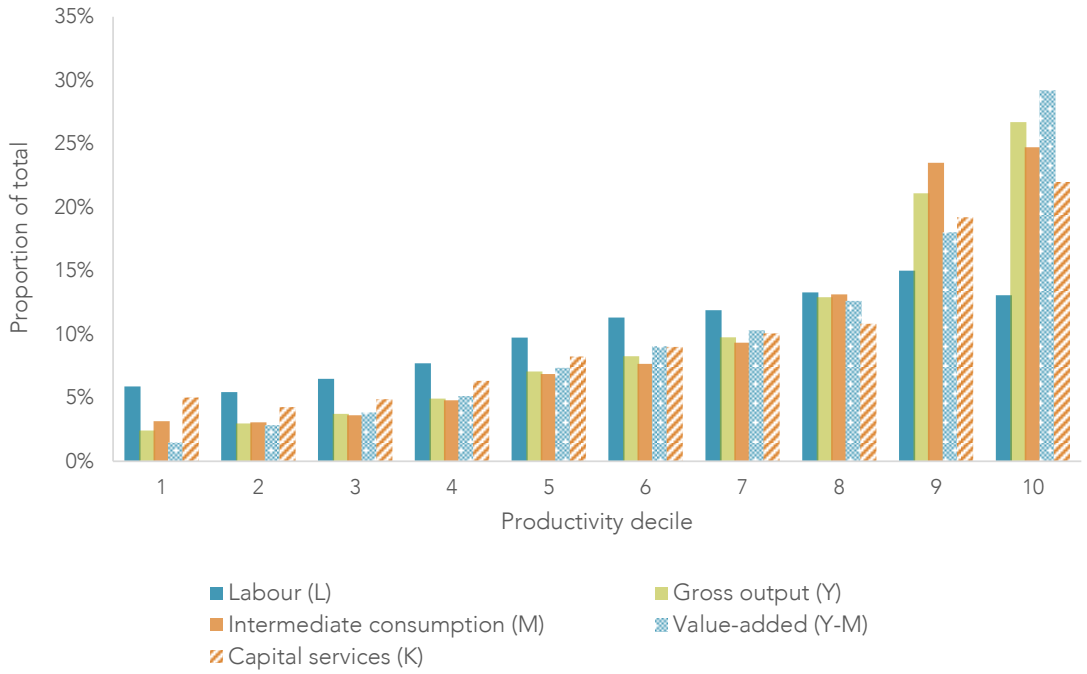
To help understand the characteristics and performance of New Zealand's frontier firms, the Commission asked an expert in microdata research to undertake a statistical analysis of these firms using Stats NZ's LBD. Data in the LBD are anonymised, so it is not possible to reveal the identities of individual firms, although the characteristics of groups of firms can be studied (subject to checking for confidentiality).

Fabling (forthcoming) analyses the characteristics and performance of New Zealand's frontier firms from 2005 to 2018. The frontier firms in an industry are defined to be the top firms in terms of productivity (based on four different tests with each test using a slightly different way of measuring multifactor productivity (MFP)). Only firms meeting three out of four of the tests qualify as frontier. For this reason, the frontier "decile" contains only around 8% of all firms rather than 10%. Non-frontier firms are ranked into lower "deciles" with some of them containing slightly more than 10% of firms.

The analysis showed these things about frontier firms.

- They are disproportionately important in the economy – while constituting only 8% of firms, they account for 13% of labour input, 22% of capital input, 27% of gross output, and 20% of value added (Figure 3.3).
- They have much higher levels of labour productivity than non-frontier firms. On average, frontier firms' value added per worker is almost double that of the second most productive group of firms (those in the second-to-top "decile") and are many times more productive than firms in the bottom 10% of the productivity distribution (Figure 3.4).
- They have had low labour productivity growth over the period, yet the combination of their high productivity levels and size has meant that they have made a significant contribution to aggregate productivity growth since 2005 (to the extent that if frontier firms had had labour input growth and labour productivity growth of zero, aggregate labour productivity growth would have fallen from 0.83% a year to 0.59% a year, a drop of nearly 30%).
- They tend to employ more workers, employ more-skilled workers, and pay a higher firm wage premium than non-frontier firms.

Figure 3.3 Distribution of selected totals across MFP "deciles", 2005-18



Source: Fabling (forthcoming).

Notes:

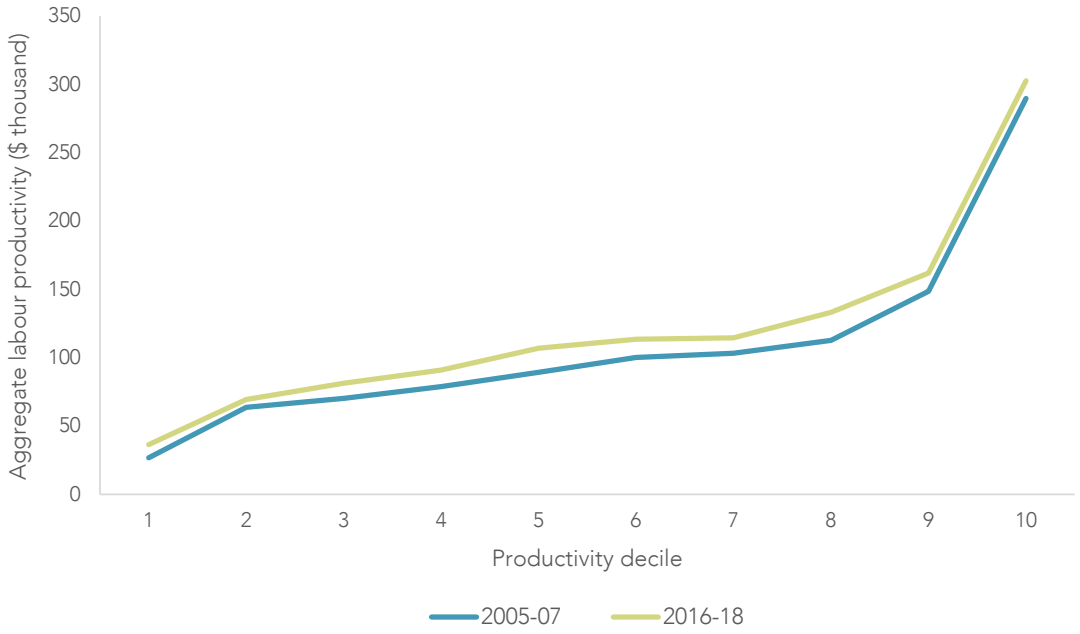
1. The Figure shows, for example, how the total number of workers (L) are distributed across the deciles. The number of workers in, say, the 8th decile is the number who work for firms in the 8th decile.
2. Frontier firms (the ones in "decile" 10) are those meeting a frontier threshold on three out of four measures of MFP. Frontier firms are around 8% of all firms.

Fabling (forthcoming) also uses data from the Business Operations Survey (BOS) to identify several other characteristics of frontier firms. He found that frontier firms have these characteristics.

- They are more likely to be exporters and have higher export intensity (ie, high export revenue as a percentage of total sales). Further, among those firms that export, frontier firms are significantly more likely to enter new export markets. They are also more likely to be foreign-owned and to have ownership stakes in overseas ventures (outward direct investment).

- They are more likely to report that their core equipment is up to date in terms of the best commonly available technology.
- While the probabilities are low across all firms, they are more likely to report that they have no competitors, which could reflect their ability to produce distinctive products.
- They are more likely to report better human-resources management practices than non-frontier firms.
- They are more likely to have ultrafast broadband.

Figure 3.4 Labour productivity by MFP "decile", 2005-07 and 2016-18



Source: Fabling (forthcoming).

Notes:

1. Labour productivity is measured by total value added divided by total number of workers in each decile, thus giving larger firms a bigger weight than smaller firms. The vertical distance from the blue line up to the green line indicates the growth in labour productivity between the midpoints of the two periods.
2. Frontier firms (in "decile" 10) are those meeting a frontier threshold on three out of four measures of MFP. Frontier firms are around 8% of all firms.

The analysis found that the propensity to undertake R&D is not significantly different between frontier and non-frontier firms. Yet among those firms that invest in R&D, the average share of total expenditure spent on R&D is higher in frontier firms. Frontier firms are less likely than non-frontier firms to spend on product design but, when they do spend, they spend more (on average), and also on marketing and market research.

Results for frontier firms are tendencies and do not apply to every firm in the frontier group. Also, the frontier group itself is dynamic, with some firms moving into the group over time and others moving out of it.

Table 3.1 Characteristics of frontier and non-frontier firms, LBD and BOS data (average 2005-18)

Firm types	Firm age (years)	Capital intensity ($ of capital services per worker)	Exporter (% of total firms)	Exports (% share of sales)	Foreign ownership (% of total firms)	Firm size (number of workers)	Value added per worker ($)
Frontier firms	11.8	58 980	17.5	8.4	13.7	24.1	282 635
Non-frontier firms	12.3	31 481	16.3	6.4	6.4	13.8	103 041

Source: Fabling (forthcoming).

Notes:

1. Frontier firms are defined as the top firms in the MFP distribution by industry based on meeting three out of four criteria. In the sample, frontier firms numbered 81 288 and non-frontier firms 943 254.
2. Firm and employee counts are randomly rounded according to the confidentiality rules from Stats NZ.
3. Capital intensity, also called the capital-labour ratio, is defined as the flow of capital services available per year per worker.

3.4 Benchmarking New Zealand's frontier firms and firm productivity distribution

The Productivity Commission worked with the National University of Singapore (NUS) to compare results for New Zealand with other small advanced economies with comparable data on their firm productivity distributions. These other countries were Belgium, Demark, Finland, the Netherlands and Sweden. This study compared New Zealand's performance in labour productivity levels with the other countries, both economy-wide and in nine broad industries. In this research, the Commission and the NUS adopted the following definitions.

- *Industry productivity frontiers*: the productivity at the 90th percentile of the labour productivity distributions within each country and industry across time.
- *National productivity frontier*: the weighted average of a country's industry productivity frontiers (using the number of firms in each industry to define the weights).
- *Small-advanced-economy frontier in an industry*: looking across the six countries, the average of the national frontier in an industry over 2002-2016 is calculated for each country. The three countries with the highest averages are then used to define the small-advanced-economy frontier in the industry (by taking the weighted average in each year of these three national industry frontiers).[5]
- *Small-advanced-economy frontier*: this is the weighted average of the industry small-advanced-economy frontiers (using the number of firms in each industry to construct the weights). This is referred to as the small-advanced-economy frontier to distinguish it from the *global frontier* used in OECD work (which is based on OECD countries in the MultiProd dataset).

International comparisons of productivity distributions raise some challenges given differences in how data are collected, and in countries' economic conditions. Labour productivity rather than MFP is used because it is possible to compare levels of labour productivity across countries (providing conversions across currencies are properly handled), but very difficult to compare levels of MFP.

These data provide a valuable perspective on labour productivity performance across the six countries, both economy-wide and in the nine broad industries included in the study (see Box 3.1). One would expect the global frontier to be a little higher than the small-advanced-economy frontier, but it has not been possible to estimate by how much. According to OECD 2017 figures for economy-wide labour productivity (ie, GDP per hour worked), the top 12 countries in order (with the countries in the small-advanced-economies study in

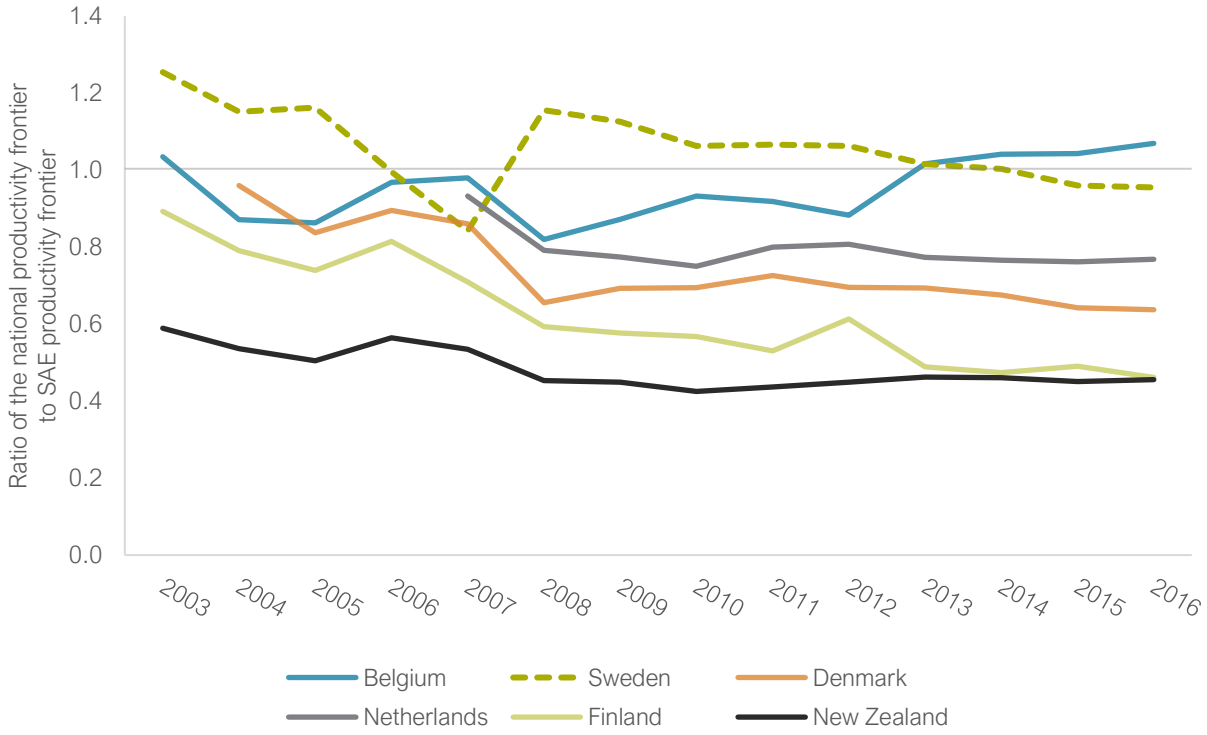
[5] Industries are broad one-digit industries: the three countries that make up the frontier remain unchanged over the period. For example, the small-advanced-economy frontier in the manufacturing industry is the average of the frontiers in Belgium, Sweden and the Netherlands that had the highest average frontier labour productivity in manufacturing over 2003-2016.

italics) were Ireland, Luxembourg, Norway, *Belgium, Denmark*, Germany, United States, *Netherlands*, Switzerland, Austria, *Sweden* and France. *Finland* was 14th and *New Zealand* 24th (OECD, 2019).

Benchmarking frontiers

Figure 3.5 shows the ratio over time between countries' national productivity frontiers and the small-advanced-economy frontier. This shows that not only did the top firms in New Zealand have the largest productivity gap relative to the small-advanced-economy frontier, but that this gap increased over time. The New Zealand frontier declined from 59% to 46% of the small-advanced-economy frontier over 2003-16, but all of the decline occurred before 2010. On average, New Zealand frontier firms lag behind the frontier defined by three successful small advanced economies. The large size of this lag is a central finding of the inquiry.

Figure 3.5 Benchmarking national productivity frontiers to the small advanced economy frontier, 2003-16



Source: Zheng and Hoang (forthcoming).

Notes:

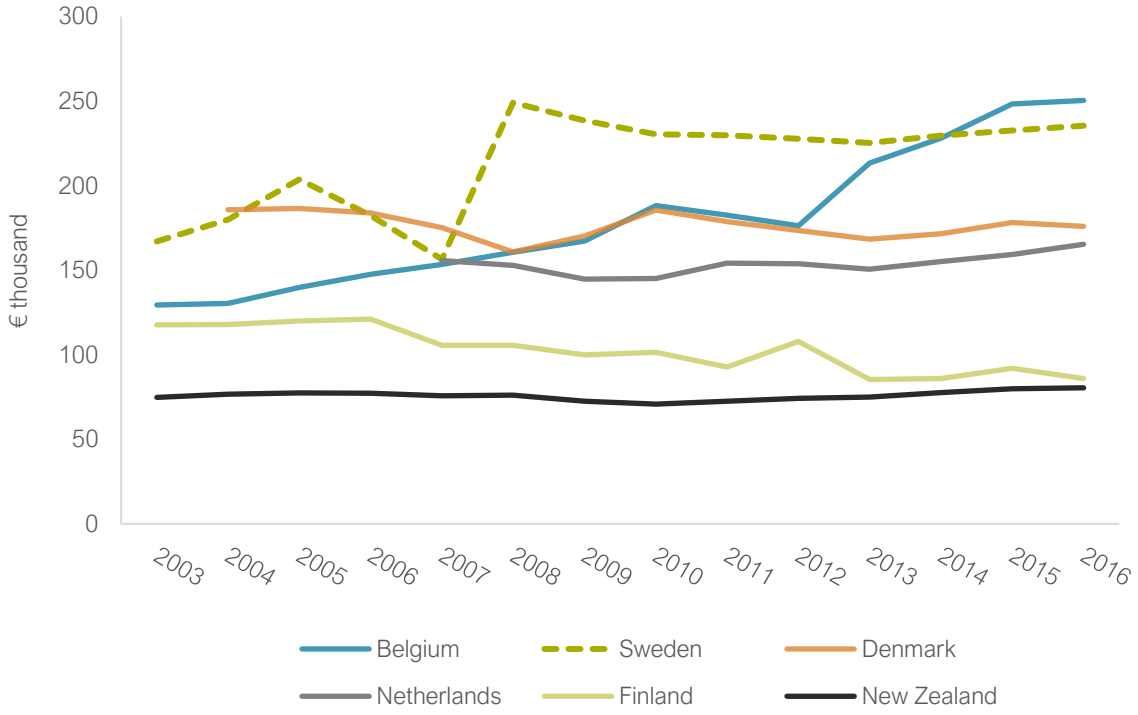
1. Each line is the ratio of the national productivity frontier (calculated as a weighted average of industry-level productivity) to labour productivity at the small-advanced-economy frontier (as defined above). Industry weights are proportional to the number of firms in each industry.
2. Denmark and Netherlands data start from 2004 and 2007 respectively.
3. Countries' results are converted into a standard currency (euros in 2005 prices) by taking country-industry specific deflators and country-level PPPs from the Eurostat-OECD programme.
4. The dip in the Swedish frontier productivity in 2007 is related to inadequate adjustments to major reclassifications in the second revision to the "Statistical classification of economic activities in the European Community" (NACE2), which was adopted in December 2006.

F3.1 New Zealand's frontier firms have (on average) labour productivity levels significantly below the frontier defined in each of nine broad industries by the three most successful small-advanced-economies (out of Belgium, Denmark, Finland, the Netherlands, New Zealand and Sweden).

Growth rates of frontier firms

Figure 3.6 shows the labour productivity tracks of the national frontiers of the six countries in the Commission's study. The slopes of each line indicate the growth of labour productivity at each national frontier.

Figure 3.6 Labour productivity of national frontiers in euros per worker per year, 2003-16



Source: Zheng and Hoang (forthcoming).

Notes:

1. Each line shows the national productivity frontier of the relevant country over 2003-2016 (or a shorter period for Denmark and the Netherlands).
2. Denmark and Netherlands data start from 2004 and 2007 respectively.
3. Countries' results are converted into a standard currency (euros in 2005 prices) by taking country-industry specific deflators and country-level PPPs from the Eurostat-OECD programme.
4. The dip of the Swedish frontier productivity in 2007 is related to inadequate adjustments for a large reclassification of NACE2.

The general picture in Figure 3.6 is that the New Zealand frontier has not been catching up, despite its much lower initial level. Its average annual growth rate has been very low (0.6% a year), which is a similar rate to the Netherlands frontier (0.7% a year). It is faster than the growth rates of the Denmark and Finland frontiers (-0.5% and -2.4% a year respectively), but slower than the Sweden and Belgium frontiers (2.7% and 5.2% a year respectively).

F3.2

Over 2003-16, New Zealand frontier firms have been growing their labour productivity at a similar rate to frontier firms in the Netherlands, faster than Denmark and Finland's frontier firms and slower than Belgium and Sweden's frontier firms. This is concerning given that the much lower initial level of New Zealand's productivity frontier points to the need for it to grow faster to begin to close the gap with the small-advanced-economy frontier.

A further interesting comparison would be between the growth rate of the small-advanced-economies frontier and that of the global (or OECD) one. Unfortunately, data constraints make this comparison difficult. For example, OECD estimates are based on a narrower definition of frontier firms (the top 5% rather than the top 10%) and only include firms with 20 or more employees.

On the data available, the small-advanced-economies frontier appears to have grown slightly more slowly than the global one. Bearing in mind the measurement differences noted above, OECD data suggest that the global productivity frontier in manufacturing grew by an average of 2.9% per year between 2003 and 2013, and by 3.1% per year in services. The small-advanced-economies frontier (across both manufacturing and services) grew by 2.7%.

This is reinforced by OECD data on economy-wide productivity growth, which show that between 2003 and 2013 the five small advanced economies had labour productivity growth around or below the OECD average, while the US growth rate was above the OECD average.

Technology diffusion and the width of the productivity distribution

Technologies can diffuse across firms through transactions (eg, supply chains or purchase of patents/ licences), imitation, learning by doing, or labour flows. Technology diffusion leads to recipient firms adopting more efficient production technology and practices, potentially leading to productivity convergence.

The diffusion of technology, ideas and practices from frontier firms to other firms may be particularly important in New Zealand, given the country's remoteness from foreign markets and weak international connections. It is, however, difficult to directly measure the diffusion of technology, ideas and practices between firms. This section looks at the width of the productivity distributions in the six SAEs in the Commission's study, for the following reasons.

- A narrow distribution could suggest that diffusion is working well, whereas a wide distribution could suggest the opposite.
- A widening distribution over time indicates that the productivity of non-frontier firms is falling further behind that of the frontier firms, which may suggest that diffusion is deteriorating, whereas a narrowing distribution would suggest the opposite.
- As noted, OECD and other researchers have found that, since the early 2000s, firms at the global frontier have continued to grow their productivity at a healthy rate, but firms behind the frontier have experienced a sharp slowdown. This has widened the global distribution of productivity among firms and could suggest that the "technology diffusion machine" is impaired or broken (Box 3.2).

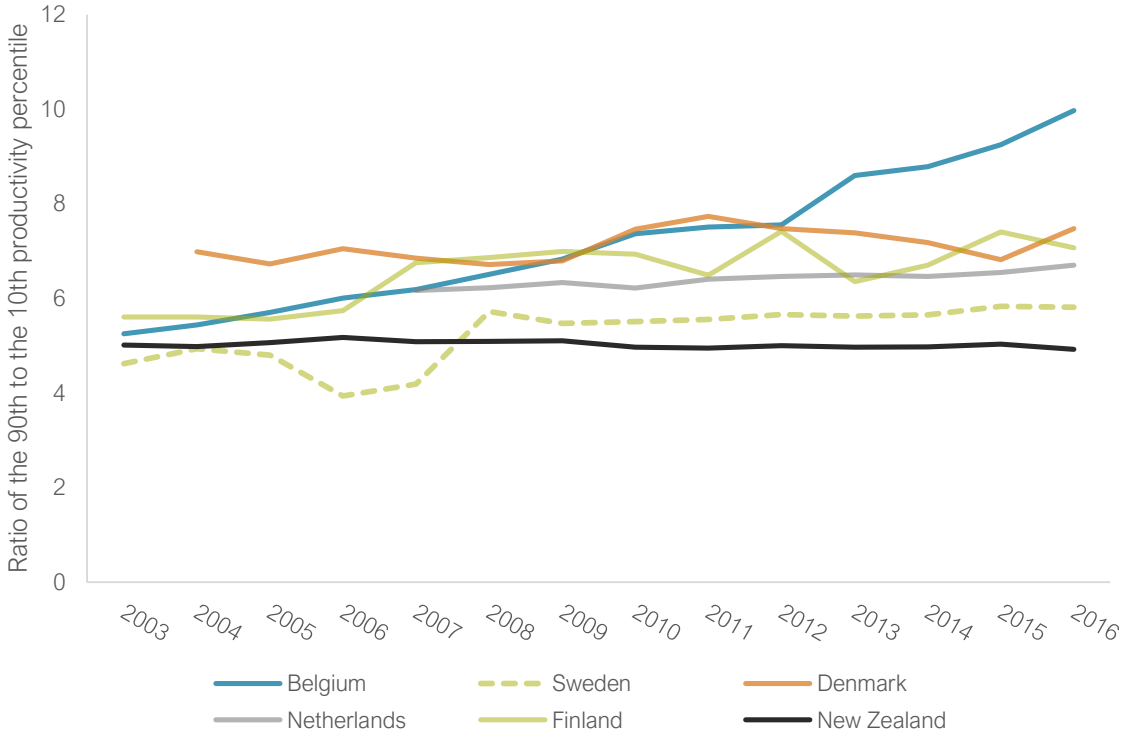
Even so, a narrow distribution is not conclusive evidence that diffusion is working well. If frontier firms are growing their productivity at an acceptable rate, and non-frontier firms are achieving the same growth rate, then this would suggest that diffusion is happening effectively. But if frontier firms' productivity growth is slow, and non-frontier firms manage to grow at the same rate, then that is not so impressive.

The CompNet data are used to investigate the width of the productivity distributions. The measure of width is the ratio of frontier labour productivity (ie, productivity at the 90th percentile of the distribution) and labour productivity at the 10th percentile of the distribution. Figure 3.7 shows these ratios over 2003 to 2016 for each country in the study. New Zealand generally had the lowest gaps between the performance of frontier and non-frontier firms. The productivity distribution in New Zealand thus appears relatively narrow: the ratio of 90th-percentile to 10th-percentile productivity sits at around five.

Figure 3.7 also suggests that the width of New Zealand's productivity distribution has been broadly stable for a long period. This is consistent with earlier work (Zheng, 2016), which showed that the productivity gaps (in MFP) between frontier and non-frontier firms at the national and industry levels in New Zealand had not changed significantly since 2001.

The results showing that New Zealand has a relatively narrow productivity distribution should be treated with care. Other studies using earlier and different data sets have estimated New Zealand's ratio as higher than five and within the range of the ratios estimated for the other small advanced economies. For example, an OECD cross-country comparison on 2011 data estimated New Zealand's 90-10 labour productivity ratio at 6.3 for manufacturing, and 8.1 for services (compared to OECD averages of 6.6 and 9.2 respectively) (Papa et al., 2018).

Figure 3.7 Benchmarking productivity spreads: ratios of the 90th to the 10th labour productivity percentiles, 2003-16



Source: Zheng and Hoang (forthcoming).

The stable width of the productivity distribution in New Zealand reflects consistent productivity growth across Kiwi firms at the 90th and 10th percentiles. Between 2003 and 2016, firms at the 10th percentile experienced labour productivity growth of 0.5% per year, while firms at the 90th percentile in New Zealand averaged 0.6%. In contrast, among the small advanced economies, firms at the 10th percentile experienced an average productivity decrease of 1.7% per year, while frontier firms (at the 90th percentile) averaged 2.7% a year growth in labour productivity over this period (Zheng & Hoang, forthcoming).

The productivity distributions widened slightly over the measurement period in Sweden and the Netherlands, more in Finland and markedly in Belgium. OECD (2017) found a similar pattern with New Zealand's 90-10 labour productivity ratio not increasing over 2001–2012 – in contrast to the ratios increasing in other countries including Denmark, Finland, Norway and France. The pattern in Belgium of its frontier firms pulling strongly away in their productivity from its laggard firms resembles the OECD's finding at the global level (Box 3.2).[6]

It seems a good thing that firms behind the frontier in New Zealand are keeping up with the productivity growth of frontier firms – suggesting that technology diffusion is working. Yet two points are sobering and worth emphasising:

- the average growth rates of labour productivity at all levels over the period have been very low; and
- the productivity at the New Zealand frontier is around only 50% of the small-advanced-economies frontier (Figure 3.5).

As noted, keeping up with frontier firms whose productivity is low and growing only slowly is not such a great achievement. Effective diffusion in these circumstances is not an assurance that diffusion would be effective with a higher and faster-moving frontier.

[6] The comparison is not quite the same because the OECD finding of a widening gap compared frontier firms with all non-frontier firms, whereas Figure 3.7 compares productivity at the 90th percentile with productivity at the 10th percentile.

F3.3

A study for this inquiry found the productivity gap between frontier and non-frontier firms in New Zealand has not changed significantly since 2003. The gap is smaller and more stable than in several small advanced European economies (whose gaps generally increase over time). This could suggest that diffusion has been effective in New Zealand. Yet it could also be due to the low productivity level and slow growth rate of New Zealand's frontier firms – so the non-frontier firms find it easier to keep up.

Another possibility is that New Zealand's productivity gap is not smaller than in other small advanced economies. Some other studies have found this. If this is the case, it would suggest that diffusion in New Zealand is no more effective than in these other countries.

Diffusion to lower-productivity firms in New Zealand comes from the domestic frontier

As part of its comparison of New Zealand with the European small advanced economies (Belgium, Denmark, the Netherlands and Sweden), the Commission used econometric modelling to investigate technology diffusion to lower-productivity firms from firms at both the domestic and international frontiers.

The Commission's modelling revealed a sharp difference between New Zealand and the other countries. In all countries, the productivity of non-frontier firms benefited significantly from diffusion from domestic frontier firms in their own country. But non-frontier firms in the other countries also benefited from technology diffusion from firms at the small-advanced-economies frontier (albeit to a lesser extent than from their domestic frontier firms). This did not happen in New Zealand (Zheng & Hoang, forthcoming).

These results echo many international-study findings that the diffusion process is expensive to transmit over distance (Andrews et al., 2015; Bartelsman et al., 2008). Advanced technologies from the international frontier firms are often highly tacit and non-codified, and so other firms find them difficult to access. They are more likely to be adopted by national frontier firms – the most capable firms in the country – and adapted to the country-specific business environment before they diffuse widely within the economy.

But what the Commission's modelling and other results from the CompNet data suggest is that, while New Zealand non-frontier firms absorb technology from national frontier firms, these firms are well behind the productivity levels of their international peers. Compounding this, non-frontier firms in New Zealand, unlike those in the other economies, do not absorb technologies directly from frontier firms internationally (or at least find absorbing them difficult). These results are likely to be another effect of New Zealand's distant location, and emphasise the criticality of:

- New Zealand's frontier firms performing better; and
- improving New Zealand's international connections in trade, investment, people and knowledge.

F3.4

Technology diffusion to non-frontier firms mainly comes from firms at the national frontier (in the same country). Yet non-frontier firms in the European countries in the Commission's small-advanced-economy study benefit also from technology diffusion from firms at the small-advanced-economies frontier (albeit to a lesser extent than from their national frontier firms). This did not happen in New Zealand over 2003–16.

This result likely reflects New Zealand's distant location, and that diffusion of tacit and non-codified technologies is difficult over distance. It emphasises the criticality of New Zealand's frontier firms performing well and improving the country's international connections.

Resource allocation across productivity deciles: good but could do better

Even when no individual firm raises its productivity, the productivity of the whole economy will rise when productive firms gain market share and resources at the expense of less-productive ones. Indeed, much of the difference in aggregate productivity levels across countries, and variations in productivity growth rates, arise from differences in the ability of countries to reallocate economic resources to more productive uses (Bartelsman et al., 2013).

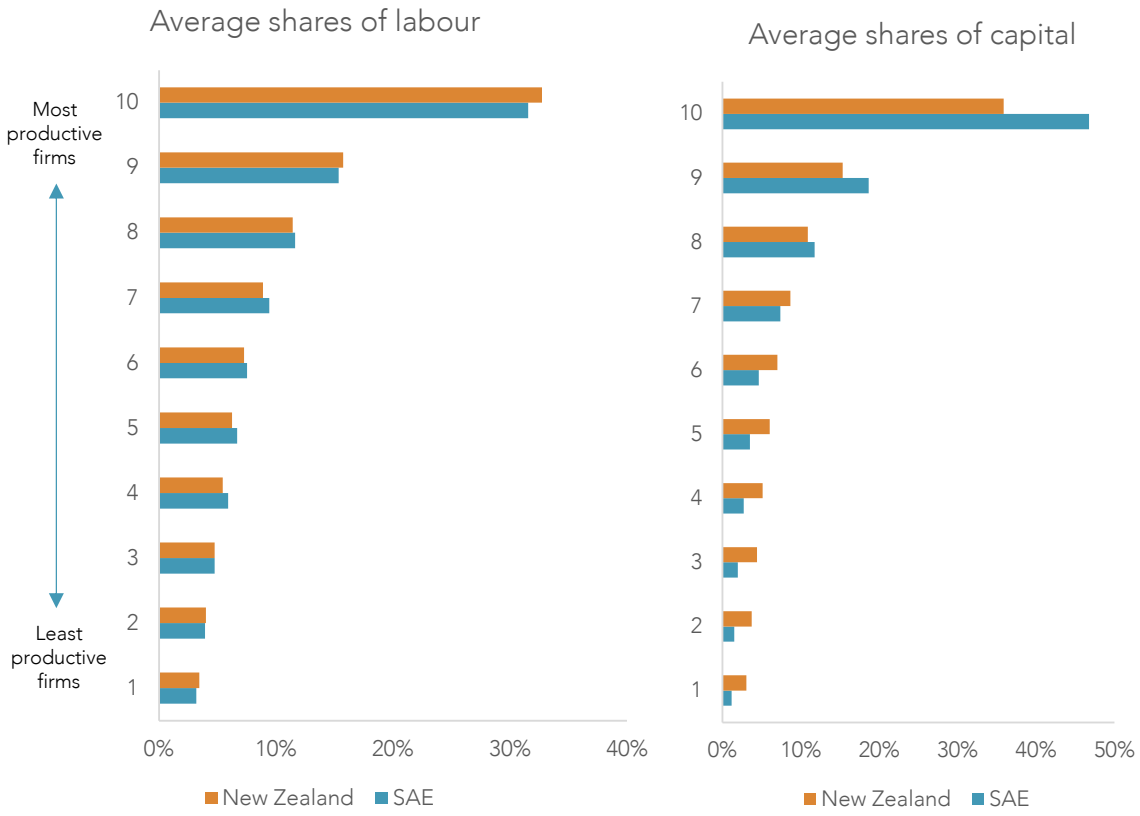
Microdata on firm productivity enables inspection of how a country's resources are allocated across productivity deciles. Each decile contains the same number of firms. But if firms in top deciles are on average larger (using the size measures of employment or capital stock), then more of an economy's resources of labour and capital will be employed productively.

The allocation of resources across productivity deciles varies depending on whether firms are ranked by MFP or by labour productivity. Because labour productivity is a combination of MFP and capital intensity, firms with higher capital per worker will, for given MFP, have higher labour productivity and be in a higher decile of the labour productivity distribution compared to their position in the MFP distribution.

Figure 3.8 shows the estimated allocation of labour and capital across MFP deciles in New Zealand and the European small advanced economies. The left and right panels in the figure show labour and capital shares by MFP deciles for New Zealand and for the other countries studied.

The data indicate that the most productive firms employ high proportions of total labour and capital. While the allocation of labour is very similar in New Zealand and the European countries, a higher proportion of capital is allocated to the top two deciles in the European countries, and a smaller proportion to the lower deciles than in New Zealand. Overall, the results for New Zealand are good, with most resources allocated to firms with high MFP. Yet the better result for capital in the European countries demonstrates the scope to improve.

Figure 3.8 Allocation of resources by MFP deciles, average shares over 2003-16



Source: Zheng and Hoang (forthcoming).
Notes:
1. The small advanced economies (SAEs) are Belgium, Denmark, Finland, the Netherlands and Sweden.
2. MFPs are estimated from country industry-specific Cobb-Douglas productions with labour and capital as the two inputs.
3. Denmark and Netherlands data start from 2004 and 2007 respectively.

F3.5 In the Commission's study comparing New Zealand with several European small advanced economies, the most productive firms in terms of multifactor productivity employed high shares of total labour and capital. While this is a good result on the allocation of resources, the European countries allocated a higher proportion of capital to their frontier firms, demonstrating the scope to do better.

When firms are ranked by labour productivity rather than MFP, firms with a lot of capital per worker (ie, high capital intensity) will tend to shift to higher deciles, and those with low capital intensity will tend to shift down to lower deciles. As noted in Chapter 2, New Zealand firms tend to have low capital intensity, much lower on average than the European small advanced economies such as Belgium, Denmark and the Netherlands. With this in mind, Figure 3.9 benchmarks the allocation of labour and capital across the labour productivity deciles in New Zealand and the European small advanced economies.

Given that productivity deciles within each country contain the same number of firms, the share of labour in each decile is proportional to the average number of workers per firm in that decile.

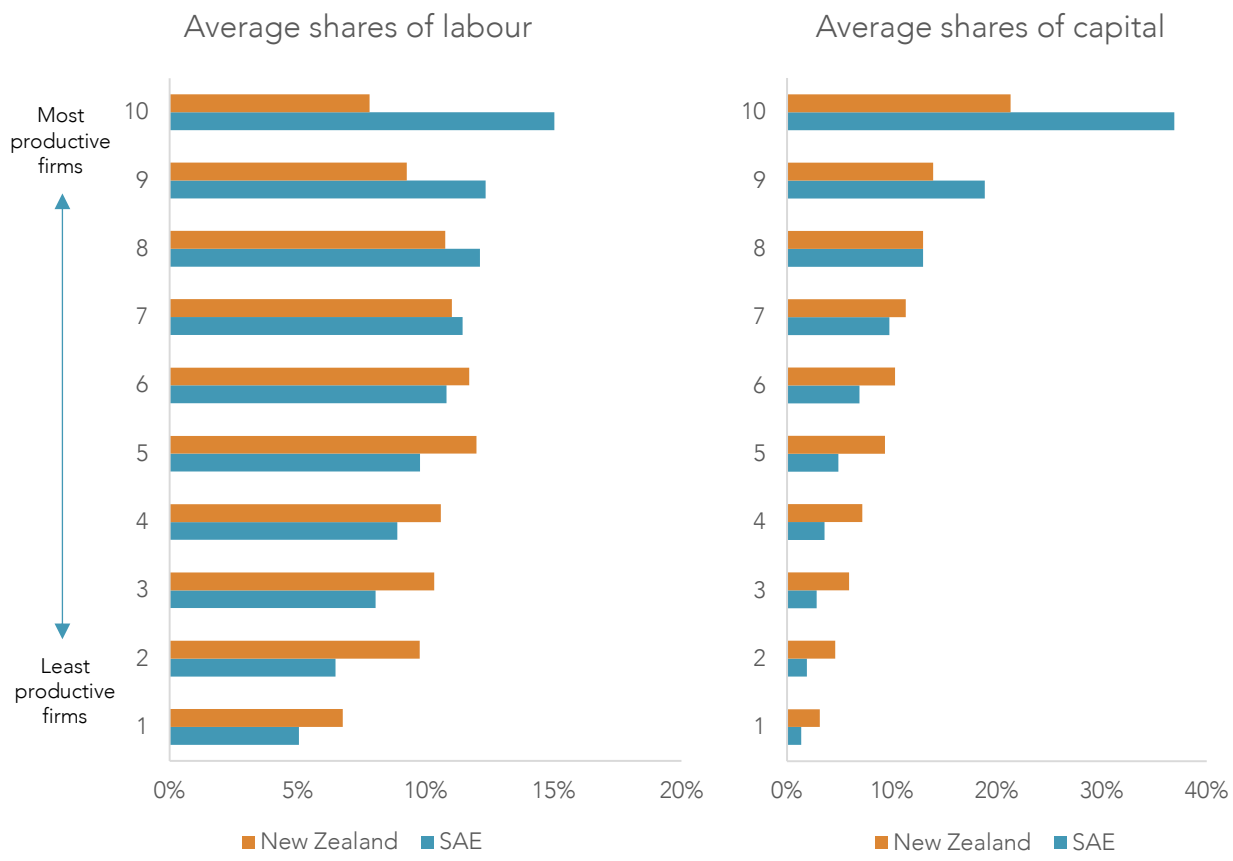
The left panel of Figure 3.9 therefore shows that in the European economies, on average, the largest firms (by employment) are in the top productivity decile, the next largest are in the ninth decile, and so on down to the bottom decile, which has the smallest firms. By contrast, in New Zealand the largest firms are in the fifth labour-productivity decile. This result is consistent with the observation that New Zealand has few large, successful, export-orientated firms with high labour productivity. Rather, New Zealand's large firms tend to be middle performers and likely to be serving the domestic market (see next section).

The least-productive firms in terms of labour productivity still have significant shares of labour in both New Zealand and the EU. This may reflect sluggish reallocation of resources away from some low-productivity firms that survive for a long time. It would be preferable for such firms to exit and make their capital and labour resources available to more productive firms (Stephenson, 2019).

In all countries, the positive association of capital intensity with labour productivity means most capital is likely to be located in the upper deciles – hence the pattern of allocation of capital in the right-hand chart in Figure 3.9 is not surprising.

The combination of Europe's frontier firms being well ahead of New Zealand's frontier firms in their levels of labour productivity *and* being the largest firms in their country by employment makes New Zealand's large negative gap in output per person compared with these countries unsurprising.

Figure 3.9 Allocation of resources by labour productivity deciles, average shares over 2003-16



Source: Zheng and Hoang (forthcoming).

Notes:

1. The small advanced economies (SAEs) are Belgium, Denmark, Finland, the Netherlands and Sweden.
2. Denmark and Netherlands data start from 2004 and 2007 respectively.

F3.6

Most capital is allocated to firms in the top three labour productivity deciles in New Zealand and the European small advanced economies in the Commission's study. But more labour is allocated to the upper deciles in those countries than in New Zealand.

This means that the European countries perform better than New Zealand on two margins that impact overall labour productivity performance: their frontier firms generally are significantly more productive (partly because of higher capital intensity), and they employ more people than firms in lower deciles.

3.5 Other perspectives on New Zealand's frontier firms

As noted earlier in this chapter, the Commission is open to other ways of considering frontier firms. This section briefly examines some facts and figures on New Zealand frontier firms defined in two other ways – large exporting firms and large firms by revenue.

Large exporting firms

Skilling (2020) argues that in small advanced economies large firms are critical for breaking into international markets. As described in Box 2.2 in Chapter 2, Denmark, for example, has well-established large firms in shipping (Maersk), pharma (Novo Nordisk), renewable energy (Vestas), brewing (Carlsberg), as well as Lego, Grundfos and others. A similar story is true in Finland, Sweden, the Netherlands and Switzerland.

These large firms are typically surrounded by an extensive ecosystem of small and medium-sized firms, some of which may also be successful in international markets. Indeed, the large firms enable the strong networks around them. These large firms can make a disproportionate contribution to economic outcomes. Just a few of them can "shift the dial" of performance at the national level. As a simple matter of arithmetic, 100% annual growth in twenty $100 million turnover firms is required to match 10% annual growth in a $20 billion turnover firm.

New Zealand has few large exporting firms. Some examples of large, established, internationally oriented Kiwi firms are Fonterra, Zespri, F&P Healthcare, Xero, a2 Milk and Datacom. Box 3.3 outlines the history and approach to innovation of F&P Healthcare. Yet few such firms exist, and they are not very large by international standards. To illustrate the paucity, Skilling (2020) considered the top 10 listed New Zealand firms on the NZX by market value.

- Four are domestic utilities (Meridian, Mercury, Contact, Vector).
- Two largely serve domestic customers (Spark, Ryman Healthcare (although this company is expanding in Australia)).
- Two are international infrastructure companies (Auckland Airport, Ports of Tauranga).
- Only two compete in global markets at scale (F&P Healthcare, a2 Milk).

Box 3.3 **The history of Fisher & Paykel Healthcare**

The New Zealand parent company, Fisher & Paykel Appliances (F&P), had manufactured and/or sold washing machines, dishwashers and other appliances to New Zealand and overseas customers since the 1930s. It became involved in healthcare in the late 1960s as it recognised the opportunity to use its growing manufacturing and electronic expertise.

It was not until 2001 that Fisher & Paykel Healthcare (FPH) became a separate company. Today it is one of New Zealand's most successful companies, earning the vast majority of its revenue from exports. The emergence of FPH is an excellent example of innovation happening through a firm moving into an adjacent product space (Chapter 2).

F&P brought its first major healthcare product to market in the 1970s. It was a heated humidification system: the Spence-Melville humidifier. Illustrating that innovation often requires bringing together diverse knowledge and skills, it involved the cooperation of a clinician (Spence) from Auckland Hospital, who developed a crude prototype; a government employee (Melville) from the Department of Scientific and Industrial Research (DSIR), who provided a key mechanical part – a prototype humidifier made of a fruit preserving jar; and an appliance engineer (F&P). F&P took over the development of the equipment, improved on the crude model, and brought in suppliers of specialist parts.

The niche that F&P and then FPH have so successfully carved out to become a world leader in their products and sales is a persistent aim to perfect the temperature and humidity, while stopping condensation build-up in medical ventilators. What others may have overlooked as a simple concept has developed into a very successful innovation niche.

FPH has relied on close and productive working associations with a number of hospitals and clinicians, particularly in New Zealand and the United States. These associations offered the firm valuable opportunities to test emerging technologies and to access world-class medical expertise. It enabled FPH to test the clinical efficacy and reliability of its prototypes in a hospital environment, and to investigate patient responses.

FPH likes to work with small local suppliers because it can meet with them frequently and resolve issues promptly. FPH teams prefer to physically see prototypes from suppliers before they proceed. As well, the frequency of face-to-face interactions builds trust.

As a large player in the sector, FPH has the power to attract local suppliers who are keen to secure a supply contract with a big manufacturer. These suppliers benefit immensely from having a company like FPH as their customer. With no direct competitors in New Zealand, FPH has also benefited from the low risk of a medical professional or a supplier leaking valuable information relating to FPH innovation to a competing firm.

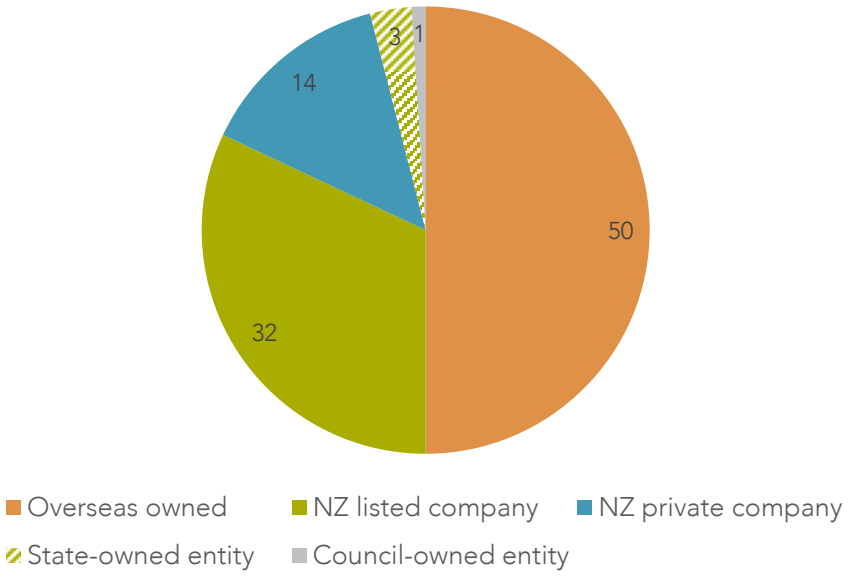
FPH has had a few collaborations with Crown Research Institutes (CRIs) and universities. FPH has funded and supported projects to explore new ideas that it might be able to incorporate in its future products or processes. Most were pure research projects, but ones that might result in a major breakthrough and radical innovation for FPH. Yet while successes have come from them, these collaborations with universities and CRIs have been relatively rare due to perceived risks around IP ownership.

Source: Biswas (2012); NZHIT (2016).

The paucity of New Zealand exporters is linked to the heavy concentration of export revenues: 33 firms accounted for over 50% of New Zealand's exports of goods and services in 2019. Only a small number of firms export at any sort of scale: just 297 firms exported more than $25 million a year. This profile has changed little over the past 20 years. Further, the "New Zealand champion" firms of 20 or 30 years ago – such as Fletcher Challenge and Carter Holt Harvey – have been split up and reduced in size. And the growth aspirations of firms from Air New Zealand to The Warehouse Group and Telecom (now Spark) had to be dialled back, partly because their international expansion experiences ran into trouble – mostly in Australia.

Many of New Zealand's largest firms are in ownership structures that do not appear conducive to ambitious growth strategies. In the primary sector, the cooperative structure appears at times to constrain risky investments and make it more likely that the product mix skews towards commodities. It seems unlikely that many of these firms could act as the growth engines of the New Zealand economy, or anchor innovative, high-productivity activity across a connected network of suppliers and researchers. An exception is Zespri – a cooperative that is large and fast-growing on the back of an innovative product packed with IP (gold kiwifruit). It continues to invest in R&D and acts as an anchor firm for a large number of growers and packhouses. Figure 3.10 shows the breakdown in the ownership of the 100 largest firms by revenue operating in New Zealand in 2019. Less than half of these firms are significant exporters.

Figure 3.10 Ownership structure of New Zealand's 100 largest firms, 2019



Source: Deloitte Access Economics (2020) and NZPC calculation, based on Companies Office data.
Note:
1. Overseas-owned firms are those that have their global ultimate parent (ie, majority ownership) registered in a country other than New Zealand.

There have been some improvements over time, but New Zealand's largest firms (in aggregate) have not yet shifted the economic dial. Some successes have occurred, such as Xero, but they remain exceptions in terms of the scale and pace of growth. New Zealand has a considerable number of successful small-to-medium-sized, fast-growing technology firms, but they are not yet at a scale to make a material difference to overall economic performance.

F3.7

Looking at New Zealand's overall population of firms, a striking feature is the low number of large exporting firms.

- Only a small number of firms are internationally engaged at scale. In 2019, 33 firms accounted for over 50% of New Zealand's exports of goods and services.
- Only 297 firms exported more than $25 million a year.
- Of the top 10 listed New Zealand firms on the NZX:
  - four are domestic utilities;
  - two largely sell services to the domestic market;
  - two are international transport infrastructure companies; and
  - only two compete in global markets at scale.

New Zealand's largest 200 firms by revenue

In work for the Commission, Deloitte looked at the performance of the 200 largest firms in New Zealand by revenue for each year from 2000 to 2019 (Deloitte Access Economics, 2020). The sample excluded financial institutions such as banks. It then compared these results to those of the general business population, using Stats NZ's Annual Enterprise Survey.

The Top 200 is a very small segment of Kiwi firms. New Zealand has around 300 000 firms with employees, so the 200 largest companies are very much the top of the top. In contrast, the Commission's definition of the frontier as the top 10% of firms in the productivity distribution includes around 30 000 firms. Yet the Top 200 firms employ large numbers of staff and are responsible for billions of dollars' worth of capital assets. They are disproportionately important in the New Zealand economy.

Deloitte's work showed that there were 40 "billion-dollar companies" in New Zealand in 2019 (ie, companies with revenue above $1 billion). This was up slightly from 37 in 2008 (after adjusting for inflation). The size of firms drops off rapidly, with the majority of the Top 200 having revenue below $0.5 billion (109 companies in 2019), and a third having revenue below $300 million.

Deloitte's work also showed that between 2000 and 2019 there was a significant increase in overseas ownership of Top 200 firms. This change appears to have been driven in part by the growing presence of the Australian Stock Exchange (ASX) in New Zealand, and a fall in the share of Top 200 companies listed on the New Zealand Stock Exchange (NZX).

Overall, overseas ownership increased from 43% of the Top 200 in 2000 to 56% in 2019, with the bulk of this increase taking place between 2000 and 2009. Consequently, overseas-owned firms accounted for an increasing share of the total profit after tax of the Top 200, with the share of total profits going to overseas-owned firms increasing from 21% in 2000 to 48% in 2019.

Two industries accounted for around 50% of the total revenue of the Top 200 firms in 2019: manufacturing (including food processing) accounted for 26%, and retail trade and accommodation 23%. No other industry accounted for more than 10% of total revenue. Among manufacturing firms, 40% of revenue came from just three companies – firms heavily reliant on exports, including dairy and meat product processing. One of these companies, Fonterra, had revenue of over $20 billion in 2019, more than twice the revenue of the next largest company by revenue: Fletcher Building.

3.6 Conclusions

The Commission's empirical investigation of New Zealand's frontier firms has led it to several important conclusions that point to where Government should focus its efforts to improve the country's economic performance and the wellbeing of its residents.

- The labour productivity levels of New Zealand frontier firms are well below the levels of firms at the small-advanced-economy frontier.
- Average growth rates of labour productivity of New Zealand's frontier firms have been slow over 2003-16 – similar to Denmark, the Netherlands and Sweden; faster than Finland's frontier firms; but slower than Belgium's frontier firms. While this may be seen as keeping up, the failure to catch up and narrow the large productivity gap is concerning.
- The width of the productivity distribution of New Zealand firms is relatively narrow. While this suggests that diffusion from frontier firms to non-frontier firms is satisfactory, the benchmark set by the frontier firms is unsatisfactorily low.
- In the small advanced European economies, more labour is employed in the top labour-productivity decile than in any other. In New Zealand, this happens in the 5th decile. This contrast in the allocation of labour is a concern, as is the much higher average capital intensity of the European firms.
- Related to the above, New Zealand has few of the large exporting firms with deep surrounding innovation ecosystems that are visible in the comparator small advanced economies in Europe.

Much of the remainder of this draft report will be looking at what government can do to move New Zealand's economy in the direction of better performance at the frontier, with consequential benefits for firms behind the frontier and for the wider national interest.

Chapter 5 explores the close relationships between scale, exporting and innovation for a small, distant economy like New Zealand.

Chapter 6 looks at the characteristics of successful innovation ecosystems: the arrangements that some other small economies use to focus innovation support in specific areas of the economy.

Chapter 7 examines the current state of play with innovation policy in New Zealand and how it could be reshaped to improve frontier-firm outcomes.

Chapter 8 examines the importance of talent and leadership to business success, where New Zealand has gaps, and where opportunities exist to improve.

Chapter 9 gives examples from the Commission's case studies of where changes to regulations in New Zealand could support and stimulate more, and more successful, innovation.

4 Insights from Māori firms

Key points

- The Māori economy comprises a range of organisational forms, structured under various legal frameworks. Māori business activity has grown and diversified significantly in recent decades.
- Quantitative analysis of a sample of Māori firms found that they perform similarly to non-Māori firms. The best-performing Māori firms have strong capacity across a range of organisational factors, including the right management, relationships, HR processes and cultural capital. Māori frontier firms are able to combine and leverage these factors to gain success over their competitors.
- High-quality data and analytics are important for informing Māori business innovation and development. The Government should invest further in qualitative and quantitative research to better understand Māori firm performance and productivity.
- Many of the features and characteristics of Māori firms present both challenges and opportunities. Examples of leading Māori firms show that these entities have been able to turn challenges or barriers into strengths and opportunities, as they find ways to work around them or use them to their advantage. The successes of Māori frontier firms build the confidence and ambition of these firms, and can help light the way for other Māori businesses.
- Māori firms operate within a unique Māori business ecosystem. Challenges arise from having to navigate the complexity of governance structures, relationships and other dimensions. However, common values and features help bring Māori businesses together around shared goals. Formal and informal networks among Māori businesses are important for diffusing knowledge, exploring innovations and enabling collaboration.
- The governors of Māori businesses managing collectively owned assets are accountable to multiple owners and shareholders. Governors of these entities do not necessarily see multiple ownership as detrimental to the strategy, objectives or innovation in their business. In fact, it can be seen as a strength in that it drives transparency around decision making and the impact of decisions.
- The desire to serve multiple objectives ("multiple bottom lines") can be a strong driver of ambition, which can also flow through to expectations on suppliers. High shareholder ambition can also spur innovation and experimentation, providing the underlying assets are not put at risk. This appetite for innovation is reflected in statistics which show that rates of innovation and R&D are higher for Māori businesses, compared to all New Zealand businesses.
- Māori cultural values such as kaitiakitanga, kōtahitanga and whanaungatanga help differentiate Māori goods and services and provide added brand value overseas. They also closely align with growing global consumer demand for products with strong environmental and social credentials. This presents growth opportunities for kaupapa Māori firms and collectives.
- There is a small talent pool of Māori with the skills and experience to govern and manage Māori frontier firms. The demands on this talent pool are increasing, due to the growing number of Māori commercial entities and competing demand from non-Māori firms for Māori business skills.
- Existing and prospective Māori land-based businesses face constraints from the land tenure and compliance requirements of Te Ture Whenua Māori Act 1993. Resolving the long-standing dilemma of balancing land retention, with effective governance and management to raise productivity and returns for Māori land owners, is challenging but important. Options available to the Government include continued improvement of services to Māori business and further reform of the legislation.

4.1 Various ways of defining a Māori firm

A range of organisational forms

The Māori economy, including Māori businesses and the Māori asset base, reflects its unique culture and history. Pre-colonial Māori communities operated their own economy, with land and other resources recognised as being held by traditional collectives (Te Puni Kōkiri & Federation of Māori Authorities, 2006). Māori traded with the early settlers and other British colonies, and Māori collective enterprise thrived during the period of early colonisation (NZIER, 2003). However, from the second part of the 19th century, including the New Zealand wars and continuing into the 20th century, Māori were systematically dispossessed of their land and other resources, and suffered significant losses to their population, language, culture, authority, wealth and wellbeing.

In the 1930s, Māori-owned land-based businesses became incorporated under special Acts of Parliament. Redress provided in settlement of Treaty of Waitangi claims from the 1990s onwards have significantly strengthened the Māori asset base, contributing to its focus on land-based and fisheries industries. Treaty negotiation processes also led to the legal recognition of Post-Settlement Governance Entities (PSGEs) – which have gone on to be the parent entities of commercial vehicles to govern and manage the commercial assets and cash proceeds of Treaty settlements.

Today, the Māori economy is characterised by a range of organisational forms, including collectively owned Māori Freehold Land Incorporations and Trusts, other trusts, PSGEs, pan-tribal and national Maori organisations (such as the Federation of Māori Authorities (FOMA) and the Poutama Trust), limited liability companies, and self-employed owner-operators. These are structured under several legal frameworks such as Te Ture Whenua Māori Act, Companies Act, Charitable Trusts Act, Māori Trust Boards Act, statutory bodies and publicly listed companies, as well as the PSGEs legally recognised in association with Treaty settlements (Te Puni Kōkiri & Federation of Māori Authorities, 2006).

Different ways of identifying Māori firms

There are various ways of defining a Māori firm. Interpretations can include: the ethnicity of the business owners (and/or governors, or managers); the ethnicity of employees; the nature of the product (goods or services); or businesses and/or social enterprises operating with Māori values, philosophy and tikanga.

Stats NZ has been publishing its *Tatauranga umanga Māori – Statistics on Māori businesses* since 2014, and is continuing to expand and develop the information it provides on a sample of Māori enterprises. Using data from Poutama Trust, NZ Māori Tourism and the Business Operations Survey (BOS), Stats NZ provides statistics on two subsets of Māori businesses – Māori authorities (that manage Māori assets held in communal ownership) and Māori SMEs (businesses that self-identify as Māori and have fewer than 100 employees). This approach has identified 1 200 Māori authorities, and 492 SMEs. It also identified 234 Māori tourism businesses (which may be Māori authorities or SMEs) (Stats NZ, 2020b).

Commissioned by Te Puni Kōkiri, Nicholson Consulting (2020) used the microdata in Stats NZ's Integrated Data Infrastructure (IDI) and Longitudinal Business Database (LBD) to generate statistics on three categories of businesses within the Maori economy:

- Māori-owned businesses – with a majority of shareholders who are Māori;
- Māori sole traders; and
- large employers of Māori – businesses with 75% or more employees who are Māori.[7]

This work, *Te Matapaeroa*, identified a much larger number of Māori businesses than the Stats NZ definition. In addition to the 1 300 Māori firms identified as Māori by Stats NZ (SMEs and Māori authorities, including tourism businesses), the work identified a further 8 800 businesses which have a majority of Māori

[7] Noting that people can identify with multiple ethnicities, and may do so in surveys for official statistics such as the Census.

shareholders. The work also identified 14 700 Māori sole traders (according to self-reported ethnicity) and 10 200 businesses that are not Māori-owned but are large employers of Māori.

Other significant work to quantify the Māori economy has focused largely on the Māori asset base and overall contribution to GDP. BERL estimated value added in the Māori economy at $11 billion in 2013,[8] representing 5.6% of national GDP, and the Māori asset base at $42.6 billion, or 6.1% of New Zealand's total asset base (Nana et al., 2015). In 2017 KPMG estimated this asset base at $50 billion, including an estimated 50% of New Zealand's fishing quota and around 30% of plantation forests that are Māori-owned (KPMG, 2017).

F4.1 There is no single or agreed definition of a Māori business or "Māori firm". The Māori economy comprises a range of organisational forms, structured under various legal frameworks. Depending on the purpose, definitions may consider the ethnicity of the business owners, the ethnicity of the employees, the legal status of the business, the nature of the product, and whether the business has a kaupapa Māori focus or has adopted Māori cultural values in the way it operates.

4.2 Activities and performance of Māori firms

Growing and diversifying

Recent decades have seen significant growth and diversification of the Māori economy. Employment by Māori authorities expanded by 52% over the period 2012-19, and in Māori SMEs by 38%, amounting to compound annual growth rates (CAGR) of 6% and 5% respectively. This compares to employment growth of 18% (2% CAGR) across all New Zealand businesses. Within firms, 36% of Māori SMEs reported that they invested in expansion in 2019, compared to 32% across all New Zealand businesses (Stats NZ, 2020b).

While the business interests of Māori authorities remain dominated by resource-based industries,[9] they have expanded into areas such as non-residential property and tourism. Māori SMEs are more diverse than Māori authorities, spanning a greater range of industries (Stats NZ, 2020b).

Using the broader definition of Māori businesses in *Te Matapaeroa* gives a quite different picture of business activity compared to *Tatauranga umanga Māori.* For example, while the official statistics show rental, hiring and real estate services as the most significant Māori industry, *Te Matapaeroa* found construction to be the biggest industry.

F4.2 The Māori economy has grown and diversified significantly in recent decades. Employment by Māori authorities and Māori SMEs has increased strongly, and a high proportion of Māori SMEs have invested in expansion.

Internationally connected

According to the BOS, 27% of Māori authorities and 28% of Māori SMEs were involved in goods exporting in 2019, compared to 26% across all New Zealand businesses. Goods exports by Māori authorities totalled $741 million. The top commodity was kaimoana (49% of total Māori authority merchandise exports) and the top market China (48% of goods exports, compared to 28% for all New Zealand goods exports). Goods exports by Māori SMEs totalled $202 million, and went to a range of countries (the top market being Australia)[10] (Stats NZ, 2020b).

[8] BERL used a broad definition, capturing Māori collectively owned enterprises and entities, as well as individually owned businesses and SMEs.

[9] Stats NZ defines a Māori authority as having a Māori business flag on the Business Register. This flag denotes: business with a collectively managed asset, which uses current Inland Revenue eligibility criteria to be a Māori authority; commercial business that supports the Māori authority's business and social activities, and sustains or builds a Maori authority's asset base; and business that is at least 50% owned by a Māori authority.

[10] A breakdown of Māori SMEs' exports by commodity is not available.

F4.3 Māori authorities and Māori SMEs are slightly more likely to be involved in goods exporting than New Zealand businesses overall. Almost half of exports from Māori authorities go to China; the export markets of Māori SMEs are more diverse.

Māori frontier firms have strong firm capabilities and processes

Haar (2020) analysed survey data covering 146 Māori enterprises, including 106 private sector firms.[11] He looked at the effect of a range of factors on firm performance, covering firm structure, assets, strategy and entrepreneurial culture. Assets included the firm's people, relationships, management and cultural factors, as well as human resource management (HRM) systems. Performance was measured by product innovation, top talent retention, organisational performance (managerial effectiveness, worker satisfaction and customer loyalty) and breakthrough sales (percentage of total sales generated from new products).

Haar found that all these factors were important for firm success, and that the results support several modern strategic management frameworks. The findings suggest that "Māori firms operate in ways that do align very closely to theoretical and empirical evidence from the western world, which of course, is logical given these Māori firms operate in a western economy" (Haar, 2020, p. 30).

The analysis of firm assets included consideration of cultural capital. This was measured by survey questions assessing the knowledge and skills of employees in working with Māori culture. While cultural capital was significantly correlated with firm performance, its effect was weaker than that of other dimensions of firm assets.

As a way of considering Māori frontier firms, Haar looked at the top 12 firms in the sample according to their organisational performance (representing the top 8.1%). He found that the top-performing Māori firms have strong capacity across all factors *and* can successfully leverage these together to gain success over competitors. Having both the capabilities and processes to do this provides a buffering effect against hostile industry forces (such as strong competitive pressures). Interestingly, firm size did not affect performance, suggesting that these Māori frontier firms outperform their rivals due to differences in their organisational makeup. He concluded that,

> Māori firms seeking to perform well and outperform their competitors will need to focus on a broad array of firm factors … having strong firm assets, with the right people, good managers, strong relationships, and excellent HRM and cultural practices, should equip a Māori firm to do well. (Haar, 2020, p. 29)

As with non-Māori firms, there will be a variety of Māori firms behind the frontier, across the spectrum of performance.

F4.4 Quantitative analysis of a sample of Māori firms found that they operate similarly to non-Māori firms. The best-performing Māori firms have strong capacity across a range of organisational factors, including the right people, management, relationships, HR processes and cultural capital. Top Māori firms are able to combine and leverage these factors to gain success over their competitors.

4.3 Characteristics and opportunities

Māori values in business

Māori entities and firms often endeavour to incorporate Māori values and principles into their strategic goals and approach to the governance, management and operations of their business. This presents both challenges and opportunities for them.

[11] The remaining 40 firms were public sector and not-for-profit. The sample did not include Māori authorities.

In work for this inquiry, Mill and Millin (forthcoming) interviewed a number of experienced iwi and Māori business people to seek their views and insights on how Māori frontier firms grapple with this and other aspects of business productivity.

Interviewees said that one challenge they face is how to define the kaupapa Māori values for the business, and whether and to what extent they would make a difference.

> How do we run our businesses with a real kaupapa Māori approach? It is a real discipline for many of us because we are commercial business people… Entities with Māori leadership values are most successful, but at this point a lot of Māori businesses are running a conventional western governance model… So it is well worth Māori governors taking a step back and taking the time to wananga about what is important to the business from a kaupapa Māori perspective. (Traci Houpapa, FOMA)

Some of the values, principles and concepts identified as relevant and beneficial to Māori businesses included kaitiakitanga (guardianship), rangatiratanga (leadership, ownership), manaakitanga (hospitality), and whanaungatanga (relationship/kinship).

> Our business is based on certain fundamental Māori principles and values. Rangatiratanga – leadership and ownership. These are cultural things inherently in our DNA. Our continuous effort is to take the tikanga of the balance sheet and put our Ngai Tai korowai over it. (James Brown, Ngai Tai)

Māori values and concepts also have the potential to benefit non-Māori firms. Simon Karipa observed that Māori values and concepts are increasingly being recognised and adopted in the non-Māori economy.

> Operating in a Māori ecosystem – with the values that are engrained in Māori business is a positive … and their worth is demonstrated by the fact that key concepts are being adopted by non-Māori businesses as well. (Simon Karipa, Te Atihaunui-a-Pāpārangi)

Multiple bottom lines

Māori businesses and iwi commonly refer to a "multiple bottom line" approach. This approach balances multiple values and objectives – spanning social, cultural, financial, environmental, spiritual and political domains.

The drive to serve cultural, social and environmental sustainability objectives brings a long-term focus to decision making by Māori enterprises. This focus reflects the drive to preserve and grow value for future generations. It can be a challenge for decision making, but also an economic opportunity. In an engagement meeting, Whaimutu Dewes told the Commission that

> …having a Māori kaupapa doesn't mean taking a discount on assets. It's a strong driver, in my view, to aspire to perfection.

Most people interviewed by Mill and Millin didn't see multiple bottom lines as a disadvantage for their business.

> He waka eke noa – we're all in this together. Focus on the UN's SDGs [Sustainable Development Goals] – climate change commitment programme. Good model for front-end engagement with government and other businesses globally… However, for a lot of Māori businesses, balancing the environment with commercial goals is more about how environmental goals improve the commercials. (Traci Houpapa, FOMA)

The desire to achieve multiple bottom lines can also drive relationships and expectations with suppliers.

> Multiple bottom lines – we do have these; they are not an excuse for failure. These are dealt with by having a clear strategy and communication with owners and suppliers so that those multiple bottom lines are implicit in the supplier relationships (such as raising employment for iwi members).
>
> Everyone knows that Pukeroa Oruawhata aims to have its own people employed wherever that is possible. We set that expectation with our suppliers and providers, and expect no trade-off for costs for our business because the contractors accept this in deciding to work or partner with us. This is now accepted in our market and not seen as an unusual request. Pukeroa also strive for community buy-in to its business and new developments. It forms these expectations through its visibility and stake in the city

> and the associated relationships. Our primary duty is to our owners, and communication there is key. (David Tapsell, Pukeroa Oruawhata Trust)

Some interviewees considered that the balance tipped towards commercial bottom lines as Māori businesses mature.

> As firms mature, their views on bottom lines mature too. Iwi and Māori firms' attitude moves from – we must ensure we can provide social and financial (sometimes cultural) dividends to our owners, however – we must make money and build the value of the asset before we can do any of these other things. (Robin Hapi, Māori Economic Development Advisory Board (MEDAB), Te Wānanga o Raukawa)

Box 4.1 **How Māori values helped forge a frontier partnership**

The Tawapata South Incorporation is a Māori entity that runs Onenui Station, a 10 000 acre farming block on the Māhia Peninsula. Tawapata South formed a partnership with the aerospace company Rocket Lab, setting aside land for Rocket Lab to use as its launch site. Tawapata South operates a competing values or multiple bottom lines approach, which played an instrumental role in developing the partnership with Rocket Lab.

> Tawapata South operates under a competing values framework… Our business has competing values: control vs innovation, economics vs environmental and social objectives. Most Māori don't go into business to make lots of money – it's more about protecting taonga Māori… Our people are becoming more astute – sustainability – must ensure that they're not investing in unsustainable businesses. (George Mackey, former Chair of the Tawapapa Incorporation)

This Māori approach played an important role in confirming the formal land use and [per launch] payment arrangement between the parties.

> After much bouncing back and forth of the draft agreement between our respective lawyers it seemed like we were no closer to finalising an acceptable agreement. So at that point we invited Peter Beck [CEO of Rocket Lab] to meet with us in person [in Wairoa] to see if we could nut out our differences and find a solution that was consistent with our [Māori] way.
>
> The decision to partner with and lease the land was challenging for our shareholders because Rocket Lab was an unknown quantity and their business was foreign and unfamiliar to our shareholders.
>
> Trust and a commitment to a culturally informed solution was hugely important for us to confirm the relationship and as it turned out – it resonated with Peter too.
>
> Peter also liked our five bottom lines to assess the implications of the proposition: economic, social, cultural, environmental, political. (George Mackey)

The success of the venture has built the confidence of Tawapata South's committee and owners, and led to further opportunities.

> The Tawapata South committee and owners have changed their perspective significantly on the scope of options and opportunities for the farm business as a consequence of our partnership [with Rocket Lab]. The partnership has expanded our horizons massively.
>
> Success breeds success. As a consequence of our partnership, we have been able to develop and implement:
>
> - funded conservation initiatives with MfE [Ministry for the Environment] and DoC [Department of Conservation];
> - significant roading infrastructure developments with the PGF [Provincial Growth Fund] – which included social procurement elements.
> - an ag-research model using MBIE's science and innovation funding to gather and combine data with a neighbouring farm for R&D to identify potential innovations on both our farms. (George Mackey)

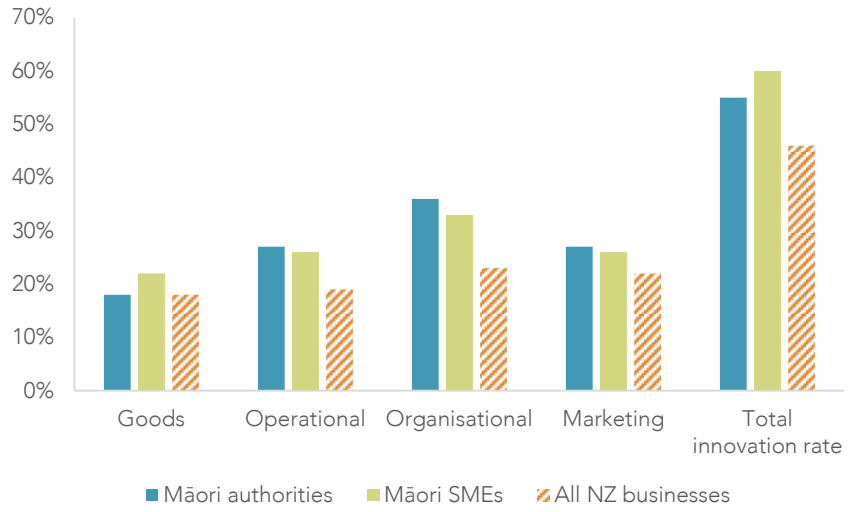
Source: Mill and Millin (forthcoming).

Innovative and entrepreneurial

Māori have a long tradition of entrepreneurship, innovation and technology adoption. Colonisation resulted in the loss of wealth and assets, but recent decades have seen a revival in Māori entrepreneurial activity. Today, Māori enterprises extend into a variety of high-tech industries, either as business operators or partners, as well as innovative social enterprises.

Data from the BOS show that both Māori authorities and Māori SMEs have higher innovation rates compared to New Zealand businesses overall. In 2019, the total innovation rate reported by Māori authorities was 55% and for Māori SMEs was 60%, compared to 46% for all businesses. Innovation rates by type of innovation activity were higher for Māori businesses across every category covered in the BOS (Figure 4.1). For Māori authorities and Māori SMEs, 18% reported that they undertook R&D activity, compared to 11% across all businesses (Stats NZ, 2020b).

Figure 4.1 Innovation rates, by type of innovation, 2019



Source: Stats NZ (2020b).

Note:

1. "All NZ businesses" include Māori authorities and SMEs.

One-third of Māori authorities and 19% of Māori SMEs sampled in the 2015 BOS reported no barriers to innovation at all. Māori authorities reported low levels of concern regarding access to intellectual property protections, and around government regulation, compared to businesses in general. Stats NZ posited that this lower level of concern "may reflect Māori authorities' unique status as kawanatanga-mana holders (or governance authorities) and kaitiaki (guardians) over Māori intellectual property and governance" (Stats NZ, 2016, p. 15).

The drive to balance multiple bottom lines can help spur innovation. For example, Dewes distinguished between low appetite for risking the underlying assets, but high appetite for innovation and trying new things. And Jason Ake told Mill and Millin that

> [t]here are huge shareholder/stakeholder expectations. Many of their constituents are at the bottom of socio-economic ladder and they justifiably expect to receive direct benefits from tribal business. It's a careful balancing act between managing the assets to grow them and giving back to our people. We measure our success and productivity on how innovative we can be in balancing those bottom lines. (Jason Ake, Waikato Tainui)

F4.5 Māori firms' desire to serve multiple objectives ("multiple bottom lines") can be a strong driver of ambition, which can also flow through to expectations on suppliers. High shareholder ambition can also spur innovation and experimentation, providing the underlying assets are not put at risk. This appetite for innovation is reflected in statistics which show that self-reported rates of innovation and R&D are higher for Māori firms compared to all New Zealand firms.

Opportunities in meeting demand for sustainable, ethical products

Māori cultural values such as kaitiakitanga (guardianship), kōtahitanga (unity, solidarity) and whanaungatanga (relationships) differentiate Māori goods and services, and provide added brand value overseas. They are also closely aligned with growing interest globally in environmental sustainability and corporate social responsibility (KPMG, 2017). Work by Lincoln University has found that consumers are prepared to pay price premiums for food products with socially responsible and environmentally sustainable credence attributes. For example, consumers in developed countries are prepared to pay a premium of 16–30% to raise the socially responsible standard of fruit and vegetables from "minimum" to "improved" (Miller et al., 2017; Tait et al., 2016).

The growing consumer demand for sustainable products presents opportunities for Māori firms and collectives. In engagement meetings, a number of participants commented that kaupapa Māori firms resonate well with consumers looking for products with strong environmental credentials, and features such as provenance and authenticity.

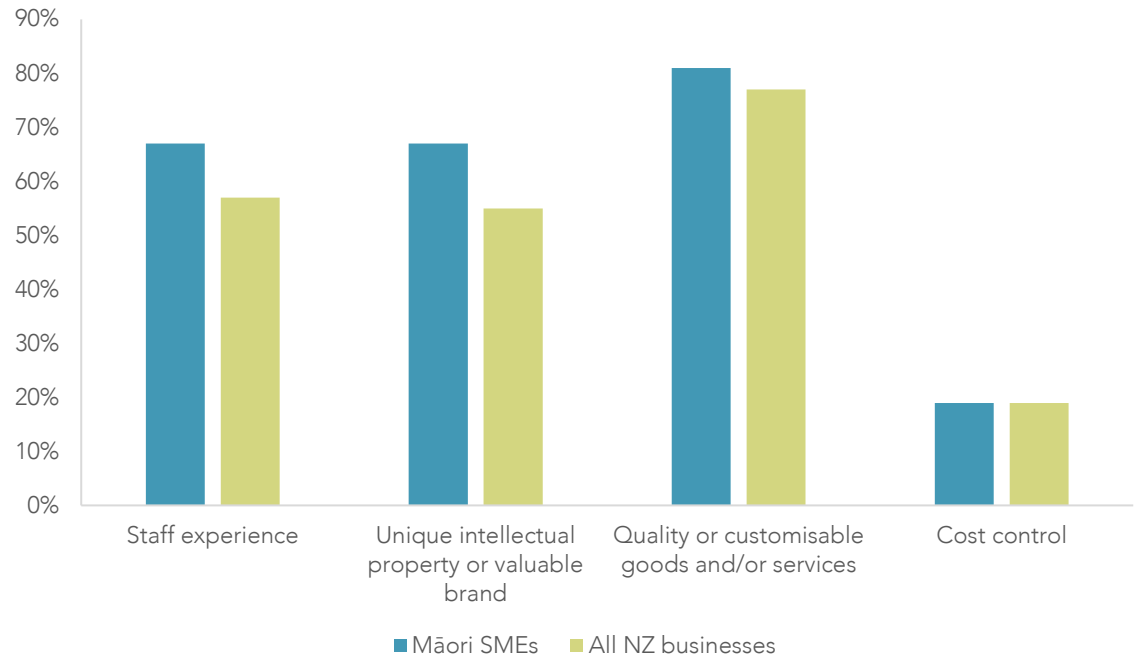
There are many examples of successful Māori firms focused on kaupapa Māori values and approaches, and well placed to benefit from growing global demand for sustainable, ethical products. Here are two examples.

- Kono is a business arm of Wakatū (a Māori Land Trust). Kono is a vertically integrated, family-owned food and beverage producer and exporter of award-winning wines, as well as cider, seafood, fruit and natural fruit bars. Kono has a strong intergenerational focus and works to a 500-year plan (Te Pae Tawhiti). Their business approach is underpinned by the principles of kaitiakitanga, which are reflected in its adherence to certified sustainable and ethical production practices (Kono, 2020).
- Miro is a partnership between 28 Māori authorities and investors that produces blueberries for export. It has a long-term goal of transforming 500–1 000 hectares of Māori land into productive horticulture. The business is underpinned by kaupapa Māori values and sustainability. For example, its Eureka variety of berries is planted in polytunnels and fed by a "fertigation" system that creates a low environmental footprint (Miro, 2020; Skellern, 2020).

Harmsworth and Tahi (2008) found that cultural brand distinctiveness is becoming a significant asset, and Māori branding (Tohu Māori) may provide Māori businesses with a competitive advantage in some markets. Tohu Māori is also used by non-Māori businesses and contributes to the value of "Brand NZ". This gives rise to concerns about cultural appropriation of Tohu Māori, and the authors emphasised the need for adequate protections and processes around the use of indigenous branding.

In the 2019 BOS, two-thirds (67%) of Māori exporting SMEs reported that their unique intellectual property or valuable brand helped them compete overseas. This compares to 55% across exporting businesses generally (Figure 4.2).

Figure 4.2 Factors that helped exporting businesses compete overseas, 2019



Source: Stats NZ (2020b).

Notes:

1. Figures for Māori authorities not available (suppressed due to data quality).
2. Includes businesses who either reported selling in overseas markets, or both in New Zealand and overseas.

F4.6 Māori cultural values such as kaitiakitanga, kōtahitanga and whanaungatanga help differentiate Māori goods and services and provide added brand value overseas. They also closely align with growing global consumer demand for products with strong environmental and social credentials. This presents growth opportunities for kaupapa Māori firms and collectives.

Māori business networks support diffusion, innovation and collaboration

Māori firms operate within a unique Māori business ecosystem. This poses both challenges and opportunities. Challenges arise from having to navigate the complexity of governance structures, relationships and other dimensions.

> Maori business people are like "swamp navigators". To be successful they have to be able to effectively navigate the complex ecosystem of Māori entities including the structures, accountabilities, relationships and multiple bottom lines. (George Mackey, Tawapata South)

> Waikato Tainui has multi-layered iwi governance structures with different roles, but all have parts to play and therefore need to be navigated with their different priorities. (Jason Ake, Waikato Tainui)

However, common values and features also help bring Māori businesses together around shared goals. All those interviewed by Mill and Millin raised the importance of the range of formal and informal networks among Māori businesses for diffusing knowledge, exploring innovations and enabling collaboration.

> Powerful Māori networks and models for working together create larger commercial, social and cultural opportunities. There is a huge opportunity in property for iwi and Māori throughout our region and there is lots of whanaungatanga going on between the tribes to take advantage of this. (James Brown, Ngai Tai)

> Te Pūia Tāpapa collective is an example of an innovative network. It's a de-politicised vehicle for investment, [and] gives exposure to capability and sidecar investment opportunities. It is a learning experience and provides Māori entities with ready access to deal flow. It's taking the politics out of the

decision making and allows the group to jump on opportunities by having funds committed upfront, so the collective can pounce. (Simon Karipa, Te Atihaunui-a-Pāpārangi)

Project Whetu was set up to help settlement entity commercial arms to better understand the language of funds management and investment. Project Whetu is designed to increase knowledge, network with other groups, promote financial and investment education at trustee/director/executive level, and discuss financial innovations. (Debbie Birch, IWIinvestor)

F4.7 Māori firms operate within a unique Māori business ecosystem. Challenges arise from having to navigate the complexity of governance structures, relationships and other dimensions. However, common values and features help bring Māori businesses together around shared goals. Formal and informal networks among Māori businesses are important for diffusing knowledge, exploring innovations and enabling collaboration.

Separating governance and management

It has become the standard approach for Māori businesses managing collectively owned assets to set up their organisational arrangements to clearly separate governance from management functions (Mill & Millin, forthcoming). Entities do this for a range of reasons.

Our commercial and social subsidiaries allow separation and transparency (for our iwi members) between our tribal leadership and the proper management of our assets. (James Brown, Ngai Tai)

To avoid strategic ambiguity and mixed objectives and responsibilities, it is essential to keep governance and management separated. This can be a legal or operational separation which will depend on the circumstances. (David Tapsell, Pukeroa Oruawhata Trust)

Māori businesses these days seek to achieve the optimal dividend, and then leave it to shareholders to work out what they do with it. (Robin Hapi, MEDAB, Te Wānanga o Raukawa)

The separation of governance and management also facilitates better management of multiple bottom lines.

With Kokiri Construction consortium, we will create a property company to build houses for our people and the people of Auckland with zero additional investment and risk to our assets. The arrangement will wash its face, build value and create more opportunities for productivity and growth… We will give effect to rangatiratanga with high-quality kawanatanga. (James Brown, Ngai Tai)

The importance of transparency and communication

The governors of Māori businesses managing collectively owned assets are accountable to multiple owners and shareholders, sometimes numbering in the thousands. However, this is not necessarily seen as detrimental to the strategy, objectives or innovation in the business of these Maori entities. In fact, it can be seen as a strength in that it drives transparency around decision making and the impact of decisions.

Māori entities have a closer relationship with owners (most often governors and owners are related and personally known to each other) – this makes for strong transparency and accountability. (Robin Hapi, MEDAB, Te Wānanga o Raukawa)

The multiple ownership of Trust assets and accountability of the trust and subsidiary governors is not detrimental to the business – in fact it has been in the most part a positive element, presenting opportunities to achieving the overarching vision and goals of Pukeroa Oruawhata. (David Tapsell, Pukeroa Oruawhata Trust)

The importance of good communication and transparency with shareholders was expressed by a number of interviewees.

Our core business comprises commercial leases over a single site mall and another retail site. The underlying land for these was returned by the Crown in very poor condition so we had a battle to get everything moving in a productive way, [for] nearly a decade. Those sites are now providing nicely for our owners. Right now, in the middle of a tourism crisis, we are embarking on a significant tourism build due to complete in 2022! In each case we have explained to our owners what we are doing, why, and what it means for them and our people. The key to the success of our governance and business to date

> is "communication, communication, communication". We clearly and continuously communicate our big vision, what we have done or are doing to achieve it, and what we intend to do to grow the value and income from our assets. (David Tapsell, Pukeroa Oruawhata Trust)
>
> We'll show our iwi, our partners the balance sheet of the [Kokiri Construction] consortium with our commercial partners seven days a week – because we are confident about our achievements and we need that level of transparency to bring our people along on the journey. (James Brown, Ngai Tai ki Tamaki)

Engagement with shareholders also allows good boards to test ideas, as well as gain buy-in for direction and proposals for the business.

> Generally speaking, a very small percentage of our shareholders don't agree on a regular basis with what we propose to do, leaving the vast majority who do agree. However, this minority view is really important, it challenges us to test our thinking and keeps us on our toes which is actually a positive mechanism and exercise for the Trustees and directors. We would be stuffed if we got disconnected from our shareholders – even a relatively small minority. (David Tapsell, Pukeroa Oruawhata Trust)

4.4 How the Government can help grow Māori frontier firms

Leveraging the Māori-Crown relationship

Almost all Māori businesses that manage collectively owned assets have their origins in acts or omissions of the Crown. This includes the creation of the Māori land tenure system, land trusts and incorporations in order for the Crown and private interests to acquire land from Māori. It also includes the loss of land and other assets through confiscation or other unjust means that are returned as settlement redress.

Some interviewees emphasised the significance of settlement entities being able to better leverage the Māori-Crown relationship and the Crown's Treaty obligations, and pointed to government procurement processes as a vehicle for doing this.

> Ngai Tai's win with the seminal decision against DoC in the Supreme Court recognised the true intent of section 4, the Treaty Clause, of the Conservation Act… The outcome of [that decision] needs to be energized as part of the unlock. Get rid of the third world businesses operating low value, low investment activities on conservation land – and realise the partnership that DoC should have with Maori… We do a better job than the existing concessionaires. Trust is a big issue. Treaty procurement (as a consequence of provisions like section 4) should be a policy alongside any social procurement policy. (James Brown, Ngai Tai)
>
> [The] conventional government procurement process needs to be decluttered to allow Crown-Māori business partnerships to be pursued and realised more effectively (in all areas of development). We need help from government to unblock red tape and the jostling caused by artificial procurement processes. Māori are the perfect private partner in development partnerships because we own the land, we can bring the investors, we care about the communities and holistic support, and we have an intergenerational view of effort and success. (James Brown, Ngai Tai)

Q4.1 How can Māori-Crown relationships be better leveraged, in order to unlock the potential of Māori frontier firms and help meet the Crown's Treaty obligations? Would using government procurement processes be an effective way of doing this (eg, through a Treaty partnership procurement policy)?

Better coordination of government engagement and support

Māori interviewees expressed concerns about the difficulty of navigating government agencies and supports for Māori business (similar concerns were also expressed by non-Māori inquiry participants, see Chapter 7).

> Pukeroa don't engage with the Crown that often and just go about our business growing our asset base for our owners. When we do engage with the Crown it is often difficult to navigate and understand who (in the Crown) is in charge of what. In our view Crown assistance needs to be better coordinated. At the very least one department needs to know and coordinate what the others are doing for Māori businesses. That agency needs to have the single goal to drive the Māori economy by assisting and

> providing guidance to participate in the market. Ultimately I believe it would be better to actually collapse and disperse the Crown effort and spend across multiple Crown agencies into the Māori economy into a single entity (a CCO or such like), which has the authority and resource (annual Crown appropriations that were otherwise spread across the Crown on this kaupapa) to assist growth and productivity within the Māori economy that is apolitical and governed and run by Māori. (David Tapsell, Pukeroa Oruawhata Trust)
>
> Māori should be supported to define a model for the Māori economy. Support a Māori model and get out of the way. The PM and Government should back something like that over 20 years. A Māori wealth, cultural and prosperity model. Get a bunch of smart, connected Māori in a room to define and design the Māori economy. What does it comprise, what are the opportunities and how do we address the challenges? The "Maori economy" is wider than business – it is a Māori ecosystem. Resource Māori to define and optimise the ecosystem. (Traci Houpapa, FOMA)

A couple of interviewees called for government support and resourcing for Māori to define the Māori economy and design work to optimise the Māori business ecosystem. One idea was for a Hui Taumata (national Māori business summit) of iwi and Māori business stakeholders, to focus on the Māori economy, Māori business resilience and innovation in the Covid-19 recovery environment. This forum would enable a national discussion by Māori for Māori through the sharing of information, insights, and knowledge. The hui would aim to formulate ideas and recommendations as to how the Government and Māori business networks can work together to encourage and promote productivity and growth in the Māori economy.

F4.8 Māori business stakeholders interviewed for the inquiry expressed concerns about the difficulty navigating government agencies and supports for Māori business. Some expressed a desire for government to support a Māori-led approach to defining the Māori economy and optimising the Māori business ecosystem, to better promote productivity, innovation and growth in the Māori economy.

R4.1 The Government should facilitate a Hui Taumata (national Māori business summit) of iwi and Māori business stakeholders and workers. The Hui Taumata would:

- enable a national discussion by Māori for Māori on ways to support productivity, growth, innovation and resilience in the Māori economy;
- focus on defining the Māori economy and consider ways to improve the Māori business ecosystem; and
- formulate ideas for how the Government and Māori business networks can work better together.

Scoping of the Hui Taumata could be led by Te Puni Kōkiri, working closely with the Ministry for Business, Innovation and Employment, the Treasury, the Ministry for Primary Industries, and the Māori Economic Development Advisory Board.

Māori businesses face legislative constraints to developing their land

Mill and Millin found that Māori land-based businesses face constraints from the Māori land tenure and compliance requirements of Te Ture Whenua Māori Act 1993. The Trusts and incorporations established and administered under that legislation are subject to a range of compliance requirements under the Act. These requirements stem from the primary intentions of the Act:

- to promote the retention of Māori land in the hands of its owners and their whānau and hapū; and
- to facilitate the occupation, development, and utilisation of that land for the benefit of its owners and their whānau and hapū.

In practical terms this means that it is very difficult to sell the land owned by these entities, and to securitise the land with debt finance from banks and other financial institutions. For example, most banks do not

consider the value of the land and infrastructure on Māori land blocks on which businesses operate, and will almost always only lend against the value of stock. Additionally, certain major transactions and governance decisions require the entities to apply to the Māori Land Court for approval. These transactions and decisions include the partition of land and the appointment of Trustees and Management Committee members.

Although generally dissatisfied with these legislative constraints, interviewees saw some benefits. They explained ways to work round or mitigate the constraints so they could operate their businesses in an effective and optimal manner.

> We have the legislative constraints associated with being a Māori Incorporation. However, our shareholders whakapapa to this land, so they generally accept the kaupapa of Te Ture Act – to promote land retention in the hands of its owners and for this and other reasons are really risk averse. Like most Māori land, we can't use the incorporation's primary assets for security for debt finance. This limits our options for development of our primary farm business significantly.
>
> A work-round we have implemented is to buy and use neighbouring private land – that we can use for security. It provides part of a solution, but it would be good to have the banks recognise the value of our land in the same way that they do for private land. (George Mackey)

An interviewee also expressed that the banks do have some discretion, but for the most part choose not to allow Māori land to be used as security for debt finance because "banks like to deal with businesses whose business offers less hassle".

There is a long history of efforts to resolve these problems. Te Ture Whenua Māori Act was reviewed in 2012 by an expert review panel. The panel recommended substantive changes to the act, including provisions to:

- allow engaged owners to make governance and utilisation decisions without needing approval by the Māori Land Court;
- maintain safeguards to support the retention of Māori land;
- allow for external managers to administer under-utilised blocks pending owner engagement;
- establish a clearer framework for Māori land governance entities such as trusts and incorporations;
- place greater emphasis on mediation; and
- promote continued access to the Māori land court on relevant Māori land issues, but with fewer matters requiring direct and extensive Court involvement.

They also proposed options to address and manage further fragmentation of Māori land interests.

The panel's reforms were approved by Cabinet, and a Bill was introduced to Parliament in 2016. In 2018 the Bill was withdrawn. Funding was provided to improve the administration of Māori freehold land, and to support the development of Māori land and improve governance capacity. Targeted changes to the legislation were passed in 2020, to simplify and improve Māori Land Court processes for landowners (Te Puni Kōkiri, 2020).

The recent amendments do not address the fundamental issues tackled by the 2012 review. Resolving the long-standing dilemma of balancing land retention, with effective governance and management to raise productivity and returns for Māori land owners, is challenging but important.

F4.9 Existing and prospective Māori land-based businesses face constraints from the land tenure and compliance requirements of Te Ture Whenua Māori Act 1993. Resolving the long-standing dilemma of balancing land retention, with effective governance and management to raise productivity and returns for Māori land owners, is challenging but important. Options available to the Government include continued improvement of services to Māori business and further reform of the legislation.

Box 4.2 **Matakana kiwifruit – the BOOT is on the other foot**

Many Māori land trusts struggle with raising the capital necessary for significant expansion or operational diversification. This can lead to forgone business opportunities as land is not put to its most productive use. But what if land owners did not need to carry the financial risk?

In the kiwifruit industry, Te Tumu Paeroa (and the Māori Trustee) is managing the financial risk and establishing new enterprise without taking land out of the hands of the Māori land owners.

Whai Orchard Island has been established to turn unproductive land into productive orchards. It is part of a $30 million investment in kiwifruit by Te Tumu Paeroa in the Bay of Plenty and Gisborne – the single largest kiwifruit investment ever made on Māori land (Te Ao Māori news, 2017).

The land itself is held by a collective of 95 land owners. Te Tumu Paeroa and Quayside Holdings will temporarily lease the land from the collective and operate the orchard business. Full ownership of the orchards is expected to transfer back to the collective after achieving a targeted rate of return on capital invested.

The investment vehicle is a variation on the well-established BOOT (Build, Own, Operate, Transfer) public/private financing model to access capital without risking security of the land. The financing model helps Māori land owners transition from lower-yielding land leasing to a more productive land use, using high-value, unique products and gaining operational expertise to continue after asset transfer.

The land owners benefit from the capital invested, and also have the opportunity to gain expertise and experience on the ground and in governance. The model's combination of capital, purpose, return of asset wealth and Māori entity dynamics makes Te Tumu Paeroa an important catalyst for this type of innovative transition of land use.

Source: Gillespie (2017); Te Ao Māori news (2017).

More work required to understand Māori firm performance and productivity

Some interviewees emphasised the need for high-quality data and analytics, to inform Māori business innovation and development.

> We need access to the best data for innovation. We need innovation to ensure the corpus/our important assets are not put at risk. (Wayne Mulligan)

> Data and analytics of Māori business and the Māori economy are important – we currently lack key data on the Māori economy. Nothing will change unless you measure it. (Debbie Birch, IWIinvestor)

Haar (2020) recommended a number of areas warranting further research, including exploring how firms' cultural values and practices relate to firm operation and performance, investigating different measures of performance, and comparing his findings with non-Māori firms. Using his survey dataset to provide more descriptive analysis of the characteristics and performance of Māori firms would also be worthwhile.

Work to estimate and compare the productivity of Māori firms has not yet been undertaken, but would be a valuable addition to the knowledge base. The larger population of firms identified through the latest IDI/LBD work opens up new analytical possibilities.

More work is desirable to produce agreed authoritative definitions of Māori businesses. The current Māori Economic Resilience Strategy being led by the Chief Executives of TPK and MBIE will produce further data and analytical work in this regard.

F4.10

More work is required to better understand the productivity and performance of Māori firms, and how they are contributing to the wellbeing of Māori.

- Promising areas of future quantitative research include using the Integrated Data Infrastructure/Longitudinal Business Database and other datasets to investigate Māori firm performance and productivity.
- Complementary qualitative research would help explore the reasons behind the characteristics and relationships observed in quantitative work. Another fruitful area of inquiry could be a deeper exploration of the lessons that innovative Māori clusters and collaborations offer for both Māori and non-Māori firms.

R4.2

The Government, and the Productivity Commission, should invest in further qualitative and quantitative research on Māori firm performance and productivity. This work should be coordinated with the work being led by Te Puni Kōkiri and the Ministry for Business, Innovation and Employment on the Government's current Māori Economic Resilience Strategy.

Helping to build governance and management capability for Māori businesses

All those interviewed by Mill and Millin (forthcoming) identified the pressing need to build significant capability, skills and experience for the governance and management of Māori entities and businesses. They described a small pool of Māori with the necessary skills and experience. At the same time, the demands on this talent pool are increasing, due to the growing number of Treaty settlements and entities managing collectively owned assets, as well as competing demand from non-Māori organisations for Māori business skills.

Interviewees were keen to grow the pipeline of Māori business talent, including in older age groups. People suggested that a mentoring programme would be useful.

F4.11

There is a small talent pool of Māori with the necessary skills and experience to govern and manage Māori frontier firms. The demands on this talent pool are increasing, due to the growing number of Māori commercial entities and competing demand from non-Māori firms for Māori business skills.

Q4.2

How can the Government help build the pipeline of Māori business people with the necessary skills and experience to govern and manage Māori frontier firms?

5 Exporting and innovation

Key points

- To compete in global markets, firms need to have high productivity. Therefore, exporting firms are more likely to be frontier firms.
- Innovating in specialised, knowledge-intensive goods and services with a competitive advantage and exporting them at scale (even if in a global niche market) are key to more New Zealand firms reaching the global productivity frontier.
- In a small domestic market like New Zealand, firms that produce specialist goods and services must export if they are to achieve sufficient scale to cover their fixed costs, exploit economies of scale and scope and impact national productivity.
- Innovative, knowledge-intensive goods have high fixed costs of development because of the knowledge embedded in them. Moving into export markets also has high fixed costs such as obtaining market intelligence, branding, and developing distribution networks and supply chains.
- Because the size of the domestic market is small, New Zealand's firms that wish to grow beyond it by exporting must begin exporting when they are still small firms by international standards. This makes expanding overseas with its fixed costs even more difficult, expensive and risky.
- This, together with New Zealand's distant location, is likely to at least partly explain why New Zealand has relatively few large, established, successful exporters.
- In other small advanced economies, large businesses exporting specialised products at scale are crucial to lifting national productivity. They have the scale to export and innovate, provide a route to market for local small and medium-sized firms and researchers, and help diffuse global innovation into the local economy.
- In order to have more firms exporting specialised products at scale, New Zealand needs to support firms to overcome these hurdles to exporting, attract high value-adding export-oriented multinationals and build scale through networks. Government supports much of this activity via New Zealand Trade and Enterprise (NZTE) and other partners, but this should be better evaluated and successful programmes scaled up.
- Assistance for exporters through NZTE is mostly focused on individual firms. Assistance develops the capability of firms and helps meet the fixed costs of acquiring market intelligence. However, it does little to share the fixed costs of building and extending the domestic innovation ecosystem in areas of government focus or more broadly. The innovation ecosystem is crucial for building the capabilities needed to successfully export (see Chapter 6). Efforts to attract foreign investment should also be better targeted.

Exporting has long been recognised in both economic theory and practice as a powerful means for countries to increase their prosperity. It enables countries to specialise in goods and services they are good at producing, and which trading partners desire, and then ramp up production to reap the gains from trade. For a small country, the international market is huge and so production and the income earned from it is not constrained by a small domestic market.

This chapter builds on this reasoning for why exporting is a crucial part of raising economic performance. It explains why exporting and frontier firms are closely linked. It describes the challenges of exporting and why innovation, specialisation and scale are all important. The last section of the chapter describes and assesses the current arrangements in New Zealand for supporting exporters.

5.1 Through exporting, firms can reach for the global frontier

Only through exporting can New Zealand firms specialise in niche markets and operate at sufficient scale to impact national productivity performance. This means that capabilities for successful exporting are central to New Zealand's economic success. The current mix of exports and the extent to which the exports possess an enduring competitive advantage reflect the capabilities in New Zealand's innovation ecosystem (Chapter 2). In any country, these capabilities (broadly understood) evolve and refine themselves over decades of experience in producing and exporting (see Chapter 6). They also reflect New Zealand's history of economic development and the selection process by which non-frontier firms close and resources are reallocated to growing firms. International links formed in the course of exporting are also an important channel for technology diffusion.

Exporting and innovation are intimately linked

Innovation in specialised goods and services that are both globally traded is a key way to reach the global productivity frontier. As noted in Chapter 2, developed economies must predominantly rely on innovation to gain competitive advantage and avoid competing directly with low-wage economies in producing standard products that can be easily replicated.

The obvious exception is for countries that are rich in natural resources, such as Australia and to a lesser extent New Zealand (ie, land). However, at some point resources become constrained, and countries need to innovate and add value to products in order to raise their living standards, within environmental limits. Adding value without increasing environmental impact is another reason the "weightless" sector[12] holds such promise for New Zealand (Greenaway-McGrevy et al., 2020).

Innovative, knowledge-intensive, specialised products typically have large upfront development costs followed by low marginal costs once the product is fully developed (Chapter 6). This pattern of costs creates strong scale economies – unit costs are driven down with the scale of production and productivity is driven up.

Achieving scale in output of products of this type necessarily involves small advanced economies (SAEs) like New Zealand exporting. This is why established New Zealand companies like Fisher & Paykel Healthcare, Zespri and Xero (and a new tranche of younger companies such as Pushpay and Volpara Health) rely predominantly on exports for their revenue.

F5.1 Developed countries can raise their productivity through firms finding new areas of specialisation that give them a competitive advantage. For small advanced economies (SAEs), including New Zealand, this necessarily involves expanding into export market niches to achieve economies of scale in things like development, production and marketing. Exporting specialised goods and services at scale is the way that a SAE can significantly lift national productivity.

Exporting firms are more productive than non-exporting firms

To succeed in international markets, a firm has to be near the global productivity frontier. New Zealand's internationally connected firms have relatively higher productivity levels and growth rates. For example, labour productivity is 6% higher among exporters in the same industry (Fabling et al., 2008). Exporting firms are also larger than other firms and there is a link between exporting and innovation (Stats NZ, 2012). Even so, superior productivity before exporting explains much of the productivity gap between exporters and non-exporters (Fabling & Sanderson, 2013). Sanderson (2017) found that "firms which are already succeeding in innovative or niche markets and which have definite plans for expansion hav[e] a higher chance of expanding further" (p. 10).

[12] Weightless industries are those that produce knowledge-intensive goods and services whose value is high relative to their transport costs.

Participation in global value chains can build capabilities

Participation in global value chains (GVCs) (defined in Chapter 2) also provides opportunities for firms to specialise in niche products and so raise productivity. Participation provides other productivity benefits.

- Firms can "gain from access to a larger variety of cheaper and/or higher quality and/or higher technology imported inputs".
- Engagement with large multinational enterprises can "facilitate knowledge spillovers through domestic supply chains".
- Access "to larger markets and competition from foreign firms leads to the growth of more productive firms through leveraging scale economies while at the same time inducing the exit of the least productive firms" (Criscuolo & Timmis, 2017, p. 63).

GVCs offer opportunities for deeper niche specialisation, but they also present greater risk. New Zealand firms participate in GVCs at relatively low (and falling) rates, partly because of distance from large regional economies (in North America, East Asia and Europe) where cross-border GVCs are concentrated (Chapter 2). This reinforces the importance for the New Zealand economy of it understanding, building, and using the capabilities that underly product specialisation.

5.2 Exporting involves fixed costs that further emphasise the need for scale

Exporting provides the best opportunity for firms to produce specialised and distinctive products at scale, allowing them to reach the global frontier and, as a result, improve New Zealand's productivity. However, in a country like New Zealand which has a small domestic market and is distant from larger markets, exporting is a hugely risky step. Firms face large fixed costs when entering export markets, and they are forced to make that leap when relatively small.

Expanding overseas can be difficult, expensive and risky

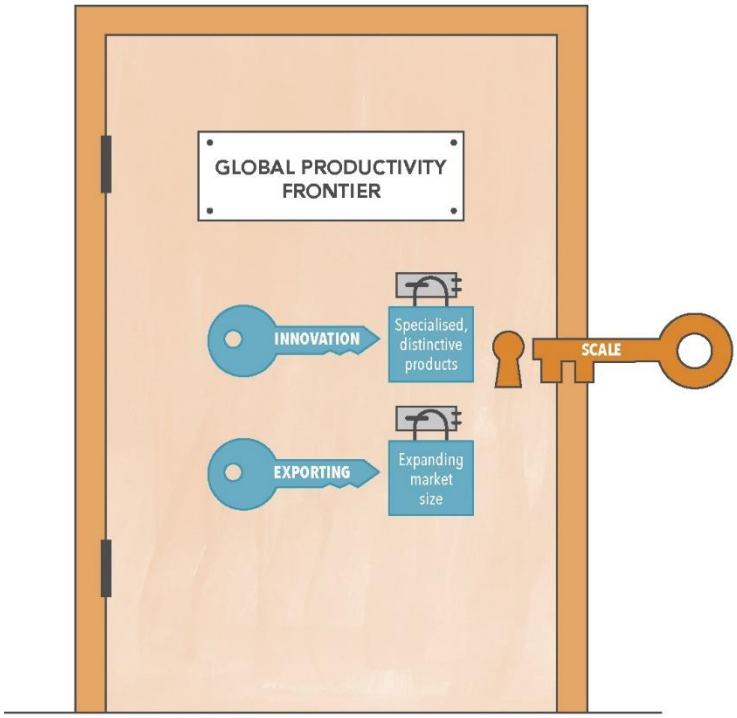
Having dealt with one set of fixed costs in developing an innovative, knowledge-intensive product, New Zealand firms can face substantial hurdles when looking to expand overseas and export. Entering international markets can be a difficult, lengthy and expensive process, with no guarantee of success (Figure 5.1). It can involve many years of research and planning, including work to understand target markets, develop supply chains, build in-country partnerships, and tailor product offerings.

Even the largest New Zealand firms are small by international standards, and the small size of the domestic market does not support productive efficiency. Any large New Zealand companies that export, such as Fonterra and Zespri, get only a small share of their revenue from the domestic market. Expanding offshore is essential for many types of firms to achieve economic scale. However, this often means that Kiwi firms must go global very early in their life-cycle – much earlier than many of their overseas counterparts who can grow within large domestic markets or adjoining markets within free-trade blocs.

As a result, New Zealand firms can face a significant step-change in cost, effort and risk, when they are still relatively small. This can be particularly challenging for entrepreneurs who are risking their own capital (such as the family home) in order to make the leap offshore.

Given these challenges, and that New Zealand firms can face them early on, it is not surprising that many do not start or sustain international activity. Research by New Zealand Trade and Enterprise (NZTE) found that, out of an estimated 4 000 firms that attempt to start exporting each year, up to 60% cease after one year. And after seven years, 90% have stopped trading internationally (Holt, 2016). The reasons for this are explored in the next section.

Figure 5.1 Exporting innovative, specialised products at scale is a key to success



F5.2

Exporting has fixed costs, for instance in market intelligence and branding, and in the development of distribution networks and supply chains. To provide the volume of products required for exporting, firms may also need to invest in more plant and machinery. High fixed costs make it risky and challenging for small New Zealand firms to move into exporting – they need scale to cover the fixed costs, but only when they succeed in export markets can they attain that scale.

Kiwi firms are often under-prepared for these challenges

Inquiry participants told the Commission that New Zealand firms tend to underestimate the work needed to successfully gain a foothold in international markets, often failing to do the necessary groundwork and preparation. As one participant said, "they don't land ready – they land and learn".

Research by the Commission found that the strength of competition in overseas markets, even in neighbouring Australia, can take New Zealand firms by surprise (J. Smith & Garden, 2020). This is supported by other data – for example, overseas competition is one of the most common difficulties reported by exporting firms in the Business Operations Survey. In its industry case studies, the Commission found that competition was reported as a barrier by a significant proportion of firms, including 41% of those in horticulture and 18% in software. [13]

Text-mining work by Sim and Bull (forthcoming) similarly found that competition was one of the most common challenges facing exporting firms. Analysis of correspondence between NZTE and its Focus700 (F700) firms found that the top challenges facing these firms related to competition, building brand awareness, finding partners, developing distribution channels and supply chains, and market understanding. Market understanding includes understanding how overseas markets work and what foreign consumers want.

[13] Reported by exporting firms in the International Engagement module of the 2015 Business Operations Survey.

Sim and Bull found that the nature of challenges varies by industry and destination market. This is unsurprising, as countries have different legal and regulatory systems (including tariff and non-tariff barriers), as well as different institutions, cultures and languages. For example:

- services and tech firms are more likely to face challenges with market presence (getting "boots on the ground" or with recruitment, networks and contacts) and having sufficient resources (people and money);
- food and beverage firms are more likely to contend with challenges around brand awareness, cost and pricing, supply chains, having a sufficiently compelling value proposition, and product differentiation; and
- establishing partners and channels, and market access are particular challenges for both food and beverage firms, and for manufacturing firms.

In terms of destination markets:

- firms targeting Australia are more likely to contend with challenges around brand awareness, governance and planning, and resources;
- challenges facing firms expanding into the United States and Canada include presence and recruitment, networks and contacts, having a sufficiently compelling value proposition, and product differentiation;
- firms entering China, Taiwan, India, the Middle East, African and Latin American markets struggle with regulation and certification, and supply-chain problems; and
- East Asian and European markets pose challenges around culture and language.

While this evidence is indicative of the problems that New Zealand firms face, there is no reason to think such firms are systemically worse at exporting than firms from other countries. These problems are more likely to be a symptom of having to export at relatively earlier stages of their development.

New Zealand lacks large high-performing firms with a global reach

Successful SAEs tend to have developed disproportionately high numbers of large multinational companies. Thanks to their scale, these firms are able to invest more, spend more on R&D, innovate and export. As a result they are more productive, and in SAEs they make a substantial contribution to national productivity (Skilling, 2020).

This is not to say that SMEs are not important, or cannot be productive. But in successful SAEs large companies provide "canopy cover" for an innovation ecosystem that includes researchers and smaller businesses (Box 2.2 in Chapter 2). Large firms have the scale to innovate and export, allowing them to move towards the global frontier. They provide a ready market for SMEs and researchers, who also benefit from the diffusion of global innovations. SMEs can provide the dynamism and agility that large firms can lack.

Compared to the successful SAEs, New Zealand lacks large businesses exporting specialised, distinctive products (Chapter 3). Many of New Zealand's large businesses focus on the domestic market. Only six of the top 20 firms (ranked by revenue) export, and less than half of the top 100 export. Of those, half again are exporting largely based on natural resources; mostly dairy, meat, forestry, horticulture, oil and gas, and mining. (Deloitte Access Economics, 2020). As noted above, the scope of exporting natural resources to continually increase living standards is limited.

Few New Zealand businesses export at scale without natural resources as their base. These businesses can be divided into two groups. They include some innovative, global businesses such as Mainfreight, a2 Milk, Datacom, Haier New Zealand (formerly Fisher and Paykel Appliances), Fisher & Paykel Healthcare, Xero and Frucor Suntory. All these firms are world leading, or have led the world in their industry at some time. The list also includes local companies with a large domestic presence that have grown into the Australasian market such as EBOS Group, Lion New Zealand, DB Breweries, Restaurant Brands, CPB Contractors, Freightways, Beca, and Kathmandu.

Yet Fonterra is New Zealand's only firm that operates at anything like global scale. Even this is not enough to earn it a position in the Forbes Global 2000. The formation of Fonterra in 2001 was intended to give it sufficient scale to export more innovative, specialised products, making it the "Nokia of the South". This has not materialised, and in recent years Fonterra has retrenched from riskier investments (Hickey, 2019). Regulatory issues relating to Fonterra and the broader dairy industry are discussed in Chapter 9.

5.3 Boosting the chances of export success

Gaining market intelligence and connections

The Commission's research, as well as input from submitters and inquiry participants, pointed to several things that can boost a firm's success in exporting and lifting their productivity.

Having a dedicated physical presence in overseas markets is important for building market understanding and making connections. Expertise is important for in-country supply chain and logistics. Attracting "smart money" (investors with the right experience and connections) can help build networks and open doors.

While not substituting for physical presence, the accelerated uptake and normalisation of digital technologies / ICT is in some ways helping to "flatten the world". As mentioned in Chapter 8, firms can use these technologies to help access knowledge and skills, and build networks (including with talented and well-connected New Zealanders), living in destination markets. This is removing some of the disadvantages of distance, which may explain why international trade in services is growing faster than goods. New Zealand firms seem to be investing more in ICT than their counterparts overseas. However, there is a need for greater investment in skills and management to allow businesses to make the most of these technologies (Conway, 2020).

Several businesses that participated in the inquiry commented that Covid-19 has accelerated this process by normalising the use of digital technology such as online videoconferencing. Dealing with New Zealand is now no different from dealing with a firm in the same country, as there is no face-to-face contact either way. The impact of this change is likely to be even greater for "weightless" exports where little shipping is required.

Inquiry participants told the Commission that firms need to thoroughly analyse the competition in the target market, to ensure they have a genuine competitive advantage. Firms then need to research the target market and culture, and develop tailored offerings and approaches for each market.

Participants described scope for greater collaboration among New Zealand firms, to assist those firms in expanding offshore. This could include pooling resources to help overcome barriers to entry (eg, sharing the costs of exhibiting at a trade fair).

> We need to foster a culture of collaboration between our NZ firms that are exporting, to share resources, reduce barriers and costs to entry. (Kirsty Reynolds and Anton Douglas, sub. 25, p. 5)

Several people mentioned the supports provided by NZTE for aspiring exporters. Internationally experienced directors can also help firms overcome challenges and avoid common pitfalls when expanding overseas (see Chapter 8).

Building scale

New Zealand's challenge is to build firms or networks of firms that can export at sufficient scale to reach the global frontier and in turn substantially impact national productivity. As noted above, local firms must overcome significant hurdles in order to reach that scale. Drawing on best practice from SAEs there are three broad means to achieve effective scale.

1. Attract multinational corporations that want to use New Zealand as a base to export high value-added products to the world. Bringing in MNCs can provide instant scale, acting as "canopy cover" for our SMEs while helping expose domestic firms to the global frontier. This requires courting them and investing in a first-class domestic environment: skills, research, infrastructure, regulation and liveable cities. This is explored more below.

2. Support New Zealand's existing larger firms to do better and encourage a bigger pipeline of up-and-coming firms. Fewer than 300 firms earn more than $25 million in export revenue (NZTE, 2019). NZTE and its partners already do a lot to help exporters overcome the hurdles to growth, as is discussed more in section 5.4 below.

3. Build networks around firms to create world class innovation ecosystems. Their networks can help businesses share the fixed costs and risks associated with innovation and, to a lesser extent, exporting. This concept will be looked at in more detail in Chapter 6.

MNCs can provide scale and global reach and benefit local innovation

One way to sidestep the hurdles faced by domestic firms beginning exporting is to attract foreign investment prepared to establish operations in New Zealand and use it as an export base. This provides many of the same spillover benefits of having large domestic exporting firms. MNCs can afford to invest in innovation and in growing new export markets. They provide a demand for skills, encouraging more training, attracting international talent, building career paths and helping keep skilled people in New Zealand. They provide access to GVCs, and through the diffusion of innovation they can help domestic firms raise their productivity. Investments by foreign investors also help develop a network of specialised partners such as suppliers and researchers.

Of course, this approach has downsides – most noticeably that while the revenue is generated in New Zealand, the profits accrue to foreign shareholders. This can be seen in Ireland with their growing gap between Gross Domestic Product (GDP) and Gross National Product. Ireland's GDP is also overstated due to United States MNCs shifting profits to make the most of their favourable corporate tax rate. Even so, the benefits can outweigh the costs (Box 5.1).

The key is getting the right kind of foreign direct investment (FDI). This has not been the case historically for New Zealand. As noted in Chapter 3, the level of foreign ownership of New Zealand's Top 200 firms has grown over time. Yet, foreign investment has tended to focus on supplying the domestic market (Skilling, 2020). The profile of MNCs in New Zealand accords with the description of large firms generally in section 5.2 above. The majority don't export at all and those that do export natural resources. Of the few foreign owned businesses exporting specialised products, all started as New Zealand businesses (eg, Haier purchased Fisher and Paykel Appliances). This sort of FDI can give existing New Zealand products the scale to enter global distribution networks, but it does not create new, innovative exports.

To help New Zealand attract the right sort of FDI, lessons exist from the experience of high-performing SAEs such as Ireland.

Box 5.1 **Ireland's success in attracting FDI**

Ireland's economic growth has been strong since the mid-1990s, and the general consensus is that Ireland's success in attracting FDI contributed to this growth. The country has moved up the Inward FDI Performance and Potential index from a ranking of 50th place in the mid-1990s to fourth place in 2004 (Rios-Morales & Brennan, 2007).

Ireland has a natural geographical and linguistic competitive advantage in attracting FDI, acting as a gateway between the United States (with which it has longstanding cultural links) and the rest of Europe. However, Ireland has also deployed several initiatives that have raised its advantages and global competitiveness.

The Industrial Development Authority (IDA) is the state agency responsible for growing and sustaining FDI in Ireland. Rios-Morales and Brennan (2007) claim that Ireland's educated, low-cost labour force and access to a large market and a stable economy were necessary but not sufficient determinants to create an attractive market site for FDI. The introduction of the fiscal and financial policies (including a controversial corporation tax regime) and the aggressive promotional framework of the IDA created the investment climate conducive to high added-value investment.

Networks of companies have been important in attracting FDI in Ireland, and the FDI has had positive spillovers for the local economy. For example, in 1990 only four Irish companies were operating in a growing network of medical device technology businesses in Galway. In 2011, 59 companies were operating in this area and 38 of these were home-grown (GetReskilled, 2015).

The IDA claims that for every ten jobs directly created by FDI in Ireland, eight more jobs are generated in the wider economy (IDA Ireland, 2020). The IDA has also adopted a regional focus, where FDI companies have created skilled roles in lesser-populated or non-urban areas of Ireland, increasing the opportunities and choices for local talent (IDA Ireland, 2018).

New Zealand shares many characteristics with Ireland – both countries have good policy fundamentals such as the ease of doing business and a skilled workforce. So what needs to change to attract the right kind of FDI? Some potential answers are either impossible to influence, such as proximity to large markets, or out of the scope of this report, such as New Zealand's approach to taxation of capital, or the affordability of housing in major centres.

The Commission looked at barriers to openness at the border in its *Technological change and the future of work* inquiry (NZPC, 2020b). New Zealand has low regulatory barriers in most product and input markets, including low barriers to digital trade; generally less restrictive barriers to trade in services in most sectors than the OECD average; and relatively positive scores on OECD measures of regulatory restrictiveness.

One exception is barriers to FDI. The barriers relate mostly to the purchase of "sensitive land", as defined in the Overseas Investment Act 2005. The Treasury, in a consultation document on amendments to that act, also reported that applying for consent to invest in New Zealand typically involved high costs and long waiting times. The Treasury noted that New Zealand has struggled to attract the most valuable forms of overseas investment, and generally has a lower stock of FDI than many other SAEs (The Treasury, 2019). Even so, it seems unlikely that difficulty in purchasing land is stopping New Zealand from attracting the most valuable forms of overseas investments. A lack of profitable investment opportunities, rather than the restrictiveness of the FDI regime, is a more plausible explanation for relatively low levels of FDI in New Zealand.

Q5.1 What would a well-designed package look like (including its delivery) that is proactive and targeted to attract multinational corporations that are knowledge-intensive, high value-added, oriented to exporting and a source of spillover benefits?

One issue within the scope of this report could make a big difference. Building an innovation ecosystem with deep networks between industry, researchers and government can help provide the scale needed to innovate and export (Chapter 6). SAEs achieve this through collaborative efforts focused on specific sectors. This allows small countries to build the depth of skills, research and supply chains needed to operate at the global productivity frontier.

There is a chicken and egg problem here. As noted above, attracting MNCs would help build deep networks within the innovation ecosystem. Yet, only by having the innovation ecosystem in place are MNCs likely to invest in the first place. Given this, the policy prescription requires a balance between attracting FDI and upgrading New Zealand's innovation ecosystem. In SAEs, the latter is best achieved by focusing efforts on a few target areas of existing domestic strength. This will be explored in more detail in Chapter 6.

NZTE's investment team, as New Zealand's Investment Promotion Agency, is tasked with driving economic benefit for New Zealand through investment, focusing on opportunities that are productive, sustainable and inclusive. Based both in New Zealand and in various offshore locations, NZTE develops propositions and connects these with domestic and international investors. Specifically, the team focuses on large-scale greenfield opportunities and growth-stage companies, committed to yield sustainable, long-term returns for the country. Opportunities come from overseas enquiries, local sponsors and identified sectors where New Zealand excels and has room to grow. NZTE adds value to opportunities in these sectors, such as wood processing and tourist accommodation, by developing business cases and making connections.

Some of these sectors may be targeted for reasons other than improving productivity; for example, regional development. Even so, if the intent is to increase productivity, then the target areas for FDI attraction should be aligned across government.

F5.3

New Zealand lacks multinational corporations (MNCs) that are knowledge-intensive, oriented to exporting and a source of spillover benefits. MNCs of this type are attracted to locations by:

- world-class, leading edge research institutions and researchers in their area of business;
- a good prospect of being highly competitive in international markets (for example by accessing lower-cost inputs);
- a supply of creative talent and well-trained graduates in their area of business;
- attractive urban, social and environmental amenities for their staff, including the quality of schooling and affordable housing;
- high quality infrastructure;
- a community of firms that provide relevant inputs;
- a conducive regulatory environment; and
- direct support under well-crafted FDI attraction programmes.

R5.1

The Government should take a more proactive and deliberate approach to attracting multinational corporations (MNCs) that are knowledge-intensive, oriented to exporting and a source of spillover benefits. The approach should develop programmes of attraction similar to those used successfully in some small advanced economies (SAEs). In practice, creating the conditions that act as a magnet for MNCs will require upgrading the innovation ecosystem and building deep networks between industry, researchers and government. In SAEs, this has been best achieved by focusing efforts on a few target areas of existing domestic strength. Such a programme requires careful monitoring, evaluation and adaptation to New Zealand circumstances to ensure it is in the national interest.

5.4 Export assistance in New Zealand

As the government's international business development agency, NZTE has a dual focus: to support exporters to succeed, and to help match investment opportunities with capital and international connections. Government funding for NZTE is $208 million a year "to grow companies internationally and located in New Zealand" (New Zealand Government, 2020d, p. 29). In Budget 2020, NZTE received $216 million from the Government's Covid-19 Response and Recovery Fund to grow the intensity, reach and scale of its support to New Zealand exporters and contribute to their and New Zealand's COVID-19 economic recovery.

NZTE currently works with approximately 6 000 export companies based throughout New Zealand. The nature of these businesses is diverse, including food producers, Māori land trusts and iwi, tech start-ups, service providers, manufacturers and more.

NZTE supports businesses to grow, enter new markets and expand exports into existing locations. NZTE also works alongside partners and the New Zealand business community to offer advice and connections to customers to support their internationalisation journey and prepare them for domestic or international investment.

The majority of NZTE's efforts (about 80% of total resource) are on the Focus portfolio. Focus customers have growth aspirations, the ability to compete internationally and are willing to share their plans and history with NZTE. They are not always the largest companies by size or revenue, in fact of the Focus portfolio 50% of firms each have a turnover of less than $3 million per annum. As part of its Covid-19 response and recovery plan, the Government has significantly increased the number of exporters that receive intensive support from NZTE within the Focus portfolio. Since May 2020 the number of Focus companies has risen from 700 to approximately 1 400.

Focus customers can use NZTE's growing team of local experts to be "boots on the ground" in international markets. NZTE also helps businesses find and fund private sector advice and support through their "Springboard" platform.

NZTE's Foundation customers are generally at an earlier stage in their international journey so engagement with Foundation customers is lighter touch than the Focus portfolio and is increasingly delivered through digital channels. NZTE is focusing on developing innovative and secure digital platforms to ensure its customers and other New Zealand exporting firms can access NZTE services online. This will allow it to expand its reach and increase the scale of its service delivery. It also reflects the changing way businesses engage with and access information, as well as the new ways of doing business as a result of the Covid-19 pandemic. NZTE also supports small emerging businesses through its Regional Business Partner Network.

NZTE also works with coalitions; self-selected, business-led groups of customers that are willing to work together on a common opportunity, challenge or go-to-market purpose. The companies are usually from the same or a complementary sector and collaborate to share costs, risk, knowledge and leverage collective resources, expertise, and technology.

NZTE works with New Zealand's other internationally facing and innovation agencies, including MBIE, MFAT, the Ministry for Primary Industries and Callaghan Innovation. Some inquiry participants found government supports for exporting difficult to navigate. In particular, crossover exists between Callaghan and NZTE: of the NZTE 700 Focus firms, about 300 also worked with Callaghan. Room for improvement exists to reduce duplication and make it easier for businesses to find the appropriate support (Chapter 7).

As will be explored in Chapter 6, most successful SAEs focus their support in order to build innovation ecosystems that can enable firms to reach the global frontier. While NZTE are willing to support self-selected coalitions of businesses, the majority of their services are focused on supporting individual businesses, rather than building networks between businesses or the wider innovation ecosystem.

The effectiveness of NZTE investments are measured through standardised metrics such as the size of export deals achieved with the assistance of NZTE. While these measures are a reasonable first step, they do not measure the added value of NZTE services, and what the businesses could have achieved without NZTE's

help. While it can be difficult to get an accurate measure of added value, it would be straightforward to "tag" NZTE-supported companies in the Longitudinal Business Database.[14] This would allow the performance of NZTE-supported companies to be compared with a control group, and a more robust long-term evaluation, at a relatively low cost, of which NZTE services are most effective.

NZTE would need to gain the consent of firms already receiving NZTE services to tag them in this way. While this would be the correct procedure for existing 1400 "Focus" firms, in future tagging could be made a condition of assistance at the point firms apply to NZTE.

F5.4 New Zealand Trade and Enterprise (NZTE) has a suite of reasonable performance measures in place. Yet it is difficult to accurately demonstrate NZTE's added value. This would be possible at relatively low cost by identifying in the Longitudinal Business Database the businesses that receive NZTE support.

R5.2 NZTE should regularly commission independent evaluations of their services. These evaluations should assess the effectiveness of their range of services, to inform choices around the future mix and design of services. To facilitate evaluation, businesses receiving NZTE support should be tagged in the Longitudinal Business Database to allow for more robust long-term assessment of NZTE's performance.

[14] "Tagging" a firm in this way in the Longitudinal Business Database would involve identifying on the firm's unit record that it has received support from NZTE.

6 Innovation ecosystems

Key points

- Only through innovation can firms reach the productivity frontier – whether international or national. Innovation is pervasive in successful economies. Leading firms innovate to push towards the global technology frontier; other firms innovate to keep pace with best domestic practice.
- A firm has many different ways to innovate, ranging from how it organises its business, through what it offers, to how it services its customers' ongoing needs. Successful innovation requires dynamic capabilities that use complementary contributions from different ways of innovating.
- Innovation is complex, cumulative, risky and path dependent. A wide variety of capabilities held by firms and embodied in the business, social and administrative environment together shape the rate and direction of innovation. These collective capabilities form an innovation ecosystem.
- Governments have an integral role in shaping and contributing capabilities to innovation ecosystems. For example, they support R&D and the supply of skilled workers. They own or fund research and educational institutions, and incentivise their behaviour through governance and funding instruments. They provide a regulatory and social assistance framework that affects the risks and rewards for both firms and workers that innovate.
- Governments in most small advanced economies focus some support for innovation in areas of potential export strength. To do so, they create platforms of research, and make associated investments in skills, the national science system, and build links between firms and researchers.
- Governments employ such focused innovation policies with a variety of objectives that sometimes overlap. Mission-oriented policies address societal challenges such as those arising from climate change, technological disruption and social inequality. Focused innovation policies to enhance productivity will only be durable if they are also consistent with environmental and social objectives.
- Focused innovation policies are not a matter of governments "picking winners". Instead, they are a means for governments to work with other partners, to explore and identify opportunities to accelerate innovation to maximise impact in emerging areas of success. Focused innovation strategies require effective governance, implementation, monitoring and evaluation, and sometimes the creation of new institutions, if they are to succeed.

Innovation is central to firms reaching the productivity frontier – whether international or national. This chapter looks at innovation ecosystems and the inextricable role of government in supporting innovation. It describes and assesses the strengths and weaknesses of the New Zealand Government's system of support for firm-level innovation.

6.1 Innovation and innovation ecosystems

In successful economies, innovation is pervasive, and not just limited to R&D-intensive sectors or technologies. Many low- or medium-tech industries innovate by imitating others, or by adapting the results of basic research or particular technologies to produce new or better goods and services (K. Smith, 2006).

What is innovation?

Innovation involves far more than developing new products or new production technologies. It includes changes in supply chains, distribution networks, marketing and markets, and the network of relationships among researchers, firms and other economic actors.

> Innovation is … doing something new. An innovation may be a new or improved product, process, or function. Innovation is a process that leads to new or better ways of creating value for society, business and individuals. The value of innovation arises from [how an idea is used]. The value … may be commercial, social, or environmental. Innovation may be unplanned or even accidental… (MBIE, 2019b, p. 17)

A firm has many different ways to innovate, ranging from how it organises its business, through what it offers, to how it services its customers' ongoing needs (Figure 6.1).

Figure 6.1 Ten types of innovation – the Doblin framework

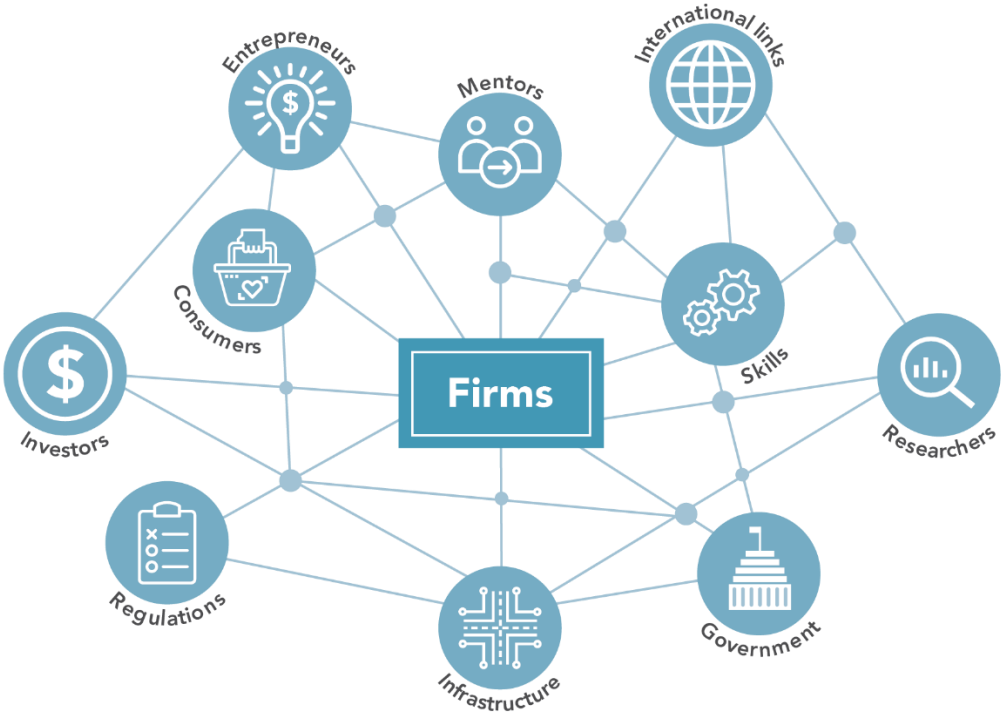
Source: Keeley et al. (2013).

The Doblin framework stresses the importance of complementary innovations as a basis for success. Keeley et al. (2013) claim that, on its own, product innovation provides the lowest return on investment and the least competitive advantage. Similarly, the Commission found that a firm will likely gain little benefit from adopting new ICT unless it also innovates in its business processes and business model (NZPC, 2014a).

Innovation ecosystems

Innovation is complex, cumulative, risky and path dependent. Given its scope (Figure 6.1), a wide range of factors directly or indirectly impact on innovation by firms – together, these form an innovation ecosystem. An innovation ecosystem comprises the many capabilities and activities that shape the rate and direction of innovation. Capabilities of individual firms, the network of relations among firms (including international links), research bodies, providers of capital, and the wider regulatory, tax and institutional framework are all relevant (Figure 6.2). Together, these factors make up the environment that supports risk taking along the often long and twisty path to successful implementation of an innovation (Ridley, 2020).

Figure 6.2 The innovation ecosystem



Governments have an integral role in innovation ecosystems. Governments contribute to capabilities for innovation in obvious ways, such as support for R&D, supply of skilled workers, provision of physical infrastructure, and economic regulation. They also contribute in less direct ways, such as through the quality of public institutions, fostering international trading relationships, and the quality of engagement and alignment between government agencies and other economic actors.

F6.1

Innovation is complex, cumulative, risky and path dependent. An innovation ecosystem includes the capabilities that are:

- held by individual firms, research institutions and the workforce;
- reflected in the network of relations among firms (including international links), and with research centres;
- contributed by government agencies and their investments in hard and soft infrastructure; and
- provided by the wider regulatory and institutional framework.

Together these capabilities shape the rate and direction of innovation.

Innovation at the national frontier

Innovation by New Zealand's national frontier firms (or potential national frontier firms) will be central to New Zealand closing its productivity gap with other small advanced economies (Chapters 2 and 5). This is most likely to happen through finding some niche in specialised goods or services that will give New Zealand firms a sustainable competitive advantage. This could involve relatively incremental technological innovation, combined with innovations in business processes and models, and in marketing. For instance, Zespri successfully combined existing technology with plant variety rights and savvy marketing, to tweak its kiwifruit in a way that gave it a secure hold in international markets. Or it is possible, but less probable, that a New Zealand firm may launch a product based on a world-leading technological innovation.

MBIE distinguishes innovating towards the frontier ("the leading edge of what the world knows") from innovation behind the frontier ('the adoption of existing technologies") (2019b, p. 18). Both are important for productivity growth. Yet, the distinction is not clear cut, as the Zespri example shows. Factors that encourage and support firms to innovate (discussed further in section 6.2) will also encourage them to seek out and make use of international innovations to improve their business outcomes.

New Zealand faces specific challenges to adopting international innovations, given its size and distance from large economies (Chapter 2). Policies that build international connections through trade promotion, both inward and outward direct investment, and skilled migrant labour can help reduce these disadvantages (Makhlouf, 2015) (Chapter 5 and Chapter 8).

Other small advanced economies (SAEs) face similar disadvantages, at least in terms of size, and, to a lesser extent, distance. Some of these countries actively promote international connections through additional policies that speed the flow of innovative ideas. For instance, Singapore funds study for local skilled workers in top international business schools, and actively recruits top talent to base themselves in Singaporean universities and industry. The Academy of Finland operates similar programmes (OECD, 2017a), and the Scandinavian countries have a long history of actively seeking knowledge about leading technologies internationally (Berg & Bruland, 1998). Since 2006, Denmark has set up eight innovation intelligence outposts in countries at the forefront of innovation (Independent Experts Panel, 2019). New Zealand's draft research, science and innovation strategy signals an intention to move in similar directions, but without providing detail on how such policies would be implemented (MBIE, 2019b; see Chapter 7).

Diffusion from the frontier

Evidence suggests that national frontier firms being distant from the global frontier is a substantial component of New Zealand's relatively poor productivity performance. While evidence is limited, the current

distribution of productivity among firms behind New Zealand's national frontier appears relatively compact, suggesting that diffusion between firms within New Zealand is working relatively well (Chapter 3). However, the inquiry Terms of Reference direct the Commission to consider ways to improve the rate of diffusion behind the frontier. And, if the productivity of New Zealand's frontier firms surged, there is a question of how quickly these benefits would flow on to other firms.

Innovative technology, ideas and practices spread through networks of firms. National frontier firms are often active in adapting new international technologies and business processes to their own use to improve outcomes. Non-frontier firms typically wait until innovations have been successfully tested and adapted locally (Andrews et al., 2015) .

The "absorptive" capacities of non-frontier firms and the incentives they face influence the rate of domestic diffusion (Berlingieri et al., 2020). Absorptive capacities include management capabilities, human resources, and links with other firms and research and education institutions (Harris & Le, 2018). Harris and Le (2018) found that characteristics that raise absorptive capacity in New Zealand firms included being a larger or a newer firm, having outward FDI, and having links with universities. Rho (forthcoming) found that New Zealand firms with a higher share of employees with international experience and with higher average skill levels had greater absorptive capacity. Yet, the effect was small. Diffusion can also happen through workers moving from an innovative frontier firm to a non-frontier firm (Poole, 2013). Some submitters to the inquiry identified this as a key mechanism for diffusion from frontier firms to other firms in the economy.

Competition for a greater market share may increase the profits for an innovating firm and so encourage diffusion. Yet, if competition in an industry is too strong (not likely in New Zealand), non-frontier firms may get little extra benefit from innovating – unless they need to do so simply to survive (Aghion et al., 2005).

Policies that support innovation will likely both stimulate productivity growth at the frontier and speed diffusion. Such policies include R&D, improving the supply of skilled workers, and alleviating financial constraints to investments (Berlingieri et al., 2020).

Inquiry participants commented that there is little collaboration among New Zealand firms, resulting in rivalry rather than the kind of cooperation that would assist commercialisation and export success. A notable exception is the kiwifruit industry. Industry stakeholders describe the sector as having a highly open approach to innovation, where the diffusion of ideas occurs rapidly. Zespri helps generate and protect the intangible assets of the industry, acts as an anchor for the myriad of growers and other supporting firms, and provides sufficient scale for the industry to be at the global frontier. Factors that enable such innovation and diffusion in the industry include strong intellectual property protections, the structure of the industry, and a culture of collective action after incidences of near industry collapse.

The role of innovation in domestic trading firms

New Zealand will not significantly raise its aggregate productivity without lifting its export performance (though firms typically need to be more productive to export) (Chapter 2 and Chapter 5). Even so, domestic trading sectors of the economy will continue to make important direct and indirect contributions to aggregate productivity. For example:

- domestic trading sectors account for a substantial proportion of the economy.
- domestic trading firms provide a large portion of the inputs used by exporting firms, so the price and quality of their outputs matter for export success.

Many of the general conditions that favour innovation in exporting, such as support for R&D and for the supply of skilled workers, are also likely to favour innovation in some domestic trading firms. And successful exporting firms are likely to exert direct pressure on suppliers to raise the quality and lower the cost of their output.

Strong growth in exports will, other things equal, also have an indirect effect on the productivity of domestic trading firms. Strongly growing export firms will attract resources of labour and other inputs, and put upward pressure on wages and prices. This will stimulate investment and innovation in domestic trading firms to

economise on the more expensive inputs. On the other hand, exporters in low-wage industries may lobby for policies to hold wages down (such as low-skilled immigration - see Chapter 8).

6.2 A broad-based innovation policy

Governments provide, fund, or regulate a broad set of goods and services that impact firms' capability to innovate both directly and indirectly. For instance, typically they directly:

- incentivise (through grants and tax credits) business R&D;
- negotiate and regulate firms' access to overseas markets (eg, through negotiating free trade agreements and managing trade relations);
- regulate the ability of foreigners to invest in New Zealand firms and of foreign firms to start producing in New Zealand;
- fund basic and applied research in universities and research institutes;
- design and implement the incentives on universities and research institutes through statute, and through governance and funding arrangements;
- subsidise venture capital;
- procure innovative goods and services;
- provide protection for intellectual property (IP) that balances incentives for innovation against the benefits of disseminating new technology; and
- assist firms to build the capacity to enter foreign markets, including providing market intelligence.

Less directly, governments provide other goods and services that contribute to firms' innovation capabilities, including through mitigating the risks of innovation. For instance, they:

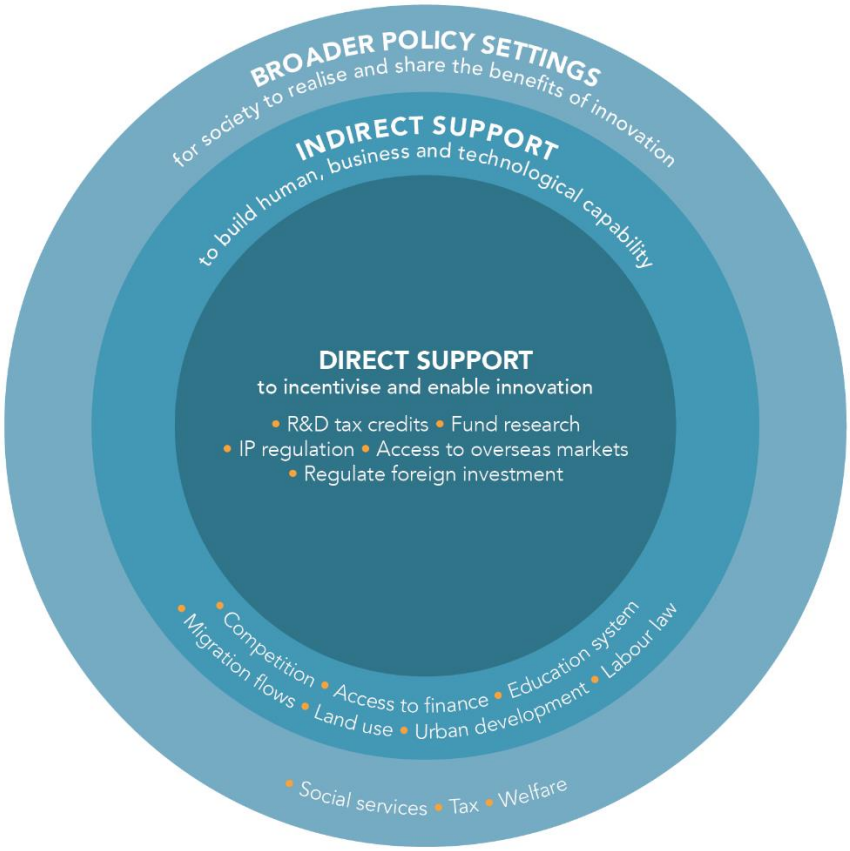
- provide or otherwise fund basic and post-school education and training that build the skills of workers (Chapter 8);
- regulate flows of skilled and other immigrants (Chapter 8);
- provide physical and digital infrastructure that affects firms' production possibilities;
- regulate the use of land and natural resources, and urban development;
- regulate the operation of the financial system from which firms access finance for their innovation investments; and
- provide a framework of business, bankruptcy, financial, tax, competition and labour law within which firms operate, and which modifies the costs, returns, risks and uncertainty of doing business.

Governments also help shape the broader social and cultural landscape within which innovation takes place and the rewards from innovation are shared. For instance, they:

- provide social services for the health of workers and their families;
- raise revenue for the services and transfers the government provides to firms and citizens;
- redistribute and regulate to share benefits among citizens and maintain social cohesion.

Figure 6.3 illustrates direct, indirect and broader government support for innovation.

Figure 6.3 The spheres of government support for innovation



F6.2 The leading edge of innovation is most often driven by firms, yet government is an integral part of the innovation ecosystem because it provides many of the capabilities that influence innovation by firms.

Many, but not all, of these influences on firms' innovative capabilities, once in place, operate without ongoing intervention by government agents. Within the legal framework, firms buy inputs and sell products at prices shaped by competition and demand; firms innovate to get a competitive advantage through lower costs, new products or higher quality. Competition often goes hand in hand with collaboration – for instance, firms may need to work closely with suppliers to improve the quality of their products, or they may need to work together to establish distribution channels in overseas markets. Many exporters are successful without tailored government support.

Several inquiry participants emphasised that government policy levers can only achieve so much, and that the private sector must take responsibility for driving success. In the absence of a dedicated large-scale research institution, people from the software industry said that commercially led founders play a key support role in the software innovation system.

Stimulating knowledge spillovers for their wider benefits

Bloom et al. (2019) identified knowledge spillovers as a central rationale for government support of innovation:

> If one firm creates something truly innovative, this knowledge may spill over to other firms that either copy or learn from the original research – without having to pay the full research and development costs. Ideas are promiscuous: even with a well-designed intellectual property system, the benefits of new ideas are difficult to monetize in full. There is a long academic literature documenting the existence of these positive spillovers from innovations. (p. 166)

Strong evidence exists that tax incentives to raise firms' R&D are effective both in increasing private sector effort and in raising productivity. Evidence also exists for the effectiveness of government research grants in increasing innovation. Grants may be provided to universities and research institutions, or directly to firms.

The high share typically going to universities in developed economies reflects a view that the spillovers from basic academic research are larger than those from near-market applied research (MBIE, 2019b). Yet, public research grants to firms (eg, for military or medical research) increase private investments in such research. Research grants to private firms increase their success in attracting venture capital funding, and raise firms' revenues and patenting rates (Bloom et al., 2019).

Governments also support R&D through measures that increase the supply of skilled researchers (through universities and through immigration), and through intellectual property (IP) protection laws. Bloom et al. (2019) find that evidence for the importance of skilled migration is high, and for university supply of skilled workers is moderately strong. Evidence on IP protection is mixed, reflecting the balance it must strike between providing rewards to innovators and not unduly hampering the dissemination of new technology.

Government support for R&D favours industries that are R&D-intensive. While innovation is pervasive across the economy, R&D effort is not. Significant spillovers to non-R&D innovation effort exist (Hausmann & Rodrik, 2003). This raises the question of how governments should support such innovation.

Tax credits and contestable grants are the two most common forms of government support for private-sector R&D. While tax incentives are usually available to all firms doing R&D in eligible sectors, grants are more discretionary and often targeted at specific projects. The impacts of these two funding mechanisms differ, and many countries, including New Zealand, now use both (International Monetary Fund, 2016). Government subsidies for venture capital, and for education and training, are examples of a policy that supports innovation in areas of the economy that are not R&D intensive.

F6.3 Innovation has spill-over benefits. These provide the rationale for broad government support for innovation through policies like R&D tax credits, research grants and intellectual property protection; and also, more widely, for policies such as support for venture capital and skills (the benefits of which are not restricted to R&D-intensive firms).

6.3 Focusing where innovation potential is high

Uncertainty exists around where the next economically important innovations will appear. Broad-based innovation policy that is "blind" to which firms or areas of the economy benefit keeps options open. Even so, policies that are seemingly neutral across the economy in practice have stronger impacts in some areas than in others (Hausmann & Rodrik, 2006). R&D tax credits, for example, work for innovative R&D-intensive firms, but do nothing to support innovation in areas of the economy that are not R&D-intensive.

Understanding what policies and interventions are likely to have the most impact on innovation in specific parts of the economy requires substantial and continuing engagement between government, the private sector, and research and education institutions (section 6.4). Governments have limited resources and expertise to undertake the intensive engagement required to improve understanding and work out and implement successful interventions. As a result, they need to choose areas for more intensive engagement.

It makes sense to focus specialised support on areas where existing capabilities make successful and impactful innovation more likely (Harvard Growth Lab, 2020; Hausmann & Rodrik, 2006). These areas may not reflect standard industry classifications, but instead involve technologies with broad application (eg, digital technologies), or a set of diverse technologies that focus on a particular area of production (eg, agritech); or include upstream and downstream production in other industry classifications. Governments will also take a more active role in areas of innovation relevant to tackling societal challenges (such as those arising from climate change).

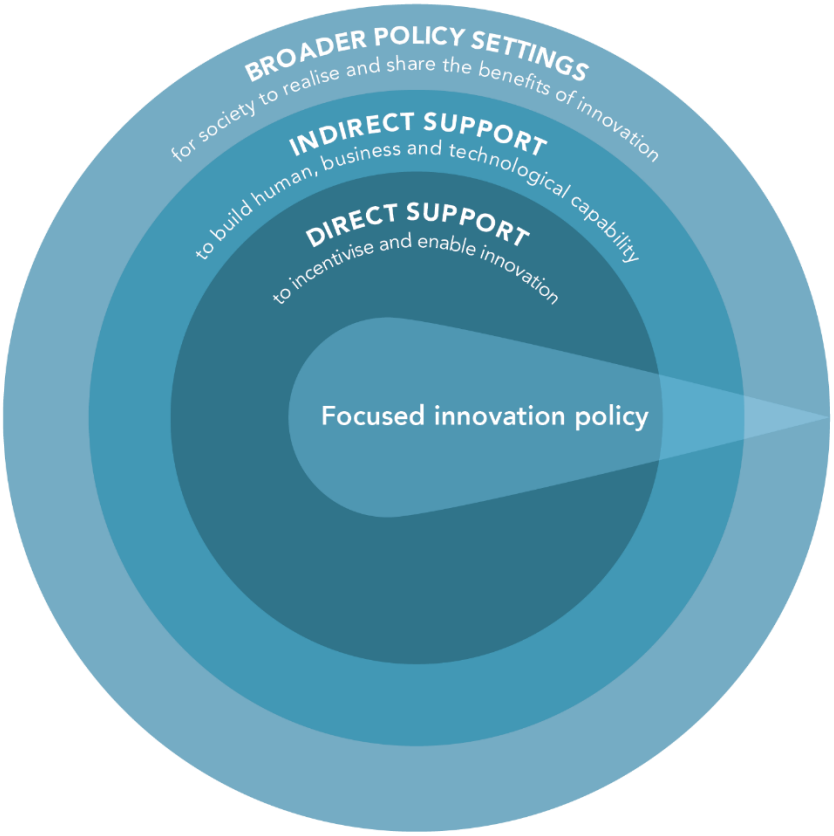
A focus on particular areas of the economy is not a matter of the Government "picking winners". Rather it is about employing ongoing adaptive collaborative processes to elicit information from firms and other economic actors about emerging innovation possibilities, and so identify appropriate collaboration that will get the ball rolling faster and overcome bottlenecks and barriers (Rodrik, 2004).

These actions increase the chances of developing a rich, dense innovation ecosystem in these areas, and firms building global visibility and scale. This could entail, for example:

- a more active role for government aimed at supporting thematic platforms of research, with associated investments in the national science system and building links between firms and researchers; and
- setting up and/or funding specialised training, applied research and innovation centres or funding key infrastructure or technology; and
- government encouraging, and possibly cofunding, the development of whole-of-sector research or exporting strategies.

Figure 6.4 shows how focused innovation policy involves policies that directly affect innovation, but can also involve indirect support and broader policy settings.

Figure 6.4 Focused innovation policy



Most small advanced economies employ focused innovation policies

Most SAEs employ some version of focused innovation policy adapted to their circumstances, and New Zealand is in the very early stages of developing such an approach (Chapter 7). The governance, duration and focus of such policies varies, influenced by country-specific factors such as history, existing institutional arrangements, and the structure and performance of the economy. Some northern European economies have employed such policies for over 100 years, originally as a stimulus to industrialisation.

The Netherlands

The Netherlands has adopted varying approaches to innovation policy over the last 50 years. In the last 20 years it has shifted from a generic approach to one that aims to build critical mass in selected areas of the economy and technologies. In the 2000s, the Government focused attention on 10 "innovation programmes" including "flowers and food", "high-tech systems and materials" and "chemistry".

From 2010, a new Government adopted the "Top Sectors policy" to strengthen competitiveness through innovation, internationalisation, and human capital development. The policy aimed to achieve this through better coordination among business, government and public research and education institutions in the

chosen areas of the economy. The Top Sectors comprised Agri-food, Horticulture and propagation materials, High-tech systems and materials, Energy, Logistics, Creative Industry, Life Sciences, and Chemicals and Water (OECD, 2014). Public support for business R&D was simplified and shifted from direct support to tax incentives. The Netherlands government allocated over €1 billion (roughly NZ$1.7 billion) a year to the Top Sectors policy in the period 2013 to 2016. Evaluators in 2017 found that the new approach had improved networking and cooperation within and across the top sectors. It had generated more demand-driven research and skills, but had been less successful in developing new markets or stimulating radical innovation (Fagerberg & Hutschenreiter, 2020).

More recently the Netherlands Government has introduced mission-oriented approaches to tackling societal challenges (such as reducing greenhouse gas emissions) within the Top Sectors framework.

Finland

Finland has for many decades had strong institutions and substantial government funding to foster collaborative research between public agencies and the private sector in technologically significant areas of the economy (such as forestry and forestry products, and digital technologies) (Finnish Forest Cluster Research Strategy, 2010). The Research and Innovation Council (and its predecessors), chaired by the Prime Minister, has taken the lead in shaping overall strategy.

Business Finland (formed from Tekes and Finland's former export promotion agency) is responsible for funding "to promote the competitiveness of Finnish industry and the service sector by assisting in the creation of world-class technology and technological know-how" (Business Finland, 2020). For a period following the global financial recession and the collapse of Nokia's share of the mobile phone market, the Finnish government substantially reduced dedicated funding for public sector and private sector collaborative innovation initiatives. Tekes earlier partly financed an industry-based non-profit company, DIMECC (Digital, Internet, Materials and Engineering Co-Creation Ltd.), to build a networked ecosystem of digital innovators to speed time to market. The network currently comprises over 2 000 R&D and innovation professionals, 400 organisations, 69 shareholders, and 10 co-creation facilitators. In 2016 DIMECC achieved a €50 million (roughly NZ$86 million) research portfolio (DIMECC, 2020).

From 2008 to 2015, Tekes funded six industry-research collaborations, with annual public funding in total of €100 million (NZ$173 million) at its peak. Participating companies contributed about one-third of total funding. The programmes covered included bioeconomy, energy and metals. After evaluating the programme, which showed multiple problems in design and governance, direct public funding was phased out.

More recently, the Government has developed collaborative mission-led strategies to find knowledge-based solutions to societal challenges, including climate change (OECD, 2017a).

Sweden

Since the 1940s, Swedish universities have played a central role in applied industrial research involving cooperation with firms. From 2012, the Government invited universities, firms, and other actors to pursue "strategic innovation agendas" within "strategic innovation areas" to contribute to growth in productivity, income and jobs. The relevant stakeholders developed proposals within criteria and budgets set by the funding agencies. The OECD (2016) found that this approach had reinforced high-quality research-based innovation activities, mostly in fields where Swedish industry is already strong (such as mining and metallurgy, with subsequent extensions to areas such as aerospace and bioscience). The budget for these initiatives has been around SEK600 million (or NZ$107 million) a year.

More recently, through Vinnova (the Swedish Governmental Agency for Innovation systems, which includes union representation on its board), the Government has introduced a focus on challenge-driven innovation covering areas such as future healthcare, the information society and competitive production.

In 2015 the Government established a National Innovation Council, headed by the Prime Minister, to achieve better coordination among the public actors involved in innovation policymaking and delivery (Fagerberg & Hutschenreiter, 2020). The Council has wide representation from unions, industry, and research and educational institutions, though members participate in their personal capacity.

Denmark

The Danish economy has export strengths in transport, ICT and pharmaceutical, with Danish and foreign-owned multinational corporations accounting for two-thirds of exports. While recent productivity growth has been slow, Denmark rates highly in various innovation rankings including R&D intensity and GDP per capita. Business R&D is increasingly concentrated in a small number of large Danish companies. The Ministry of Higher Education and Science (MHES) and Ministry of Industry, Business and Financial Affairs together support knowledge-driven innovation and its translation into commercial results. There is a wide range of institutions for collaborative research and innovation, including universities, other higher education institutions, and seven research technology organisations (RTOs), enjoying both public and private sector funding support.

The MHES funds 17 national innovation networks that link knowledge institutions and businesses in areas of economic strength such as energy, food and ICT, and in emerging industries. The networks have independent secretariats operated by universities, RTOs or cluster organisations, which are funded for two-year periods. Funding in recent years has been around €30 million (NZ$52 million) each year in total. There were previously a much larger number of regional networks and clusters. The government has been reducing the number of publicly funded clusters, by concentrating on areas of economic strength (determined by the Danish Board for Business Promotion). Within these "strongholds", the MHES uses a competitive process to choose the best clusters for promotion (Independent Experts Panel, 2019).

In 2018, the Danish Government launched its Strategy for Digital Growth (Danish Ministry of Industry, Business and Financial Affairs, 2018) to build on existing strengths in digital technology. The strategy sets out six complementary initiatives aimed at businesses and individuals realising the potential for growth from digitisation. These include:

- a public-private hub to facilitate business access to expertise and cooperation in developing new business models;
- promoting research in digital technologies;
- consultancy and training initiatives targeted at small and medium enterprises;
- reviewing regulation to make it easier for businesses to experiment with new business models; and
- strengthening cybersecurity in businesses; and developing broader digital skills and awareness in the population.

Singapore

Singapore has regularly (at five to ten-year intervals) refreshed an economic strategy that includes a focus on industry sectors. In 2017 the Committee on the Future Economy, led by economic Ministers and reporting to the Prime Minister, set out an approach that included six cross-economy strategies and one focused on industry sectors. The cross-economy strategies cover international connections, skills, digital capabilities, city vibrancy and opportunity, and partnerships for innovation and growth (Singapore Committee on the Future Economy, 2017).

The current sector approach intends to produce 23 industry transformation maps (ITMs), eventually covering 80% of the economy. Singapore has developed ITMs for a range of industries, including retail, professional services, food services, hotels, precision engineering, logistics, sea transport and food manufacturing. In essence, the ITMs are a device for collaboration across industry interests (employers and workers), universities and other research and training institutions, and the government. Together they will identify how the cross-economy strategies are coming together in a particular area of the economy, and decide how to tackle barriers and realise opportunities (including those involving innovation and technology). In 2016, the Singapore Government allocated S$4.5 billion (NZ$4.9 billion) to the ITM programme over a period of five years (Lee, 2016; Singapore Ministry of Trade and Industry, 2020b).

In pursuing its economic agenda, Singapore has also adopted a "cluster" approach to look for synergies and spillovers (for instance, in common technology supply chains or skill requirements) across related industries (Singapore Ministry of Trade and Industry, 2020a). Subcommittees of the Future Economy Council (the

successor to the Committee on the Future Economy) lead the development of ITMs within the cluster approach. The Future Economy Council includes representatives from the government, unions, industry and universities.

The Singapore Government favours a pragmatic approach of taking "calculated bets", pursuing promising results vigorously but cutting losses when they become apparent (Singapore Committee on the Future Economy, 2017, p. v). The political context in Singapore is relevant – one party has governed the country since independence in the 1960s, and there are strong and enduring personal links across government, academic institutions, firms and unions.

Common themes

While each country has its own history, institutions and culture, common themes arise from their recent experience.

Scale

Consolidated data on resources devoted to focused innovation policy are not always available. Where data are (the Netherlands and Singapore), such resources are substantial with annual expenditure in the order of NZ$1 billion. Across all countries, and within the broad aggregates, programmes focused in given areas also receive substantial funding (certainly much more substantial than New Zealand's current Industry Transformation Plans attract – see Chapter 7).

Governance

Overall governance of focused innovation policy and related industry strategies are increasingly joined with the governance of broader innovation policy. Finland has long had a peak body for this purpose: the Research and Innovation Council, headed by the Prime Minister. Its role has been evolving as Finland has reformed its innovation policy in the face of adverse economic circumstances. A main purpose is to bring together government leaders, industry experts and researchers to prioritise areas of the economy and technologies for focused effort. Sweden adopted a similar model in 2015. An expert panel reviewing Denmark's innovation policy identified a lack of overall strategic focus as a problem, and recommended steps to address this (Independent Experts Panel, 2019). The Singaporean Future Economy Council plays a similar role. A further advantage of a multiple stakeholder peak body is that it gives transparency and broad ownership of strategic decisions, and so sustains effort across electoral cycles (Fagerberg & Hutschenreiter, 2020).

The countries described have long histories of collaborative relationships across government, industry partners, and research and education institutions. As a result, informal networking reinforces the role of more formal institutional arrangements (Independent Experts Panel, 2019).

The governance of specific focused innovation initiatives is also important. Some countries reinforce active stakeholding by encouraging "bottom-up" initiatives, and requiring substantial industry co-funding. Initiatives are often governed by boards comprising government, industry partners and research institutions. Ensuring that bottom-up initiatives are developed within the context of overall strategic priorities helps ensure that they do not become too numerous and so dissipate effort. As well, the proponents of the initiatives are challenged to push the innovation frontier rather than just enhancing business as usual.

Evaluation and review

While the Commission has not yet undertaken a comprehensive study of innovation evaluation practices across the countries studied, it is clear that most, if not all, have a strong commitment to evaluating initiatives and reviewing strategies. Evaluation is important as a guide to amending or discontinuing unsuccessful initiatives, and reviewing strategies regularly helps keep them on track.

Societal challenges

All the countries have moved in recent years to adopting mission-oriented, government-led innovation strategies to tackle societal challenges. These sometimes take the form, as in the Netherlands, of a dimension added to existing focused innovation strategies; or they may take the form of an innovation focus

in particular areas of the economy of importance to the mission. An example of the latter is a focus on low-greenhouse-gas-emissions technology in the energy sector.

F6.4 Each country has a specific set of capabilities that mean some technologies or types of goods or services provide more opportunities for productivity-enhancing innovation than others. As a result, and with limited resources, many small-advanced-economy governments play an active role in selected areas of their economy to support platforms of research and innovation, with associated investments in skills, the national science system, and building links between firms and researchers.

F6.5 The areas of the economy that governments select for focus often do not correspond to industries defined by standard classifications. They may, for instance, include upstream and downstream industries (such as biotechnologies that depend on a supply of primary products); or cover technologies that are used across different parts of the economy (such as digital technologies).

Governments typically have a range of objectives for focused innovation policy (sometimes called industry policy), which may not feature raising productivity at the frontier (Fagerberg & Hutschenreiter, 2020; Mazzucato et al., 2020; Meyer-Stamer, 2005). Examples exist where policy intends to:

- increase employment in declining regions;
- increase the size of the national or regional economies;
- stem potential employment losses from adopting new technologies or other employment shocks; or
- promote the adoption of "green" (eg, climate change mitigating) technologies.

Innovation policy necessarily has a range of objectives. Yet, synergies likely exist between objectives. Moreover, policies to enhance productivity will not be durable if they do not, at the same time, meet environmental and social objectives. A long-term perspective is likely to better promote approaches that simultaneously meet multiple objectives. Some Māori businesses provide a New Zealand example of a long-term and multiple-bottom-line approach to growing value for future generations (Chapter 4).

F6.6 Governments employ focused innovation policy with a variety of sometimes overlapping objectives. Mission-oriented policies address societal challenges such as those arising from climate change, technological disruption and social inequality. Focused innovation policies to enhance productivity will only be durable if they are also consistent with environmental and social objectives.

Choice of areas for focus

Strong arguments exist for governments in SAEs to choose areas of focus for their innovation policies to complement broad-based innovation policies. SAEs lack the resources and expertise to support intensive innovation effort across the whole economy and specialisation is key to finding new areas of competitive advantage in exports (Chapter 5).

Even so, identifying areas where focused innovation effort will have the highest chance of commercial success poses a challenge. Uncertainty abounds. Innovators typically proceed by trial and error, selecting from variations in design that sometimes occur by chance and through bringing together (recombining) different technologies (Ridley, 2020). Low-tech innovation (eg, containerisation or prefabrication) may have as much or greater impact as hi-tech innovation on productivity and firm-level competitive advantage.

Evidence from history shows that innovation is mostly gradual, often involves multiple contemporaneous development of similar ideas, and in retrospect can seem inexorable (in the sense that it is easy to see where the ideas came from) (Ridley, 2020). Innovation thrives in areas of the economy where there is already a ferment of entrepreneurial activity and competition.

Hidalgo et al. (2009) showed that as countries develop, they tend to build on existing productive capabilities to find new areas of competitive advantage – which are often in "adjacent" export product areas. Countries also develop new capabilities that can enhance existing areas of strength. Capabilities include not only technical capabilities but the wide range of supporting conditions that create an innovation ecosystem (see above). Consistent with this, SAEs tend to focus innovation policy on areas of existing strength – although sometimes also focusing on technologies that have wider application across their economies (such as digital technologies).

Economists have analysed patterns of trade to identify each country's areas of high potential for innovation in specialised export goods (Harvard Growth Lab, 2020). The approach has limitations because it covers only trade in goods. While relatively fine-grained (using 4-digit goods classifications), the analysis does not necessarily get to the degree of specialisation that often gives a company or a country a competitive advantage (Hausmann & Rodrik, 2003; Lucas, 1993).

For instance, many countries produce cheese (so in indices of complexity it counts as a relatively unspecialised product). Yet Fonterra produces highly specified cheese toppings for pizza chains in the international markets. Few companies can produce cheese at scale with the reliably precise properties needed to fit with the highly automated but dispersed production processes of large retail food chains. And cheeses from denominated locations (and with regulated quality) can command a price premium – again showing that broad product classifications do not fully capture the competitive advantage from specialisation.

Focused innovation policy is a process of discovering opportunities and tackling challenges to realising those opportunities (Rodrik, 2004). It makes sense, as a result, for governments to choose relatively broad areas for attention and, with industry and other partners, to design institutions, processes and funding arrangements from which the more promising opportunities can emerge (section 6.4).

Each country has specific circumstances of history, culture, geography and economic structure that will shape its choice of institutions and processes. Denmark, for instance, has given more shape to a relatively open process of geographic cluster development, by focusing on areas of economic strength. Within those areas, it is encouraging the competitive emergence of collaborative cluster-based innovation approaches. This is consistent with the approach recommended by Cluster Navigators (sub. 20). In Sweden, the universities have worked closely with firms on applied research over many decades. Singapore's approach appears broad-based in intention, but in practice is focused in a subset of industry sectors, and relies on a relatively compact set of enduring linkages across government, industry, and research and education institutions.

6.4 Implementing an effective focused innovation strategy

Governments undertaking focused innovation strategies with firms, workers, and academic and research institutions face challenges (Lerner, 2013; Mazzucato, 2018; Rodrik, 2004). The two main challenges follow.

- Governments lack full information about the conditions that will make success likely or not, including, for instance, the pressures and choices facing individual firms, consumer preferences for yet-to-be-developed goods and services, and future prices of relevant inputs. Indeed, no party holds all relevant information – but many players hold and understand part of the emerging picture.
- The availability of government support (eg, funding or regulation) can divert firms into socially unproductive lobbying for favourable treatment.

Government agencies can manage these problems through good policy design, governance and implementation.

- A focused innovation strategy is a process of discovery (Rodrik, 2004). Over time, and with the right processes and linkages, more complete information can be shared amongst parties on the opportunities for and barriers to innovation as they emerge. Innovation often builds on combining information from different sources (Ridley, 2020).

- A clear focus on supporting innovation (rather than business as usual) and transparency around any assistance offered will mitigate the risk of firms diverting their effort into lobbying (Rodrik, 2004). It will be important to design interventions so they do not discourage the entry of new firms, the exit of poorly performing ones, or the reallocation of resources to better-performing firms.

Processes and institutions

Implementing an effective, focused innovation strategy requires political and stakeholder leadership and capable administration. Much of the value of a strategy lies in its ability to coordinate action around promising lines of innovation, but in the face of uncertainty and complexity. Multiple actors are involved, stretching from the suppliers of inputs to consumers, and bringing in researchers, innovators and educators. And innovation happens through iteration, trial and error that further multiplies the interactions that underlie success. Processes need to elicit information about promising opportunities and conditions affecting their realisation, and provide incentives for firms to increase their innovation effort.

Many SAEs have well-developed processes and institutions for implementing focused innovation strategies, but the designs differ in ways that reflect history, geographic circumstances, economic structure and culture (section 6.3). Researchers studying focused innovation strategies suggest that they need to have several broad features (Hausmann & Rodrik, 2006; Lerner, 2013; Rodrik, 2004, 2008). These features follow.

Experimental, adaptive and collaborative processes

- An innovation strategy needs to be experimental and adaptive. Processes should encourage trial and error, allowing for some initiatives to fail even as the strategy aims for a portfolio of initiatives that has net overall benefits.

- Government personnel need to find the means to engage over time with their industry, research and educational partners through processes and institutions that match the scale and scope of initiatives – and which result in a collective view of what is needed. The overall strategy requires national leadership, but other initiatives will require engagement with groups based on sectors of the economy or regions, or bodies and processes set up for the purpose. Willingness to participate and organise because of perceived value should be a guide to finding suitable counterparts to government. "Self-organisation" of counterparts to government is important. The main purpose of these forums is exchanging information and ongoing learning. The parties should publish the outcome of their deliberations.

A focus on innovative activity with clear measures of success

- The strategy should focus on innovative activities and not on "business as usual", and should recognise the wide and interacting scope of innovations that shape firm success (section 6.1). Support should target activities and investments that have the clear potential to provide spillovers and demonstration effects, or to solve coordination problems.

- Clear measures of success and monitoring will help shape the strategy as it adapts over time. For instance, success can be measured by assessing firm-level productivity, exporting success, and diffusion of successful innovation.

- Innovative effort requires enough time to play out and demonstrate success. On the other hand, the Government needs to be willing to cease supporting clearly unsuccessful initiatives.

A commitment to action shared across government and other parties

- Clear high-level commitment from government, industry, and research and educational institutions will speed the channelling of investments and other resources to where they will have most effect. This requires government arrangements that can cut through the long-established agendas and priorities of individual government agencies.

- Government investments should be guided by where private parties are willing to risk their own investments. A shared and grounded picture of opportunities and risks increases the probability of success, while reducing opportunities for unproductive lobbying.
- Firms engaging directly or indirectly in focused innovation strategies are likely to better identify areas where they can beneficially collaborate with other firms (through "coopetition") for purposes such as developing a shared R&D base, or pooling international marketing resources.

Evaluation and review

- The nature, quantity and target of any government assistance should be regularly and promptly published (again as a spur to accountability and a brake on lobbying).
- Periodic review will encourage the participating agencies to adapt themselves and the strategy to inevitable changes in circumstances, and to evidence of what has worked and what has not.
- The parties should ensure that specific initiatives are rigorously evaluated in terms of the outcomes sought, and that all evaluations are made public. This requires prior planning for data collection and evaluation before commencing initiatives (Warwick & Nolan, 2014). Evaluation should inform decisions on continuing or adjusting initiatives.

Governance

Successful focused innovation policy requires effective high-level governance (Fagerberg & Hutschenreiter, 2020; Mazzucato et al., 2020). Typically, multiple objectives are at play. Each government agency has its line of responsibility to its own minister. Each agency has its own performance requirements, and is usually reluctant to relinquish direct control of the resources that parliament has allocated it to carry out its functions. These government agencies are together interacting with a multiplicity of non-government agencies, firms and individuals, many of whom will have only a loose focus on innovation. No one party has a complete understanding of relevant interests and developments.

Hausmann and Rodrik (2006) argued that government agencies in these circumstances need to foster

> …more network-like arrangements that may deliver what is required without any single node of the network being fully aware of all the things that are going on at any point in time … many of the existing organizations, whether private or public, may be acting as part of an institutional tissue that identifies opportunities, creates the incentives to act and coordinates the outcome. (p. 35)

Yet, a "therapeutic dose" of focused innovation policy requires not only discovery and coordination mechanisms (as described above), but the ability to apply government and private resources and effort at the right time, and where they will have the most effect. Governance arrangements need to have enough authority and clout to prise open the bureaucratic doors behind which resources are often locked.

Some SAEs (for instance, Finland, Sweden and Singapore) have governance arrangements for innovation policy (and focused innovation policy) that are led from the highest level of government and of other partners (section 6.3). This leadership serves both as a signal of the importance of innovation for national prosperity and wellbeing, and as a guide to where government and private sector resources are well applied.

Mazzucato et al. (2020) liken the required governance arrangements to the exercise at the national level of the "dynamic capabilities" that underlie a firm's strategic ability to innovate (Teece, 2019) (Chapter 8). What is required, they argue, is "an organizational structure capable of learning and of adjusting behaviour to what is learned"(p. 428, citing Nelson & Winter (1982)). A country like Singapore, with its long-established, dense and stable interpersonal linkages across industry, academia and government, can exercise such an approach more readily than countries with looser linkages across society and a less settled economic leadership role for government. These countries may require a more deliberate approach to building the required high-level governance arrangements. Fagerberg and Hutschenreiter offer the examples of Finland and Sweden in particular, which have "comprehensive and inclusive innovation policy councils, with the prime minister in a central role" (Fagerberg & Hutschenreiter, 2020, p. 279).

F6.7

Effective implementation of focused innovation policy requires:

- high-level governance arrangements that bring together senior government ministers and officials, top industry representatives (firms and workers), and leading researchers and educators to select broad areas for focus, shape the strategic direction and marshal the resources needed for success;
- governance of specific initiatives that involves participants having "skin in the game" to oversee an ongoing process of discovering and realising opportunities for innovation and tackling barriers;
- implementation processes that develop a shared view of what is needed, and build linkages and collaboration among researchers, firms and government agencies;
- government and private co-funding of initiatives to bring forth common and realistic perspectives on opportunities for success;
- a willingness to take an experimental "portfolio" approach, accepting that not all initiatives will succeed;
- transparency around what the key judgement calls are on where to focus effort;
- transparency around the nature, extent and target of government assistance;
- transparent monitoring and evaluation of initiatives and adjustment of the mix over time; and
- a consistent but adaptive approach to strategic direction that allows sufficient time for innovative initiatives to bear fruit.

6.5 Evidence on effectiveness of focused innovation policy

The effectiveness of focused innovation policy (at an overall national level) is, by its nature, hard to evaluate. Countries each adopt their own mix of governance arrangements and interventions, to reflect judgements about effectiveness and on where effort is best targeted. Policies may aim to improve productivity, to counter the effects of sectoral shocks, or to tackle challenges such as climate change. As a result, each of the two main approaches to broad evaluation has its limitations.

- Country case studies run the risk of being selective to favour the evaluators' prior beliefs and it is often difficult to say what would have happened in the absence of intervention; or if the interventions had been applied in another country.
- Cross-country econometric studies suffer from poor and inconsistent specification of interventions. Also, because countries may select such interventions precisely because an economic sector is experiencing difficulties, interventions may be associated with relatively poor outcomes even if they improve those outcomes (Lane, 2020; Rodrik, 2008; Warwick & Nolan, 2014).

Despite these difficulties, evidence on effectiveness is still available. First, numerous studies, with a wide variety of designs, provide evidence for the effectiveness of specific types of interventions within national strategies. Here are two examples.

- Government research grants, both to research institutions and to firms, have (on average) positive effects on innovation and productivity, both in general and in selected sectors (Bloom et al., 2019; Warwick & Nolan, 2014).
- Policies focused on strengthening business networks, and links with research institutions (often in a defined geographic area) have positive impacts on firm-level collaboration and innovation (Warwick & Nolan, 2014).

Researchers do not usually include the effects of transport infrastructure, land-use planning, migration policy and skills acquisition in evaluations of focused innovation policy. Yet, these policies can clearly have positive local and sectoral effects (NZPC, 2017; Warwick & Nolan, 2014).

A second source of evidence comes in the form of "natural experiments" – events (largely) outside the control of participants that create a difference in treatments across different firms, sectors or regions. Lane (2020) pointed to two persuasive European examples.

- After the Second World War, the Soviet Union required Finland to make reparations by supplying heavy industrial goods (ships, locomotives, cables, and engines) that it had little experience in producing. The Finnish government provided short-term support to develop these industries. The requirement had long-term intergenerational impacts, both directly on growth in production and employment in the targeted sectors (compared to other sectors), and also through skills acquisition in higher learning and through earnings (Mitrunen, 2019).
- Also after the Second World War, a Marshall Plan project in Italy provided credit for firms to purchase advanced American capital goods, and promoted modern management practices. After inviting applications from any firm in a region, the administrators eventually targeted assistance only to firms in selected provinces within regions. This enabled Giorcelli (2019) to compare long-term outcomes of firms in the provinces that benefited with the outcomes of those applicants in other provinces that did not. She found that firms that received assistance were more likely to survive after 15 years, and had significantly more sales, employment, and productivity than comparable firms that did not receive assistance.

Of course, while these studies demonstrate that focused innovation policies can be successful, some are not (Lerner, 2013).

Third, many OECD countries periodically commission broad reviews of innovation policy and the place of focused innovation policies within this broader picture (Independent Experts Panel, 2019; OECD, 2014, 2015a, 2016, 2017a, 2017c). Typically, experts with a good knowledge of international innovation policy and practice undertake such reviews. They bring together a range of evidence (for instance, detailed empirical studies of specific interventions; case studies of institutional practice; socio-economic and political assessments of national governance arrangements; and international comparisons of innovation outcomes). Reviews identify opportunities for improvements in policy, institutions and practice, rather than making judgements about whether focused innovation policies as such have net benefits. Such reviews are consistent with the idea of innovation policy being experimental and adaptive, with system-level learning playing a key role in improving outcomes over time.

7 Innovation policy and New Zealand firms

Key points

- New Zealand's innovation performance is weaker on many dimensions than that of other small advanced economies. Business and overall R&D is low, and links between businesses and public research institutions are mostly poor.
- The Government has an ambitious draft research, science and innovation (RSI) strategy. The Government should develop and consult with stakeholders on governance and implementation arrangements that will provide confidence that the strategy will deliver on its objectives. It should do this in partnership with the private sector, research sector and Māori.
- In implementing its RSI strategy, the Government should pay close attention to policies and funding arrangements that will strengthen collaboration between businesses and public research institutions.
- To make progress, the right materiality of ambition is required, with significant investments in a small number of selected focus areas that have the potential to innovate at the global frontier and so boost productivity and exporting. These areas should build on New Zealand's existing and emerging strengths and capabilities. Currently New Zealand's innovation policies, economic development policies, and effort on both, lack a clear enough focus on such areas.
- Government must be patient and stay the course with its investments, but also be prepared to cease support for clearly unsuccessful initiatives. This will require rigorous, independent and transparent monitoring and evaluation.
- Smart strategies alone will not be sufficient; execution is crucial. The Government should partner with other stakeholders to put in place effective arrangements for the governance, resourcing, implementation, monitoring and evaluation of its strategy. Senior political and public service leadership is also needed, to unlock resources from across government. agencies.
- The Government should reduce and consolidate the large number of programmes designed to assist firms with innovation and exporting. It should simplify processes for firms to identify and access assistance.
- The Government should commission a full independent review of New Zealand's innovation policies. The review panel should have expertise in assessing the scope, shape and resourcing of innovation policy and the governance of innovation institutions and processes. It should have experience in assessing the effectiveness of innovation policies in small advanced economies. It should include expertise on New Zealand innovation policy and on mātauranga Māori.

New Zealand frontier firms are less productive than their counterparts in other small advanced economies (SAEs) and New Zealand's productivity performance lags other SAEs more generally (Chapter 2 and Chapter 3). Only through innovation can firms become more productive and governments have an inextricable role in innovation ecosystems (Chapter 6). This chapter compares innovation performance in New Zealand with other SAEs and then considers the contribution of government policies, institutions and processes to this performance.

A broad range of policies potentially impact successful export-oriented innovation by firms (Chapter 6). This chapter mostly looks at the effects of policies and institutions that are closely linked with research, science and innovation policy. Section 7.3 looks at how focused innovation policy can, with good governance and

effective implementation, bring a wider suite of policies to bear on innovation for export success. Section 7.4 examines the design of the numerous export-assistance policies and innovation policies targeted at individual firms.

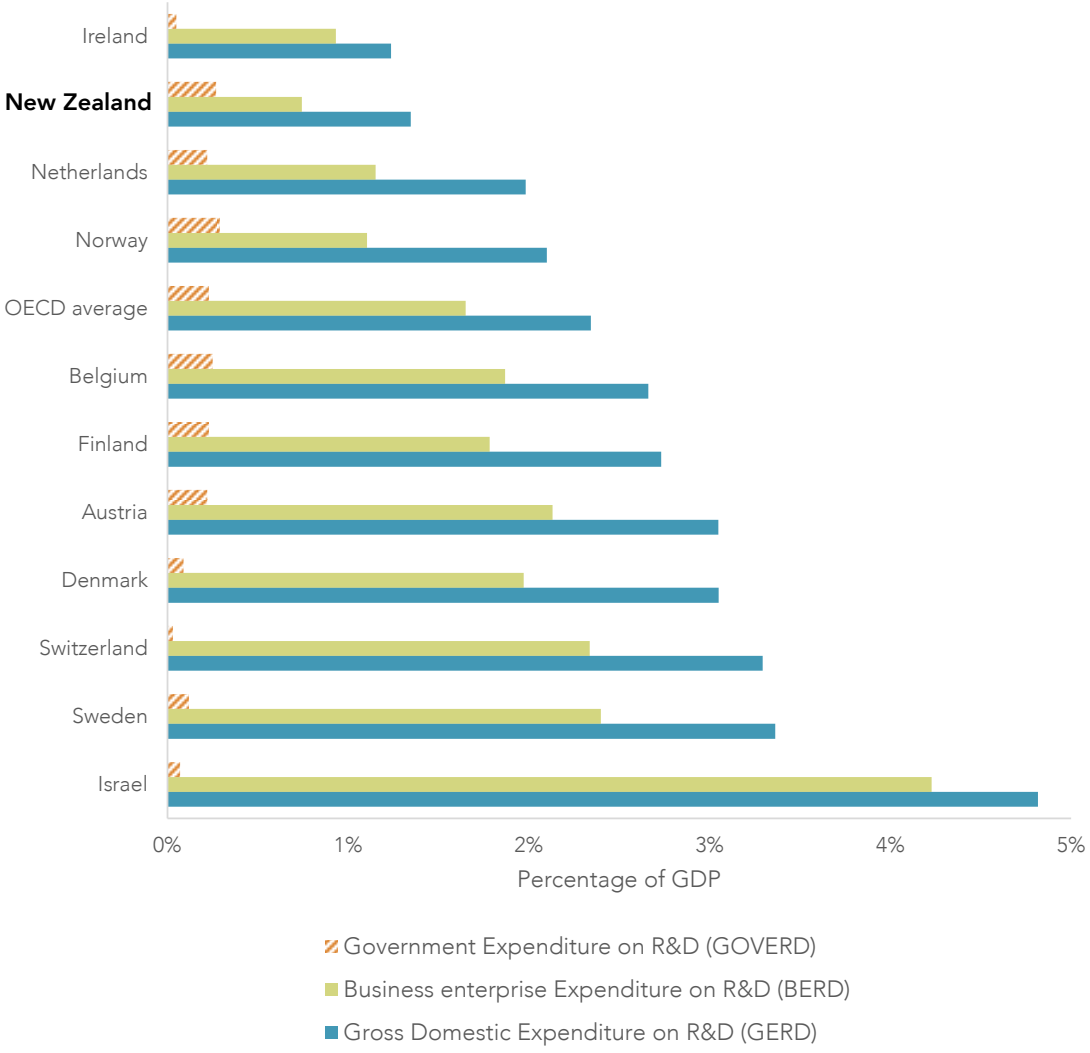
7.1 New Zealand's broad innovation policy settings

This section first compares the performance of New Zealand's innovation ecosystem with other SAEs, and then reviews the policy settings and institutions that are at the core of New Zealand's research, science and innovation (RSI) system.

Performance of New Zealand's innovation ecosystem

New Zealand's innovation ecosystem is weaker on most dimensions than other SAEs. Investment in R&D in other SAEs (except Ireland) is significantly larger than in New Zealand. New Zealand's gross domestic expenditure on R&D (GERD) is 1.3% of GDP, which is less than half of the average GERD in SAEs (2.7%). Similarly, business enterprise expenditure on R&D (BERD) is well below the SAE average (0.74% of GDP v. 1.9%) (Figure 7.1).

Figure 7.1 Expenditure on R&D, 2017



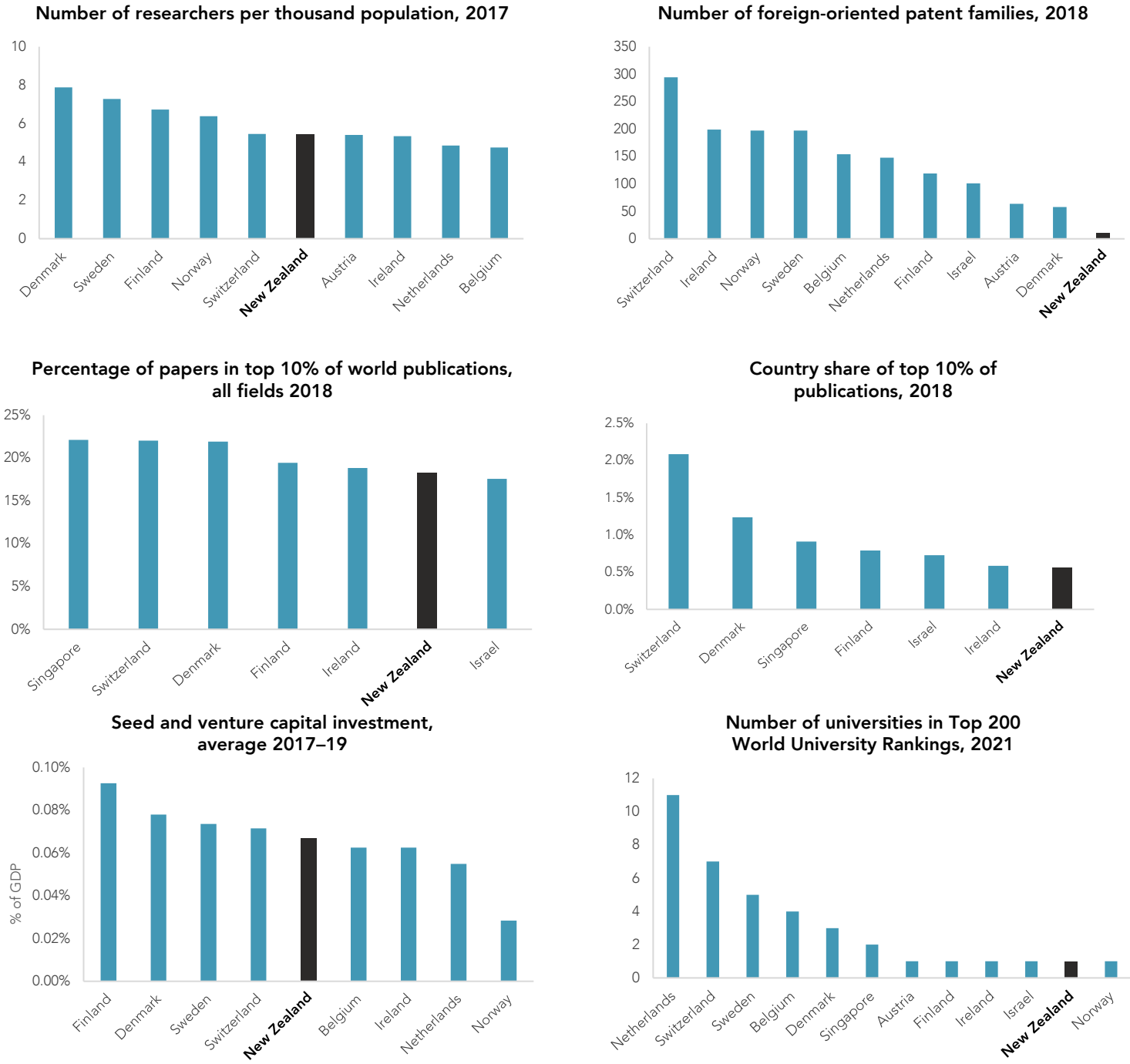
Source: OECD (2020a).

Notes:

1. Expenditures on R&D include all expenditures within a sector, regardless of source of funds.
2. GERD includes R&D performed by the higher education sector.
3. Definition of GOVERD differs in Netherlands, Switzerland and Israel. Definition of BERD and GERD only differ in Israel. OECD averages are estimated values.

New Zealand also performs poorly in registering patents. Researchers in SAEs, on average, file over 150 patent families in filing offices other than the office of their country of origin each year. In 2018, New Zealand filed only 11 patent families in overseas offices (Figure 7.2).

Figure 7.2 Recent innovation performance in New Zealand and other small advanced economies



Source: OECD (2020a); WIPO (2020); MBIE, updated from MBIE (2019b); OECD (2020c); Times Higher Education (2020).

Notes:

1. Number of researchers per thousand population is calculated based on OECD's Main Science and Technology Indicators (2017).
2. A patent family is a set of interrelated patent applications filed in one or more countries to protect the same or a similar invention. A foreign-oriented patent family is a patent family with at least one filing office different from the office of the applicant's origin. The indicator is based on World Intellectual Property Organization (WIPO) data.
3. The third and fourth graphs are based on Dimensions Analytics data.

F7.1

The performance of the New Zealand innovation ecosystem is notably weaker than in comparator small advanced economies on some measures. These are:

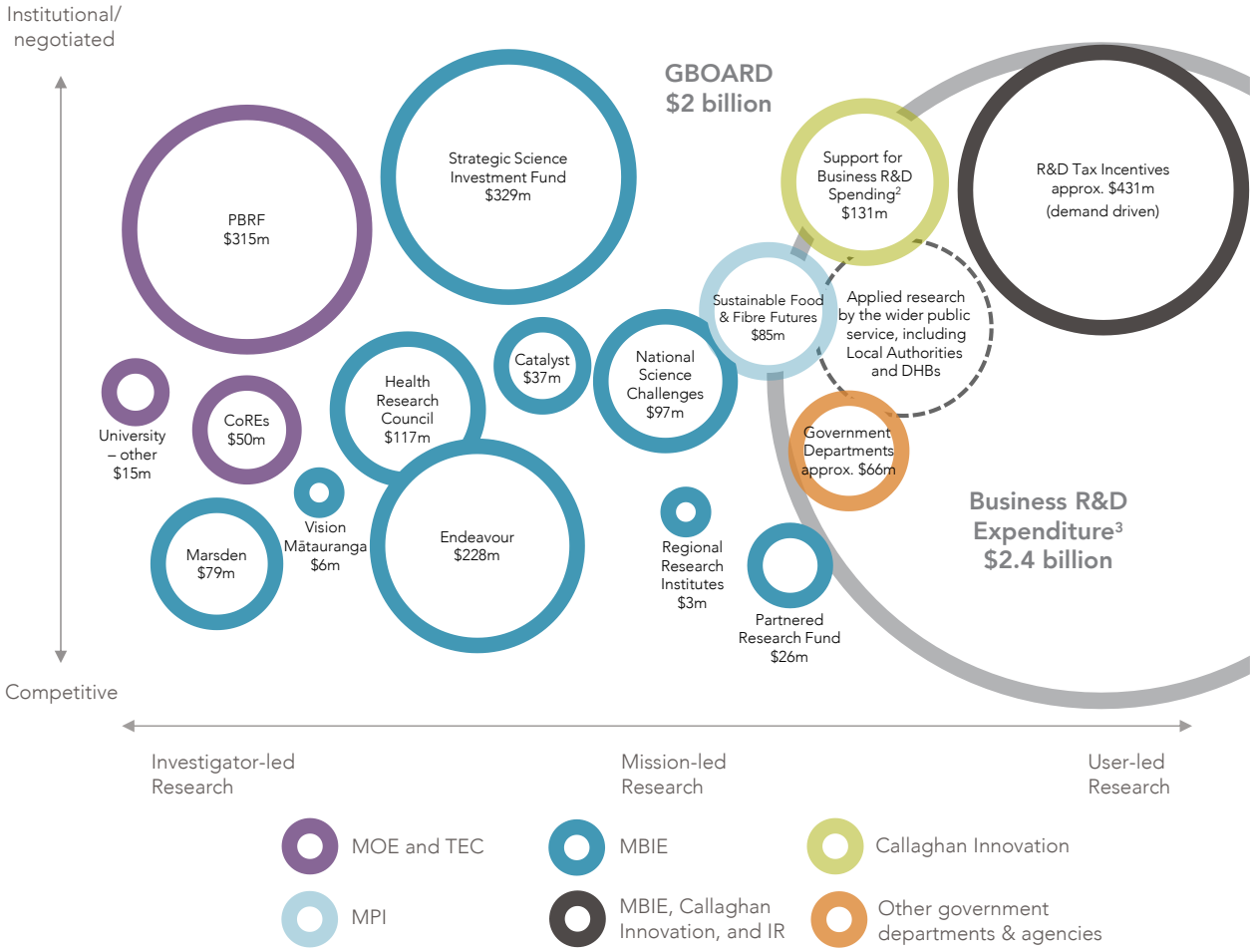
- public and private expenditure on R&D as a percentage of GDP;
- internationally significant patenting;
- share of the world's top academic publications; and
- the number of world-class universities.

Public support for research, science and innovation

Government funding for research, science and innovation is spread across many varied funds. The funding supports different forms and stages of research (Figure 7.3). The R&D tax credit for firms, at about $430 million a year (demand-driven), comprises a substantial proportion of total public funding. The credit, introduced in 2019, is based on strong evidence that such a policy would stimulate innovation by firms and raise productivity (Chapter 6). Even so, some submitters expressed concern that government funding and related policies such as the R&D tax credit are overly biased towards sectors that perform R&D as opposed to other forms of research, development and innovation.

Firms also receive direct support for innovation through Callaghan Innovation (ie, R&D grants, services and repayable loans at about $130 million a year), and from other funds such as the Sustainable Food and Fibre Futures Fund ($40 million a year, on average, covering very small projects to large partnerships). Other funds support research that is partly relevant to innovation by firms, but is led by universities, Crown Research Institutes (CRIs) and other research institutions. Yet, evidence overall shows that business links with such researchers are weak in New Zealand compared to other SAEs (section 7.2).

Figure 7.3 Projected funding for research, science and innovation, 2021-22



Source: MBIE, updated from MBIE (2019b).

Notes:

1. Dollar amounts represent appropriations used in the GBOARD (Government Budget outlays and appropriations on R&D) calculation. The figure reports projected funding for the 2021/22 financial year, to avoid recent one-off fundings in response to Covid-19.
2. Support for Business R&D spending, delivered by Callaghan Innovation, includes R&D grants, services and repayable loans. It excludes the R&D Growth Grant, as this grant no longer accepts applications: the R&D Tax Incentive has replaced it.
3. Business Expenditure on R&D is based on the Business R&D survey.
4. Funds that support investigator-led research mostly go to universities and research institutes, and funds that support user-led research mostly go to innovative firms.
5. Abbreviations: CoRE: Centre of Research Excellence, DHB: District Health Board, IR: Inland Revenue, MBIE: Ministry of Business, Innovation and Employment, MoE: Ministry of Education, MPI: Ministry for Primary Industries, PBRF: The Performance-Based Research Fund, TEC: Tertiary Education Commission.

The Government has set a goal to raise overall R&D expenditure to 2% of GDP by 2027. To achieve this, the Ministry of Business, Innovation and Employment (MBIE) projects that government expenditure will need to increase from its 2019 level of $1.6 billion to just under $3 billion in 2027 (not including the cost of the R&D tax credit). Business expenditure on R&D (BERD) will need to increase from $2.2 billion in 2019 to almost $5 billion in 2027 (MBIE, 2019b). BERD has grown strongly from $970 million in 2010 to its current level (Stats NZ, 2019).

Consolidated evidence on the quantity and source of public funding to support innovation in firms is lacking. Section 7.3 identifies areas of funding that appear to be relevant to areas of the economy chosen by the Government for focus in its industry strategy.

The Government's draft research, science and innovation strategy

MBIE has consulted on a draft government research, science and innovation (RSI) strategy to shape the direction of RSI investment (MBIE, 2019b). The strategy proposes that principles of excellence, impact and connections guide all investments and policy decisions. The strategy acknowledges the complexity of current funding arrangements but argues that the objectives of the current RSI funds are clear, and that their operation closely matches those objectives. The RSI strategy will sit alongside the Government's industry strategy (section 7.3), and will update the National Statement of Science Investment (2015–2025) (MBIE, 2015). Cabinet is yet to approve a final version of the strategy.

The draft strategy sets out areas for action, with Callaghan Innovation and New Zealand Trade and Enterprise (NZTE) having a central role in delivering the strategy objectives. These areas for action are:

- making New Zealand a magnet for talent (including improving pathways for domestic researchers and attracting and retaining skilled people from overseas);
- improving connections among researchers and innovators (including internationally);
- strengthening support for start-ups to grow and access global markets;
- creating conditions for Māori thinkers and researchers to thrive in the RSI system, and resourcing and protecting mātauranga Māori (Māori knowledge); and
- increasing investment in the RSI system, improving coordination in the network of research providers, and increasing the quality of the research infrastructure.

The draft strategy signalled an intention to focus RSI effort on building scale "in areas of emerging opportunity, disruption, or critical need to New Zealand" (MBIE, 2019b, p. 34). The strategy outlined and sought feedback on possible areas for focus. These included the sectors marked out for industry transformation plans (ITPs) in the Government's industry strategy (see section 7.3), but also identified aerospace, renewable energy and health technologies as possibilities.

A successful RSI strategy requires effective governance and implementation

The draft RSI strategy is very ambitious in its proposed direction and desired outcome that "[b]y 2027, New Zealand will be a global innovation hub, [and] a world-class generator of new ideas for a productive, sustainable, and inclusive future" (MBIE, 2019b, p. 6). The Commission believes that successful implementation will require considerable investments in workforce development and infrastructure. The strategy by itself gives little indication of how it will be implemented, and on what scale the various initiatives will be resourced. The strategy also does not indicate what governance arrangements will be put in place to guide successful implementation.

Successful implementation of a strategy must bring together the efforts of a large and diverse group of actors over an extended period of time. Implementation, for instance, involves periodic decisions on where to invest resources, how to engage various parties, and what incentives to provide for improved connections within the system (which may require adjustments to funding policy settings). In turn, an adaptive and learning approach requires effective data collection, monitoring and evaluation of initiatives and periodic review of the system.

Successful implementation of the strategy will thus require strong and transparent overall governance arrangements. Chapter 6 discusses how other SAEs use such arrangements. The strategy will need an implementation plan that has been transparently developed and finalised through engaging with relevant major stakeholders (government agencies, Māori, industry (firms and workers), researchers and the research communities). The plan needs to indicate the resources that will be assigned to the identified action areas, and over what time, and which agencies will take the lead in each action area.

Funding contestability

Inquiry participants who were researchers said that the innovation funding system is unhelpfully competitive. They said the contestable and often short-term nature of funding is not conducive to research and can be a

barrier to attracting top talent. People also said that overly bureaucratic application processes absorb large amounts of a senior researchers' time (often with low success rates). Once they have won funding, researchers may have little time, desire or flexibility to respond to other requests for research assistance, including those from business. Participants asked for better incentives for cooperation and collaboration across research institutions, and simpler, lower-cost funding application systems.

The Government's draft RSI strategy noted the tensions. "Stable long-term funding is important to build and grow teams and make significant progress on big challenges and problems. Competitive funding creates dynamism and the opportunity for new ideas" (MBIE, 2019b, p. 14).

F7.2

The Government's draft research, science and innovation (RSI) strategy of 2019 signals an ambitious programme of actions to improve the performance of the RSI system by:

- developing, attracting and retaining skilled researchers;
- improving connections among researchers and innovators;
- strengthening support for start-ups to grow and access global markets;
- building scale in innovation effort in chosen areas of focus;
- attracting more Māori researchers and innovators into the RSI system, and better protecting and resourcing mātauranga Māori; and
- increasing investment in the RSI system, and increasing the quality of the research infrastructure.

However, the Government has yet to finalise the strategy, and to develop transparent governance, implementation and monitoring arrangements that will provide confidence that its objective of New Zealand being a global innovation hub by 2027 will be achieved.

R7.1

The Government should update and confirm its research, science and innovation (RSI) strategy to signal its intended innovation effort and direction over the next five to ten years.

The Government should develop and put in place transparent arrangements for the governance, implementation and monitoring of its RSI strategy.

Governance and oversight of the implementation of the Government's RSI strategy should include high-level representation from Government, Māori, industry (firms and workers), researchers and educators.

R7.2

The Government should engage with relevant stakeholders (Māori, researchers, firms and workers, and educational institutions) to develop a transparent implementation plan for its research, science and innovation strategy. After initial engagement, the Government should publish a consultation draft and invite submissions from stakeholders. The implementation plan should cover (among other things):

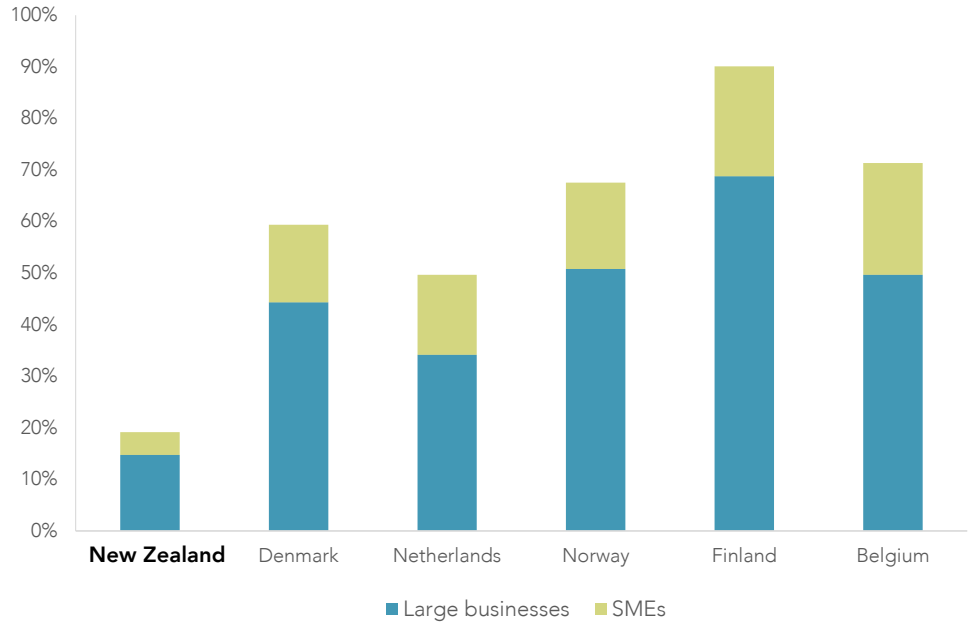
- how the areas for action under the strategy will be resourced and over what timeline;
- proposed changes to policies and practices (including funding criteria) that will better achieve the strategy's objectives;
- which agencies will take the lead on the actions; and
- arrangements to monitor and evaluate initiatives and the overall success of the strategy.

7.2 Researchers and firm engagement – key institutions

Compared to other SAEs, links between New Zealand's firms and researchers in universities and research institutes have been very weak (Figure 7.4). New Zealand's low levels of business R&D are part of the explanation. Yet, other SAEs appear to have longstanding, better developed institutions and processes and more determined policies to forge links between businesses and researchers (Chapter 6). This section considers whether the design of New Zealand's business-facing research institutions and policies has weaknesses, and how the Government can tackle those weaknesses.

The Government's draft RSI strategy also reported other measures of weak links between businesses and researchers in New Zealand. A relatively low proportion of New Zealand research publications are co-authored with businesses. Business investment in research in educational institutions is relatively low, though this is offset to some extent by business investment in research in CRIs (MBIE, 2019b).

Figure 7.4 Percentage of innovating businesses collaborating with researchers (in six SAEs), 2012-14



Source: OECD (2017b).

Notes:

1. Data represent the percentage of product and/or process-innovating businesses that collaborate with researchers.
2. Researchers include higher education institutions and research institutes.
3. SMEs are defined as businesses with 10 to 249 employees and large firms as businesses with 250 employees or more.

Crown Research Institutes

The Government funds the seven CRIs through a mix of core funding (from the Strategic Science Investment Fund), contestable funding and contracts with government agencies. In 2018, funding from public sources (a total of $545 million) comprised almost 70% of total CRI funding, though the percentage varied greatly across CRIs. For historical reasons, industry-oriented CRIs are active mainly in the land-based industries and geothermal technology (Table 7.1).

Table 7.1 Crown Research Institutes science revenue by source, 2018-19

	Science revenue		
	Total ($m)	Public revenue share	Industry revenue share
Plant & Food	167	48%	52%
AgResearch	147	50%	50%
GNS	95	76%	24%
Scion	56	80%	20%
NIWA	161	80%	20%
Manaaki Whenua - Landcare	84	88%	12%
ESR	79	94%	6%

Source: Te Pae Kahurangi Review Panel (2020).

Review of Crown Research Institutes

In 2019, MBIE commissioned an independent panel to undertake a review of CRIs, with a focus on how they could best contribute to collective science capabilities for the future. The panel submitted its report in mid-2020 (Te Pae Kahurangi Review Panel, 2020). The panel commented that incentives arising from current funding arrangements result in "insufficient financial capacity to sustain a balanced portfolio of research that focuses on future horizons and to deliver on organisational priorities consistently" (Te Pae Kahurangi Review Panel, 2020, p. 21). The panel also commented:

> CRI commercialisation portfolios lack the scale and diversity to manage risk and to build end-to-end excellence …Some CRIs are reliant on inherently risky commercialisation activities to sustain their core activities…[this] may bias CRIs towards retaining publicly funded IP and seeking to monetise it directly rather than making the new knowledge widely available through an appropriate mechanism. (Te Pae Kahurangi Review Panel, 2020, p. 23)

The panel recommended ways to improve the contribution of CRIs.

- The CRI operating model and funding arrangements should ensure they are organisationally and financially resilient, while remaining accountable for performance. This implied a greater reliance on core rather than contestable funding, making CRIs no longer subject to the Companies Act, and developing an organisational and governance arrangement "that leverages their collective capability and contribution" (p. 7). The panel commented that one of the problems with current funding arrangements is that they "incentivise unproductive competition [among CRIs and with other research providers] and distort choices on ways to achieve impact from new knowledge" (p. 2).
- Mechanisms should be implemented to strengthen and overcome barriers to collaboration among CRIs and with other science system participants.
- CRIs should collaborate on "integrated investment planning" [planning their investments as a group], "resolving areas of unproductive duplication", "pooling commercialisation opportunities to diversify risk" and "standardising systems and processes" (p. 5).
- CRIs should work collaboratively to tackle emerging skills' shortages, such as in data science, and make it easier for researchers to move to areas within the science system where they can best deploy their skills.
- CRIs should work collectively to provide a "single door" to those wanting access to their services.
- CRIs should work together to build a tiriti-based partnership with Māori and to provide a supportive environment for Māori researchers.

The panel observed that policy around similar institutes in comparator countries all "appear to leverage geographic clustering of different types of research organisations and businesses more actively [than

New Zealand], to stimulate innovation" (Te Pae Kahurangi Review Panel, 2020, p. 11).[15] Clustering involved co-location of research institutions with universities and industry organisations, networking and more formal partnerships across those agencies and businesses within the innovation system.

The Commission questions whether CRIs and universities in New Zealand have well-defined and complementary roles in the innovation system. Other SAEs, including Denmark and the Netherlands, have worked on strengthening integration and have even amalgamated some public research institutes and universities (Independent Experts Panel, 2019; OECD, 2015a). A comprehensive review of New Zealand's innovation policies should tackle this question (section 7.5).

Callaghan Innovation

Callaghan Innovation, the Government's business innovation agency, is a Crown Entity established in 2013. It provides services to businesses aimed at activating innovation and accelerating commercialisation. Client businesses range from start-ups to experienced R&D performers. Callaghan's services to businesses include:

- connecting businesses to experts, technology and capital providers, and potential partners;
- providing in-house R&D services (by around 200 scientists and engineers); and
- fostering initiatives to improve business innovation skills.

Callaghan Innovation is unusual in its balance of services, for historical reasons. When it was established, the former CRI Industrial Research Limited was merged into it. This accounts for the existence of its in-house R&D services. With a large in-house research function, Callaghan Innovation faces some of the same revenue generation pressures as the CRIs. Some inquiry participants considered that this dual role as a funder of innovation support services and provider of in-house research services creates a potential conflict of interest in dealing with firms.

Callaghan Innovation received Crown funding of $80 million in Budget 2020, to broker and provide innovation services to businesses (New Zealand Government, 2020d).[16] In financial year 2020, it also earned $25 million in commercial revenue, interest and other sources (Callaghan Innovation, 2019a). Callaghan Innovation also administers some Business R&D funds, including Growth Grants, Targeted Business R&D Grants, and repayable Grants for Start-ups.

Tertiary Education Organisations and Centres of Research Excellence

Tertiary Education Organisations (TEOs) undertake a wide range of research, including much that has the potential to lead to innovation by firms, or which supports actual innovation. The Performance-Based Research Fund (PBRF), at around $321 million a year currently, funds a significant part of TEO research. Government (through contestable and departmental sources) and businesses fund over another $500 million a year of research in TEOs (PBRF Review Panel, 2020). Universities attract the large majority (96%) of PBRF funding. Universities also self fund some of their research from internal sources.

Centres of Research Excellence and other university research centres

The Government established Centres of Research Excellence (CoREs) in 2001 to increase resources for areas of research strength in New Zeland and so enable concentrated research effort in academic disciplines. In 2014 the Government made changes to improve the performance of CoREs by clarifying expectations and making performance management more transparent (Office of the Minister for Tertiary Education, Skills and Employment, 2014). The Government's investment intention is to "support growth in research excellence and the development of world class researchers in areas of existing excellence that are important to New Zealand's future development"(p. 15).

The TEC invests $49.8 million a year in CoREs (Tertiary Education Commission, 2020). Tertiary education institutions access the fund through a contestable process. A CoRE must undertake leading-edge research

[15] Comparator countries included Australia, Canada, Denmark, Germany, Singapore, the United Kingdom and the United States.

[16] The Crown appropriations include $36 million for Building Business Innovation, $8 million for Business R&D Contract Management, $36 million for R&D Services and Facilities, and $8 million for National Measurement Standards. The RSI funding, also reported in section 7.1, does not include the contract management appropriation.

of world-class quality in an area of importance to New Zealand in order to be eligible. CoRE funding places strong incentives on participant universities to collaborate.

The Royal Society Te Apārangi administers the selection round on behalf of the TEC. In the 2019/20 general selection round, the Society recommended ten CoREs for funding for up to eight years (commencing 2021) (Royal Society Te Apārangi, 2019a). The selection reflects a mix of mission-oriented research and research focused on innovative enabling technologies (Table 7.2).

Table 7.2 Centres of Research Excellence funded from 2021 until 2028

CoRE	Research area	Host
Bio-Protection Research Centre	Environmental protection (pest management solutions)	Lincoln University
Coastal People: Southern Skies	Climate change	University of Otago
Dodd-Walls Centre for Photonic and Quantum Technologies, Te Whai Ao	Photonic and quantum technologies	University of Otago
Healthy Hearts for Aotearoa New Zealand – Manaaki Mānawa	Heart and respiratory diseases	University of Auckland
Ngā Pae o te Māramatanga – New Zealand's Māori Centre of Research Excellence	Māori communities	University of Auckland
Te Hiranga Rū QuakeCoRE: Aotearoa New Zealand Centre for Earthquake Resilience	Earthquake Resilience	University of Canterbury
Riddet Institute	Innovations in food and related sciences	Massey University
Te Pūnaha Matatini – Aotearoa New Zealand Centre of Research Excellence for Complex Systems	Complex systems	University of Auckland
The MacDiarmid Institute for Advanced Materials and Nanotechnology	Advanced materials and nanotechnology	Victoria University of Wellington
The Maurice Wilkins Centre	Molecular biodiscovery (human diseases)	University of Auckland

Source: Tertiary Education Commission (2020).

Note:

1. The TEC currently invests in both the Brain Research New Zealand / Rangahau Roro Aotearoa and the Medical Technologies CoRE. The funding for these CoREs ends in June 2021. The TEC will fund two new CoREs instead: Coastal People: Southern Skies and Healthy Hearts for Aotearoa New Zealand – Manaaki Mānawa.

New Zealand universities also have other research centres or institutions to connect researchers with firms. For example, the NZProduct Accelerator has research and development partners in nine research organisations (including universities and GNS Science) and Callaghan Innovation. The NZProduct Accelerator undertakes research in manufacturing, materials, and design of products for innovative manufacturing companies. The collaboration aims to lower capital risk, and connect exporters and suppliers. The programme also plays a role in generating or supporting new industries. As a result, a major proportion of NZ's additive manufacturing (3D printing) research and development is taking place in the programme (NZProduct Accelerator, 2020).

The Performance-Based Research Fund

The PBRF is the Government's primary means to fund research in tertiary education organisations (TEOs). It rewards TEOs for "excellent" research performance. The fund's design creates strong incentives for research in TEOs. The PBRF currently has $321 million a year.

The PBRF has a strong emphasis on research excellence and awards greater funding for research that reaches a "world-class" standard. Some commentators have argued that this strongly incentivises

researchers to seek publication of their research in highly ranked international journals. In turn, such journals are relatively uninterested in publishing research on New Zealand-specific topics or on applied research. The commentators argue that this means, among other things, that leading researchers in New Zealand universities will be relatively uninterested in researching areas relevant to innovation by New Zealand firms.

Guidelines for PBRF assessment panels allow them to make their own judgements about research excellence and research impact – based on a broad range of considerations (Tertiary Education Commission, 2017). The guidelines are explicit that "world-class" can include research that has a primarily local, regional or national focus. And the guidelines identify engagement with industry and effects on industry processes and products as criteria for assessing the impacts and, as a result, relevance of the research. Even so, publications in highly ranked journals provide panels with a readily available metric by which to assess research quality.

In the absence of PBRF incentives, it is likely that top university researchers in New Zealand would continue to aspire to publish research in highly ranked international journals. They participate in international academic labour markets where such publications matter; and a longstanding preference exists towards the prestige they offer.

Review of the PBRF

The Government recently commissioned an independent panel to review the PBRF, consider stakeholder feedback, and make recommendations on improving the effectiveness and efficiency of the PBRF and ensuring the benefits of TEO research are shared across New Zealand (PBRF Review Panel, 2020). The panel comprised mostly university representatives.

Unlike other research, science and innovation investments, the PBRF does not fund specific research programmes or projects, nor do government objectives constrain its allocation (PBRF Review Panel, 2020). The panel did not agree with submitters who argued that the fund should prioritise topics of national need, noting that the Government has many other mechanisms to signal its priorities for research. The panel also considered whether the PBRF should focus more on the quality of research in teams rather than by individuals (as is the case currently). The panel recommended against such a change.

The panel recommended changes, however, in the definition of "excellence" that would put more emphasis on the quality and range of research outputs and processes (including engagement, impact and support for research cultures) and less on the quantity. They also recommended that more weight be put on the most meaningful contributions to the sustainability and vitality of the research system. The panel thought this should include a wide range of contributions, including sustained engagement with industry.

Proposed removal of PBRF funding to reward external research funding

The panel recommended a significant shift in funding across the main components of the PBRF. Currently the fund is allocated in three categories – Quality Evaluation (55%), Research Degree Completions (25%) and External Research Income (20%). The last category rewards TEOs in proportion to research income they attract from other sources such as government or industry. The rate of reward has varied over time, but currently stands at around 16 cents for each dollar of research income (PBRF Review Panel, 2020).

The panel recommended that the External Research Income component reduce to zero by 2024, mainly on the grounds that it reflects government and business research priorities rather than research excellence; and that researchers already have access to contestable funds. The panel also noted that in practice two universities with large medical faculties together receive more than half this component of funding.

Since the inception of the PBRF, the External Research Income allocation appears to have incentivised a significant increase in eligible research income – from $195 million in 2002 to $515 million in 2018 (or nearly double in real terms). Yet in 2017, of this external income, only 6% came from overseas sources and 15% from non-government New Zealand sources (Ministry of Education, 2018).

New Zealand continues to have relatively low rates of business funding for research in universities. While detailed data on trends in business funding for universities are not available, the External Research Income component of the PBRF does not appear to be contributing greatly to raising its level to that in other SAEs. The Commission recommends that this key issue, and the broader issue of collaboration between

universities and businesses, be considered as part of a more comprehensive review of RSI and related policies (section 7.5).

The Ministry of Education has recently completed targeted consultation on the review panel's recommendations, before preparing advice for Ministers on proposed changes.

The National Science Challenges

The Government set up the 11 National Science Challenges from 2014 as collaborative cross-disciplinary mission-led approaches to tackling issues important to New Zealanders (MBIE, 2018). It will invest just over $680 million in the Challenges over 10 years. Principles include purposeful collaboration across research providers, stakeholder engagement (including with business) and public participation, and Māori involvement and mātauranga. Several Challenges have some focus on economic applications. Here are a few examples.

- The University of Auckland leads the High-Value Nutrition Challenge which, with $84 million over 10 years, aims to enable "the transformation of New Zealand's food and beverage industry to become an exporter of high-value foods with scientifically proven health benefits" (p. 22).
- AgResearch leads the Our Land and Water Challenge which, with $97 million over 10 years, "aims to enhance primary sector production and productivity while maintaining and improving our land water quality for future generations" (p. 28).
- Callaghan Innovation leads the Science for Technological Innovation Challenge which, with $106 million over 10 years, aims "to enhance the capacity of New Zealand to use physical and engineering sciences for economic growth" (p. 34).

Other research and commercialisation institutions

The Government has contributed $65 million[17] to help establish four Regional Research Institutes (RRIs), including Bragato Research Institute in Marlborough (grape and wine research) and PlantTech Research Institute in the Western Bay of Plenty (horticulture technology). Other organisations have also contributed establishment funding: for example, Bragato's first five years have been jointly financed by RRI funding, other central-government funding, the local council, an industry levy, and participating firms.

The purpose of these institutions is to provide industry-led research that deepens R&D intensity in areas of existing competitive advantage and brings benefits to regions outside the main population centres. The Government's expectation is that the RRIs become financially self-sustaining (MBIE, 2020d).

The Food Innovation Network (NZFIN) comprises four open-access food and beverage and scale-up facilities. Two food research hubs also exist – FoodHQ in Palmerston North and another hub based around Lincoln University. The purpose of NZFIN is to enable firms to develop and commercialise value-added food and beverage products for local and export consumer markets. The NZFIN facilities are currently funded through a mix of government funding and user charges, the proportions of which vary by facility. For example, paying clients meet all the costs of FoodWaikato but only around 20% of the running costs of the FoodBowl and Food South.

This funding model has proven insufficient to cover fixed costs and adequately maintain the capital equipment. The network received two years of funding through the 2019 Budget for the FoodBowl and Food South, to allow these facilities to continue operating, while the network's activities and funding model are reviewed (Callaghan Innovation, 2019b; New Zealand Government, 2019c).

The Kiwi Innovation Network (KiwiNet) is one of two Commercialisation Centres that MBIE funds as part of its Commercialisation Partner Network (the other is Auckland UniServices) (MBIE, 2019a). KiwiNet represents about 80% of New Zealand's publicly funded researchers working in universities, CRIs and other research organisations (KiwiNet, 2020). The goal of KiwiNet is to increase the scale and impact of innovation based on

[17] The $65 million is made up of $25 million in Budget 2015 and a further $40 million in Budget 2016.

science and technology. KiwiNet administers funds from MBIE's PreSeed Accelerator Fund, and also actively engages with Angel, High Net Worth and investment fund communities (KiwiNet, 2020).

International connections

Frontier firms often need knowledge about global frontier technologies to innovate for export success (Chapter 6). They may acquire this knowledge through a range of channels, including from customers and suppliers, hiring staff with international experience, establishing their own connections with international researchers, or from accessing the research and technology development literature.

Another potentially important indirect route is through the connections that New Zealand researchers establish with international counterparts. Evidence suggests that New Zealand's international research connections are, on some measures, similar to those of other SAEs – with a high proportion of publications involving international collaboration and a high proportion of scientific workers from abroad. Yet a low proportion of New Zealand's research is funded from abroad, indicating relatively weak international engagement (MBIE, 2019b).

The governments of some SAEs obtain intelligence on leading international technologies through establishing outposts in leading technology centres and through generous funding for hiring international experts locally (Chapter 6).

Feedback from inquiry participants

In the Commission's industry case studies, some stakeholders expressed concern at the lack of continuity/sustainability of funding for industry-based research institutions. They said this situation is not conducive to attracting top talent or developing long-term research programmes. Industry stakeholders identified a need for a more concentrated/greater scale of funding and more longer-term funding horizons.

Several inquiry participants, including industry stakeholders in the Commission's case studies, commented that the CoRE model is working well. This contrasted with universities and CRIs, which participants regarded as disconnected from industry needs. Several inquiry participants associated with the CoREs emphasised that they encourage collaboration and nurture the development of an active and mutually supportive network of groups, firms and researchers.

Submitters to the inquiry commented on the need to improve connections, collaborations and skills and technology transfers between tertiary education institutions and firms. One way of addressing this is to better align university courses to industry needs, such as offering opportunities for industry to feed into curriculum design and work-integrated learning.

Participants from the research community said that competition between research institutions is unhelpful and has resulted in sub-scale investments. One participant remarked that the "publish or perish" model results in research being skewed towards academic research rather than the needs of New Zealand industry – "productivity is not measured in papers!" Another comment was that the current funding model ties IP too tightly to individual firms, rather than promoting the industry good. The Commission heard calls for changes to the funding incentives for CRIs and universities, to better encourage collaboration and a greater focus on research translation and transfer.

Strengthening collaboration in innovation across firms and public research institutions

The evidence in this section and international comparisons point to considerable weaknesses in links across and between firms and public research institutions, including universities (though the relationship works well in some areas). Land-based CRIs attract a substantial proportion of their revenue from industry sources, suggesting a strong relationship between business and researchers. By contrast, other knowledge-based industries have only small pockets of dedicated public research effort to support innovation effort.

Many SAEs have developed deep and enduring research collaborations between business and public research institutions – in areas where the economy has particular and developing strengths. Governments

have deliberately focused effort in selected areas for innovation. New Zealand should put more effort into a similar approach, based on areas of the economy selected for focus (section 7.3).

F7.3

Compared to other small advanced economies, collaboration between public research institutions and businesses in New Zealand is weak as a whole. This reflects historical and cultural factors such as those noted below.

- Reputational and financial incentives for university researchers to engage in applied research are weak.
- Only a subset of Crown Research Institutes (CRIs) have a substantial industry orientation and, for historical reasons, these are focused on land-based industries and geothermal technologies.
- Given weaknesses in core funding, CRIs likely focus on short-term fee-for-service research rather than investing in deep, mission-focused, research that can lay the basis for future radical innovation.
- A relatively small proportion of New Zealand businesses are technologically sophisticated and undertake R&D.
- Government policies have not had a strong focus in the past on forging collaborative innovation efforts between public research institutions and businesses, except in the land-based and geothermal industries.

R7.3

In implementing its research, science and innovation (RSI) strategy, the Government should:

- pay close attention to strengthening the capacity and capability for collaboration between businesses and public (or publicly funded) research institutions on innovative technologies, including strengthening international connections;
- prioritise building collaboration in areas of existing and emerging strength in the economy where it has chosen to focus its innovation efforts; and
- allocate a proportion of its RSI budget to building business-oriented research capabilities in public research institutions in chosen areas of focus.

7.3 Focused innovation policy in New Zealand

Chapter 6 set out a strong rationale for SAEs choosing promising areas of focus for innovation policy, to complement broad economy-wide innovation policy. The idea of focused innovation policy is not new in New Zealand, as the concentration of CRIs on land-based industries demonstrates (section 7.2). A past focus on agriculture encouraged technology development, diffusion and adoption. Research institutions such as the Department of Agriculture Research Farms (like those at Ruakura), Lincoln Agricultural College and Massey University investigated leading-edge, science-based agricultural practices. From this, the Department of Agriculture's "farm extension service" identified and spread good practice.

In recent decades, broad government economic development strategies have included sectoral approaches.

- The Growth and Innovation Framework (2002–2008) targeted the information and communication technology, biotechnology and creative sectors (especially screen production and design) on the grounds that they were "core competencies needed to drive success across the economy, including in our traditional primary industries" (New Zealand Government, 2019b, p. 13).

- The Business Growth Agenda (2012–2017) included initiatives that targeted the "high-value manufacturing and services", health, food, and primary sectors. (MBIE, 2012).

Yet, the resources, attention and effort applied to these strategies pale beside those applied previously and currently to the primary sector. Skilling (2020) memorably characterises most of these sorts of sector initiatives (including current initiatives) as delivering a "sub-therapeutic dose"(p. 22).

> To make progress, the right materiality of ambition is required (percentage points of GDP, not a few extra million dollars of exports); a focus is required on the cluster as opposed to very specific activities; and a structural, whole of government policy agenda is needed (skill, infrastructure, research, FDI attraction, and so on) rather than some financial support. This should be done properly or not at all. And importantly, choices will need to be made in terms of what not to do. (p. 22)

Other SAEs have typically been much more ambitious than New Zealand in pursuing focused innovation policies (Chapter 6).

Choice of areas for focus

Potential areas of focus for innovation policy are numerous, and different ways of defining focus areas in the economy are available. Most commonly, commentators and governments look to build on existing strengths in their economies and emerging areas of success, where potential for innovation is evident (Chapter 6). Choices are not only a matter of science; they are equally a matter of judgement informed by a range of factors.

- Skilling (2020) points to two broad areas of the New Zealand economy with the potential to build competitive strength given the country's starting point and distinctive circumstances – primary production and weightless industries (defined in Chapter 5).
- The Government's draft RSI strategy suggested a focus in about five areas that build on existing strengths and advantages, and provide the opportunity to shift from "volume to value", while being consistent with:
  - work under way to build depth and scale in the RSI system;
  - RSI portfolio efforts focused at the global frontier of innovation and knowledge; and
  - the focus areas in the Government's industry strategy.

Any choice of focus needs to account for a range of objectives for focused innovation policy (Chapter 6). This section (section 7.3) concentrates on the objective of raising the productivity and exporting performance of frontier firms.

The Government's industry strategy

The Government has recently refreshed its industry strategy and is developing industry transformation plans (ITPs) (MBIE, 2020a, 2020c). The strategy aims to "lift aggregate productivity and enable the scaling up of highly productive and internationally competitive clusters based on New Zealand's comparative advantage" (Minister for Economic Development (Hon Phil Twyford), 2020, p. 2).

A subset of ITPs focuses on sectors that "could become a highly productive and internationally competitive cluster of businesses" (p. 2). These "high-potential" sectors cover digital technologies, advanced manufacturing, and parts of the food and fibre sector (including agritech) (Box 7.1). A further ITP focuses on productivity in the construction sector. Other sector strategies focus on tackling impacts from Covid-19, and improving resilience to shocks, such as those from climate change, natural hazards, and pandemics.

A wide range of policy instruments can contribute to successful innovation

The industry strategy envisages using instruments such as active labour market programmes, targeted trade policy, regulation, investment support, government procurement, emissions reduction pathways, capability building, and tax measures (such as accelerated depreciation). "Appropriate actions and initiatives …will be identified and developed in partnership with industry" (p. 7). Even so, only modest provision has yet been

made for resourcing such initiatives. Governance of the strategy rests with the Economic Development Ministers Group. A Tripartite Oversight Group (involving the Government, Business New Zealand, and the New Zealand Council of Trade Unions) provides advice across the strategy.

Box 7.1 **High-potential sectors under the Government's industry strategy**

The Government has identified five "high-potential" areas of focus as part of its industry strategy, with the intention of enabling "the scaling up of highly productive and internationally competitive firms". The initiatives are at different stages of developing Industry Transformation Plans (ITPs). Officials are partnering and engaging with industry to develop ITPs that have a shared vision, identify issues holding the sector back and agree on actions needed to transform these sectors.

Advanced manufacturing

MBIE staff are in the early stages of partnering with key stakeholders in the sector to develop the scope and direction of an ITP. The focus is on assisting New Zealand manufacturers and the manufacturing workforce to adopt advanced manufacturing skills, business models and technologies that will improve productivity and international competitiveness. This work follows on a Budget 2019 initiative: the "Industry 4.0 Demonstration Network". Current year funding for this initiative is $1.9 million.

Agritech

The agritech sector covers manufacturing, biotechnology and digital-based technology companies that add value in agriculture and horticulture. In partnership with Agritech New Zealand, the Government published an ITP for Agritech in July 2020. A focus of the ITP is scaling up the size of the sector. The ITP sets out a range of actions across six workstreams, and includes three "high-impact" projects. Budget 2020 appropriated a further $11.4 million for the Agritech ITP initiatives over three years. MBIE is the lead agency for this ITP.

Digital technologies

MBIE has established a sector reference group and issued an update on progress towards an ITP in August 2020. The sector covers firms whose core activity is creating and selling digital solutions. The Government has indicated a strong focus on promoting weightless digital exports. Budget 2020 allocated $5 million to implement initiatives under the digital technologies ITP.

Food and beverage manufacturing; and forestry and wood processing

The Ministry for Primary Industries is the lead agency for developing the Food and Beverage Manufacturing ITP. Te Uru Rākau (Forestry New Zealand) is the lead agency for developing the Forestry and Wood Processing ITP. The intention is to find ways to increase the value of output in these two domestic and export sectors that are already large. The ITPs are "nested within" the Government's response to the Primary Sector Council's vision and strategic direction for the agriculture, food and fibres sector. Detailed ITPs are being scoped with industry partners. At the same time, agencies have undertaken work on development of the forestry and wood processing workforce and on opportunities to add value in wood fibre technologies.

Source: Minister of Economic Development (Hon Phil Twyford) (2020); New Zealand Government (2020c, 2020a, 2020b); MBIE (2020b); Bio Pacific Partners (2020); The Forestry and Wood Processing Workforce Action Plan Working Group (2020).

Assessment of focused innovation policy in New Zealand

The Government has both implicitly and explicitly selected areas of the economy and technologies on which to focus innovation effort. Generally, these areas reflect existing strengths and concentration of innovative activity, consistent with SAE practice and the literature on focused innovation policy (Chapter 6). Yet, weaknesses exist in current policies.

Areas of focus for innovation policy are not consistently defined

New Zealand policy focuses innovation effort, deliberately or otherwise, in areas relevant to promoting competitiveness and export success.

New Zealand has always, for instance, had a strong focus on innovation in the primary industries. The extent of industry funding for CRIs in the primary sector suggests that firms in these industries value this support for innovation. The National Science Challenges include a focus on primary sector productivity and exporting. Two of the Regional Research Institutes have a focus on food and beverage, and the Government contributes funding to the Food Innovation Network. The Riddet Institute (the host of a CoRE) has a focus on innovations in food science. The Sustainable Food and Fibres Fund supports another set of relevant initiatives. Even so, it is not clear how well these many separate initiatives are connected. Participants told the inquiry that researchers tend to work separately on related topics, often incentivised by a need to compete for and control their share of available funding, creating a fragmented approach overall.

Other areas of science effort are also relevant to components of the Government's industry strategy. Callaghan Innovation, for historic reasons, has an in-house science and engineering capability covering advanced materials, advanced manufacturing, the internet of things, data science and biotechnology. Callaghan uses sector teams to engage with individual firms in selected sectors, currently including digital, health, food and beverage, agritech, and manufacturing. The MacDiarmid Institute, another CoRE host, has a focus on advanced materials. One of the National Science Challenges has a focus on using advanced technologies for economic growth.

Yet, consistency of focus across various areas of innovation policy is partial at best. The draft RSI strategy has signalled an intention to focus funding for innovation in areas where New Zealand "has, or will be able to build, a sustainable competitive advantage on the world stage"(MBIE, 2019b, p. 35). Yet, the draft RSI strategy only briefly mentions the possibility of focusing on the high-potential areas selected with the same objective in the Government's industry strategy, and raises alternatives to consider.

The Government's industry strategy has limited access to resources

The Government has allocated a relatively small resource (compared to the overall RSI budget) to support the operation of its industry strategy for "high-potential" sectors (Box 7.1; section 7.1). The strategy envisages that Ministers can seek further resources through future budgets as opportunities for worthwhile investments emerge (Minister for Economic Development (Hon Phil Twyford), 2020). These opportunities will also require funding beyond RSI funding, such as in skills development and infrastructure.

Other current substantial RSI resources may be available to support initiatives identified through the ITP processes. Yet, the processes by which this could happen and how relevant decision makers would respond to requests for support are not clear, given that the draft RSI strategy and the industry strategy are not yet aligned in their areas for focus. A risk exists that industry partners spend time and resources engaging with officials to develop ITPs and plan their own investments, but will be disappointed if complementary government investments are not forthcoming.

Pre-commitment of resources for focused innovation investments that have yet to be identified is not necessarily the answer (although other countries such as Singapore and the Netherlands have done so). Participation by a senior member of the Government in governance arrangements would help speed the allocation of resources for investments as opportunities emerge. Some other SAEs (eg, Finland, Sweden and Singapore) employ such governance arrangements in their focused innovation policies (Chapter 6). Effective governance also needs active participation of senior industry leaders (firms and workers) and Māori interests with a commitment to making investments in innovation work.

Commitment to review industry strategies and evaluate initiatives appears weak

Focused innovation strategies are, by their nature, exploratory. Government works with industry partners to identify areas for productive investment and barriers to successful investment. Transparent information and reviews of progress are key to keeping strategies on track over time. Strategies are experimental and not all initiatives will be successful. So, it is important to evaluate the outcomes of initiatives and improve understanding about what works and what does not (Chapter 6). As a result, provision for monitoring, review and evaluation is a core part of designing a successful strategy.

The possibilities for evaluation of business-led innovation investments in New Zealand have been illustrated by the evaluation of the former Primary Growth Partnership programmes (Battell, 2018). The evaluation

assessed the benefits and outcomes of individual programmes and the overall success to that point of the partnership, and made recommendations for increasing its impact.

The Government's draft RSI strategy signals an intention to monitor progress towards achieving the Government's vision and towards achieving particular targets (such as raising R&D expenditure to 2% of GDP). MBIE has produced a companion position paper setting out its framework for measuring the impact of research. The paper also sets expectations on public research funders, public research organisations and researchers to measure impact. The paper notes that currently "New Zealand makes only limited use of impact in performance evaluation"(MBIE, 2019c, p. 9).

Publicly released summary documents on the Government's industry strategy do not reference the monitoring, review and evaluation of the overall strategy. The Agritech Industry Transformation Plan describes indicative measures of outcomes that could be the basis for evaluation, and signals an intention to develop a detailed approach (MBIE, 2020a). An evaluation approach proportionate with resources expended on initiatives should be advanced with urgency.

A successful strategy requires effective leadership and a large step up in resources and focus

Currently, public resources allocated to the Government's industry strategy are very small as a proportion of RSI and economic development expenditure. New Zealand has a history of small-scale, sector-focused initiatives that often fade away without any clear idea of what they have achieved. The current initiatives, rather than being transformational, run the risk of a similar fate.

If New Zealand is to achieve innovation-driven export success on the scale of comparator SAEs, it must be similarly bold in identifying the most promising areas for focus; and in allocating substantial resources to chosen areas over a sustained period of time. A repeat of past "sub-therapeutic doses" will achieve little or nothing. Only strong and committed senior leadership across government, industry, researchers and educators will achieve this.

Government should share the lead with industry and other stakeholders

A successful focused innovation strategy must have buy-in from the stakeholders that will drive it forward. Other SAEs achieve this through engagement of senior and expert stakeholders in both high-level strategic governance arrangements and through governance arrangements for specific initiatives (Chapter 6). These arrangements must be both transparent and genuine in sharing decision making across government, Māori, industry (firms and workers) and research leaders. The arrangements should provide for shared decision making around the choice of areas for focus, and around the resourcing, implementation monitoring and evaluation of focused implementation policy.

A range of models exist for shared decision making and the Commission will undertake further study of what might work best in New Zealand.

F7.4 Some of the Government's Industry Transformation Plans intend to focus innovation effort to raise productivity in high-potential sectors of the economy that have an export focus. Other than in the primary sector, the Government has devoted only a very small proportion of its research, science and innovation funding, export assistance funding and economic development funding directly to its chosen areas of focus. This is not consistent with taking focused innovation effort seriously.

F7.5 The Government has varying areas of focus in its support for research, science and innovation and economic development. Some of this variety reflects different, yet well-considered, objectives. The Government has not yet settled on consistent, clear areas of the economy to focus innovation efforts at scale for the purposes of raising firm productivity and export success.

R7.4

As a complement to broad innovation policy, the Government should partner with stakeholders to:

- choose a small number of areas of the economy to focus innovation effort for the purposes of raising firm productivity and export success; and
- support these focus areas with a large enough proportion of its funding for research, science and innovation, export assistance and economic development to make measurable progress towards its policy objectives.

R7.5

The Government should partner with stakeholders to develop and put in place transparent arrangements for the governance, implementation, monitoring and evaluation of its focused innovation strategies.

Overall governance and oversight of the focused innovation strategies should include senior representation from Government, Māori, industry (firms and workers), researchers and educators.

Governance of focused innovation strategies should provide for shared decision making across stakeholders around the choice of areas for focus and around the resourcing, implementation, monitoring and evaluation of the strategies.

A capable public sector workforce underpins successful engagement with stakeholders

A key success factor for focused innovation policy will be to have officials with knowledge and experience of stakeholder engagement processes, and who can gain the respect of those stakeholders and build a long-term relationship. Other SAEs have decades of experience in focused innovation effort across government, industry and research organisations (Chapter 6). This experience means that their public sectors have built the capabilities and organisational cultures to engage successfully with the main players in the innovation ecosystem. New Zealand public sector agencies engaging in focused innovation policy need to give close attention to building the same workforce capabilities here.

Firm-focused assistance or a focus on chosen areas of innovation

A large part of government assistance to firms to innovate and to export is, for good reasons, targeted at individual firms and aimed at building capability. NZTE has the primary responsibility for building firms' exporting potential (Chapter 5); Callaghan Innovation has the primary responsibility for supporting innovation by firms (section 7.2).

A strong focus on the capability of individual firms runs the risk of not applying enough attention and resources to building the innovation ecosystems that exist among networks of firms. These networks contribute strongly to successful innovation (and so to exporting) (Chapter 6). NZTE does provide international market intelligence and support and so shares the cost of this intelligence across participating firms. Yet, its current focus does not appear to do a great deal to help spread the costs to firms of developing domestic innovation networks and sharing the costs of innovation services such as R&D. While NZTE cannot offer these services to all its client firms, offering them to firms in the Government's chosen areas for focused innovation policy makes sense.

Callaghan Innovation has staff with a sector focus, and helps firms connect with expert researchers, technology advisors and capital providers. Yet, like NZTE, it does not appear to have a strong focus on building the innovation ecosystems in which firms in the Government's chosen areas for focus operate.

The Commission considers that both NZTE and Callaghan Innovation should develop policies and practices that place greater weight on incentivising firms to organise into networks in the areas chosen for focused innovation policy. The Commission is seeking more information on what these policies and practices would look like; and how responsibility for them could best be shared between the two agencies.

F7.6

Most Government funding channelled through Callaghan Innovation and New Zealand Trade and Enterprise to support innovation and exporting by firms is targeted at individual firms. Some of Callaghan's assistance is targeted at firms in sectors that reflect the Government's choice of areas of the economy or technologies for focused innovation effort. Yet, this assistance aims to build firm capabilities; it does not directly support strengthening the innovation ecosystems in which these firms operate.

R7.6

The Government should:

- review its funding channelled through Callaghan Innovation and New Zealand Trade and Enterprise (NZTE) and targeted at individual firms to support innovation and exporting; and
- design and implement policies and mechanisms that give greater weight to encouraging firms to collaborate in the development of innovation and export strategies, in areas chosen for focused innovation policy.

If Callaghan and NZTE bring more of their resources to bear on the areas chosen for focused innovation policy, this will materially raise the prospect of success.

Q7.1

How could Callaghan Innovation and New Zealand Trade and Enterprise (NZTE) best marshal a proportion of their resources to build the innovation ecosystem of firms operating in areas chosen by the Government for focused innovation policy? How would this fit with their current services to individual firms? How should responsibility for this approach best be shared between Callaghan Innovation and NZTE?

7.4 A firm's-eye view of support for innovation

Firm-focused support for innovation is cluttered and hard to navigate

A strong theme from the Commission's engagement and case studies, as well as submissions, was that the plethora of government supports for innovation is siloed, fragmented, cluttered and confusing (Figure 7.5). The Commission was told some firms find it so difficult to navigate they give up on seeking assistance.

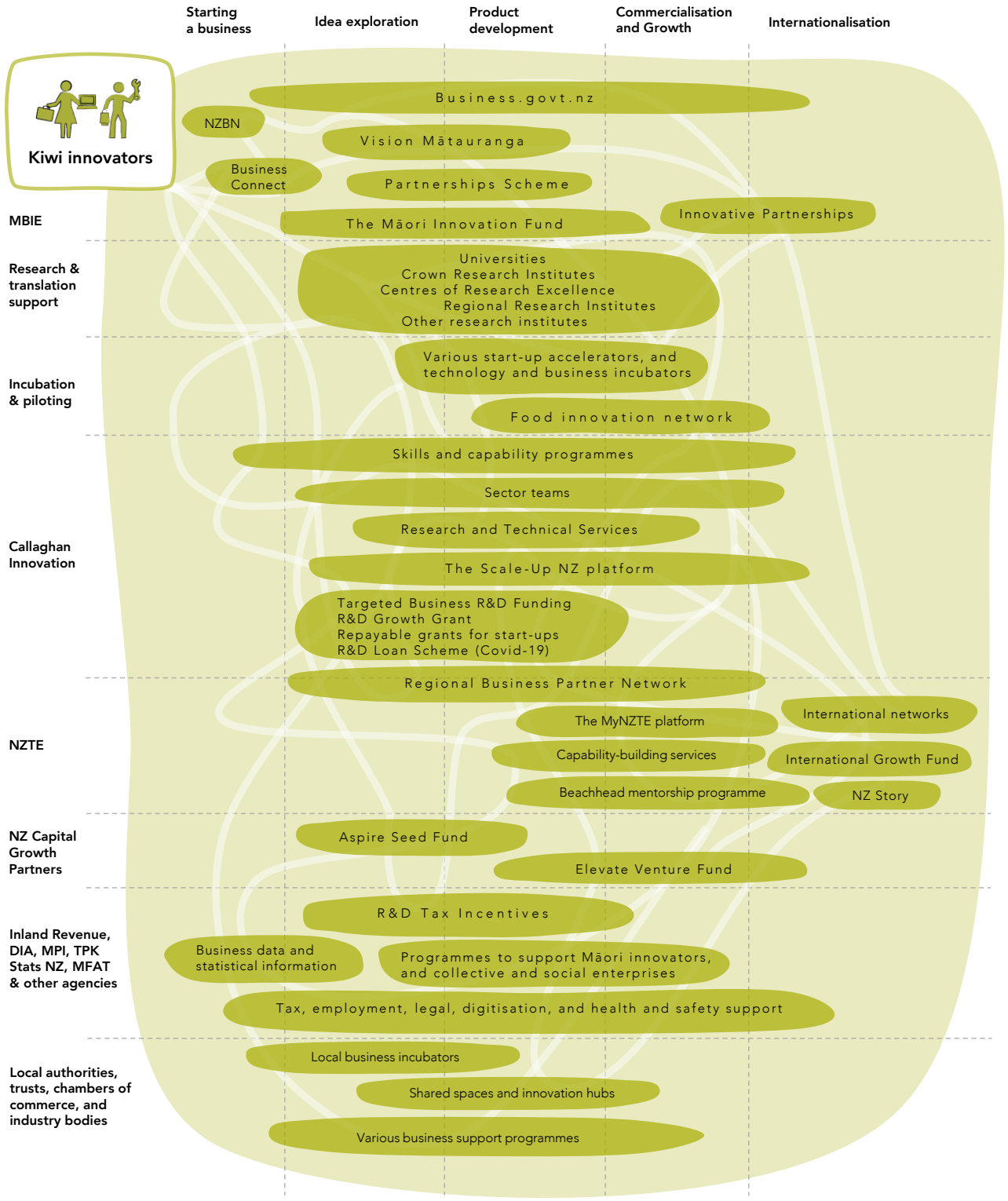
Government support for firms needs to be better coordinated and more accessible

Inquiry participants said that government support needs to be better aligned across agencies. Creating new funds without shutting down old ones results in scattered, sub-scale support. Instead, existing funding should be consolidated, to provide sufficient scale to be transformative.

Participants also suggested better road-mapping, so firms can understand what support is available and how to access it.

Initiatives designed to improve accessibility include those provided by or being developed by MBIE (Business Connect, and Business.govt.nz); Te Puni Kōkiri (Business Growth Support for Māori firms); and by MBIE, NZTE, and Callaghan Innovation together (Regional Business Partner Network) (see Appendix B). Business.govt.nz told the Commission that it is building systems that will allow businesses to save, share and re-use the information they enter into, and generate on, the site.

Figure 7.5 Firms' interactions with government support for innovation



Notes:

1. The diagram illustrates major innovation support programmes that government partly or fully funds, and that interact directly with Kiwi innovators. Appendix B provides a brief description of these programmes.
2. The diagram presents the innovation journey as having five stages. In practice, a firm's innovation journey is seldom straightforward or linear. Firms may move backwards and forwards between stages or, at the same time have different projects at different stages.
3. Abbreviations: DIA: Department of Internal Affairs, MBIE: Ministry of Business, Innovation and Employment, MFAT: Ministry of Foreign Affairs and Trade, MPI: Ministry for Primary Industries, NZBN: New Zealand Business Number, NZTE: New Zealand Trade and Enterprise, TPK: Te Puni Kōkiri.

F7.7

New Zealand firms seeking government assistance for innovation and exporting have a bewildering choice of programmes and points of contact. This likely makes it difficult for:

- firms to access the assistance they desire; and for
- government agencies to apply assistance in a way that best achieves the Government's objectives.

R7.7

The Government should review the suite of programmes designed directly to assist firms with innovation and exporting. The review should identify and implement ways to:

- reduce and consolidate the number of programmes;
- simplify the process for firms to apply for assistance; and
- make it easier for firms to identify and access relevant programmes, including by providing a common platform and "front door" across programmes.

7.5 A full independent review of New Zealand's innovation policy

The evidence presented in this chapter shows that New Zealand's innovation ecosystems are insufficiently strong and focused to propel frontier firms into exporting at scale in areas of enduring competitive advantage. Innovation policy is a major government lever to influence the shape, scale and focus of New Zealand's innovation effort.

The Commission has not had scope to undertake a full review of government innovation policy. A more thorough understanding of how New Zealand policies stand up alongside those of more successful SAEs would be valuable.

Periodic review of innovation policy is the norm in small advanced economies

Innovation policy has multiple components and institutions that interact in complex ways with the wider innovation ecosystem. Policies and institutional design and performance can interact with other influences on innovation and evolve in ways that are unanticipated at the time they are put in place. Periodic review of the design and performance of innovation policy can help governments take stock and reset the course to better achieve their objectives.

Many SAEs (and other countries) engage independent reviews of their innovation policy for this purpose. Sweden, Finland, Norway and the Netherlands (for instance) have all commissioned the OECD to undertake such a review in the last six years (OECD, 2014, 2016, 2017a, 2017c). Denmark recently commissioned a review from an independent panel of experts appointed under the umbrella of the European Union (Independent Experts Panel, 2019). The OECD carried out the last such review for New Zealand in 2007 (OECD, 2007).

The Government should progress current reviews and bring a "frontier firms" lens to decisions

The Government is actively considering reviews of parts of the innovation system (CRIs and the PBRF) and has yet to finalise its draft research, science and innovation strategy. Understandably, none of these reviews has a primary focus on frontier firm outcomes. A further comprehensive review of New Zealand's RSI policies would provide greater confidence around the coherence and aptness of the range of changes currently recommended or already being implemented.

Even so, the Government should bring to completion this suite of reviews and make decisions using the best available current information and judgements. In doing so, the Government should take care to bring a "frontier firms" perspective to its decisions, including taking into account the Commission's recommendations in this chapter. An important motivation for such a perspective is that New Zealand's

frontier firms, on average, trail well behind the frontier defined by the group of European SAEs that the Commission used as a benchmark (Chapter 3).

Scope of review

A review of innovation policy should start with core science and innovation funding policies as a major focus. Yet policies that impact innovation and successful exporting are much broader (Chapter 5 and Chapter 6), and a review should consider these as well.

A review should take full account of New Zealand's position as an SAE, and how this affects the preferred shape and scope of innovation policy. It should draw on the experience of other SAEs to assess the appropriate design of focused innovation to achieve the Government's objectives. The review should also have a Māori perspective and draw insights from mātauranga Māori in reaching its conclusions.

A wide range of questions around innovation policy exist

Overall, the review should seek to identify which aspects of New Zealand's innovation ecosystem are weakest and what policies or institutional changes would strengthen them. The review should be comprehensive. The list below sets out some of the issues that the Commission considers such a review should encompass.

Funding

- How much funding should the Government provide for RSI policy (taking account of the costs of grants and tax credits for private R&D)?
- Is the R&D tax credit policy working as intended and how can it be improved?
- What is the right balance for New Zealand between funding for basic research and applied research, and between industry-led, mission-led and investigator-led research?
- What is the right balance between contestable funding and core funding for research institutions (including universities) and science infrastructure? How can the administrative burden of contestable funding pools be reduced?

Roles and functions

- Are the Government's funding and innovation-support agencies well designed and complementary?
- Are the roles of public-research institutions well defined and focused, and are they complementary?
- Do opportunities exist for amalgamation or more formal collaboration among CRIs and between CRIs and universities that would improve the performance of the public innovation system?

Building connections

- What policies and practices will build better connections across all aspects of the system, including between researchers and business, researchers in different entities in New Zealand, and with international researchers and innovative businesses?
- How can the PBRF be better configured to improve incentives to build connections between researchers and businesses? Should the Government design and implement other instruments instead?

Focus of effort

- Does enough focused innovation support exist for mission-led and economic objectives? Is it going into areas that best meet the Government's objectives?
- How can the Government best marshal resources to build innovation ecosystems that support innovative exporting?
- How can incentives and performance be improved around the management of intellectual property created by universities and CRI researchers to enhance returns to New Zealand as a whole?
- What other policies and practices will improve the volume and success of commercialisation of R&D?

Capability and capacity

- Is New Zealand's existing research infrastructure adequate?
- What policies and practices will build the capability and capacity of the RSI workforce?
- What policies and practices will facilitate the participation of Māori researchers and strengthen mātauranga Māori in New Zealand's innovation ecosystem?
- How can the diversity of the RSI workforce be improved?

Governance

- What institutions and processes will improve the governance of the Government's RSI strategy (taking account of the broader range of policies that impact innovation and the need to focus in chosen areas of the economy; and also taking account of the role of mātauranga Māori in New Zealand innovation system)?

Performance of innovation policy, monitoring and evaluation

- Are New Zealand's current efforts to improve excellence and impact through innovation policy working in practice? How can excellence and impact be further improved?
- How well are systems for monitoring system performance and outcomes working, and how can they be improved?
- How can the capability for evaluation of the impact of innovation policy initiatives be improved?

Choice of reviewers

The OECD is experienced in undertaking such reviews and is well placed to make international comparisons. It has recently conducted reviews of innovation policy in several SAEs – which would help contextualise a review of New Zealand's policies. If the OECD conducted such a review, the Government should ask it to include a New Zealand entity or expert group to work with it alongside international experts. The New Zealand entity or expert group should include expertise on mātauranga Māori. The Commission would be available to assist with perspectives gained from the current inquiry. Alternatively, the Commission could undertake such a review in a future inquiry – with input from international experts on innovation policy in small advanced economies and from experts on mātauranga Māori.

A third approach would be to assemble an independent review panel with particular experience in assessing innovation policy in SAEs. The Danish Government engaged such a review in 2017 (Independent Experts Panel, 2019). Again, such a panel should include expertise on New Zealand's existing institutions and innovation policies, and on mātauranga Māori.

R7.8

The Government should commission a comprehensive independent review of New Zealand's innovation policies. The review should take into account:

- the Government's full range of objectives for its innovation policy, but pay particular attention to the objective of increasing the success of frontier firms in exporting in areas of sustained competitive advantage;
- New Zealand's circumstances as a small advanced economy and how this shapes a preferred approach to innovation policy;
- the role of mātauranga Māori in New Zealand's innovation ecosystem; and
- the broad range of policies that impact export success.

A review panel should have expertise in assessing the scope, shape and resourcing of innovation policy and the governance of innovation institutions and processes, as well as a thorough knowledge of New Zealand's existing institutions and innovation policies. It should have experience in assessing the effectiveness of innovation policies in small advanced economies. It should include expertise on mātauranga Māori.

8 Talent and leadership

Key points

- The tertiary education system lacks responsiveness to industry and research needs, specifically in the supply of sophisticated post-graduate skillsets for research and development. Scope exists for better integration of work and learning at higher education levels to:
  - build the pipeline of post-graduate talent needed to support innovation; and
  - increase retention of post-graduates in New Zealand by developing career pathways.
- Individual institutions have a variety of initiatives under way to improve the industry relevance of their qualifications and research, and partner with firms to help build career paths for students. Focused innovation policy provides a mechanism to scale up collaborations between research institutions and industry, for the purpose of developing skills in the selected focus areas (recommendation 7.4). Chapter 7 also makes recommendations for strengthening funding and capability building for business-oriented research in public research institutions, including universities (recommendations 7.3 and 7.8).
- High-quality management, leadership and governance are important determinants of firm productivity. Evidence suggests that many New Zealand firms lack the management capabilities needed to lift their productivity.
- Many of the skills needed for effective management and governance are built through commercial experience rather than formal training. If New Zealand can grow or attract more large multinational firms, this will help grow future leaders through on-the-job experience. It will also help create career paths, and support diffusion as skilled people move between firms. Connecting with talented and well-networked New Zealanders via the Kiwi diaspora is another way for firms to build their leadership capabilities.
- New Zealand's immigration policy settings are encouraging reliance on low-cost migrant labour. This is inhibiting capital investment and innovation.
- The current border closures due to Covid-19 present an opportunity to review and reset New Zealand's migration policy settings. The Government should place greater focus on lifting the productivity of actual and future frontier firms, by having a principle of primarily accepting highly-skilled migrants, and over time reducing the inflows of low-cost temporary workers.
- Any such review would need to work with those industries currently reliant on low-cost migrant labour, to consider the transition path away from the current heavy reliance on such labour, and the role of government in supporting that transition. This may include working with industries to accelerate the development of automation and other labour-saving and productivity-enhancing technologies; to build the necessary skill base for higher-tech production practices; and to make jobs more attractive to domestic workers.

8.1 Meeting industry needs for advanced research skills

Inquiry participants from industry and research communities expressed concern at the lack of domestic supply of sophisticated skills, especially for their research and development needs. Research institutions told the Commission that they source a significant proportion of their workforce from overseas, as New Zealand universities are not supplying the numbers or types of post-graduates they need (including via postdoc support mechanisms[18]). This includes the skill mix – for example, modern science requires not only traditional core subjects, but also data science, commercial and business skills, as well as soft skills such as communication.

In its *New models of tertiary education* inquiry, the Commission found that the tertiary education system lacks responsiveness to both student and employer needs, due to prescriptive regulatory and funding controls, which would take a whole-of-system overhaul to address. The Commission's *Technological change and the future of work* inquiry also highlighted the need for a more flexible and responsive education system, to better meet the skills demands of a dynamic economy and support innovation.

In its tertiary education and future of work inquiries, the Commission found scope for better integration of work and learning at both vocational and higher education levels. These inquiries recommended a range of reforms to improve the responsiveness of the tertiary education and training systems, to better meet industry needs. Education agencies are working to implement a number of these recommendations, in a way that is consistent with the Government's Reform of Vocational Education and its draft Tertiary Education Strategy.

Individual institutions have a variety of initiatives under way to improve the industry relevance of their qualifications and research, and partner with firms to help build career paths for students. For example:

- The MacDiarmid Institute for Advanced Materials and Nanotechnology has a range of programmes to help bridge academia and industry, including its Future Leaders Programme, business scholarships and Interface Industry Challenge.
- The Riddet Institute has strategic partnerships with a number of firms, some of which include activities to help PhD students build industry-relevant skills and connections. Around a third of Riddet's current PhD students are funded by individual firms. The Institute also partners with Massey University-based Pūhoro STEM Academy, with a particular aim of helping build Māori capability and capacity in advanced food science and related disciplines.

While these are positive initiatives, scope exists for a more systematic approach to improving the industry-relevance of advanced research skills. Various experts have suggested ways of providing more systematic support for building domestic career paths in advanced research. Nicola Gaston and Justin Hodgkiss, co-directors of the MacDiarmid Institute, have suggested a nationally contestable postdoc funding scheme (Gaston & Hodgkiss, 2020). And Wendy Larner, the former president of the Royal Society of New Zealand, has suggested more extensive use of collaborative PhD schemes (Royal Society Te Apārangi, 2020).

Focused innovation policy also provides a mechanism to scale up collaborations between research institutions and industry, for the purpose of developing skills in the selected areas of focus (see recommendation 7.4). Chapter 7 also makes recommendations for strengthening funding and capability building for business-oriented research in public research institutions, including universities (recommendations 7.3 and 7.8).

F8.1

Scope exists for a more systematic approach to:

- building the pipeline of post-graduate talent needed to support innovation; and
- increasing retention of post-graduates in New Zealand by developing career pathways.

[18] A postdoc is a temporary position that allows a PhD graduate to continue to build their skills and experience through further research.

F8.2

Creating more opportunities for research students to gain industry experience and exposure would help to:

- build their broader skillsets (such as entrepreneurial and communication skills) alongside their research capability; and
- strengthen the industry relevance of their research and knowledge transfer from it.

F8.3

Individual institutions have a variety of initiatives under way to improve the industry relevance of their qualifications and research, and partner with firms to help build career paths for students. Ways of providing more systematic support for building domestic career paths in advanced research could include introducing a postdoc funding scheme and extending the use of collaborative PhD schemes.

Focused innovation policy provides a mechanism to improve collaboration between research institutions and industry, for the purposes of skills development in the selected focus areas.

8.2 High-quality management matters for productivity

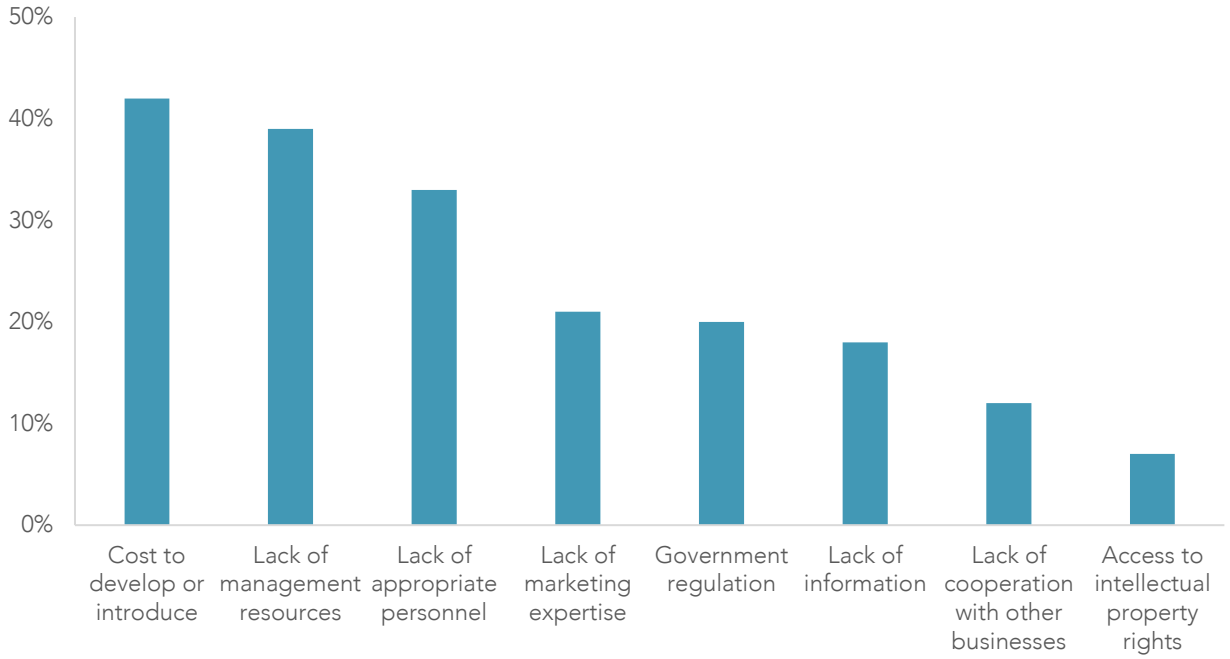
High-quality management is an important driver of productivity

Management capability and practices are a significant determinant of firm productivity (Bloom et al., 2017, 2019). Firms need the right management skills and culture to learn and adopt new ideas, technologies and processes from high-performing firms at the frontier. Adopting industry best practices around operational matters such as human resource (HR) management, health and safety, performance measurement and quality control involves what Teece (2019) terms "ordinary capabilities".

A firm with more strategic, entrepreneurial ability – "dynamic management capabilities" – is able, in addition, to sense (identify) and seize opportunities to innovate and transform its business, potentially pushing the frontier out (Teece, 2019). Teece postulates that these strategic, dynamic management capabilities are necessary for radical innovation and sustained productivity growth.

Evidence suggests that many New Zealand firms lack the governance and leadership capabilities needed to innovate, grow and internationalise. A benchmarking study of management practices in New Zealand manufacturing firms found that New Zealand firms have relatively poor management practices compared to their international counterparts, with HR management an area of particular weakness (Green & Agarwal, 2010). Lack of management resources was the second most significant barrier to innovation reported by firms in the 2019 Business Operations Survey (Figure 8.1).

Figure 8.1 Barriers to innovation, 2019



Source: Stats NZ (2020a).

Note:

1. Percentage of respondent firms reporting these factors as medium to high barriers to innovation in the Business Operations Survey.

The importance of management and leadership skills in driving firm productivity, and the paucity of these skills in New Zealand firms, was one of the strongest themes across the Commission's engagement and submissions. Submitters suggested several reasons for this shortcoming in management capability, including weak domestic competitive pressures to spur firms to improve and a lack of awareness about the scope for doing better.

The study of New Zealand manufacturing firms found that larger firms perform better than small firms, and multinationals perform better than domestic firms (Green & Agarwal, 2010). This suggests that the small scale of many New Zealand firms, and weak international connections, are contributing factors.

Businesses will need to deploy dynamic capabilities to identify areas of competitive advantage for New Zealand, understand risk, and drive innovation to push out the productivity frontier. Building the entrepreneurial and leadership capability of management and boards is therefore critical for lifting the performance of New Zealand's frontier firms.

Directors have an important role to play

Boards of directors play an important role in nurturing a firm's dynamic capabilities. Key roles include appointing the CEO, supporting the development of the firm's long-term strategy, and enabling innovative investment decisions. Boards also need strong capabilities of their own (Teece & Brown, 2020).

Smith and Garden (2020) investigated the role of boards in helping New Zealand firms grow, innovate and internationalise. They found that boards with strong dynamic capabilities can spur innovation, through supporting calculated risk-taking and bringing a long-term view to strategic investments.

Directors with international commercial experience can help firms avoid common missteps when expanding into overseas markets, through helping them understand the risks, the pre-work required and the timeframes needed to be successful. For example, they may be able to advise on target markets (such as consumer nuances, business culture, institutional arrangements), and appropriate business models and strategies to pursue. They may also be able to use their connections to help firms establish in-market networks and partnerships.

Experienced directors can play a vital role in helping firms access the capital they need, particularly start-ups. They can do this through their connections, and their ability to sell investment opportunities to investors by "speaking their language" (Figure 8.2).

Smith and Garden also found that the most important decision the board makes is appointing the CEO. Getting the right CEO is critical, as is exiting them promptly if they are under-performing or not well-matched to the company.

Figure 8.2 How high-performing boards support frontier firms

Growing and attracting more large firms will help build leadership skills

Many of the dynamic capabilities needed for effective management and governance are built through commercial experience rather than formal training. If New Zealand is able to grow or attract more large internationally focused firms, over time this will assist the development of leadership capabilities through on-the-job experience and the movement of these skilled people between firms.

Firms can also link into global Kiwi talent

Another way for New Zealand firms to access managerial and governance skills, as well as build links into international markets, is to tap into the global Kiwi diaspora (which is one of the world's largest relative to size of the resident population). The current flow of New Zealanders returning due to Covid-19 presents an opportunity for New Zealand firms to source the talent and experience among them. The normalisation of digital communication technologies also enables firms to connect with experienced and well-connected Kiwis who remain overseas.

Mentoring for entrepreneurs and managers

Growing more large firms and linking into global talent are also routes to grow the opportunities for upskilling through coaching and mentoring. In their report for the Commission, Teece and Brown (2020) recommended focused government support for building dynamic management capabilities. Their suggestions included an international exchange and mentoring platform for managers in New Zealand frontier firms, with foreign multinational corporations (MNCs).

New Zealand Trade and Enterprise (NZTE) currently provides firms with access to a range of coaching and support services, including through their Beachheads and Springboard services. In Chapter 5, the Commission recommends that NZTE regularly commissions independent evaluations of the effectiveness of their services (recommendation 5.2). Its coaching-type services should be included within the scope of these evaluations.

Learning from Māori firms

Māori firms offer valuable lessons for other New Zealand firms. As described in Chapter 4, Māori businesses often seek to balance multiple bottom lines. The drive to serve environmental and social objectives, alongside commercial goals, brings a long-term focus to business strategy and decision making.

Taking a long-term view and managing multiple bottom lines do not need to be seen as trade-offs to innovation and productivity. Rather, they are complementary. Long investment horizons are important for supporting experimentation and innovation, and long-term value creation. This contrasts with a short-term focus on financial performance and shareholder returns that can dominate the focus of company boards and management. Furthermore, innovation is key to serving multiple bottom lines, as innovative solutions are required to solve many of the environmental and social challenges facing New Zealand.

F8.4 High-quality management and governance are important determinants of firm productivity. Evidence suggests that many New Zealand firms lack the leadership capabilities needed to lift their productivity.

F8.5 Many of the skills needed for effective management and governance are built through commercial experience rather than formal training. If New Zealand is able to grow or attract more large internationally connected firms, this will assist capability development through on-the-job experience and the movement of these skilled people between firms.

F8.6 Another way for New Zealand firms to access managerial and governance skills, as well as build links into international markets, is to tap into the global Kiwi diaspora. The current flow of New Zealanders returning due to Covid-19 presents an opportunity for New Zealand firms to source talent and experience among returnees. The normalisation of digital communication technologies also enables firms to connect with experienced and well-connected Kiwis who remain overseas.

R8.1 New Zealand Trade and Enterprise currently provides its customers with access to a range of coaching and support services to help build firm-level capabilities. These services should be evaluated for their effectiveness.

F8.7 Māori approaches to business can offer lessons for other New Zealand firms. For example, the drive to serve multiple bottom lines brings a long-term focus to strategy and decision making. Long-term investment horizons are important for supporting experimentation and innovation, and long-term value creation.

8.3 Migration policy settings are inhibiting productivity improvements

Migration policy can influence firm productivity in several ways

Migration policy can affect innovation within firms, and diffusion between firms, in several ways.

- It can help boost productivity by bringing in people with skills, knowledge and connections that local workers do not have (including in relation to overseas markets), and to complement New Zealanders' skills. New Zealand's Skilled Migrant and Long-Term Skills Shortage visas seek to do this.
- Migration policy can also seek to attract innovators and entrepreneurs. The investor and entrepreneur visa categories (eg, the Global Impact visas) aim to attract such people.

However, the characteristics of immigrants matter. Migration can stifle productivity growth if it brings in people with skills that are the same or lower than the average local population. Inflows of low-skilled, low-cost labour can depress wages for locals, and thereby reduce the incentives for firms to make productivity-enhancing investments such as adopting new technologies (Fry & Wilson, 2020).

Fry and Wilson found that the skill levels of permanent migrants have fallen, and the skills of temporary migrants is increasingly at or below the New Zealand average. They attribute this to a series of migration policy changes that have shifted the emphasis away from the original objectives of adding value to the New Zealand economy. In particular, they point to:

- large numbers of working holiday agreements (negotiated as a way of cementing goodwill between reciprocating countries);
- significant work rights granted to international students (to make New Zealand a more attractive place to study); and
- the Recognised Seasonal Employer (RSE) scheme, which has multiple objectives including addressing labour shortages in New Zealand and supporting economic development in participating Pacific Island countries.

Fry and Wilson note that large inflows of immigrants, such as New Zealand has experienced over the last 10 years, has led to continued downward wage pressure. Meanwhile, skilled labour shortages continue. Difficulty finding skilled labour was a common theme in the Commission's engagement meetings, particularly in the software industry.

The primary sector is heavily reliant on low-cost migrant labour

Reliance on low-cost migrant labour, including seasonal labour, is inhibiting capital investment and innovation, particularly in the primary sector.

Horticulture New Zealand considers the industry's single biggest constraint is a reliable supply of seasonal and permanent workers (Horticulture New Zealand, 2018). The industry is highly seasonal, with the peak periods for picking and packing for some crops lasting just a few weeks each year.

Horticulture growers struggle to find sufficient local labour for seasonal fruit and vegetable picking, including in the wine industry. This is partly because the work is unattractive to many domestic workers, due to low wages and piece rates in some roles, and the strenuous and short-term/insecure nature of the work. But it also reflects other difficulties with the pool of long-term unemployed. Inquiry participants told the Commission that despite ongoing efforts to train and employ locals, they encounter problems with drug use and absenteeism. This is symptomatic of deep-seated social problems, including poverty and other inequalities, that are beyond the ability of the private sector to address.

Due to the mismatch in the supply and demand of domestic labour, the horticulture industry is heavily reliant on temporary migrant workers, including through the RSE scheme and the Working Holiday Scheme. Strong demand for RSE workers has seen the annual cap continue to grow – from 5 000 when the scheme was

established in 2007, to 14 400 in 2019 (Immigration New Zealand, 2020). The number of Working Holiday Visas has also increased dramatically, from just under 9 000 in 2000 to over 79 400 in 2019.

New Zealand Kiwifruit Growers (NZKGI) predicts the kiwifruit industry will need an additional 8 000 seasonal workers by 2027 to cope with the planned increase in production (NZKGI, 2018). The wine industry is also experiencing a chronic shortage of skilled permanent staff, including machinery operators, mechanics, managers and supervisors (New Zealand Wine & Ministry for Primary Industries, 2019). Pre-existing industry concerns about labour shortages have been exacerbated by the border closures prompted by Covid-19 (Frykberg, 2020).

The dependence on low-cost labour is inhibiting capital investment

The seasonal peak combined with the low cost of labour act as disincentives to the development and uptake of automation. For example, the average pay rate for kiwifruit seasonal workers in 2018/19 ranged from $18.01/hour for unskilled packhouse workers to $22.89/hour for picking gold kiwifruit (the minimum wage was $17.70) (NZKGI, 2018). This makes it challenging to achieve an acceptable rate of return on capital investment in labour-saving and productivity-enhancing technology.

Fry and Wilson's (2020) case study on the New Zealand fruit industry points to other problems with the reliance on seasonal workers, particularly RSE workers. While the scheme has clearly provided benefits for both employers and workers, two recent studies have also shown negative impacts on some RSE workers and their communities (Bailey, 2019; Bedford et al., 2020). Continued reliance on the scheme also suppresses wages for locals.

The primary sector's vision, as developed by the Primary Sector Council, highlights the centrality of global consumer expectations to continued demand for New Zealand products (New Zealand Government, 2020a). There is growing consumer demand for socially responsible production processes. It is therefore important for the horticulture industry that it maintains – and is seen to maintain – high-quality employment conditions for its workers.

Inquiry participants and submitters said that the uptake of automation overseas is being driven by rising labour costs and employment standards, as well as more favourable depreciation rates. In countries such as the UK and the US, labour shortages due to Covid-19-related border closures are also accelerating interest and investment in robotics for harvesting crops (Hodge, 2020; Terazono, 2020). Higher wages could also spur investment in growing and harvesting technologies to reduce the strenuousness of the work (and hence make it more attractive for local workers), such as hydraulic platforms for reaching tree crops and raised beds for growing ground crops. And as Nunns et al. (2020) point out, automation creates new types of jobs that are more skilled.

Two submitters advocated for raising the minimum wage, to reduce the incentives on industries such as horticulture to rely on low-cost labour. Another way of increasing wages could be by industry such as through Fair Pay Agreements. These would have the benefit of better matching the wage floor to the industry rather than raising wages across all industries.

There are technical challenges with automation. The tasks in the horticulture industry are many and varied. Some, such as picking, are proving difficult to automate due to the nature of the action required (making it hard to achieve the speed of human pickers). This means that the pathway to commercialisation could still be many years for some technologies.

An opportunity to hit reset

The current border closures present an opportunity to review and reset New Zealand's temporary and permanent migration policy settings. The Government's draft Research, Science and Innovation (RSI) Strategy has an aim of making New Zealand "a magnet for talent". The Strategy points to the way in which RSI-related businesses and skills are considered under migration policy settings as a factor in achieving this goal (MBIE, 2019b).

If the Government wishes to give greater priority to lifting the productivity of New Zealand's actual and potential frontier firms, it should review and adjust migration policy settings.

- Migration policy should have a principle of primarily accepting highly-skilled migrants (and reducing inflows of low-skilled migrants).
- Migration policy should also reduce the inflows of low-cost temporary workers, by reassessing the employment rights of fee-paying students and the number of working holidaymaker visas. It would also look to improve the balance between the productivity and development-assistance objectives of the RSE.

These changes would not apply to humanitarian immigration, such as refugees and asylum seekers.

These adjustments to migration policy would need to consider the transition path for industries currently reliant on low-cost migrant labour, and the role of government in supporting that transition. This may include working with industries to accelerate the development of automation and other labour-saving technologies, build the necessary skill base for higher-tech production practices, and make jobs more attractive to domestic workers. It may also include assisting low-paid workers currently employed in these industries to find similar or better jobs in the industry or elsewhere.

F8.8 Reliance on low-cost migrant labour, including seasonal labour, inhibits capital investment and innovation, particularly in the primary sector. The current border closures due to Covid-19 present an opportunity to review and reset New Zealand's migration policy settings.

R8.2 The Government should refocus migration policy more towards improving the productivity of actual and future frontier firms, by:

- having a principle of primarily accepting highly skilled migrants; and
- reducing the inflows of low-cost temporary workers.

R8.3 The Government should commission a review of migration policy. The review should involve working with those industries currently reliant on low-cost migrant labour, to consider the transition path away from the current heavy reliance on low-cost labour, and the role of government in supporting that transition. This may include:

- working with industries to accelerate the development of automation and other labour-saving technologies, build the necessary skill base for higher-tech production practices, and make jobs more attractive to domestic workers;
- assisting low-paid workers currently employed in these industries to find similar or better jobs in the industry or elsewhere.

9 Innovation-enabling regulation

Key points

- Opportunities exist to reform regulation and so create new markets, stimulate innovation, and benefit New Zealand firms and consumers.
- Regulation should be designed and operated to encourage long-term value creation. Too often regulations block or hinder innovative approaches by failing to keep up to date with technology developments.
- A good system of regulatory stewardship focuses not only on monitoring and compliance with current regulations, but also on what new or amended regulations are needed to encourage innovation and long-term value creation.
- The Commission came across opportunities for regulation to better support innovation in four case studies it undertook in dairy, software products and services, horticulture and healthtech.
- The Dairy Industry Restructuring Act 2001 (DIRA) permitted the creation of the giant Fonterra dairy cooperative, which initially purchased 96% of the milk supply from New Zealand dairy farmers. DIRA regulated Fonterra's monopsony power by guaranteeing farmers fair rights to enter and exit supply contracts with Fonterra, and by regulating the supply of milk to other dairy processors.
- Positive developments under DIRA include the emergence and growth of new dairy processors, and innovations in products, organisational forms and business models. Yet Fonterra itself has failed to deliver on expectations that it would be a "national champion".
- Fonterra's share of total milk supply needs to fall further for healthy competition and entry of new, innovative businesses based on access to milk. Recent changes to DIRA have, however, bolstered Fonterra's market power and weakened the forces for competition and innovation.
- Regulatory reform to improve consumer rights and access to their data would be beneficial. As the reach, quality and variety of digital goods and services has expanded, digital data about consumers has been increasing and become an increasingly important product. If firms can access this data (with the consumer's permission), they can offer consumers new and better goods and services.
- Genetic modification (GM) research is an important pathway to innovation in New Zealand's primary industries. It offers opportunities for boosting productivity, reducing biosecurity risks, and responding to climate change risks effectively and efficiently. The country is bearing large opportunity costs from the current restrictions on GM tools such as gene editing.
- The Government should review the GM regulatory framework, with a view to bringing it up to date and enabling New Zealand to seize market opportunities and remain competitive, in a safe and timely manner.
- Timely access to new plant genetic material is critical for New Zealand's primary sector to retain and build its competitive advantage in international markets. Innovation is currently hampered by inefficient systems and limited post-entry quarantine (PEQ) capacity for importing new plant genetic material. The Ministry for Primary Industries' work on designing new PEQ facilities, and improving the import health standards system, is a welcome and important investment.
- New Zealand's healthtech sector is vibrant and growing, but is hampered by most District Health Boards' reluctance to collaborate in the healthtech innovation ecosystem. The Government should improve the mandate and incentives for DHBs to do so. This will provide vital support for the healthtech sector and lead to better health outcomes.

9.1 Characteristics of good regulation

Regulation is indispensable to the proper functioning of economies and societies. It underpins markets, protects the rights and safety of citizens and their property, and ensures the efficient, safe and equitable delivery of goods and services. However, if regulation has misplaced objectives, is used when not needed, or is poorly designed and executed, then it can fail to achieve worthy policy objectives and have unintended consequences that harm the wellbeing of New Zealanders (Mumford, 2011; NZPC, 2014b).

Healthy competition in an economy is fundamental to allowing innovators to thrive, and to resources shifting from low-performing to high-performing firms. But healthy competition requires the regulatory underpinning of strong competition policy and operation (Box 9.1).

Box 9.1 **Strong competition policy and operation are essential to productivity growth**

Competition affects all three forces that shape an economy's productivity growth: reallocating people, physical resources, and finance from lagging to leading firms; pushing out the technology frontier; and diffusing technology from leading to lagging firms.

For instance, on the first (reallocation) issue, weak competitive pressure could allow relatively unproductive firms to continue trading and doing what they do with limited risk of going out of business in New Zealand.

Competition can also spur growth in the technological frontier and the spread of improved business practices from leading to lagging firms. Competition encourages managers to undertake productivity-raising actions that they may otherwise not. As Maré and Fabling (2019) put it, "Competition acts as a discipline on firms."

Because adopting new technology or practices can be risky and costly, producers facing less competition may prefer not to innovate so they avoid these risks and costs. This can hold back both growth in the technological frontier and the diffusion of innovation.

Because competition policy aims to keep markets competitive, it generally has rules about the behaviour of large firms – they must not abuse their market power. Yet large firms can be good for efficiency because of economies of scale. Particularly in small economies, competition policy must strike the right balance between size and healthy competition. When large firms in small economies are exporters, the discipline of international competition usually makes achieving this task a lot easier.

The design and operation of a country's competition policy is therefore a key piece of regulatory infrastructure for supporting innovation and productivity growth.

The two main ways that regulation can fail are failures of design and failures of operation. Poorly conceived and implemented regulatory arrangements not only fail to achieve stated objectives, but also impose significant costs that can undermine the very purpose of regulatory intervention.

The institutional arrangements and regulatory practices that constitute regulatory regimes shape the behaviours of regulators, the quality of their decision making, and the behaviour of those regulated. Done well, such regimes build legitimacy and trust in the regulator and regulatory regime – another important factor in achieving desired regulatory outcomes.

If New Zealand is to maximise the contribution of frontier firms, the Government will need to pay close attention that its laws and regulations:

- remove unhelpful barriers to innovation and technology adoption;
- adequately and efficiently control harms created or enabled by new technologies; and
- keep up to date with technological progress.

A tension can exist between the different roles of regulation. The risk is that regulatory regimes overly focus on monitoring and compliance with respect to existing regulations at the expense of good regulatory stewardship: keeping regulations up to date, removing unnecessary regulations, and designing and implementing new regulations when needed. These, as well as good regulatory operational practice, are needed to encourage long-term value creation (APC & NZPC, 2019; Crampton & Ting-Edwards, 2017).

Regulatory stewards – who include Ministers and public servants in policy and regulatory agencies – must ideally exercise *dynamic capabilities* to sense when regulations need to change, seize opportunities to do so, and thereby transform the possibility set within which entrepreneurs, researchers and businesses can create value. Establishing New Zealand's space programme is a good example of dynamic regulatory stewardship (Box 9.2).

Box 9.2 **Regulation and New Zealand's space programme**

New Zealand's space law regime is a recent development. While New Zealand ratified some of the core United Nations (UN) space treaties in the 1960s and 1970s, it did not have a dedicated space agency until 2016 and did not have dedicated space legislation until 2017.

In 2016, the Rocket Lab company, which was founded in New Zealand but had moved its headquarters to the US, indicated its wish to establish a commercial space-launch business in New Zealand. To take advantage of this opportunity, the New Zealand Government initiated the process of developing the country's first space policy.

The Government's policy objectives were to meet New Zealand's obligations as a launching state under international treaties, while capitalising on the economic opportunities associated with a commercial space-launch industry.

The Government's work programme resulted in the rapid introduction of the Outer Space and High-altitude Activities Bill (the Outer Space Bill) in June 2016. The Outer Space Bill was designed to create a certain and predictable, yet flexible, space law regime that contained the minimum regulation needed to comply with New Zealand's international obligations.

On 21 December 2017, the Outer Space and High-altitude Activities Act 2017 (the Outer Space Act) came into force and established New Zealand's first regime for the registration, licensing and operation of launch vehicles, payloads and high-altitude vehicles (HAVs).

Rocket Lab established the world's first private orbital launch range on Māhia Peninsula in New Zealand, and the company completed its first commercial launch on 11 November 2018. It has since completed 14 successful launches, has a full order book, and is developing its own satellites and re-usable rockets. Rocket Lab now operates in California and Auckland as well as from its Māhia launch site. It has around 500 employees, most of whom are based in New Zealand.

Source: Martin (2019), Pullar-Strecker (2020).

F9.1

Regulatory regimes support innovation through good design and operation, and by keeping up to date. Good regimes are open to new ways of achieving desired regulatory outcomes and keep abreast of new technologies. They allow businesses, workers and consumers to enjoy the benefits of new technologies while curbing their potential misuse (where costs would exceed benefits).

Regulation quite often fails to keep pace with technology, and this can be a costly barrier to innovation and competitive advantage.

R9.1 The Government should prioritise keeping areas of regulation up to date with technological and other changes, where not doing so would curb innovations that have potentially high payoffs. Where such changes require new or updated regulations, their design and operation should allow flexibility in achieving the desired regulatory outcomes, without compromising adequate monitoring and enforcement.

As part of this inquiry, the Commission conducted case studies into four important sectors of the New Zealand economy. It selected exporting sectors of significant size, and/or with high-growth potential: dairy (both farming and processing); horticulture (with a focus on kiwifruit and wine); health technology; and software products and services. Each case study examined primary drivers of productivity including investment in innovation and R&D, the innovation ecosystem, international connectivity, and organisational form and ownership.

The Commission was also alert to instances of regulation, or lack of regulation, that could be hindering innovation, growth and productivity in the key areas of the economy that the case studies represent. The following sections describe regulatory or structural issues of concern from each case study.

9.2 Improving competition in the dairy industry

The structure and performance of the dairy industry in New Zealand has changed significantly over the last few decades and has been heavily influenced by government policy. The Dairy Industry Restructuring Act, 2001 (DIRA) allowed the creation of the giant Fonterra company, a vertically integrated farmer-owned cooperative. Proponents of Fonterra argued it needed this scale and scope to become a "national champion" and global player in dairy. At the same time, DIRA abolished the New Zealand Dairy Board (with its single-exporter status) and folded its assets into Fonterra. This effectively deregulated dairy exporting by permitting all dairy processors to sell their products on international markets.

But these moves also left Fonterra with huge monopsony power as a purchaser of raw milk from farmer suppliers (at formation, it controlled 96% of all farmers' milk production in New Zealand). It also had huge monopoly power in the sale of milk to other dairy processors, and to manufacturers of dairy products for the domestic market. DIRA therefore included the following provisions (some of which have since been amended) to manage the risks arising from Fonterra's dominance.

- Open entry and exit requirements: every farmer in New Zealand had the right to become a shareholder in Fonterra and supply milk; could freely exit to supply another dairy processor; and could choose to return to Fonterra. This enabled farmers to respond to Fonterra's performance by switching their milk supply from and to Fonterra, thus exposing Fonterra to actual or potential competition through the entry and growth of other dairy companies.
- Fonterra's base milk price calculation and Trading Among Farmers (TAF): Fonterra sets its price for farmers' milk supply, but must use a transparent base (benchmark) milk price that it calculates and the Commerce Commission monitors. Both must follow DIRA's pricing principles and requirements for governance and information disclosure. The DIRA also contains TAF-related provisions to ensure that the market price for Fonterra shares reflects Fonterra's financial performance. These requirements aim to inform farmers' decisions about where to direct their milk supply and share capital.
- Access to raw milk from Fonterra: The Raw Milk Regulations require Fonterra to make up to 5% of its annual milk collection available for purchase by other dairy processors at a regulated or agreed price. The two aims of this are to: (i) provide new dairy processors with an entrance pathway into the market for farmers' milk; and (ii) enable dairy processors to offer New Zealand consumers product choice. Individual dairy processors can purchase up to 50 million litres of raw milk a year from Fonterra. Eligibility ceases when an independent processor has obtained its own raw milk supply of 30 million litres or more per season for three consecutive seasons. Goodman Fielder, a major supplier of retail dairy products in New Zealand, is entitled to purchase up to 250 million litres of raw milk per year from Fonterra, on regulated or agreed terms. This entitlement is designed to support competition in the New Zealand domestic market for retail dairy products, given that Fonterra is a major supplier to this market.

Since 2002, under DIRA, the dairy-processing industry has seen major changes – notably the entry and growth of several new players who have demonstrated innovation in organisational form, ownership, products and business models. The major entities all have an export focus. One of the success stories is the emergence, rapid growth and high profitability of The a2 Milk Company (Box 9.3).

Box 9.3 **a2 Milk: highlighting the value of intangibles**

The a2 Milk Company was founded in 2000, positioning itself as offering a healthier alternative to other cows' milk via its a2 beta-casein certification.

The company has seen exponential growth as a global leader in branded nutritional dairy products. Its shares are publicly listed on the NZX and ASX. Its share price has grown rapidly, and it is now one of the most valuable companies listed on the NZX, with a market capitalisation of around $13 billion.

Owning no cows, no farms and no processing factories, the company can be considered the "Uber of New Zealand's dairy sector". At least so far, the company has been strictly a marketing and distribution company, having entered into strategic supply agreements with dairy processors in both foreign and domestic markets.

The a2 Milk Company has recorded strong revenue and profit growth, reporting a further 30% increase in profit in the 2020 financial year. The company's market value today reflects its successes in Australia and New Zealand with liquid milk and infant formula; in China with infant formula; and its growth prospects in China, the US and the UK.

Source: Barry and Pattullo (2020).

As a hoped-for national champion, Fonterra has fallen short of expectations. Industry leaders projected that Fonterra's revenue was to grow at 15% a year to $30 billion by 2010 as the company diversified into high-value consumer products. In fact, revenue has grown by less than 2.5% a year, and the company has had to write down millions of dollars from unsuccessful overseas investments. With a change in leadership around two years ago, Fonterra is showing signs of recovery, but it has reshaped its ambitions to concentrate on its staples of milk powder and specialised ingredients.

Fonterra's lack of success seems partly due to a misalignment between:

- a business strategy of value-added products, such as establishing New Zealand style-dairying operations offshore and investing in "fast-moving consumer goods" (FMCGs); and
- the priorities, needs and capital constraints of its farmer shareholders, who favour conservative, lower-risk and the lower-capital requirements of making and selling dairy powders and ingredients.

Successes from deregulation

The deregulation of dairy processing and exporting has produced some successful outcomes (Barry & Pattullo, 2020).

- Several major new firms have entered the sector offering different products, with different business models and different corporate strategies. These include The a2 Milk Company, Synlait Milk, and Open Country Dairy.
- The different companies have focused on and added value to the economy at different parts of the "value chain". Open Country Dairy, for example, has been successful at manufacturing and exporting low-cost commodity cheese and milk powders while, at the other end of the "value chain", companies like The a2 Milk Company, Synlait Milk, The Tatua Co-operative Dairy Company, and the Māori-owned Miraka have developed business-to-business (B2B) and high-end brands and distribution channels.
- Competition in corporate form has seen no single form (eg, cooperative, listed companies or private companies) proving dominant across the sector.

- Competition for milk at the farmgate has gradually increased, with Fonterra's market share falling from 96% to 81% of the 21 billion litres of milk now produced each year. Nationwide, around 74% of farmers now have access to more than one processor to take their milk.

Remaining challenges and concerns

The dairy sector still faces significant challenges and concerns. Some of these, but not all, can be solved by changing regulatory settings. Others will require the dairy innovation system to work better. Challenges and concerns include the following.

- Even putting Fonterra aside, large dairy processors have earned mediocre returns (as measured by Return on Capital Employed) on average. It is also notable that these processors use business models that look a lot like Fonterra at the lower end of the "value added" spectrum.
- Fonterra's regulated pricing of farmgate milk based on a hypothetically efficient processor risks overpricing it with several undesirable consequences:
  - inflating the value of dairy land;
  - reducing Fonterra's retained earnings when it would be better invested in the value chain from the factory gate onwards; and
  - raising the price of raw milk – the essential input that other processors and would-be new entrants require to operate. Inquiry participants told the Commission that this is an unwarranted premium that processors must pay, and so depresses investment and innovation.
- Dairy expansion has reached its environmental limits in terms of pressures on water quality, availability of water, biodiversity, natural landscapes and greenhouse gas emissions. The likelihood is that the industry has reached "peak cow" and the limits of its social licence, and must now grow value rather than volume.
- The threat posed by the rapid development of synthetic, factory-produced protein and plant-based milk that is cost-competitive with the natural product and has a much lower emissions footprint.
- Unspectacular earnings in the industry in the form of returns on capital and average wages. Farmers overly rely on capital gains and on boosting average yields (sometimes to the detriment of profit), in order to raise land values. Hiring migrant workers for farm work at wages and conditions below those necessary to attract New Zealand workers is quite common. This in turn contributes to unwillingness to invest in productivity-boosting, labour-saving automation.

The frontier firms in the industry that have earned high returns are those that have invested most in innovation, R&D, IP, and other intangible assets (eg, specialised global supply chains). They are The a2 Milk Company, The Tatua Co-operative Dairy Company, and parts of Fonterra. Tatua has remained small, specialised and highly profitable for its restricted number of farmer shareholders over many years.

Why Tatua has remained small despite its profitability, or why similar innovative dairy companies have not sprung up, are interesting questions. With its Māori ownership, Miraka offers another example of dairy innovation. It has a novel product range, a sustainability ethos, and a strategic partnership with the Vietnamese dairy company Vinamilk. More pessimistically, the continued high price of farmgate milk (referred to above), and recent legislated changes to DIRA have likely put a brake on the emergence of other innovative new entrants.

In July 2020, DIRA was amended to reduce some of the regulatory requirements on Fonterra.

- From June 2023, the open-entry provision will be removed that required Fonterra to accept milk, including from farmers who previously supplied Fonterra and left, perhaps to supply another dairy processor. If Fonterra does accept supply from such farmers, it may apply different terms compared to farmers who remained with Fonterra (other amendments to DIRA already enabled Fonterra to refuse milk not compliant with Fonterra's standards of supply, or supplied from newly converted dairy farms).

- From June 2021, the requirement will be removed for Fonterra to supply regulated milk to independent processors, up to the point where these processors have their own supply of farmers' milk of 30 million litres or above a season *for three consecutive seasons*. Rather, the obligation will exist only up to the point where an independent processor has their own supply of 30 million litres or above *in a single season*.

The first of these changes came late in the parliamentary select committee stage of the amending Bill. It risks curbing competition and discouraging innovation. It will enable Fonterra to use its still-dominant position to lock in its farmer supplier-shareholders and thereby deter entry by new enterprises, or expansion of existing ones. The Government commissioned MPI in 2018 to review the DIRA. The review included extensive industry and public consultation before and after the release of a discussion document in November 2018. The MPI review expressed concern about Fonterra's dominant position and how it might use it to the detriment of the long-term interests of dairy farmers, consumers and the wider economy.

> The review found that despite the changes in the dairy industry structure and Fonterra's reduced market share, **Fonterra is still dominant**. Fonterra enjoys a significant incumbency advantage and may have an incentive to use it to lock farmers in or out of the co-operative and/or pay inefficiently high farmgate milk price, which may foreclose entry or expansion by other dairy processors. Fonterra's co-operative status is unlikely to provide sufficient counterbalance to such behaviour, as Fonterra's farmer-shareholders may not anticipate the long-term costs they might bear if rival processors are foreclosed – particularly if they are rewarded in the short-term with relatively high farmgate milk prices. As a result, there **remains a significant risk** that Fonterra may behave in a way that is detrimental to the long term interests of New Zealand dairy farmers, consumers and the wider economy. (Ministry for Primary Industries, 2019, p. 10)

Synlait expressed similar concern in a note following its submission on the DIRA amendment Bill:

> The risk is that the removal of open entry will be used as a heavy stick by Fonterra. A current Fonterra supplier looking to cease and begin supplying an independent processor, like Synlait, may be told that should it not work out with the independent processor, they will not be accepted back to Fonterra, as the DIRA change will allow for this. This would be a deterrent to suppliers leaving Fonterra and moving to independent processors thereby restricting further growth by current independent processors and making it more difficult for new processors to start up.
>
> As Synlait is now a well-established processor with a history of collecting milk and paying a competitive price, on time, we hope this will limit the impact of any risk; but certainly not nullify it completely. The impact of this change on any new independent processors will we believe be considerable and have far reaching impacts on further competition in the industry. (Pers. comm., 2020)

The 2020 amendments to DIRA also provide for a review of the need for DIRA every four to six years. The thinking is that once Fonterra becomes acceptably less dominant in the market for farmers' milk (eg, its share could fall from 80% to 60%), the need to restrain its behaviour falls away.

Given the concerns about the removal of open entry, the Commission regards four to six years as too long to wait for another review of DIRA. With few new dairy conversions, because of environmental limits, milk supply for new entrants and Fonterra competitors will largely have to come from current Fonterra farmers. Under the change to open entry, that is less likely. Fonterra will likely retain its dominance, but with an increased ability to foreclose the aspirations of competitors and innovative entrants. That would be undesirable. Given its challenges, the dairy sector needs more healthy competition and innovation, not less.

F9.2

The Dairy Industry Restructuring Act 2001 has opened dairy processing to greater competition and freedoms to innovate in products, supply chains, international connections, ownership, corporate form and business models. This is welcome.

The previous prevailing ethos in the dairy industry (albeit with exceptions) of expanding volume rather than innovating for value failed to recognise environmental limits. This ethos appears to be changing, which is also welcome.

F9.3 The July 2020 amendment to the Dairy Industry Restructuring Act 2001 removed the right of farmer-shareholders of Fonterra to leave the cooperative and return on similar terms. This will increase Fonterra's power to deter them from leaving. Such power risks causing detrimental effects on competition, new entry and innovation in dairy processing, yet these are needed more than ever in the face of environmental limits to further expansion of land under dairy.

R9.2 The Government should reverse the July 2020 amendment to the Dairy Industry Restructuring Act 2001 that will give Fonterra the right to refuse the re-entry of any of its farmer supplier-shareholders who have left the cooperative to supply another processor and then wish to return.

9.3 The case of consumer data rights

The Commission has previously argued for the desirability of reviewing and refreshing competition and regulatory settings for the digital age (NZPC, 2020b). In this inquiry, the Commission's case study on software products and services reinforced this conclusion.

Regulation can create new markets and opportunities to innovate with new products and services that raise consumer wellbeing. As the reach, quality and variety of digital goods and services has expanded, data about consumers and firms has become an increasingly important resource for firms, consumers and workers. Firms can use data to offer new and better goods and services, and some workers can use it to obtain jobs (eg, via ratings for platform workers that can build and publicise their reputation).

Regulatory reform is needed to expand the rights of consumers and businesses to the data they generate (including the right to authorise its use by trusted third parties). Access to data and the right to transfer it would give consumers greater choice and control. This will give rise to new products and services, allowing consumers (among other benefits) to compare products, seamlessly switch product providers, and transact with greater convenience and efficiency.

Under current regulatory settings, barriers exist to consumers gaining access to their data from data holders such as banks, and power and telco utilities.

- Such data is often tightly held by some firms that do not want to create openings for their competitors.
- Third-party providers, such as fintech firms, are likely to struggle with the cost of dealing bilaterally with different data holders (even if they have access to them).
- Consumers may be concerned about data privacy and the ability of other firms to access data about them.

Reforms in Australia and the UK have sought to overcome these barriers by creating and regulating *consumer data rights* (CDRs). In creating rights for people to access and transfer information, CDRs aim to "support a social license for better data use economy-wide" and "underpin a new wave of competition policy" (APC, 2017, p. 191). The extension of data rights in the UK financial system is already having an impact (Box 9.4).

Box 9.4 **Open banking: how regulatory change aided ethical consumption**

Open banking is a regulatory system that allows individuals to securely share their financial information with other service providers (eg, price comparison services, payment platforms, budgeting applications). It establishes an obligation on banks to release this information, when requested by their customers. Open banking aims to encourage competition and innovation in financial services. The UK introduced open banking regulations in 2018, and Australia implemented a similar system in mid-2020 as part of a wider national consumer data right.

One beneficiary of opening banking in the UK has been the New Zealand-founded ethical consumption platform CoGo (short for "connecting good"). CoGo is an app-based service that allows consumers to identify their ethical priorities (eg, reducing waste, or buying vegan or carbon-neutral products), and then connects those members with accredited firms that meet those priorities. CoGo launched in New Zealand in 2015 and expanded into the UK in 2018.

CoGo has used open banking to offer new services to its UK members. Those members who connect their bank to the CoGo app receive information on how much of their spending is with firms accredited for taking action on members' consumption priorities. Based on the transaction histories of members, the app will also recommend how members can switch their spending to achieve greater impact on what they care about. CoGo also provides businesses with information about members' preferences and values, enabling them to improve their practices, signal this, and be rewarded.

Progress on consumer data rights in New Zealand has been slow

The banking industry and Payments NZ have led most work to date on open banking in New Zealand. But progress has been slow (Minister of Commerce and Consumer Affairs (Kris Faafoi), 2019). The Commerce and Consumer Affairs Minister is considering the introducing a parliamentary bill to establish a broad CDR.

The Commission supports such a right because it will encourage technology adoption, innovation and productivity growth, particularly in the fintech sector and other digital businesses. The Commission has heard of cases of businesses keen to start up or expand in New Zealand but needing open banking to do so. Some have got tired of waiting and intend moving to Australia. Other benefits of establishing consumer data rights in New Zealand include these three.

- Establishing consumer data rights offers an opportunity for New Zealand to harmonise with Australia, thereby enlarging the market of firms who use CDRs to provide innovative services that are valued by consumers and other firms. Harmonising CDRs would advance the New Zealand-Australia Single Economic Market agenda (APC & NZPC, 2019).
- The surge in use of contactless payments as part of the response to the Covid-19 pandemic is stranding New Zealand's highly efficient EFTPOS payments system (which does not support PayWave) in favour of the systems of the major international credit card companies, with their much higher merchant fees. Open banking opens opportunities for alternative payment systems.
- When data is shared, security improves because of strengthened privacy and data protection. Individuals and businesses then have greater control over the information held about them, and can use this data for their benefit.

It should be noted that a consumer data right and open-banking reforms are based on the concept of individual rights to personal data. Yet policy debate is ongoing about collective data rights and "indigenous data sovereignty" (Kukutai & Taylor, 2016). This refers to the rights of indigenous groups to govern and control data about their members.

The Ministry of Business, Innovation and Employment (MBIE) released a discussion document in August 2020: "Options for establishing a consumer data right in New Zealand" (MBIE, 2020e). Informed by

submissions on the discussion document, MBIE intends to advise the new government on whether it believes that regulatory reform to establish a CDR in New Zealand is desirable.

In the discussion document, MBIE investigates four reform options.

1. Maintain the status quo. Not introduce a CDR and leave individual businesses or sectors to develop consumer data portability.
2. A sectoral-designation approach. This would be like Australia's recently enacted regime. The legislation would establish a high-level framework that would apply across the economy, but the CDR would only apply to sectors or markets designated through secondary or tertiary legislation. Australia initially designated its banking and energy sectors.
3. An economy-wide consumer data right. This could be like the economy-wide general data protection right (GDPR) approach in the EU. The GDPR came into force in 2018: it aims to strengthen the data-protection rights of individuals by giving them the right to receive a copy of their personal data in a structured, commonly used and machine-readable format. They can also transfer this data to a trusted party.
4. A sector-specific approach. The primary legislation would apply to a specific sector. The UK's open banking regime is an example of this approach.

MBIE suggested five criteria for choosing among the options and, based on these, it chose the sectoral-designation approach (Box 9.5).

The Commission agrees with MBIE's criteria and its choice of the sectoral-designation approach as the option that performs best against these criteria. The Commission goes further than MBIE and recommends that the Government seeks to legislate a CDR for New Zealand (of the sectoral designation type), as a priority in the current Parliament. Banking should be one of the initially designated sectors.

Box 9.5 **Criteria for choosing the best form of a Consumer Data Right**

MBIE suggested the following criteria for assessing CDR options.

a. **Trust**. How well will the option strengthen privacy rights and maintain the security of consumer data while it is being used and shared?

b. **Reach**. How well will the option enable multiple sectors to become "open", thriving, data-sharing economies? An option which enables multiple "open" sectors would likely deliver greater economic development opportunities, competition and productivity, for the long-term benefit of consumers.

c. **Speed**. How quickly will data portability become widespread throughout the economy, allowing the benefits to be realised?

d. **Cost**. How well will the costs of implementing a CDR be minimised so that the costs do not outweigh the benefits?

e. **Flexibility**. How well will an option allow for solutions to be tailored to the needs of a sector, and allow sector-led solutions to be developed before regulatory intervention?

MBIE assessed the sectoral-designation approach as the best option under these criteria. MBIE's overall assessment on each of the options is set out below.

Consumer data right option	MBIE overall assessment
Maintain the status quo	The status quo is unlikely to meet the assessment criteria. Without some form of regulatory intervention, it is unlikely that the consumer welfare and economic benefits of a CDR will be realised.
A sectoral-designation approach	Appears the most likely to meet the criteria and address the problems that have been identified. While imposing significant implementation costs, this option is likely to lead to improved consumer welfare and economic benefits.
An economy-wide consumer data right	An economy-wide approach may meet the criteria of reach and trust, but is unlikely to meet the remaining criteria. We consider that it would be effective at strengthening existing privacy rights, but its limitations reduce the likelihood of this option achieving the full consumer welfare and economic benefits of a CDR.
A sector-specific approach	A sector-specific approach will meet our criteria of speed and flexibility, but will fail to meet other criteria. While it might lead to individual open sectors, the potential benefits of a CDR will be diminished due to the lack of interoperable open sectors.

F9.4 Establishing a consumer data right would enable consumers and businesses to access their data from a variety of data holders and transfer it at their discretion to trusted third parties. Such regulatory reform would open opportunities for innovative digital businesses to devise new products and services that can lift productivity and enhance consumer wellbeing.

R9.3 The Government should introduce a consumer data right consistent with Australia's sectoral-designation regime. Banking should be one of the initially designated sectors to facilitate the development of efficient and effective open banking in New Zealand.

9.4 Reducing constraints to innovation in the primary sector

The restrictive regulation of GM is imposing opportunity costs and risks

Genetic modification (GM) research is an important pathway to innovation, including in New Zealand's primary industries. It offers opportunities for boosting productivity, solving biosecurity risks, and responding to climate change risks effectively and efficiently.

Gene-editing technologies have proved effective in improving plant traits such as drought tolerance, disease resistance, fruit ripening, and reducing greenhouse gas emissions in grazed animals; and animal traits such as increased meat yield and disease resistance. They can also speed up conventional plant-breeding processes, meaning innovations such as new cultivars can be developed more quickly (Royal Society Te Apārangi, 2019b).

Case study participants expressed concern about New Zealand's restrictive stance on GM. They said that the current regulatory approach is stifling the primary sector's ability to innovate and seize significant opportunities, as well as its ability to protect existing markets. Restricted access to GM tools also inhibits the sector's ability to prepare for potential risks, such as biosecurity threats.[19] Similar concerns have been raised with the Commission in previous inquiries.

GM organisms and technologies are regulated under the Hazardous Substances and New Organisms Act 1996 (HSNO). The purpose of this act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms.

HSNO defines GM organisms (GMOs) as those that contain or are derived from genetic material that has been modified *in vitro* (in a test tube). Regulation sets out a list of techniques that are captured by the GM definition, but which are exempt from regulation on the basis that they have been deemed safe and were in use before 29 July 1998. The regime therefore defines GMOs by the process through which they have been developed, rather than the attributes of the resulting products. Approval to develop, trial or commercialise GMOs must be sought from the Environmental Protection Authority (EPA).

The regulatory regime was last reviewed in 2001 by the Royal Commission on Genetic Modification, with subsequent amendments being incorporated into HSNO. Technologies have moved on significantly over the last 20 years. In particular, advances in gene editing have produced technologies such as CRISPR, which enable much faster and more precise modification than earlier tools.

Modern gene-editing techniques enable changes to be made *in vivo* (directly inside an organism) – a technique that was not envisaged at the time the current regulations were made. This means the techniques can produce changes that do not involve inserting foreign DNA. This is in stark contrast to earlier techniques, which sparked consumer fears of "Frankenfoods" created from mixed genetic sources. Gene editing can also produce changes that are indistinguishable from naturally occurring organisms, and indistinguishable from changes made by techniques that are exempt from regulation (Ministry for the Environment, 2018, p. 1).

In 2018, the Ministry for the Environment (MfE) advised that the regulatory settings were quickly becoming outdated and hard to enforce. It recommended that future regulatory settings should be informed by broad public input, noting that

> [l]eaving a public conversation for too long (eg, 2-3 years away) could mean that New Zealand risks missed opportunities, playing catch-up on the international stage, and facing increased compliance issues from GMOs indistinguishable from conventionally developed organisms. (Ministry for the Environment, 2018, p. 5)

[19] These concerns were raised in the context of the Commission's horticulture and dairy case studies. Participants' comments therefore focused on the primary sector, in particular food-producing industries. However, the use of GM tools is also relevant to other industries and applications, such as vaccine production, microbial products (eg, for bioremediation) and potential areas such as biopharming (where pharmaceutical proteins and industrial chemicals are produced in organisms).

Regulatory approaches in other countries are evolving in light of technological advances. In some jurisdictions such as the US and Australia,[20] some new organisms that would be considered GM in New Zealand fall outside their GM controls (Royal Society Te Apārangi, 2019b). MfE has advised that "major players appear to be moving towards less regulation on some organisms created using new technologies", based on their own country's scientific risk assessments that these technologies pose no greater risks than organisms developed through conventional breeding (Ministry for the Environment, 2018, p. 2). Some countries, such as Canada, are regulating on a products or traits-based approach, rather than a process-based approach (Government of Canada, 2016).

As at 2018, 26 countries were growing GM crops, including Australia, Canada, China, Spain and the US. Since 1992, there have been over 4 000 regulatory approvals for GM crops in 70 countries, with 825 of these for environmental release or cultivation (ISAAA, 2018).

If New Zealand's regulatory regime does not evolve, it will constrain New Zealand's ability to quickly grasp emerging opportunities in consumer markets and remain competitive. It will also stifle the primary sector's ability to respond to and recover from threats such as biosecurity incursions and climate change, potentially putting significant industries at risk.

The products derived from gene editing span a range of "degrees of separation" from human consumption. For example, applications in forestry (products not consumed); ryegrass (consumed by animals, which are then consumed by people); fruit varieties from gene-edited parents, and milk from gene-edited cows, both of which are consumed directly. However, even the latter type of products may be indistinguishable from conventionally bred crops and animals (Royal Society Te Apārangi, 2019b). This may help alleviate consumer fears and support increased acceptance. It is also possible that the superior qualities of GM products could, in future, generate price premiums in major markets.

New Zealand already imports GM foods. As with many other OECD countries, New Zealand regulates food GMOs through a separate regime and regulatory body. Food produced with gene technology must be approved by Food Standards Australia New Zealand (FSANZ) and is subject to labelling requirements. FSANZ has approved a range of GM crop varieties for use in foods (including varieties of soybeans, rice, corn, potatoes and canola) (Royal Society Te Apārangi, 2019b). While many of the base crops are grown in New Zealand, the GM varieties are not. However, the GM varieties are sold and consumed here.

In 2019, FSANZ completed a review of food derived using gene technologies. It concluded that the current regulatory definitions (contained in the Food Standards Code) are no longer fit for purpose, and that there may be a case for excluding some GM foods from the requirement for pre-market safety assessment (Food Standards Australia New Zealand, 2019). FSANZ is continuing work to review the Food Standards Code (Food Standards Australia New Zealand, 2020).

In his final television interview as the Government's Chief Science Advisor, Sir Peter Gluckman said that,

> The science is as settled as it will be. That it is safe, there are no significant ecological or health concerns associated with the use of advanced genetic technologies… If we are to remain a biological economy, we will have to have another [national] conversation about it. (TVNZ, 2018)

New Zealand researchers need access to these modern technologies, to enable ongoing development of innovative and high-value products. The country is bearing large opportunity costs from the current restrictions, and it is time to revisit the positions adopted following the Royal Commission.

The Commission recommends that the Government reviews the regulation of GM. In addition to reassessing the regulatory controls, the review should also consider the legislative framework and institutional arrangements. Currently, the EPA regulates the importation and controls of both hazardous substances and new organisms. Effective regulation of modern GM technologies requires specialist expertise and is very different in practice from hazardous substances. Other jurisdictions have different arrangements. For example, Australia has separate regulations and a stand-alone regulator for GM. The review of

[20] Regulatory amendments introduced in Australia in October 2019 allow for gene editing without introduced template to guide genome repair; and organisms modified by introduced RNA that blocks gene expression (RNAi) that does not give rise to any change in the genome sequence, to not be deemed GMOs (Office of the Gene Technology Regulator, 2020).

New Zealand's regulatory regime should consider whether separate legislation and/or a standalone regulator would be a more effective approach.

F9.5

The restrictive approach to genetic modification (GM) regulation under the Hazardous Substances and New Organisms Act 1996 (HSNO) is inhibiting the ability of New Zealand researchers to innovate in vital industries. This is hampering New Zealand's ability to:

- seize future market opportunities for GM products; and
- prepare for responding to and recovering quickly from a biosecurity incursion.

R9.4

The Government should review the regulation of genetic modification (GM). The review should aim to bring the legislation up to date, and enable New Zealand to grasp the opportunities from new GM technologies in a safe and timely manner. The review should:

- consider the emerging regulatory approaches in other jurisdictions, particularly New Zealand's key product destination and competitor markets;
- consider the implications for consumer acceptance and New Zealand's reputation;
- recognise Māori views on GM and the rights and interests of iwi in taonga species (indigenous flora and fauna);
- look beyond the Hazardous Substances and New Organisms Act 1996, across all relevant acts and regulations, to ensure consistency of definitions and approach;
- assess the fitness for purpose of the current regulatory oversight and enforcement arrangements; and
- consider the merits of separate legislation and/or a standalone regulator for genetic technologies.

Consistent with good regulatory practice, the review should undertake wide public engagement, including with Māori.

Constraints in the post-entry quarantine system are also choking innovation

Selective breeding is essential for the New Zealand primary sector to retain and build its competitive advantage, particularly in the absence of GM. Selective breeding enables the horticulture industry to develop new and innovative high-value crops and cultivars. It requires timely access to new plant varieties and breeding material.

Inquiry participants expressed concern about the difficulty of importing new plant material. Bringing in new genetic material requires a current import health standard (IHS) to be in place for the plant species, and for the material to be held in an MPI-approved post-entry quarantine (PEQ) facility for inspection and/or testing prior to biosecurity clearance. Participants described significant delays and backlogs in the PEQ process, due to limited physical capacity. There is also a long-standing backlog in MPI's development of risk analyses and associated IHSs.

MPI received additional funding in Budget 2020 to boost its capacity for developing IHSs. This includes additional staff to help reduce the backlog of risk assessments. Policy work is also under way, to redesign the IHS system to improve its speed and efficiency.

The Budget also provided funding for an interim PEQ facility extension while it prepares a business case on a new permanent facility. Work on the business case includes reviewing the current pricing system, to develop a sustainable funding model. Costs are currently shared across applicants and government, which reflects that there are both private and public good benefits. As explained in Chapter 6, government funding for innovation-supporting infrastructure can be justified given the strong economies of scale and scope in such investments, and the resulting knowledge spillovers.

The current review of the Biosecurity Act provides an opportunity to take a more fundamental look at the wider system settings. In particular, it can review the balance between protecting New Zealand from biosecurity risks and enabling value-adding innovation. This is a difficult and delicate balance to strike, and will require considerable engagement with industry to reach agreement.

F9.6 Timely access to new plant varieties and breeding material is critical for New Zealand's primary sector to retain and build its competitive advantage in international markets. Innovation is currently hampered by inefficient systems and limited post-entry quarantine capacity for importing new plant genetic material.

R9.5 The Ministry for Primary Industries' work on designing new post-entry quarantine facilities for new plant varieties and breeding material, and improving the capacity and efficiency of the import health standards processes, is welcome investment. This work should consider:

- how to scale up existing processes and facilities to relieve the backlog of applications and increase future capacity;
- ways to make the system more efficient, while managing risks appropriately; and
- how costs are shared across applicants, wider industry and government, to develop a sustainable pricing model that incentivises innovation.

9.5 Integrating District Health Boards more effectively into the healthtech innovation ecosystem

Healthtech is a vibrant and fast-growing sector

Healthtech is a vibrant and fast-growing sector in New Zealand. The industry includes three main sub-sectors: medical devices; digital health and IT products; and diagnostics and therapeutics. New Zealand Trade and Enterprise reported that the sector generated $1.8 billion in revenue in 2018. According to the Technology Investment Network (TIN), healthtech revenue grew by 20.2% and employment by 16.6% over the last three years. The sector employed 7 636 people in 2019 and annual revenue per employee in the sector was $245 000 (Technology Investment Network, 2020).

DHBs are not well set up to collaborate on innovation

In the Commission's case study of New Zealand's healthtech sector, participants consistently commented that opportunities are limited for healthtech firms to collaborate with District Health Boards (DHBs) to trial and develop innovative new products and services and secure win-win outcomes.

The win for healthtech firms is getting opportunities to sharpen their understanding of challenges facing the health sector; trial new devices, services or treatments; and perhaps receive funding support in the early stages of development. These steps are important for healthtech businesses to achieve success in design, testing and validation of their products. Certification of quality, efficacy and safety are essential requirements for commercial success in healthtech.

Several wins are also possible for DHBs.

- Innovation can lead to gains in efficiency, effectiveness and people's access to health services.
- Opportunities for clinical staff to participate in new approaches can be stimulating and rewarding. This can be a drawcard for recruitment.
- Participation in successful innovation can enhance the national and international profile and reputation of the DHB and the New Zealand health system.
- Successful innovations in one DHB can be a catalyst for their uptake across other DHBs.

While there is some fragmentation, most parts of the healthtech innovation ecosystem appear to be well organised and collaborative. Many close links exist between healthtech firms, Centres of Research Excellence (CoREs), university and other research institutes, health providers, and government agencies. The MedTech CoRE has played an important role in encouraging collaboration and nurturing an active innovation network. A report by New Zealand Health IT (NZHIT), along with several other reports, has noted the high levels of connection and collaboration in the sector.

> Most companies are highly collaborative and describe a rich network of partnerships with research and development suppliers, clinical research groups and technology platform suppliers that they utilise to develop more comprehensive solutions able to deal with the complexity of the health system. There is high engagement with industry associations and government agencies supporting the industry. Most companies belong to one of the industry associations …Government agencies such as Callaghan Innovation, MBIE, NZTE, Tertiary Education Commission (through the MedTech CoRE) and the regional groups such as ATEED and Canterbury Development Corporation have provided support to the industry. Companies value this support highly… (NZHIT et al., 2016, p. 33)

DHBs are the main funders and a major deliverer of both primary and secondary healthcare in New Zealand. Yet they have various features that healthtech stakeholders see as stifling innovation.

- DHBs' lack of mandate to participate in innovation. DHBs are predominantly set up to deal with the patients in front of them, making it difficult to look beyond to opportunities for innovation and change that could lead to improved health outcomes over the longer term. Also, no guiding framework exists for how DHBs should collaborate with commercial entities that are striving to innovate.
- Lack of targeted innovation funding. DHBs in general do not have innovation funds or discretionary funding to support innovation.
- DHBs' procurement processes are overly rigid. According to participants in the Commission's case study, DHB procurement systems and processes favour large and established players and lowest-cost options.
- Siloed working (each DHB operates independently, without a coherent strategy from the centre on innovation and learning). This means that companies need to work separately with individual DHBs, across which cultures, mindsets, priorities and risk tolerance can vary widely.

DHBs' lack of mandate or reward to participate in clinical trials means that such activity competes with their day-to-day work. As a result, healthtech firms can struggle to find a "way in". The ones that succeed must rely on key individuals, clinical champions and personal networks to support clinical trials.

Two exceptions to DHBs' lack of involvement in innovation serve to emphasise the existence of lost opportunities to reap the win-win benefits described above.

First, two DHBs have acted consistently over long periods to support innovation despite prevailing norms and funding constraints: Canterbury DHB and Waitematā DHB. It is no coincidence that these are both large city-centre DHBs, and that support for innovation initiatives has been backed by their boards, CEOs and senior management. Even so, the funds they invest in innovation have been quite small.

Secondly, two of what are now New Zealand's leading healthtech companies – Fisher & Paykel Healthcare and Orion Health – benefited greatly from collaboration with the public health sector as they developed from small beginnings.

Early local support is important to success in healthtech exporting

Because the New Zealand market is small, many healthtech companies generate only a small part of their revenues domestically. Even young companies not yet exporting report their intention to do so once their products are proven in trials, further developed, or accepted by international regulators (NZHIT et al., 2016).

Yet commentators note that healthtech firms use New Zealand as their "launch pad" – as the place to develop a product or service that they can export later. Both health IT companies and medical-device manufacturers aim for local acceptance or validation of their products as a step to gaining international customer confidence. This is where DHB support can be very important.

DHBs are important sources of reference test sites and clinicians. Yet, as noted, their participation in clinical trials is not currently mandated or rewarded. Almost all the Commission's case-study interviewees highlighted the challenge of opening up DHBs to play a bigger role in innovation. Some drew a contrast with the US, where academic hospitals treat innovation and the creation of spinoff companies as part of their mandate, and attract talent and resources accordingly. Several stakeholders called for the creation of a new mechanism, at a national or regional level, that would support and incentivise DHBs to engage in innovation.

The health and disability system review

The final report of the health and disability system review went to the Minister of Health in March 2020. The Government, in its current term, has the opportunity to implement the review's recommendations in whole or in part. The review recommends major reforms, such as reducing the number of DHBs from 20 to between 8 and 12, and requiring DHBs to operate cohesively under the leadership of Health NZ, a new Crown entity (Health and Disability System Review, 2020).

The final report is largely silent on the opportunities and benefits for DHBs of working collaboratively within the healthtech innovation ecosystem. Yet some of the key recommendations could make a reformed system more open to such opportunities.

- A smaller number of larger DHBs required to act cohesively under Health NZ leadership.
- A strong emphasis on accountability for achieving population health outcomes.
- A strong emphasis on better and wider use of health data including standards, interoperability, and patient control of their own health data – including the ability to share it.

The Commission recommends that the Government grasps opportunities from its intended major reform of the health system to improve the mandate, funding and incentives for DHBs to participate in the healthtech ecosystem – for the mutual benefit of the healthtech sector and the efficiency, effectiveness and accessibility of New Zealand's health and disability system.

F9.7

District Health Boards (DHBs) are hugely important in New Zealand's health system, yet are mostly inactive in supporting healthtech innovation. As a result, opportunities for win-win benefits for the health system and New Zealand's healthtech sector are being lost. The main drivers of lack of DHB support are:

- DHBs' lack of mandate to participate in innovation;
- lack of targeted innovation funding; and
- rigidities in DHBs' procurement processes.

Another negative influence has been the tendency of DHBs to operate independently, without a coherent strategy from the centre on innovation and learning.

R9.6

The Government should use its intended major health system reform to improve the mandate, funding and incentives for DHBs to participate in the healthtech innovation ecosystem, for the mutual benefit of the healthtech sector, and the productivity and accessibility of New Zealand's health and disability system.

10 The agenda

Key points

- Maximising the contribution of New Zealand's frontier firms requires building world-leading firms. To overcome the disadvantages of being a small, distant economy, this will involve growing or attracting large exporting firms that can generate the necessary scale to deliver aggregate productivity gains.
- Innovation is key to gaining and retaining a competitive advantage in selected focus areas. The evidence considered by the Commission shows that New Zealand's innovation ecosystem is not currently working well for New Zealand's actual and potential frontier firms.
- Many efforts have been made over recent decades to lift economic performance and support innovation, but these have not managed to raise productivity. New Zealand's innovation policy settings differ from those in other small advanced economies, and it is timely to learn from these other countries.
- The Government must develop a clear overall innovation strategy and take deliberate steps to upgrade New Zealand's innovation ecosystem. Chapter 7 details the Commission's advice for developing focused innovation policy. The Commission recommends other actions to support innovation-led productivity gains, as set out in Chapters 8 and 9.
- But smart strategies alone will not be enough; execution is crucial. Effective arrangements for governance and a detailed implementation plan must be developed and put in place. Senior political leadership is also needed, to unlock resources from across government agencies.
- The Government must be patient and stay the course with its innovation investments, but also be prepared to cease support for clearly unsuccessful initiatives.
- The Commission's recommendations for change are entirely consistent with supporting sustainable and inclusive economic growth and recovery from Covid-19. Indeed, innovation-led productivity improvements are key to delivering inclusive prosperity and making the transition to a low-emissions economy.

10.1 Growing large, internationally facing firms

To overcome its productivity challenge, New Zealand must develop smart strategies that deal with its remote location and make the most of its circumstances and existing areas of strength. This requires building or attracting global frontier firms in a small number of focus areas that are internationally oriented. These are areas in which New Zealand firms can get to scale through exporting sophisticated and distinctive goods and services, as well as outward direct investment.

Even if a domestic firm is at or close to the global productivity frontier, to make an ongoing contribution to productivity growth resources need to be drawn into this activity from lower productivity uses elsewhere. This requires the growth opportunities only available in international markets. Small economies have only a limited number of areas that can get to critical mass and support sustained world-class competitive performance by frontier firms. Finite government resources therefore need to be deliberately focused on a small number of high-potential areas rather than being thinly spread.

The selected focus areas should be ones in which New Zealand already has a measure of competitive advantage in global markets, and the ability to gain critical mass. This points to activities that build off the primary sector (both on-farm/orchard and processing) and more weightless activities (eg, healthtech, creative, and digital goods and services) as promising areas of focus.

10.2 Upgrading the innovation ecosystem

Innovation is key to gaining and retaining a competitive advantage in the selected focus areas. The evidence considered by the Commission shows that New Zealand's innovation ecosystem is not currently working well for New Zealand's actual and potential frontier firms.

Many efforts have been made over recent decades to lift economic performance and support innovation, but these have not managed to "shift the dial" on productivity. New Zealand's innovation policy settings differ from those in other small advanced economies, and it is timely to learn from these other countries.

Most other small advanced economies use some version of focused innovation policy, adapted to their circumstances. Many governments in these countries play an active role in selected areas of their economy to support platforms of research, with associated investments in skills, the national science system and building links between firms and researchers.

Chapter 7 details the Commission's advice for developing focused innovation policy. This will involve the Government developing a clear overall innovation strategy and taking deliberate steps to upgrade New Zealand's innovation ecosystem. The Commission recommends that the Government engages independent reviewers to carry out a comprehensive review of innovation policy. Other actions it recommends to support innovation-led productivity gains are set out in Chapters 8 and 9.

10.3 Execution is key

Smart strategies alone will not be enough; execution is crucial. The Government should partner with other stakeholders to put in place effective arrangements for governance, resourcing, implementation, monitoring and evaluation to provide confidence that the strategy will deliver on its objectives. Senior political leadership is also needed, to unlock resources from across government agencies.

Innovation is complex, risky and non-linear. The Government must therefore be patient and stay the course with its innovation investments. This means providing funding and policy certainty over sufficiently long time horizons. Securing cross-party support for the strategy would help provide this stability. But the Government must also be prepared to cease support for clearly unsuccessful initiatives. This will require rigorous, independent and transparent monitoring and evaluation.

10.4 Supporting inclusive and sustainable growth and recovery

New Zealand's primary sector is facing some material challenges and opportunities, such as the growing focus on emissions intensity and competitive pressures from plant-based proteins. Firms in the weightless sector are also facing intense international competition. The urgency of these competitive dynamics has been reinforced by the severe economic shock from Covid-19.

On the positive side, the huge increase in the use of digital communications that the pandemic shock has prompted opens opportunities for New Zealand businesses and researchers to strengthen their international links and shrink the costs of collaboration and doing business over distance.

Innovation-led productivity improvements are key to delivering inclusive prosperity and making the transition to a low-emissions economy. The Commission's recommendations for change are therefore entirely consistent with supporting sustainable and inclusive economic growth and recovery from Covid-19.

The government has a role in supporting industries and workers to prepare for and benefit from greater technological and business innovation and adoption. The Commission has previously recommended improvements to the performance of the education and training system and updates to employment law, and advised on options for income smoothing for displaced workers (NZPC, 2020b). This current inquiry recommends that the Government also reviews migration policy settings, and works directly with industries currently reliant on low-cost labour to support those firms and workers through the transition to higher-value jobs.

Summary of questions

Chapter 4 – Insights from Māori firms

Q4.1 How can Māori-Crown relationships be better leveraged, in order to unlock the potential of Māori frontier firms and help meet the Crown's Treaty obligations? Would using government procurement processes be an effective way of doing this (eg, through a Treaty partnership procurement policy)?

Q4.2 How can the Government help build the pipeline of Māori business people with the necessary skills and experience to govern and manage Māori frontier firms?

Chapter 5 – Exporting and innovation

Q5.1 What would a well-designed package look like (including its delivery) that is proactive and targeted to attract multinational corporations that are knowledge-intensive, high value-added, oriented to exporting and a source of spillover benefits?

Chapter 7 – Innovation policy and New Zealand firms

Q7.1 How could Callaghan Innovation and New Zealand Trade and Enterprise (NZTE) best marshal a proportion of their resources to build the innovation ecosystem of firms operating in areas chosen by the Government for focused innovation policy? How would this fit with their current services to individual firms? How should responsibility for this approach best be shared between Callaghan Innovation and NZTE?

Findings and recommendations

The full set of findings and recommendations from the report are below.

Chapter 2 – New Zealand's productivity challenge

Findings

F2.1 Many of New Zealand's framework policy settings rate well in international comparisons. These include its fiscal and monetary policy frameworks, the quality of its institutions, its low levels of corruption, and its settings relating to the ease of doing business. However, the quality of these settings, while helpful, has not by itself motivated enough innovation and investment to lift New Zealand's productivity to the next level.

F2.2 New Zealand's lower rankings and performance in R&D, broader innovation, exporting, Foreign Direct Investment, Outward Direct Investment and some domains of regulation are likely to be both contributing to and reflective of its weak productivity performance and relative absence of successful frontier firms.

F2.3 New Zealand businesses are typically capital-shallow (ie, workers have limited equipment and other capital goods to work with) and this has depressed labour productivity. Historically, this has been partly explained by the high off-the-shelf cost of capital goods, past periods of high long-term real interest rates, and fast population growth. Low returns to investment, low wages and ready access to low-cost immigrant labour are also contributing factors.

F2.4 Part of the explanation for New Zealand's weak labour productivity performance is the combination of the small size of its domestic market and its distance from international markets. These disadvantages are associated with:

- weak international flows in trade, capital and knowledge;
- higher risks and lower returns to investments in exporting;
- low participation in global value chains;
- lack of distinctive and specialised products in New Zealand's export mix; and
- weak competition in domestic markets insulated from international trade.

New Zealand's low rate of exporting partly reflects the significant risks for its firms of launching into exports to distant markets from a small domestic base.

F2.5 Geography is not destiny. The existence of a few New Zealand firms at or close to the global frontier shows that it is possible to overcome the disadvantages of a small domestic market and distant location.

F2.6 Unlike high-performing small advanced economies, New Zealand has few, if any, large globally competitive firms with outstanding records of exporting sophisticated and distinctive goods and services. Around these large businesses exist ecosystems of complementary firms, researchers and innovators, pipelines of highly educated graduates, investments in enabling infrastructure and regulations, and investors with deep knowledge and understanding of the particular industry.

F2.7 Fundamental to success in any developed economy is innovation in its internationally tradeable goods and services. Innovation is essential to gain and retain a competitive advantage.

Producing at scale is also essential to earn high returns in export markets, to cover the large initial (fixed) costs of both innovation and exporting, and have a good margin of earnings for higher living standards.

F2.8 Every economy has its own set of capabilities that makes innovation more likely to happen around some products than others. Measures of economic complexity capture the sophistication of a country's exports and the extent to which the export mix conveys a difficult-to-imitate competitive advantage. New Zealand has lower economic complexity than other small advanced economies.

F2.9 The most promising path for New Zealand to lift its productivity performance is to learn from the successes and failures of high-performing small advanced economies – while duly tailoring its approach to the country's starting point and distinctive circumstances.

Businesses primarily, supported by government, will need to deploy dynamic capabilities to identify areas of competitive advantage in export markets and drive innovation that will push out the productivity frontier. Dynamic capabilities involve sensing areas of competitive advantage, then seizing the opportunities in these areas by innovating – including in business models and processes – while identifying risk and effectively managing it.

Recommendations

R2.1 The Government should develop a clear overall strategy and take deliberate steps (in collaboration with business, workers, educators and researchers) to upgrade New Zealand's innovation ecosystem and support the export, at scale, of goods and services with a difficult-to-imitate competitive advantage.

Chapter 3 – Frontier firms: analysis and comparisons

Findings

F3.1 New Zealand's frontier firms have (on average) labour productivity levels significantly below the frontier defined in each of nine broad industries by the three most successful small-advanced-economies (out of Belgium, Denmark, Finland, the Netherlands, New Zealand and Sweden).

F3.2

Over 2003-16, New Zealand frontier firms have been growing their labour productivity at a similar rate to frontier firms in the Netherlands, faster than Denmark and Finland's frontier firms and slower than Belgium and Sweden's frontier firms. This is concerning given that the much lower initial level of New Zealand's productivity frontier points to the need for it to grow faster to begin to close the gap with the small-advanced-economy frontier.

F3.3

In a study for this inquiry, the productivity gap between frontier and non-frontier firms in New Zealand has not changed significantly since 2003. The gap is smaller and more stable than in several small advanced European economies (whose gaps generally increase over time). This could suggest that diffusion has been effective in New Zealand. Yet it could also be due to the low productivity level and slow growth rate of New Zealand's frontier firms – so the non-frontier firms find it easier to keep up.

Another possibility is that New Zealand's productivity gap is not smaller than in other small advanced economies. Some other studies have found this. If this is the case, it would suggest that diffusion in New Zealand is no more effective than in these other countries.

F3.4

Technology diffusion to non-frontier firms mainly comes from firms at the national frontier (in the same country). Yet non-frontier firms in the European countries in the Commission's small-advanced-economy study benefit also from technology diffusion from firms at the small-advanced-economies frontier (albeit to a lesser extent than from their national frontier firms). This did not happen in New Zealand over 2003–16.

This result likely reflects New Zealand's distant location, and that diffusion of tacit and non-codified technologies is difficult over distance. It emphasises the criticality of New Zealand's frontier firms, performing well and improving the country's international connections.

F3.5

In the Commission's study comparing New Zealand with several European small advanced economies, the most productive firms in terms of multifactor productivity employed high shares of total labour and capital. While this is a good result on the allocation of resources, the European countries allocated a higher proportion of capital to their frontier firms demonstrating the scope to do better.

F3.6

Most capital is allocated to firms in the top three labour productivity deciles in New Zealand and the European small advanced economies in the Commission's study. But more labour is allocated to the upper deciles in those countries than in New Zealand.

This means that the European countries perform better than New Zealand on two margins that impact overall labour productivity performance: their frontier firms generally are significantly more productive (partly because of higher capital intensity), and they employ more people than firms in lower deciles.

F3.7

Looking at New Zealand's overall population of firms, a striking feature is the low number of large exporting firms.

- Only a small number of firms are internationally engaged at scale. In 2019, 33 firms accounted for over 50% of New Zealand's exports of goods and services.
- Only 297 firms exported more than $25 million a year.
- Of the top 10 listed New Zealand firms on the NZX:
  - four are domestic utilities;
  - two largely sell services to the domestic market;
  - two are international transport infrastructure companies; and
  - only two compete in global markets at scale.

Chapter 4 – Insights from Māori firms

Findings

F4.1

There is no single or agreed definition of a Māori business or "Māori firm". The Māori economy comprises a range of organisational forms, structured under various legal frameworks. Depending on the purpose, definitions may consider the ethnicity of the business owners, the ethnicity of the employees, the legal status of the business, the nature of the product, and whether the business has a kaupapa Māori focus or has adopted Māori cultural values in the way it operates.

F4.2

The Māori economy has grown and diversified significantly in recent decades. Employment by Māori authorities and Māori SMEs has increased strongly, and a high proportion of Māori SMEs have invested in expansion.

F4.3

Māori authorities and Māori SMEs are slightly more likely to be involved in goods exporting than New Zealand businesses overall. Almost half of exports from Māori authorities go to China; the export markets of Māori SMEs are more diverse.

F4.4

Quantitative analysis of a sample of Māori firms found that they operate similarly to non-Māori firms. The best-performing Māori firms have strong capacity across a range of organisational factors, including the right people, management, relationships, HR processes and cultural capital. Top Māori firms are able to combine and leverage these factors to gain success over their competitors.

F4.5

Māori firms' desire to serve multiple objectives ("multiple bottom lines") can be a strong driver of ambition, which can also flow through to expectations on suppliers. High shareholder ambition can also spur innovation and experimentation, providing the underlying assets are not put at risk. This appetite for innovation is reflected in statistics which show that self-reported rates of innovation and R&D are higher for Māori firms compared to all New Zealand firms.

F4.6 Māori cultural values such as kaitiakitanga, kōtahitanga and whanaungatanga help differentiate Māori goods and services and provide added brand value overseas. They also closely align with growing global consumer demand for products with strong environmental and social credentials. This presents growth opportunities for kaupapa Māori firms and collectives.

F4.7 Māori firms operate within a unique Māori business ecosystem. Challenges arise from having to navigate the complexity of governance structures, relationships and other dimensions. However, common values and features help bring Māori businesses together around shared goals. Formal and informal networks among Māori businesses are important for diffusing knowledge, exploring innovations and enabling collaboration.

F4.8 Māori business stakeholders interviewed for the inquiry expressed concerns about the difficulty navigating government agencies and supports for Māori business. Some expressed a desire for government to support a Māori-led approach to defining the Māori economy and optimising the Māori business ecosystem, to better promote productivity, innovation and growth in the Māori economy.

F4.9 Existing and prospective Māori land-based businesses face constraints from the land tenure and compliance requirements of Te Ture Whenua Māori Act 1993. Resolving the long-standing dilemma of balancing land retention, with effective governance and management to raise productivity and returns for Māori land owners, is challenging but important. Options available to the Government include continuing improvement of services to Māori business and further reform of the legislation.

F4.10 More work is required to better understand the productivity and performance of Māori firms, and how they are contributing to the wellbeing of Māori.

- Promising areas of future quantitative research include using the Integrated Data Infrastructure/Longitudinal Business Database and other datasets to investigate Māori firm performance and productivity.
- Complementary qualitative research would help explore the reasons behind the characteristics and relationships observed in quantitative work. Another fruitful area of inquiry could be a deeper exploration of the lessons that innovative Māori clusters and collaborations offer for both Māori and non-Māori firms.

F4.11 There is a small talent pool of Māori with the necessary skills and experience to govern and manage Māori frontier firms. The demands on this talent pool are increasing, due to the growing number of Māori commercial entities and competing demand from non-Māori firms for Māori business skills.

Recommendations

R4.1

The Government should facilitate a Hui Taumata (national Māori business summit) of iwi and Māori business stakeholders and workers. The Hui Taumata would:

- enable a national discussion by Māori for Māori on ways to support productivity, growth, innovation and resilience in the Māori economy;
- focus on defining the Māori economy and consider ways to improve the Māori business ecosystem; and
- formulate ideas for how the Government and Māori business networks can work better together.

Scoping of the Hui Taumata could be led by Te Puni Kōkiri, working closely with the Ministry for Business, Innovation and Employment, the Treasury, the Ministry for Primary Industries, and the Māori Economic Development Advisory Board.

R4.2

The Government, and the Productivity Commission, should invest in further qualitative and quantitative research on Māori firm performance and productivity. This work should be coordinated with the work being led by Te Puni Kōkiri and the Ministry for Business, Innovation and Employment on the Government's current Māori Economic Resilience Strategy.

Chapter 5 – Exporting and innovation

Findings

F5.1

Developed countries can raise their productivity through firms finding new areas of specialisation that give them a competitive advantage. For small advanced economies (SAEs), including New Zealand, this necessarily involves expanding into export market niches to achieve economies of scale in things like development, production and marketing. Exporting specialised goods and services at scale is the way that a SAE can significantly lift national productivity.

F5.2

Exporting has fixed costs, for instance in market intelligence and branding, and in the development of distribution networks and supply chains. To provide the volume of products required for exporting, firms may also need to invest in more plant and machinery. High fixed costs make it risky and challenging for small New Zealand firms to move into exporting – they need scale to cover the fixed costs, but only when they succeed in export markets can they attain that scale.

F5.3

New Zealand lacks multinational corporations (MNCs) that are knowledge-intensive, oriented to exporting and a source of spillover benefits. MNCs of this type are attracted to locations by:

- world-class, leading edge research institutions and researchers in their area of business;
- a good prospect of being highly competitive in international markets (for example by accessing lower-cost inputs);
- a supply of creative talent and well-trained graduates in their area of business;
- attractive urban, social and environmental amenities for their staff, including the quality of schooling and affordable housing;
- high quality infrastructure;
- a community of firms that provide relevant inputs;
- a conducive regulatory environment; and
- direct support under well-crafted FDI attraction programmes.

F5.4

New Zealand Trade and Enterprise (NZTE) has a suite of reasonable performance measures in place. Yet it is difficult to accurately demonstrate NZTE's added value. This would be possible at relatively low cost by identifying in the Longitudinal Business Database the businesses that receive NZTE support.

Recommendations

R5.1

The Government should take a more proactive and deliberate approach to attracting multinational corporations (MNCs) that are knowledge-intensive, oriented to exporting and a source of spillover benefits. The approach should develop programmes of attraction similar to those used successfully in some small advanced economies (SAEs). In practice, creating the conditions that act as a magnet for MNCs will require upgrading the innovation ecosystem and building deep networks between industry, researchers and government. In SAEs, this has been best achieved by focusing efforts on a few target areas of existing domestic strength. Such a programme requires careful monitoring, evaluation and adaptation to New Zealand circumstances to ensure it is in the national interest.

R5.2

NZTE should regularly commission independent evaluations of their services. These evaluations should assess the effectiveness of their range of services, to inform choices around the future mix and design of services. To facilitate evaluation, businesses receiving NZTE support should be tagged in the Longitudinal Business Database (LBD) to allow for more robust long-term assessment of NZTE's performance.

Chapter 6 – Innovation ecosystems

Findings

F6.1 Innovation is complex, cumulative, risky and path dependent. An innovation ecosystem includes the capabilities that are:

- held by individual firms, research institutions and the workforce;
- reflected in the network of relations among firms (including international links), and with research centres;
- contributed by government agencies and their investments in hard and soft infrastructure; and
- provided by the wider regulatory and institutional framework.

Together these capabilities shape the rate and direction of innovation.

F6.2 The leading edge of innovation is most often driven by firms, yet government is an integral part of the innovation ecosystem because it provides many of the capabilities that influence innovation by firms.

F6.3 Innovation has spill-over benefits. These provide the rationale for broad government support for innovation through policies like R&D tax credits, research grants and intellectual property protection; and also, more widely, for policies such as support for venture capital and skills (the benefits of which are not restricted to R&D-intensive firms).

F6.4 Each country has a specific set of capabilities that mean some technologies or types of goods or services provide more opportunities for productivity-enhancing innovation than others. As a result, and with limited resources, many small-advanced-economy governments play an active role in selected areas of their economy to support platforms of research and innovation, with associated investments in skills, the national science system, and building links between firms and researchers.

F6.5 The areas of the economy that governments select for focus often do not correspond to industries defined by standard classifications. They may, for instance, include upstream and downstream industries (such as biotechnologies that depend on a supply of primary products); or cover technologies that are used across different parts of the economy (such as digital technologies).

F6.6 Governments employ focused innovation policy with a variety of sometimes overlapping objectives. Mission-oriented policies address societal challenges such as those arising from climate change, technological disruption and social inequality. Focused innovation policies to enhance productivity will only be durable if they are also consistent with environmental and social objectives.

F6.7

Effective implementation of focused innovation policy requires:

- high-level governance arrangements that bring together senior government ministers and officials, top industry representatives (firms and workers), and leading researchers and educators to select broad areas for focus, shape the strategic direction and marshal the resources needed for success;
- governance of specific initiatives that involves participants having "skin in the game" to oversee an ongoing process of discovering and realising opportunities for innovation and tackling barriers;
- implementation processes that develop a shared view of what is needed, and build linkages and collaboration among researchers, firms and government agencies;
- government and private co-funding of initiatives to bring forth common and realistic perspectives on opportunities for success;
- a willingness to take an experimental "portfolio" approach, accepting that not all initiatives will succeed;
- transparency around what the key judgement calls are on where to focus effort;
- transparency around the nature, extent and target of government assistance;
- transparent monitoring and evaluation of initiatives and adjustment of the mix over time; and
- a consistent but adaptive approach to strategic direction that allows sufficient time for innovative initiatives to bear fruit.

Chapter 7 – Innovation policy and New Zealand firms

Findings

F7.1

The performance of the New Zealand innovation ecosystem is notably weaker than in comparator small advanced economies on some measures. These are:

- public and private expenditure on R&D as a percentage of GDP;
- internationally significant patenting;
- share of the world's top academic publications; and
- the number of world-class universities.

F7.2

The Government's draft research, science and innovation (RSI) strategy of 2019 signals an ambitious programme of actions to improve the performance of the RSI system by:

- developing, attracting and retaining skilled researchers;
- improving connections among researchers and innovators;
- strengthening support for start-ups to grow and access global markets;
- building scale in innovation effort in chosen areas of focus;
- attracting more Māori researchers and innovators into the RSI system, and better protecting and resourcing mātauranga Māori; and
- increasing investment in the RSI system, and increasing the quality of the research infrastructure.

However, the Government has yet to finalise the strategy, and to develop transparent governance, implementation and monitoring arrangements that will provide confidence that its objective of New Zealand being a global innovation hub by 2027 will be achieved.

F7.3

Compared to other small advanced economies, collaboration between public research institutions and businesses in New Zealand is weak as a whole. This reflects historical and cultural factors such as those noted below.

- Reputational and financial incentives for university researchers to engage in applied research are weak.
- Only a subset of Crown Research Institutes (CRIs) have a substantial industry orientation and, for historical reasons, these are focused on land-based industries and geothermal technologies.
- Given weaknesses in core funding, CRIs likely focus on short-term fee-for-service research rather than investing in deep, mission-focused, research that can lay the basis for future radical innovation.
- A relatively small proportion of New Zealand businesses are technologically sophisticated and undertake R&D.
- Government policies have not had a strong focus in the past on forging collaborative innovation efforts between public research institutions and businesses, except in the land-based and geothermal industries.

F7.4

Some of the Government's Industry Transformation Plans (ITPs) intend to focus innovation effort to raise productivity in high-potential sectors of the economy that have an export focus. Other than in the primary sector, the Government has devoted only a very small proportion of its research, science and innovation funding, export assistance funding and economic development funding directly to its chosen areas of focus. This is not consistent with taking focused innovation effort seriously.

F7.5

The Government has varying areas of focus in its support for research, science and innovation and economic development. Some of this variety reflects different, yet well considered, objectives. The Government has not yet settled on consistent, clear areas of the economy to focus innovation efforts at scale for the purposes of raising firm productivity and export success.

F7.6

Most Government funding channelled through Callaghan Innovation and New Zealand Trade and Enterprise to support innovation and exporting by firms is targeted at individual firms. Some of Callaghan's assistance is targeted at firms in sectors that reflect the Government's choice of areas of the economy or technologies for focused innovation effort. Yet, this assistance aims to build firm capabilities; it does not directly support strengthening the innovation ecosystems in which these firms operate.

F7.7

New Zealand firms seeking government assistance for innovation and exporting have a bewildering choice of programmes and points of contact. This likely makes it difficult for:

- firms to access the assistance they desire; and for
- government agencies to apply assistance in a way that best achieves the Government's objectives.

Recommendations

R7.1

The Government should update and confirm its research, science and innovation (RSI) strategy to signal its intended innovation effort and direction over the next five to ten years.

The Government should develop and put in place transparent arrangements for the governance, implementation and monitoring of its RSI strategy.

Governance and oversight of the implementation of the Government's RSI strategy should include high-level representation from Government, Māori, industry (firms and workers), researchers and educators.

R7.2

The Government should engage with relevant stakeholders (Māori, researchers, firms and workers, and educational institutions) to develop a transparent implementation plan for its research, science and innovation strategy. After initial engagement, the Government should publish a consultation draft and invite submissions from stakeholders. The implementation plan should cover (among other things):

- how the areas for action under the strategy will be resourced and over what timeline;
- proposed changes to policies and practices (including funding criteria) that will better achieve the strategy's objectives;
- which agencies will take the lead on the actions; and
- arrangements to monitor and evaluate initiatives and the overall success of the strategy.

R7.3

In implementing its research, science and innovation (RSI) strategy, the Government should:

- pay close attention to strengthening the capacity and capability for collaboration between businesses and public (or publicly funded) research institutions on innovative technologies, including strengthening international connections;
- prioritise building collaboration in areas of existing and emerging strength in the economy where it has chosen to focus its innovation efforts; and
- allocate a proportion of its RSI budget to building business-oriented research capabilities in public research institutions in chosen areas of focus.

R7.4

As a complement to broad innovation policy, the Government should partner with stakeholders to:

- choose a small number of areas of the economy to focus innovation effort for the purposes of raising firm productivity and export success; and
- support these focus areas with a large enough proportion of its funding for research, science and innovation, export assistance and economic development to make measurable progress towards its policy objectives.

R7.5

The Government should partner with stakeholders to develop and put in place transparent arrangements for the governance, implementation, monitoring and evaluation of its focused innovation strategies.

Overall governance and oversight of the focused innovation strategies should include senior representation from Government, Māori, industry (firms and workers), researchers and educators.

Governance of focused innovation strategies should provide for shared decision making across stakeholders around the choice of areas for focus and around the resourcing, implementation, monitoring and evaluation of the strategies.

R7.6

The Government should:

- review its funding channelled through Callaghan Innovation and New Zealand Trade and Enterprise (NZTE) and targeted at individual firms to support innovation and exporting; and
- design and implement policies and mechanisms that give greater weight to encouraging firms to collaborate in the development of innovation and export strategies, in areas chosen for focused innovation policy.

If Callaghan and NZTE bring more of their resources to bear on the areas chosen for focused innovation policy, this will materially raise the prospect of success.

R7.7

The Government should review the suite of programmes designed directly to assist firms with innovation and exporting. The review should identify and implement ways to:

- reduce and consolidate the number of programmes;
- simplify the process for firms to apply for assistance; and
- make it easier for firms to identify and access relevant programmes, including by providing a common platform and "front door" across programmes.

R7.8

The Government should commission a comprehensive independent review of New Zealand's innovation policies. The review should take into account:

- the Government's full range of objectives for its innovation policy, but pay particular attention to the objective of increasing the success of frontier firms in exporting in areas of sustained competitive advantage;
- New Zealand's circumstances as a small advanced economy and how this shapes a preferred approach to innovation policy;
- the role of mātauranga Māori in New Zealand's innovation ecosystem; and
- the broad range of policies that impact export success.

A review panel should have expertise in assessing the scope, shape and resourcing of innovation policy and the governance of innovation institutions and processes, as well as a thorough knowledge of New Zealand's existing institutions and innovation policies. It should have experience in assessing the effectiveness of innovation policies in small advanced economies. It should include expertise on mātauranga Māori.

Chapter 8 – Talent and leadership

Findings

F8.1

Scope exists for a more systematic approach to:

- building the pipeline of post-graduate talent needed to support innovation; and
- increasing retention of post-graduates in New Zealand by developing career pathways.

F8.2

Creating more opportunities for research students to gain industry experience and exposure would help to:

- build their broader skillsets (such as entrepreneurial and communication skills) alongside their research capability; and
- strengthen the industry relevance of their research and knowledge transfer from it.

F8.3

Individual institutions have a variety of initiatives under way to improve the industry relevance of their qualifications and research, and partner with firms to help build career paths for students. Ways of providing more systematic support for building domestic career paths in advanced research could include introducing a postdoc funding scheme and extending the use of collaborative PhD schemes.

Focused innovation policy provides a mechanism to improve collaboration between research institutions and industry, for the purposes of skills development in the selected focus areas.

F8.4

High-quality management and governance are important determinants of firm productivity. Evidence suggests that many New Zealand firms lack the leadership capabilities needed to lift their productivity.

F8.5 Many of the skills needed for effective management and governance are built through commercial experience rather than formal training. If New Zealand is able to grow or attract more large internationally connected firms, this will assist capability development through on-the-job experience and the movement of these skilled people between firms.

F8.6 Another way for New Zealand firms to access managerial and governance skills, as well as build links into international markets, is to tap into the global Kiwi diaspora. The current flow of New Zealanders returning due to Covid-19 presents an opportunity for New Zealand firms to source talent and experience among returnees. The normalisation of digital communication technologies also enables firms to connect with experienced and well-connected Kiwis who remain overseas.

F8.7 Māori approaches to business can offer lessons for other New Zealand firms. For example, the drive to serve multiple bottom lines brings a long-term focus to strategy and decision making. Long-term investment horizons are important for supporting experimentation and innovation, and long-term value creation.

F8.8 Reliance on low-cost migrant labour, including seasonal labour, inhibits capital investment and innovation, particularly in the primary sector. The current border closures due to Covid-19 present an opportunity to review and reset New Zealand's migration policy settings.

Recommendations

R8.1 New Zealand Trade and Enterprise currently provides its customers with access to a range of coaching and support services to help build firm-level capabilities. These services should be evaluated for their effectiveness.

R8.2 The Government should refocus migration policy more towards improving the productivity of actual and future frontier firms, by:

- having a principle of primarily accepting highly skilled migrants; and
- reducing the inflows of low-cost temporary workers.

R8.3 The Government should commission a review of migration policy. The review should involve working with those industries currently reliant on low-cost migrant labour, to consider the transition path away from the current heavy reliance on low-cost labour, and the role of government in supporting that transition. This may include:

- working with industries to accelerate the development of automation and other labour-saving technologies, build the necessary skill base for higher-tech production practices, and make jobs more attractive to domestic workers;
- assisting low-paid workers currently employed in these industries to find similar or better jobs in the industry or elsewhere.

Chapter 9 – Innovation-enabling regulation

Findings

F9.1

Regulatory regimes support innovation through good design and operation, and by keeping up to date. Good regimes are open to new ways of achieving desired regulatory outcomes and keep abreast of new technologies. They allow businesses, workers and consumers to enjoy the benefits of new technologies while curbing their potential misuse (where costs would exceed benefits).

Regulation quite often fails to keep pace with technology, and this can be a costly barrier to innovation and competitive advantage.

F9.2

The Dairy Industry Restructuring Act 2001 has opened dairy processing to greater competition and freedoms to innovate in products, supply chains, international connections, ownership, corporate form and business models. This is welcome.

The previous prevailing ethos in the dairy industry (albeit with exceptions) of expanding volume rather than innovating for value failed to recognise environmental limits. This ethos appears to be changing, which is also welcome.

F9.3

The July 2020 amendment to the Dairy Industry Restructuring Act 2001 removed the right of farmer-shareholders of Fonterra to leave the cooperative and return on similar terms. This will increase Fonterra's power to deter them from leaving. Such power risks causing detrimental effects on competition, new entry and innovation in dairy processing, yet these are needed more than ever in the face of environmental limits to further expansion of land under dairy.

F9.4

Establishing a consumer data right would enable consumers and businesses to access their data from a variety of data holders and transfer it at their discretion to trusted third parties. Such regulatory reform would open opportunities for innovative digital businesses to devise new products and services that can lift productivity and enhance consumer wellbeing.

F9.5

The restrictive approach to genetic modification (GM) regulation under the Hazardous Substances and New Organisms Act 1996 (HSNO) is inhibiting the ability of New Zealand researchers to innovate in vital industries. This is hampering New Zealand's ability to:

- seize future market opportunities for GM products; and
- prepare for responding to and recovering quickly from a biosecurity incursion.

F9.6

Timely access to new plant varieties and breeding material is critical for New Zealand's primary sector to retain and build its competitive advantage in international markets. Innovation is currently hampered by inefficient systems and limited post-entry quarantine capacity for importing new plant genetic material.

F9.7

District Health Boards (DHBs) are hugely important in New Zealand's health system, yet are mostly inactive in supporting healthtech innovation. As a result, opportunities for win-win benefits for the health system and New Zealand's healthtech sector are being lost. The main drivers of lack of DHB support are:

- DHBs' lack of mandate to participate in innovation;
- lack of targeted innovation funding; and
- rigidities in DHBs' procurement processes.

Another negative influence has been the tendency of DHBs to operate independently, without a coherent strategy from the centre on innovation and learning.

Recommendations

R9.1

The Government should prioritise keeping areas of regulation up to date with technological and other changes, where not doing so would curb innovations that have potentially high payoffs. Where such changes require new or updated regulations, their design and operation should allow flexibility in achieving the desired regulatory outcomes, without compromising adequate monitoring and enforcement.

R9.2

The Government should reverse the July 2020 amendment to the Dairy Industry Restructuring Act 2001 that will give Fonterra the right to refuse the re-entry of any of its farmer supplier-shareholders who have left the cooperative to supply another processor and then wish to return.

R9.3

The Government should introduce a consumer data right consistent with Australia's sectoral-designation regime. Banking should be one of the initially designated sectors to facilitate the development of efficient and effective open banking in New Zealand.

R9.4

The Government should review the regulation of genetic modification (GM). The review should aim to bring the legislation up to date, and enable New Zealand to grasp the opportunities from new GM technologies in a safe and timely manner. The review should:

- consider the emerging regulatory approaches in other jurisdictions, particularly New Zealand's key product destination and competitor markets;
- consider the implications for consumer acceptance and New Zealand's reputation;
- recognise Māori views on GM and the rights and interests of iwi in taonga species (indigenous flora and fauna);
- look beyond the Hazardous Substances and New Organisms Act 1996, across all relevant acts and regulations, to ensure consistency of definitions and approach;
- assess the fitness for purpose of the current regulatory oversight and enforcement arrangements; and
- consider the merits of separate legislation and/or a standalone regulator for genetic technologies.

Consistent with good regulatory practice, the review should undertake wide public engagement, including with Māori.

R9.5

The Ministry for Primary Industries' work on designing new post-entry quarantine facilities for new plant varieties and breeding material, and improving the capacity and efficiency of the import health standards processes, is welcome investment. This work should consider:

- how to scale up existing processes and facilities to relieve the backlog of applications and increase future capacity;
- ways to make the system more efficient, while managing risks appropriately; and
- how costs are shared across applicants, wider industry and government, to develop a sustainable pricing model that incentivises innovation.

R9.6

The Government should use its intended major health system reform to improve the mandate, funding and incentives for DHBs to participate in the healthtech innovation ecosystem, for the mutual benefit of the healthtech sector, and the productivity and accessibility of New Zealand's health and disability system.

Appendix A Public consultation

Submissions

INDIVIDUAL OR ORGANISATION	SUBMISSION NUMBER
Kevin Sampson	01
John Turner	02
Not published	03
Chris Boxall	04
Kevin Yiwei Huang	05
Mike Styles	06
Jonathan Mason	07
Ministry of Business, Innovation and Employment	08
HYDRA Software Ltd	09
Stephen G. MacDonell	10
Doug Galwey	12
Xero	13
The Icehouse	14
Rosebank Business Association	15
The University of Auckland	16
Ian Lockie	17
Professor Tava Olsen	18
Tony Caughey	19
Cluster Navigators	20
Productivity People Ltd	21
NZX	22
We Create Inc.	23
The MacDiarmid Institute for Advanced Materials and Nanotechnology	24
Kirsty Reynolds and Anton Douglas	25
Mark Fuller	26
New Zealand Air Line Pilots' Association	27
NZ International Business Forum	28
ExportNZ	29
Business Leaders' Health & Safety Forum	30
Chartered Accountants Australia and NZ	31
Auckland Tourism, Events and Economic Development	32
Manufacturing Alliance	33

Engagement meetings

Abrie Swanepoel, Australian Department of Industry, Science, Energy and Resources
Angel Association
Apata Group Ltd
Auckland Bioengineering Institute
Auckland UniServices
Auckland University of Technology
Bank of New Zealand
Berkeley Research Group
Biosecurity New Zealand
Bragato Research Institute

Business Leaders' Health and Safety Forum
BusinessNZ/ExportNZ
Callaghan Innovation
Canterbury District Health Board
Caroline Saunders, Lincoln University
Cemplicity
Centrality Ventures and Partnerships
Commerce Commission
Consortium for Medical Devices/MedTech CoRE
Dairy Companies Association of New Zealand
DairyNZ
Dan Andrews
David Tanner
EastPack
Eight360
Fonterra
FoodHQ
FoodSouth
Frank Siedlok, University of Auckland
Georgian Partners
IBM
Ifor Ffowcs-Williams
Institute of Directors
Keith Woodford, Lincoln University
Kerry McDonald
Kiwi Landing Pad
KLIMA
KMP Partnership
Mark Paine
Michael Reddell
Ministry for Pacific Peoples
Ministry for Primary Industries
Ministry for Women
Ministry of Business, Innovation and Employment
Ministry of Foreign Affairs and Trade
Ministry of Health
MOVAC
Nathan Berg, University of Otago
New Zealand Growth Capital Partners
New Zealand Health IT
New Zealand Kiwifruit Growers Association
New Zealand Trade and Enterprise
New Zealand Winegrowers
Next Era Global
NZX
Orion Health
Pāmu Farms of New Zealand
Peter McBride
Phil Veal
Plant and Food Research
PlantTech
Richard Dellabarca
Riddet Institute
Rocket Lab
Roger Procter

Rowan Simpson
Ruth Richardson
Science for Technology Innovation National Science Challenge
Serge van Dam
Simplicity (NZ) Ltd
Stats NZ
Taribon
Te Au Rangahau, Massey University
Technology and Innovations New Zealand
Technology Investment Network
The FoodBowl
The Icehouse
The MacDiarmid Institute for Advanced Materials and Nanotechnology
The Treasury
Tony Crawford
Trans-Tasman Business Circle
Waikato-Tainui
Waitematā District Health Board
WellSouth
Whaimutu Dewes
Whāriki Māori Business Network
Zespri

Interviews with iwi and Māori business

Jason Ake
GM Comms and Engagement, Waikato Tainui
Director, Native Voice

Debbie Birch
Director, Te Puia Tapapa Fund
Director, Tourism Holdings Ltd
Board Chair, Raukawa ki te Tonga AHC Ltd
Director, NZ Growth Capital Partners Ltd
Board Chair, Taupo Moana Investments Ltd (IWIinvestor)
Director, LGNZ Independent Assessment Board
Director, Ngati Awa Group Holdings Ltd

James Brown
Executive Director, Ngai Tai ki Tamaki Whenua Limited
Board Chair, Ngai Tai ki Tamaki Tribal Trust

Robin Hapi
Chair Māori Economic Development Advisory Board (MEDAB)
Amokapua/Chair Te Wānanga o Raukawa

Traci Houpapa
Board Chair Federation of Māori Authorities
Board Chair, Landcorp

Simon Karipa
Chairman, Te Ngakinga o Whanganui Investment Trust
Chairman, Whanganui Iwi Fisheries Ltd
Director, Whanganui District Council Holdings Ltd
Director, Maara Moana GP Ltd
General Manager, Ngāti Apa ki te Rā Tō Trust

George Mackey
Former Chair, Tawapata South Māori Incorporation

Wayne Mulligan
CEO, Fomana Ltd
Director, Anagenix
Director, Creative HQ
Director, NZ Bio Forestry
Director, Nuku ki te Puku Ltd
Trustee, Taranaki Whanui
Director, WellingtonNZ

David Tapsell
Commercial Lawyer, Company Director
Deputy Chair Pukeroa Oruawhata Trust
Deputy Chair Pukeroa Group of Companies
Director Te Arawa Management Limited
Director Te Puia/New Zealand Māori Arts and Crafts Institute
Trustee Poutama Trust
Deputy Chair Lotto NZ

Webinars and roundtables

We hosted the following:

David Skilling	Lessons on frontier firms from small advanced economies	June 2020
Productivity Commission webinar for MBIE	How can we help Kiwi firms reach the productivity frontier?	July 2020
Productivity Commission public webinar	How can we help Kiwi firms reach the productivity frontier?	July 2020
BRG Institute	New Zealand frontier firms: a dynamic capabilities perspective	September 2020
Hal R Varian, Chief Economist, Google	The state and direction of the global economy, and what governments need to do to help boost our recoveries	September 2020

We presented at the following:

4 Day Week Global & Fintech webinar	Productivity in New Zealand post Covid-19	May 2020
Massey University Executive MBA class	Developing innovative business models for New Zealand companies engaging in the global economy	July 2020
Motu webinar	Global productivity: trends, drivers, and policies	September 2020

We attended the following:

NZIER - Julie Fry and Peter Wilson	Migration and New Zealand's frontier firms (Report commissioned by Productivity Commission)	October 2020
Sense Partners - John Stephenson	Productivity decomposition and frontier firms Roundtable discussion by Professor Kevin Fox, Director, Centre for Applied Economic Research, University of New South Wales	February 2020
Technology Investment Network member roundtable	Tackling the talent challenge	September 2020

Appendix B Research and innovation support programmes and funds

Agency	Programme	Function	Starting (& operating) a business	Idea exploration	Product development	Commercialisation and growth	Internationalisation
MBIE	NZBN	The NZ Business Number provides a globally unique identifier for every Kiwi business	X				
MBIE	Business Connect	A digital service platform that will allow businesses to apply for things like licences and permits from different government agencies in one place	X				
MBIE	Business.govt.nz	Online tools and advice from across government on how to start, stop or operate a business. This covers available government support	X	X	X	X	X
Te Puni Kōkiri (TPK)	Business Growth Support	Advice and guidance for Māori to start and grow a business	X	X	X	X	
MBIE, NZTE and Callaghan Innovation (CI)	Regional Business Partner Network	Business advice, tools, and networking, including information on available government support, provided by local advisors. They also offer COVID-19 business advisory funding		X	X	X	
MBIE	The Māori Innovation Fund	Workshops, advice and mentorship for Māori collectives and coalitions	X	X	X	X	
MoE and TEC	PBRF	The Performance-Based Research Fund supports research undertaken by universities		X	X		
MoE and TEC	CoREs	Centres of Research Excellence focus on research in certain areas		X	X		
MBIE	CRIs	Crown Research Institutes support specific sectors to innovate and grow		X	X	X	
MBIE	Vision Mātauranga	Supports development of Māori science research capability		X	X		
MBIE	Marsden Fund	For excellent fundamental research in science, engineering, maths, social sciences, and the humanities		X			
MPI	Sustainable Food and Fibre Futures Fund	Supports problem-solving and innovation in food and fibre sectors by co-investing in initiatives that make a positive and lasting difference [Mission-led]		X	X	X	
MBIE	Strategic Science Investment Fund	Supports longer-term programmes of mission-led science and the platforms that enable them [Mission-led]		X	X	X	
MBIE	Health Research Council / Fund	Supports research that improves Kiwis health and well-being [Mission-led]		X	X		
MBIE	Endeavour Fund	Invests in research proposals for areas of future growth and critical need [Mission-led]		X	X		
MBIE	Catalyst Fund	Supports international research collaboration [Mission-led]		X	X		

Agency	Programme	Function	Starting (& operating) a business	Idea exploration	Product development	Commercialisation and growth	Internationalisation
MBIE	National Science Challenges	Supports research projects that address pressing issues of national significance [Mission-led]		X	X	X	
MBIE	Partnered Research Fund	Supports greater connections between researchers and end-users		X	X		
MBIE	Partnerships Scheme	Supports greater connections between researchers and end-users		X	X		
MBIE	Regional Research Institutes	For stimulating leading edge, commercially focused research in areas of strengths of the respective regions		X	X	X	
MBIE	Innovative Partnerships	Helps R&D intensive businesses connect, collaborate, and invest in New Zealand				X	X
CI	Skills and capability programmes	Helping clients to innovate, grow and scale-up. The programmes include start-up incubators, accelerators, Better by Lean, High Performance Work Initiative, Innovation IP, and Build for Speed.	X	X	X	X	X
CI	Research and Technical Services	Tailored R&D services, access to experts, innovation skills development programmes, and R&D grants to help businesses innovate and grow faster		X	X		
CI	Scale-Up NZ	A platform that provides information about, and connects, innovative Kiwi businesses of all sizes, as well as investors, hubs, and multinational corporations		X	X	X	X
CI	Sectors teams	Provide advice to firms in focus sectors, and connect them with capability programmes, and capital, business support and training providers		X	X	X	
CI	Targeted Business R&D funding	Provides project and student grants to support businesses that are relatively inexperienced at performing R&D, and internships in R&D active firms		X	X		
CI	R&D Growth Grant	Non-discretionary payments for business R&D to incentivise business investment		X	X		
CI	Repayable grants for start-ups	Funding for the development and growth of new deep tech start		X	X	X	
CI	R&D Loan Scheme	Temporary scheme to support businesses with R&D funding impacted by COVID-19		X	X		
IR	Online information	Information about business tax, as well as research and tax statistics	X	X	X	X	X
MBIE, CI and IR	R&D Tax Incentives	A tax credit at a rate of 15% for eligible R&D activities undertaken in New Zealand		X	X		
NZ Growth Capital Partners	Aspire Seed Fund	Invests in seed stage technology companies alongside angel networks and other private investors, aiming to catalyse the seed and angel capital markets		X	X		
NZ Growth Capital Partners	Elevate Venture Fund	A 'fund of funds' that looks to catalyse a domestic venture capital market			X	X	
NZTE	myNZTE	NZTE's online platform to provide current and potential NZTE customers with business tools, learning modules and			X	X	X

Agency	Programme	Function	Starting (& operating) a business	Idea exploration	Product development	Commercialisation and growth	Internationalisation
		information on markets, global trends, regulations and so on					
NZTE	Capability services	Offers various capability-building services, as well as a resource library			X	X	X
NZTE	International networks	Helps NZTE customers learn about overseas markets and sector trends, navigate local regulations and ways of doing business, and find distributors, investors and potential partners					X
NZTE	Beachhead mentorship programme	A network of private sector experts who offer perspective and insights to help NZTE customers shape the future direction of their business			X	X	X
NZTE	International Growth Fund	Assists high-growth businesses to internationalise					X
NZTE	NZ Story	Offers exporting businesses a free toolkit that includes royalty free images, video content, infographics, and consumer insights to help tell their story					X
Food Innovation Network	Various	Supports innovators from initial idea to making a commercial product for both local and export markets		X	X	X	X
Local government	Accelerators, incubators, shared spaces, and innovation hubs	Support for local innovators, funded by local authorities (often through local economic development agencies)	X	X	X	X	
Trusts, chambers of commerce and industry bodies	Business support	Advice, networking, and workshops for local businesses	X	X	X	X	

Note:

Abbreviations: CI: Callaghan Innovation, CoRE: Centre of Research Excellence, CRI: Crown Research Institute, IR: Inland Revenue, MBIE: Ministry of Business, Innovation and Employment, MoE: Ministry of Education, MPI: Ministry for Primary Industries, NZBN: New Zealand Business Number, NZTE: New Zealand Trade & Enterprise, PBRF: The Performance-Based Research Fund, TEC: Tertiary Education Commission.

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