

New Zealand firms: Reaching for the frontier

New Zealand firms: Reaching for the frontier

Final report

April 2021

The New Zealand Productivity Commission

Te Kōmihana Whai Hua o Aotearoa¹

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

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¹ The Commission that pursues abundance for New Zealand

Foreword

For the last thirty or forty years, New Zealand's main approach to maintaining and growing our living standards has relied on adding more people into the workforce, having employees working longer hours, and expanding production in industries with damaging environmental impacts. This approach is not sustainable. Long working hours can be harmful to individual and social wellbeing, our labour force participation rates are already high, and we are harming our natural resources and taonga.

If we in Aotearoa are to enjoy the incomes we aspire to while protecting our wellbeing and collective assets, we need to take a new approach. The key challenge for New Zealand is to increase our overseas earnings by growing the value of our export offerings. New Zealand needs to move from mainly exporting commodities to selling distinctive specialised goods and services. To do this, New Zealand needs to develop a cohort of large, globally significant firms that can innovate and take new goods and services to the world. Only such firms will have the scale and capability needed to successfully develop new products and enter new markets. They will also underpin innovation by networks of researchers and other local firms, raising the performance of the wider economy and acting as exemplars for others.

Building this cohort of large firms will require a different approach from the Government. Rather than spreading its research and innovation efforts thinly, it will need to focus more tightly on areas where New Zealand has existing or emerging strengths and can achieve critical mass. The Government will also need to review its policy and regulatory settings to ensure they sufficiently support innovation. And there is a pressing need for the Government to test whether its policies and rules are holding back the development and growth of innovative Māori firms. These kaupapa Māori firms are distinctive for having long-term horizons and managing multiple stakeholders and objectives, and offer valuable lessons for other New Zealand businesses.

Although this will be a new approach for New Zealand, we can look for lessons from other small advanced economies. Countries such as the Netherlands, Sweden, Switzerland, Singapore – all with similar population sizes to New Zealand – have global firms that set the pace and frontier in specific market niches. New Zealand's small size and distant location from markets have for too long been used as excuses. Other countries have escaped these traps and we can too. This report lays out the challenges New Zealand faces, and the way in which the Government can change direction to boost New Zealand's long-run productivity and the incomes and wellbeing of all in Aotearoa.

This inquiry commenced under the leadership of the previous Chair Murray Sherwin. I acknowledge and appreciate his contributions to this inquiry and report, as well as the major role he played in establishing the Commission and its reputation. I also acknowledge the support of my fellow Commissioners Andrew Sweet, Gail Pacheco and Bill Rosenberg, and the work and dedication of the inquiry team: Geoff Lewis (inquiry director), Steven Bailey, Ron Crawford, Sally Garden, Nicholas Green, Jenesa Jeram, Patrick Nolan, Hamed Shafiee, Geoff Simmons and Jo Smith. Also, the work of Anaru Mill and Declan Millin on Māori firms was hugely valuable. We all benefited immensely from our engagements with many firms and stakeholders, who shared their experiences, wisdom and insights with us, and from the consultants and experts who provided specialist advice and research to the inquiry. On behalf of the Commission, I thank each and every one who submitted on our issues paper and draft report, met with the Commission to discuss the inquiry topic, or provided research and policy inputs. Your contributions have made our advice stronger and better.



Dr Ganesh R Ahirao (Ganesh Nana)
Chair, New Zealand Productivity Commission Te Kōmihana Whai Hua o Aotearoa
Paenga-whāwhā 2021

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 / 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 Reconomy, 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.

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KEY


F
Finding

R
Recommendation

Overview

New Zealand's disappointing productivity performance is a handbrake on improved wellbeing

New Zealand's disappointing productivity performance has held back its standard of living, and wellbeing more generally, for many years. 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 the average 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 (the value of output per hour worked) have made only a small contribution to aggregate economic growth. In short, New Zealand has been working harder rather than smarter.

New Zealand's productivity performance has continued to lag despite various significant policy efforts, which highlights how difficult it is to lift national productivity. This decades-old problem has persisted through large structural changes in the economy.

This inquiry focuses on a central but relatively under-explored aspect of New Zealand's productivity performance – the economic contribution of the country's most productive firms. These "frontier" firms contribute both directly (by pushing out the productivity frontier and growing larger) and by acting as exemplars for other firms in innovative new technologies and practices. A striking finding of this inquiry is that the labour productivity of New Zealand's frontier firms is less than half (45%) that of the best frontier firms in other small advanced economies (SAEs).

Improving productivity is not 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 tackling these problems easier. Maximising the contribution from frontier firms is central to lifting national productivity and wellbeing.

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

Successful SAEs have outstanding records of exporting specialised and distinctive goods and services at scale. Their frontier firms operate at the global frontier; in other words, they are world leading. These have the scale needed to invest in innovation and exporting, through being large "anchor firms" or through collaboration among smaller firms.

A major conclusion of this inquiry is that New Zealand should aim to have more frontier firms of this type to boost its economic performance. Fundamental to the success of any developed economy 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 and wellbeing in emerging economies. But it puts pressure on developed countries to play to their competitive advantage – which is their ability to innovate by bringing together highly skilled people and specialised technologies in ways that are hard to replicate.

Innovative, knowledge-intensive products typically have high fixed costs. Making a return on the investment in the fixed costs of innovation requires scale. The challenges of getting sufficient scale are greater because of geography.

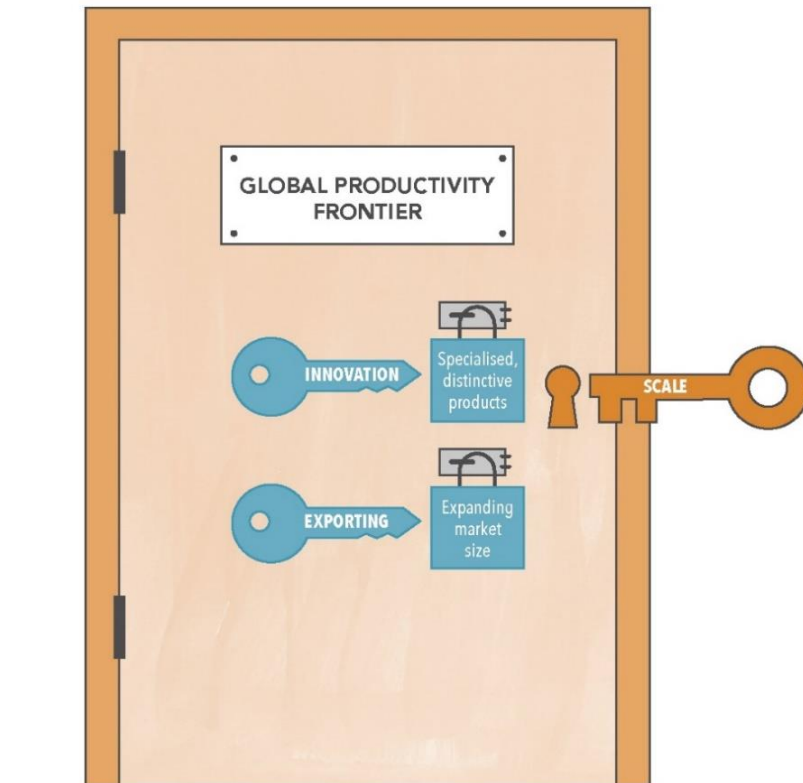
The challenges of a small domestic market and geographic distance

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. These factors create 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 distribution 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, particularly for firms in traditional industries that require transporting physical commodities across long distances. There are promising signs that these risks are lower for firms in the "weightless" industries, such as software, health technology and creative industries.

Together with New Zealand's remote location, the high fixed costs of exporting partly explain why New Zealand has relatively few large, established and successful exporting firms, and a low overall level of exports to GDP. 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. The high fixed costs of expanding into overseas markets reinforces the need for scale over and above the innovation drivers discussed above.

The Commission believes that having more frontier firms exporting specialised, distinctive products at scale can provide disproportionate benefits in terms of raising New Zealand's standard of living and wellbeing. To make the required upfront investment in the fixed costs of innovation and exporting requires scale, but attaining scale from a small, distant economy is a risky undertaking.

Exporting innovative products at scale is key to success



Geography is not destiny: New Zealand can do better

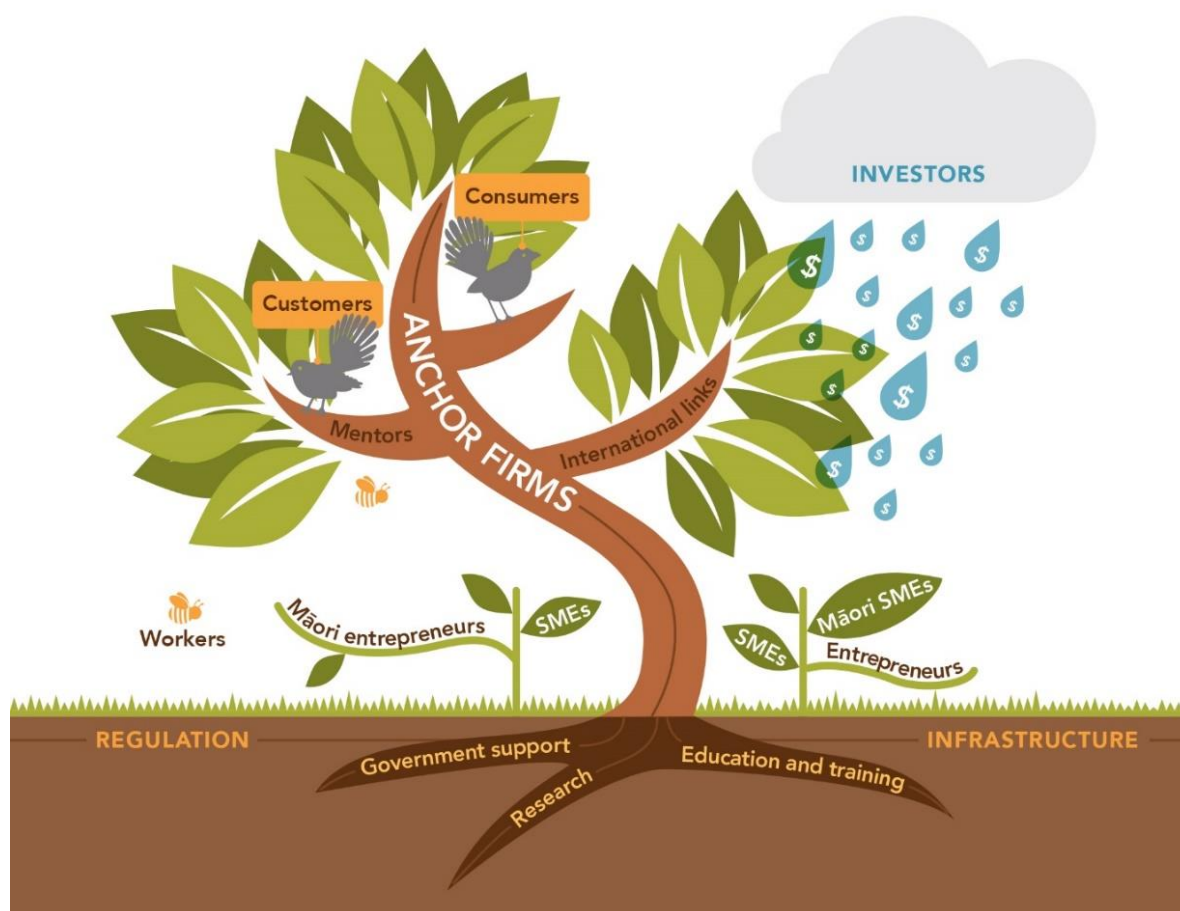
The Commission does not accept that geography is a life sentence condemning New Zealanders to low living standards. An opportunity exists for New Zealand to change key aspects of the status quo and lift performance. It is not about tearing things down and starting again. In many ways New Zealand is already 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 SAEs also face the constraints of small domestic markets and some are relatively remote. Successful SAEs can therefore provide lessons for New Zealand that are more relevant 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 prescriptions may help, but they are not sufficient for success.

Successful SAEs are located mostly in Europe (eg, Sweden, Denmark, Ireland, the 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. And the ones it does have are modest in size. 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.

Frontier firms exist within ecosystems of deep capabilities



SAEs employ three complementary strategies to achieve the goal of exporting specialised, distinctive products at scale.

- Attract high-quality foreign direct investment.
- Support individual companies to meet the fixed costs of innovation and exporting.

- Invest in building “innovation ecosystems” around their frontier firms, in selected focus areas. These ecosystems are made up of entities, their capabilities, and the networks between them. Firms are at the centre of the ecosystem, including larger “anchor” firms providing “canopy cover” for small and medium enterprise (SMEs) and entrepreneurs. The ecosystem also includes workers with the right skills, international links, research bodies, education and training providers, mentors and investors with deep knowledge and understanding of the industry, and enabling infrastructure and regulations.

These three strategies need to work together. New Zealand already does the first two actions (with varying degrees of success) through agencies like New Zealand Trade and Enterprise and Callaghan Innovation. The main difference with SAEs is that New Zealand does not, to the same degree, intentionally focus investment on a few innovation ecosystems. That is a major insight gained from this inquiry.

Increasing the rate and extent of innovation will lift performance

Innovation is a team game

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 is of value for others. Unless this is recognised and rewarded, the outcome will be too little innovation for the country’s good.

The benefits of collaboration across firms and researchers arise because innovation requires bringing together complementary ideas, skills and investments. They also arise because innovation outcomes are uncertain and collaboration spreads the risk. Government support for collaboration and risk taking can add to the benefits.

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 is a key player in innovation ecosystems

Governments have an important 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 grants and R&D tax credits, intellectual property regulation, and governance and ownership of key research organisations;
- 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).

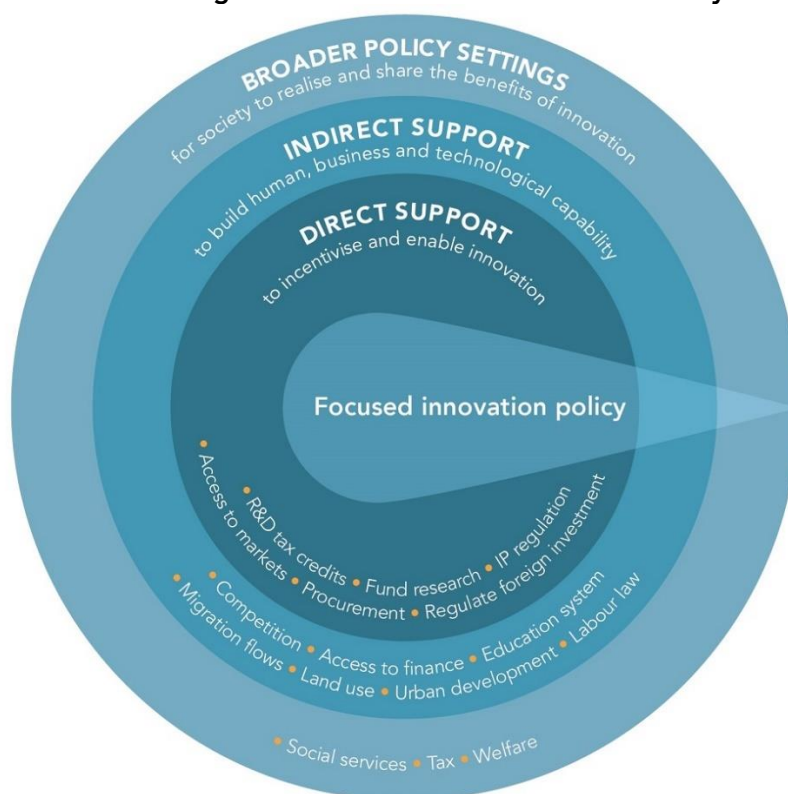
Direct government supports for innovation should target activities and investments that have the clear potential to provide knowledge spillovers and demonstration effects, or to solve coordination problems that are holding back collaboration.

The evidence considered by the Commission shows that New Zealand’s innovation ecosystems are not currently working well for actual and potential frontier firms. For example, the links between firms and public research institutions are mostly poor, and research is too focused on science excellence rather than impact and responding to industry needs. The Government must develop a clear innovation strategy and take deliberate policy steps to upgrade New Zealand’s innovation ecosystems. Industry (firms and workers), researchers, Māori and government must be effective partners on the journey.

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

SAEs must choose which areas of their economy to focus on. A small economy has 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 (which benefit all firms), finite government resources also need to be deliberately focused on a small number of high-potential areas rather than being thinly spread in what David Skilling terms “sub-therapeutic doses”.

The Government must make significant investments in innovation ecosystems in focus areas



Focus areas should reflect existing and emerging strengths and capabilities. They may not align with standard industry classifications; but instead span a range of industries (eg, creative), include upstream and downstream industries (eg, biotechnologies that depend on a supply of primary products) or cover technologies used across different parts of the economy (eg, digital technologies).

Choosing areas for focus is not a top-down exercise led by government. It is about collaborating with industry and other stakeholders to understand emerging innovation possibilities. Through such processes, stakeholders can identify ways of collaborating and making complementary investments that will “get the ball rolling” faster and overcome bottlenecks and barriers. Areas of focus will not be set in stone; the process will need to refresh and adapt them over time.

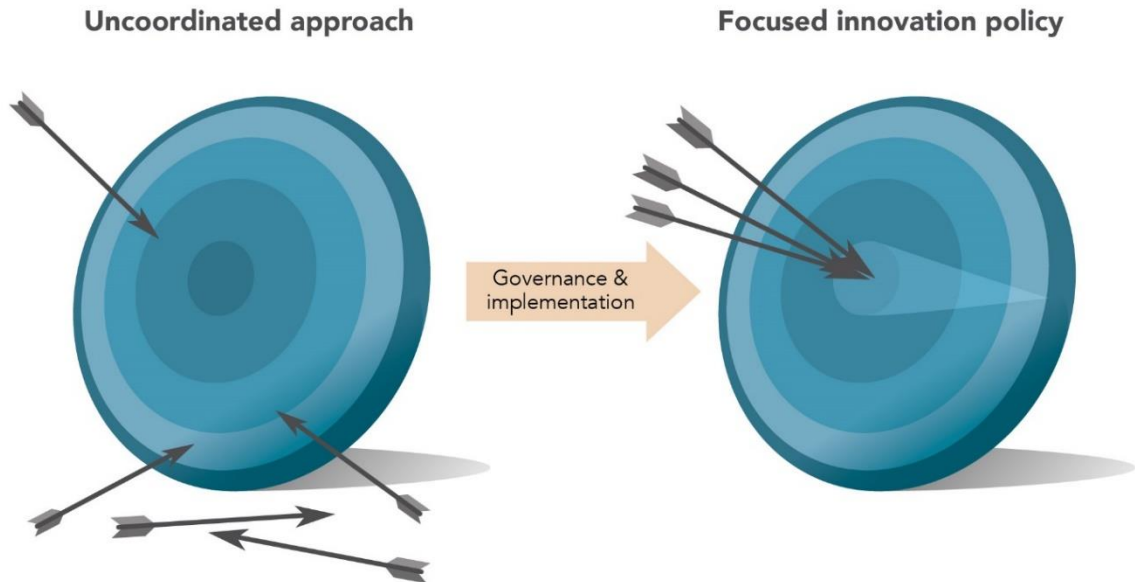
Governments can use focused innovation policies to achieve a variety of sometimes overlapping objectives. Mission-oriented policies address societal challenges such as those arising from climate change, technological disruption and social inequalities. Focused innovation policies to enhance productivity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

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. The areas of focus for innovation policy are not consistently defined, and the draft RSI strategy lacks a clear fit with the Government's industry strategy and other policy priorities. The current initiatives risk meeting a similar fate to previous efforts.

Policy efforts must be coordinated



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 should also take a more proactive and targeted approach to attracting foreign direct investment that is innovative, oriented to exporting, likely to stay long term, and a source of spillover benefits.

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. These arrangements must involve shared decision making across government, senior industry leaders (firms and workers), Māori interests and research leaders.

The Government must be patient and stay the course with its innovation investments, as innovative effort requires time to play out and demonstrate success. This means providing funding and policy certainty over sufficiently long time horizons. Securing cross-party support for the strategy would help provide the necessary policy stability. Failure to provide this stability and follow-through will risk wasting the time and effort of stakeholders who participate in the process, and generate disillusionment about engaging in government processes.

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 lobbying and 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.

Execution is critical to avoiding the failures of past efforts



Fostering and learning from Māori frontier firms

The Māori economy exhibits many of the characteristics needed for firms to innovate, grow and support improved wellbeing. Employment in Māori authorities and SMEs has been growing faster than in the wider economy. Māori authorities and SMEs are more likely to export, and have higher rates of innovation and R&D, than New Zealand firms generally.

The need of Māori firms to serve multiple bottom lines (eg, commercial, environmental and social 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.

Māori 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 traded off against 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.

Despite their successes, Māori firms face barriers and challenges that are constraining their potential. The Government should act to reduce these, to unlock the potential of current and budding Māori frontier firms, and help the Crown better meet its Treaty obligations.

- The Government should collaborate with Māori to explore and take practical steps to further reform Te Ture Whenua Māori Act 1993. The overarching goal should be to allow for more land use and development while recognising the importance of retaining Māori land in the hands of its owners and their whānau and hapū. The Government should also improve the coordination of government services and supports to Māori landowners for land development purposes.
- Government procurement processes offer potential for stimulating Māori business growth. The new 5% target for the number of contracts for public services awarded to Māori businesses is a good start but needs to be supplemented with support to build the capability of both suppliers and procuring agencies.
- Mātauranga Māori and Māori brand distinctiveness are significant assets that require adequate legal protections and processes. The Government should prioritise and accelerate actions to protect mātauranga Māori and intellectual property.
- Inquiry participants expressed a desire for the Government to support a Māori-led approach to optimising the Māori business ecosystem, to better promote productivity, innovation and growth in the Māori economy. To give effect to this, the Government should provide support and resourcing for a Hui Taumata (national Māori business summit) of iwi and Māori business stakeholder organisations. The purpose of the Hui Taumata would be to formulate actions for improving the Māori business ecosystem, and develop ideas for how the Government and Māori business networks can better work together.

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 some 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.

Review migration policy settings

Despite large inflows of migrants to New Zealand over the last 10 years, skilled labour shortages continue. This suggests an ongoing mismatch between the supply of labour and the needs of firms. That mismatch is not being met either by the domestic education and training system, or skilled migration. The lower-skilled end of labour supply also has a mismatch. Some New Zealand industries, including in the primary sector, rely heavily on temporary migrant labour to meet their seasonal employment needs. This in turn weakens the incentives to invest in productivity-enhancing automation.

The Government should commission a review of migration policy. The review should consider the optimal level and mix of permanent and temporary migrants to support innovation and productivity (humanitarian immigration, such as refugees and asylum seekers, would be outside the scope of the review). The review should assess the role and objectives of migration policy, together with New Zealand's education and training system, in meeting firms' demand for labour. The review should also look to reduce inflows of low-skilled and temporary migrant workers over time. The Government should work collaboratively with

industries that currently rely on seasonal migrant labour, to develop a planned transition away from such reliance, and determine the role of government in supporting that transition.

Improve competition in the dairy industry

The Dairy Industry Restructuring Act 2001 (DIRA) enabled 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 DIRA 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 amendments to DIRA included removing 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 removal of the right is not due to come into force until mid-2023. At the next review of DIRA, around one to two years after this, the Government should assess the effects and reverse this feature of the July 2020 amendment if the net effects are negative. Subsequent reviews of DIRA should also make this assessment if needed.

Provide a consumer data right

In the modern economy, consumer data is a valuable asset in its own right. Establishing a consumer data right would enable individuals, businesses and other entities to access their data from a variety of data holders and use it directly or 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 wellbeing. The reform could also help consumers protect their data from third parties whom they wish should not have it.

The Government should introduce a consumer data right that would enable individuals, businesses and other entities to access their data from a variety of data holders and transfer it at their discretion to trusted third parties. The reform should be consistent with Australia's sectoral-designation regime and aim for trans-Tasman and international interoperability. Banking and perhaps the wider finance sector should be one of the initially designated sectors, to facilitate the development of efficient and effective open banking and open finance in New Zealand. The reform should also respect "indigenous data sovereignty".

Review the regulatory restrictions on genetic modification

Modern genetic modification (GM) technologies such as gene-editing offer potential new opportunities for boosting productivity, improving health outcomes, reducing biosecurity risks, and responding to climate-change risks and other environmental problems effectively and efficiently. The regulatory framework for GM tools was last reviewed in 2001 and does not reflect technological advances since that time. The Government should review the GM regulatory framework, to ensure it is fit for purpose and supports domestic innovation. This review should include wide engagement with industry, Māori and the general public. It should assess consumer attitudes, and the potential impacts on New Zealand firms who wish to retain GM-free status, and on New Zealand's reputation and brand more generally.

Improve the incentives on DHBs to participate in the healthtech ecosystem

District Health Boards (DHBs) are hugely important in 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 for productivity and accessibility within the health system are being lost. The main reasons for lack of support from DHBs are their lack of mandate and incentive to participate in innovation, the lack of targeted innovation funding, and rigidities in their procurement processes. Also, health policy provides no effective strategy on innovation and learning to guide DHBs. The ensuing variety of independent approaches raises a further barrier for healthtech firms.

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. This change would be to the mutual benefit of the healthtech sector, and the efficiency, effectiveness and accessibility of New Zealand's health and disability system.

Building dynamic leadership capabilities

Firms with more strategic ability – “dynamic capabilities” – can 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.

Various government-funded supports for building management capabilities are in place or under development. Existing and pilot programmes should be evaluated for their effectiveness, so the Government can invest its resources in proven initiatives. The Government should identify opportunities for improving its support for building firm-level capabilities, collaboratively with industry.

Supporting inclusive and sustainable economic growth and recovery

New Zealand is experiencing a very significant economic shock from the spread of Covid-19. Such shocks require governments to respond by temporarily supporting 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 productivity – because productivity growth is what will deliver business success, better jobs, higher incomes and improved wellbeing over the medium to long term.

Shocks are also an opportunity for countries to take stock and to “build back better”. This includes preparing for the future known and severe threat of climate change. Productivity and innovation are directly relevant to this challenge because they will influence the nature of the transition and the costs and opportunities that New Zealanders experience.

Frontier firms will be at the forefront of the innovation and productivity improvements needed to transition New Zealand to a low-emissions economy. This makes a lift in their performance all the more critical to delivering sustainable and inclusive prosperity in the long term.

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. This decades-old problem has persisted through large structural changes in the economy.
- This inquiry focuses on a central but relatively under-explored aspect of New Zealand’s productivity performance – the economic contribution of its most productive firms. These “frontier” firms contribute both directly (by pushing out the frontier and growing larger) and by acting as exemplars for other firms in innovation, new technologies and good practice.
- 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. Even so, New Zealand has features in common with other small advanced economies so that studying them in a structured way can provide key insights and lessons for New Zealand.
- 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. These include the spread of firms across varying levels of productivity, the ideas of economic complexity, dynamic capabilities and innovation ecosystems, and the use of firm-level data, industry case studies, and qualitative research based on in-depth interviews.
- Firm performance can be measured in several ways. Firms often measure their 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, higher incomes and wellbeing.
- New Zealand has experienced a very significant economic shock from the spread of Covid-19. Such shocks require governments to respond by temporarily supporting 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 productivity – because productivity growth is what will deliver business success, better jobs, higher incomes and improved wellbeing over the medium to long term.
- Shocks are also an opportunity for countries to take stock and to “build back better”. This includes preparing for the future known and severe threat from climate change. Frontier firms will be at the forefront of the innovation and productivity improvements needed to transition New Zealand to a low-emissions economy. This must be kept in mind throughout the report.

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 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's 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 was 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 improve 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 for all people to participate in the economy and society is also important. The Government's aspiration for an economy that is productive, sustainable, and inclusive sums 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 (NZPC, 2018). 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 an early and 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 many initiatives to foster and underpin innovation and productivity.

- 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 support businesses by providing a range of research and development (R&D) services and improving 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 sectoral 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 information and communications technology, biotech, screen production and design sectors.
- In 2006 the Government replaced the GIF 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). Following the 2008–9 financial crisis, 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 (2018); 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 Draft Report, 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).

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	Internal or external	Title
Barry and Pattullo (2020)	External	<i>The dairy sector in New Zealand: Extending the boundaries</i> , TDB Advisory
Crawford (2021)	Internal	<i>Focused innovation policy: Lessons from international experience</i> , NZPC Working Paper No. 2021/03
Deloitte Access Economics (2020)	External	<i>Analysis of the Top 200 firms and Top 10 Māori businesses</i>
Fabling (2021)	External	<i>Living on the edge: an anatomy of New Zealand’s most productive firms</i> , Motu Working Paper No. 21-01
Fry and Wilson (2020)	External	<i>Could do better: Migration and New Zealand’s frontier firms</i> , NZIER
Haar (2020)	External	<i>The performance of Māori firms: A strategic management approach</i> , New Zealand Work Research Institute
Lewis et al. (2021)	Internal	<i>Frontier firms: Four industry case studies</i> , NZPC Working Paper No. 2021/02

Mill & Millin (2021)	External	<i>He Manukura. Insights from Māori frontier firms</i>
New Zealand Productivity Commission (2020a)	Internal	<i>New Zealand firms: Reaching for the frontier – summary of submissions on the issues paper</i>
Sim et al. (2021)	Joint	<i>Exporting challenges and responses of New Zealand firms</i>
Skilling (2020)	External	<i>Frontier firms: An international small advanced economy perspective</i> , Landfall Strategy Group
Smith and Garden (2020)	Internal	<i>New Zealand boards and frontier firms</i> , NZPC Working Paper No. 2020/02
Teece and Brown (2020)	External	<i>New Zealand frontier firms: A capabilities-based perspective</i> , Berkeley Research Group Institute
Wilson and Fry (2021)	External	<i>Picking cherries: Evidence on the effects of temporary and seasonal migrants on the New Zealand economy</i> , NZIER
Zheng et al. (2021)	Joint	<i>Benchmarking New Zealand's frontier firms</i> , NZPC Working Paper No. 2021/01

1.3 Concepts and tools used in this report

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

- **Small advanced economies** – comparing New Zealand with other SAEs² 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, SAEs are not just scaled-down versions of larger economies; they 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 re-allocating from lower-productivity firms to higher-productivity firms. (Chapter 3)
- **Microdata 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** – these capabilities 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 9)
- **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

² Following the approach of David Skilling, SAEs 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 SAEs: Austria, Belgium, Denmark, Finland, Hong Kong, Ireland, Israel, New Zealand, Netherlands, Norway, Singapore, Sweden, Switzerland.

economic activity where countries are most likely to discover opportunities for further innovation (Hidalgo et al., 2009). (Chapters 2, 5 and 6)

- **An innovation ecosystem** – the rate and direction of innovation in an economy is strongly influenced by the innovation ecosystem in which innovative firms operate. These ecosystems are made up of entities, their capabilities, and the networks between them. Firms are at the centre of the ecosystem, including large “anchor” firms providing “canopy cover” for small and medium enterprise and entrepreneurs. The ecosystem also includes workers with the right skills, international links, research bodies, education and training providers, mentors and investors with deep knowledge and understanding of the industry, and enabling infrastructure and regulations. The ecosystem supports risk taking along the often long and twisty path from idea to successful implementation of an innovation (Ridley, 2020; Sainsbury, 2020). (Chapters 6 and 7)

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.
Chapter 3	Describes features of frontier firms. It reports key findings from the Commission’s empirical research about the productivity of frontier and non-frontier firms in New Zealand and five European SAEs. It also examines broader, more pragmatic approaches than productivity to what constitutes a frontier firm.
Chapter 4	Contains insights about Māori frontier firms, their features, opportunities, challenges they face, and lessons they offer.
Chapter 5	Examines the close relationship between innovation and exporting in a SAE 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 importance of innovation in advanced economies and the nature of innovation ecosystems. It compares the innovation performance of New Zealand with other SAEs and examines the extent to which New Zealand’s current innovation policies support innovation by firms.
Chapter 7	Examines the case for a focused approach to innovation and considers the way that SAEs have used such an approach. It recommends increasing the effectiveness of New Zealand’s focused innovation policies.
Chapter 8	Reviews the Government’s draft research, science and innovation (RSI) strategy. Recommends that the Government work with stakeholders to develop shared governance, implementation and monitoring arrangements for the strategy, and better align the RSI strategy with its industry strategy. Also proposes a full, independent review of New Zealand’s innovation policies.
Chapter 9	Covers the importance of talent and leadership to business success. It examines the scope to improve postgraduate domestic talent, management and governance, international people connections, and migration policy settings.
Chapter 10	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 11	Outlines how the Commission’s recommendations could be implemented, summarising the priorities for action and the new types of institutions that will be needed.

1.5 Key productivity and related concepts

Productivity

Productivity as a broad concept is defined in section 1.1 and is further explained in Box 1.2.

Since this inquiry has a focus on firm performance, the sections below cover what this means, and how performance in terms of productivity applies 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, shareholders and workers often focus more on income than productivity. Box 1.2 explains the differences between productivity and income, and how they relate to the all-important outcome of wellbeing.

Box 1.2 Productivity, income and wellbeing

Productivity, income, and wellbeing are often confused, but they are different concepts. Raising productivity is a powerful way to improve wellbeing because it gives society, whānau and individuals choices.

Wellbeing is an ultimate goal. It is influenced by income, plus a range of things that money can't buy. These include relationships with friends and family, good health, leisure time, and interests and hobbies. Income can help fund these things, but more time spent working to earn that income means less time to spend on achieving those things.

Income is commonly generated by selling products (goods and services). Businesses make products to sell by employing people and using resources (machines, raw materials, land, and goods and services from other businesses). Products include hamburgers, house painting and haircuts. Businesses then use their sales revenue to pay for the costs of resources, pay their staff wages and pay tax. Anything left over is profit. Wages and profits are the main forms of income for people (alongside government transfers).

Households and businesses that make up an economy can increase their income in two ways – working harder and working smarter (productivity).

Working harder improves income, but it doesn't always improve wellbeing. For example, a higher income might come from longer working hours, meaning less time with friends and family. Or it might come from using more resources without considering that they harm the natural environment. Is our wellbeing improved from these changes? It is hard to say, but sometimes the answer is no. Higher incomes – whether made up of wages or profits – are not always a good thing for wellbeing.

Working smarter – in other words, improving productivity – nearly always improves at least some people's wellbeing and doesn't harm others. Working smarter usually comes from innovation – from doing things differently. Working smarter gives choices. For example, it can give people higher incomes for the same number of hours worked. This means they can purchase and enjoy more goods and services during their leisure time. New Zealanders – as with citizens of most developed countries – have seen their incomes rise steadily since the Second World War.

³ Firms may also monitor “softer” measures of performance, like customer satisfaction or staff retention.

Alternatively, people might decide to work fewer hours but keep their income the same. This can give people more time with friends and family and a better work–life balance – improving their wellbeing. The hours that people work in many European countries have been reducing over past decades.

Of course, a lot depends on who gets the benefit of working smarter. The workers in the business might benefit from higher wages. Consumers might benefit from cheaper products or a better product at the same price (computers and smartphones are good examples of this). And the owners of the business might benefit from higher profits. Usually, we would expect to see varying proportions of higher wages, cheaper or better products and higher profits. The proportion will depend on market and non-market factors such as the intensity of competition and who has more power. This illustrates the importance of competition law, labour law and effective regulation.

Even so, working smarter does make some people in society better off. Indeed, higher productivity is necessary for a sustained lift in material wellbeing.

In one important exception, citizens of a small country can enjoy higher living standards without higher productivity. If no firm or worker in the country raises their 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.

Profitability and productivity are also often confused, yet they are different concepts. Profit can increase without improving productivity, for example when firms and employees work harder rather than smarter. Productivity can also increase without improving profitability, for example if people work smarter and wages rise to capture all the benefit.

Two measures of firm performance based on productivity are common:

- A firm's **productivity growth**. This measures how productivity changes over time. Productivity growth rates are normally calculated by comparing the growth of the value added by a firm 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 value added with its inputs, the two most common methods are *labour productivity* and *multifactor productivity* (MFP). A firm can add value in the form of a greater volume of output or higher quality outputs.

- **Labour productivity** is the value added by a firm divided by the number of hours of work needed to produce the added value. 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") value added by a firm compared to the value added 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 flour and engineering

services. So, MFP represents the increase in added value that cannot be attributed to the measured inputs. It is the contribution to value 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?

The inquiry's ToR describe New Zealand's *frontier firms* as "the most productive firms in the economy within their industry". To make statistical comparisons with other countries, the Commission follows the OECD by defining frontier firms as those in the top 10% of the productivity distribution of firms in an industry.

But what is the "productivity distribution of firms in an industry"? Imagine all the firms arranged in order from the one with the lowest productivity to the one with the highest productivity. This is the productivity distribution. The distribution is sometimes sorted 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).

The *industry productivity frontier* is defined as the productivity of the firm in the industry with the lowest productivity among its frontier firms. This is the productivity of the firm at the 90th percentile in the industry productivity distribution.

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. And in its industry case studies, the Commission used the top 30%, to overcome the problems of a small dataset.

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 (sometimes called *lagging* 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.

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

1.6 Societal shocks and productivity

New Zealand has done well in keeping Covid-19 deaths and infections to very low levels. Even so, the country, along with the rest of the world, has experienced a very significant health and economic shock from the pandemic. Twelve years earlier, the global financial crisis (GFC) caused economic growth to stall, jobs to be lost and asset prices to fall. When major shocks like these occur, the initial focus is 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 in mind longer-term structural issues that drive productivity – because productivity growth is what will deliver business success, better jobs, higher incomes and improved wellbeing over the medium to long term.

One of the lessons of the GFC is that economic shocks can have ongoing effects that hold back productivity and living standards for years (Coleman & Zheng, 2020). It is too early to tell how long the negative effects of the Covid-19 pandemic will last.

But shocks are also an opportunity for countries to take stock and to "build back better". For example, 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. And it may have raised the country's profile as a desirable place to live and conduct business.

Major shocks are also a reminder that crises do occur from time to time. The impact of climate change will be a severe global shock that is unusual in being perfectly predictable – unless countries take urgent action to cut their greenhouse-gas emissions. So, part of building back better must be for New Zealand to play its part by fundamentally reshaping its energy, transport, and agricultural systems to cut emissions. Productivity and innovation are directly relevant to this challenge because they will influence the nature of the transition and the costs and opportunities that New Zealanders experience (NZPC, 2018).

Frontier firms will be at the forefront of the innovation and productivity improvements needed to transition New Zealand to a low-emissions economy. This makes lifting their performance all the more critical to New Zealand's long-term prosperity. This must be kept in mind throughout the report.

2 New Zealand's productivity challenge

Key points

- New Zealand's productivity performance remains poor 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 to offset its disadvantages. Yet successful small advanced economies (SAEs) often do not score well on the quality of their framework policies.
- On some 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 possible reasons for New Zealand's poor productivity performance 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 SAEs such as the Netherlands, Singapore and Sweden – while 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 ecosystems. The private sector, research sector, Māori, 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 are usually industry-specific. Capabilities 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

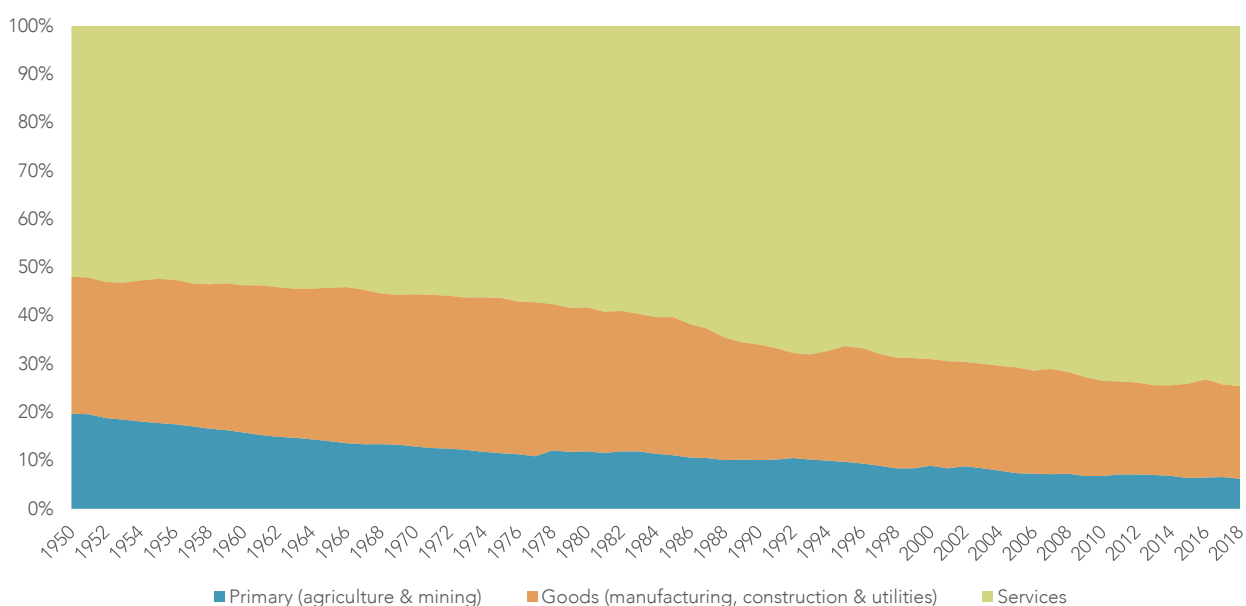
diagnosis is conclusive, but it is evident that New Zealand has much to learn from high-performing small advanced economies (SAEs) with successful large, innovative firms that export at scale.

2.1 New Zealand's productivity performance and challenges

Structure of the New Zealand economy

Like other SAEs, New Zealand has become predominantly a 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 closing 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 diffusing innovation from frontier firms).

Figure 2.1 Employment by industry sector, 1950–2018



Source: NZIER (2020).

New Zealand's exports stand at 28% 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 increasingly relied on dairy exports to China (van Rensburg, 2019). Fonterra dominates New Zealand's exports in terms of companies, 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 (Stats NZ, 2020b).

New Zealand has a low level and growth rate of productivity

New Zealand's disappointing productivity performance has held back its standard of living and wellbeing more generally 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 (value added 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 since the Global Financial Crisis (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 as they 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 context of a fall in labour productivity growth rates across a broad swathe 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 opportunities drying up for further marked increases in living standards (Gordon, 2017), mismeasurement (Syverson, 2017), and lags between recent radical innovations such as artificial intelligence (AI) and machine learning, and their full diffusion and implementation (Brynjolfsson et al., 2017).

Even so, this context does not 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 scores well on the quality of its fiscal and monetary policy settings. Also, most New Zealand policies are not contingent on the size or form of firms. Policies which are so contingent can distort incentives to adopt the optimal size and form of firms. Finally, New Zealand workers continue to undertake further education and training at high rates (NZPC, 2020b).

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

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

	Measure	NZ ranking	Source
Measures on which NZ ranks relatively well	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
	Ease of starting up a business (administrative burden)	7/34	OECD Product Market Regulation Indicators 2018
	Flexibility of labour market regulations (individual and collective dismissals (regular contracts))	10/34	OECD Employment Protection Legislation 2019
	Product market regulations (overall indicator)	12/34	OECD Product Market Regulation Indicators 2018
Measures on which NZ ranks relatively poorly	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's employment protection legislation is among the less restrictive (representing a flexible labour market), but it has the most restrictive FDI regulations in the OECD.
2. Direct government expenditure (gross) does not include indirect support such as R&D tax incentive. 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.

It is worth noting that many of the successful SAEs that this report compares New Zealand to, such as Belgium, the Netherlands and Sweden, do not rank particularly highly on some policy settings. Except for Ease of doing business, Lack of corruption and Government expenditure on R&D as a percentage of GDP, their median rankings are often near or below the median rank (19) of the full 37 members of the OECD. Many of them rank significantly lower than New Zealand on several measures. This raises the question of whether some standard OECD-recommended policy settings might be less appropriate or matter less in SAEs.

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 led to enough innovation and investment to lift New Zealand's productivity to the next level.

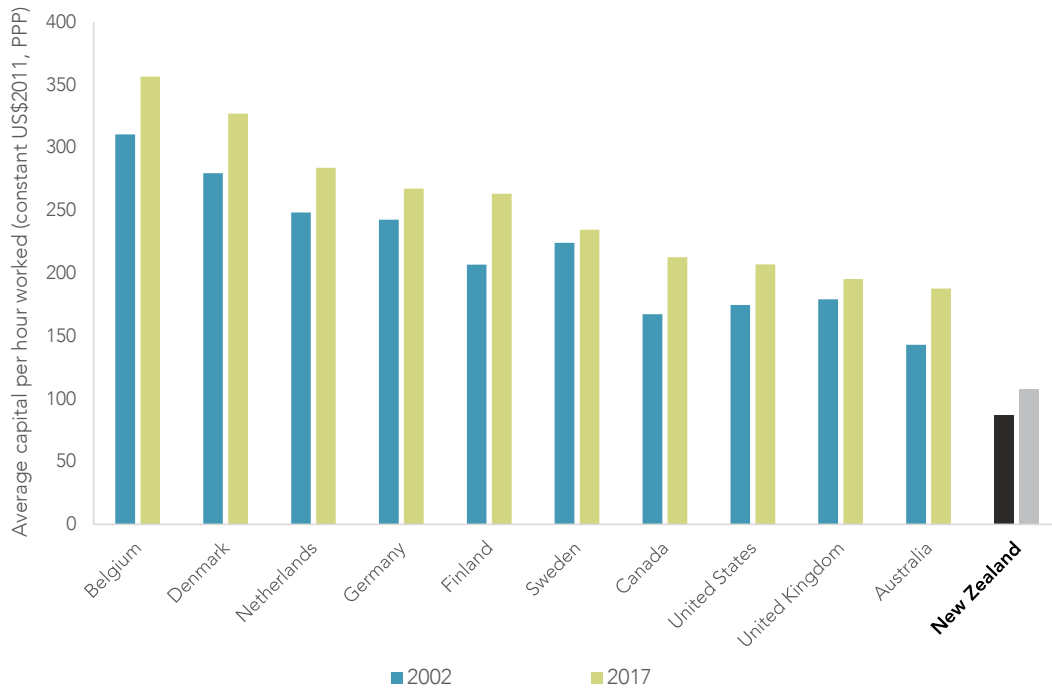
F2.2

New Zealand's lower rankings and performance in R&D, broader innovation, exporting, Foreign Direct Investment, Outward Direct Investment and some domains of regulation both contribute to and reflect, 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). Capital shallowness holds down labour productivity.

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



Source: Groningen Growth and Development Centre (2020).

Note: Capital intensity is measured by capital stock per hour worked. This is shown on the vertical axis.

The reasons for capital-shalowness 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 high 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 9).

F2.3

New Zealand businesses are typically capital-shallow (ie, workers have limited equipment and other capital goods to work with) and this has held down 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 – allows productive firms to grow and benefit from scale and specialisation. International connections also act as key channels for diffusing ideas and technology. Yet, although the New Zealand economy is relatively open on paper, concern exists 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 SAE 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 before the global financial crisis.
- **Exports lack complexity:** In the 10 years to 2018, New Zealand's ranking in the Economic Complexity Index (ECI) fell due to the country failing to diversify its exports enough. Despite some successes (eg, growth in digital products and shifts within the primary sector), the scale of the transformation in New Zealand pales in comparison to that of some other SAEs (Skilling, 2020).
- **Low participation in global value chains (GVCs):** New Zealand has low rates of participation in GVCs, both "forward participation" (exports of intermediate goods used in other countries' exports) and "backward participation" (imported inputs used in exports).
- **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.
- **Falling 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 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" and "backward participation". New Zealand has low rates of participation on both measures (Box 2.1 and Figure 2.3).

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 SAEs, 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 SAEs

Unlike New Zealand, high-performing SAEs 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 workers with the right skills, investment in enabling infrastructure and regulations, and mentors 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 SAEs, international engagement and productivity performance come disproportionately from such large firms ("anchor" 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, the cluster had 83 companies; 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 of the pharmaceutical industry, as a share of the value of production, are the highest (over 50%) across the major Danish industrial sectors. The firm has strong research links: more than a third of its researchers work closely with Danish research institutions. As part of these links, Danish universities also benefit when foreign researchers come to Denmark to work at Novo Nordisk (Novo Nordisk, 2014).

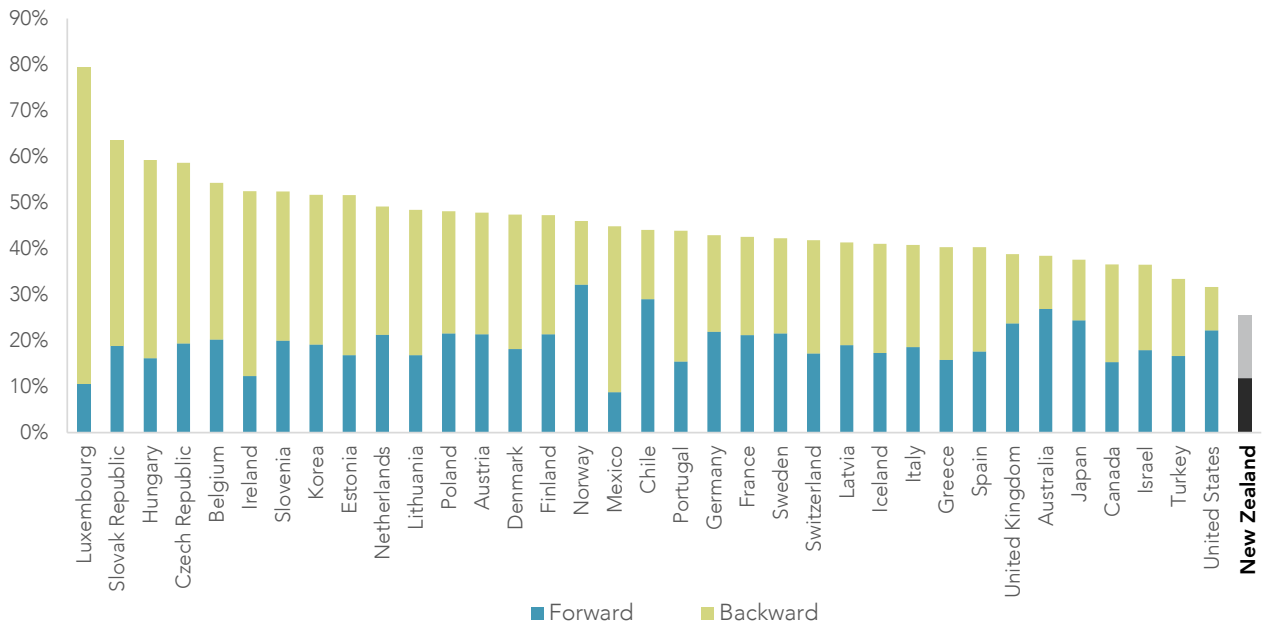
The Novo Nordisk Foundation awards research grants to independent researchers and public research institutions, and to activities that support early engagement of students and educators in the STEM disciplines (Novo Nordisk Foundation, 2020).

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 losing 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 in the Swiss precision engineering sector (Deunk, 2014).

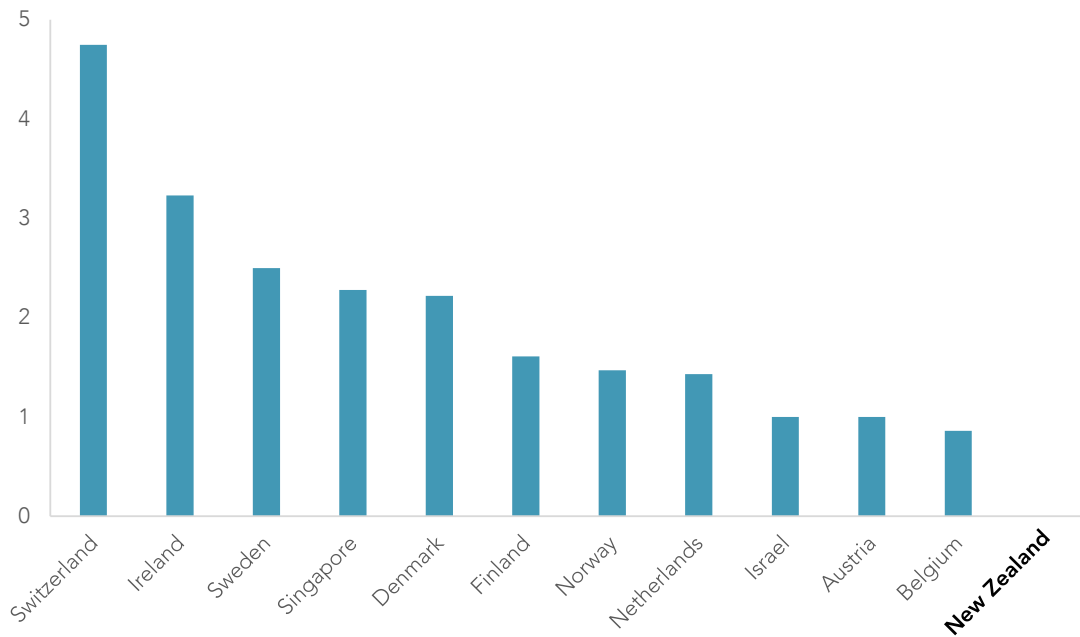
The Swiss precision industry extends beyond watchmaking to machine-building, the electrical and metal industries, and nanotechnology. In the canton of Bern, the precision industry is highly export-oriented, with exports accounting for over 80% of its production (Bern Economic Development Agency, 2016).

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



Source: NZPC 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: New Zealand has zero Forbes Global 2000 companies. Fonterra would be counted except for it being a cooperative rather than an investor-owned listed company.

F2.4

Part of the explanation for New Zealand's weak labour productivity performance is the combination of its small 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

High-performing small advanced economies typically have several 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 workers with the right skills, investments in enabling infrastructure and regulations, and mentors and investors with deep knowledge and understanding of the particular industry. New Zealand generally lacks such firms.

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

For a SAE 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 from 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 (Chapter 5).

The Commission believes that New Zealand can learn important lessons from high-performing SAEs – about how to lift its productivity performance while 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, Māori, educators, researchers and others) to upgrade New Zealand's innovation ecosystems. 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, Māori and government must be effective partners on the journey.

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, have 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 is usually industry-specific and 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. Existing capabilities may need to be adapted and recombined in new ways, or new capabilities may be added 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.

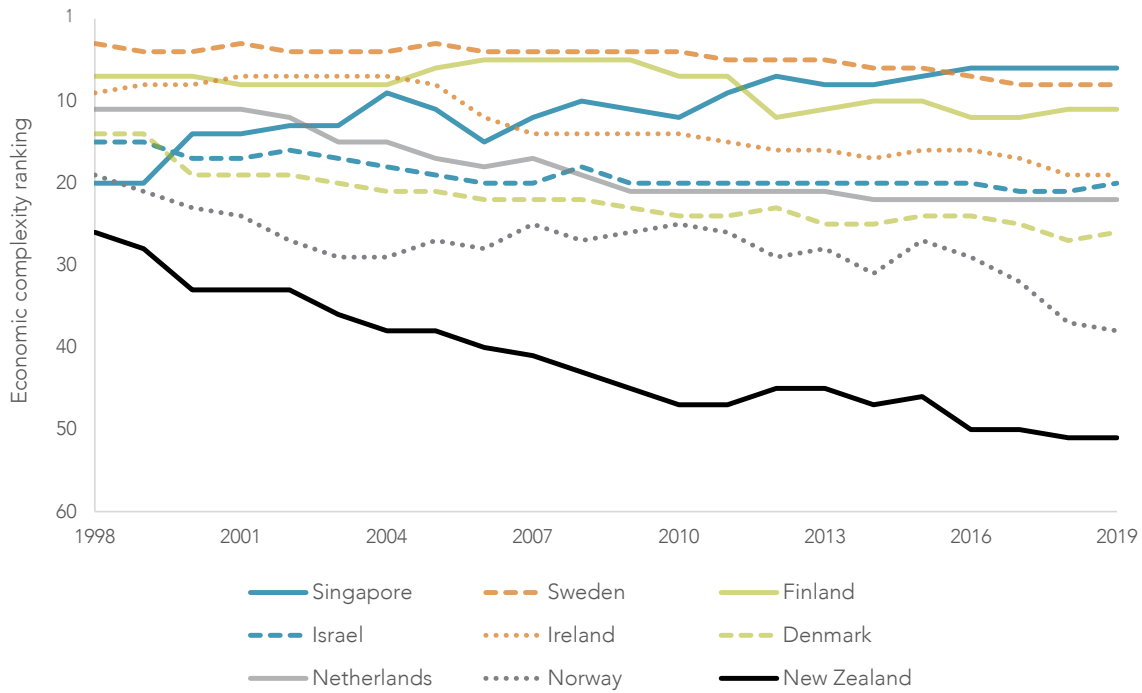
Along with its natural endowments, every economy has its own set of capabilities that makes innovation more likely to happen around some products than others. This suggests a rationale for innovation policy to focus on areas associated with these capabilities. This rationale is explored in depth in Chapter 7.

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, as noted in Box 2.1 and shown in Figure 2.5, New Zealand's economic complexity ranking has fallen over recent years. It has fallen more than other SAEs (while larger developing countries such as 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. In contrast, Singapore's ranking has been rising, reflecting its increasingly sophisticated export mix.

Figure 2.5 Economic complexity rankings of small-advanced-economies, 2000–19



Source: Observatory of Economic Complexity (2020).

Notes:

1. The economic complexity index (ECI) is based on the 6-digit HS96 classification for export goods for the period 1998–2019.
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 2000–2019 shows that this does not materially alter the overall trend in rankings, particularly for New Zealand.

F2.7

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 faces unique challenges because of its size and distance, combined with its low population density and unusual export mix. New Zealand can learn much from the successes and failures of other SAEs. Yet 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 and interventions will make largest positive difference in the New Zealand context.

The Commission believes that the Government should develop a clear overall strategy and take deliberate steps (with the help of business, workers, Māori, educators, researchers and others) to upgrade New Zealand’s innovation ecosystems. 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.

F2.8

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 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.

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.
- To make comparisons, the Commission has defined the “industry frontier” as firms at or above the 90th percentile. Industry frontiers are identified in each of the following small advanced economies (SAEs): Belgium, Denmark, Finland, the Netherlands, Sweden and New Zealand. The SAE frontier is defined as the average of the best three of these industry frontiers.
- New Zealand’s productivity level at its national frontier is well behind the SAE benchmark. According to estimates, the New Zealand frontier declined from 48% to 45% of the SAE frontier over 2003–2016.
- 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. The most productive firms in European SAEs had higher shares of total capital than the leading New Zealand firms. European frontier firms (in terms of their labour productivity) also had higher shares of total labour. These findings reflect the fact that leading firms in Europe are more capital-intensive and larger, employing more people.
- While such statistical analysis is useful for capturing aggregate trends, it is less helpful for identifying current or potential frontier firms or for targeting policy. The Commission has therefore mostly taken a broader pragmatic approach to what constitutes a frontier firm. Four interrelated characteristics distinguish leading firms from those behind the “frontier” – exporting, innovation, scale and “dynamic capabilities” (ie, sophisticated governance and leadership, risk management processes, and the ability to detect and pursue new opportunities).
- Some leading New Zealand frontier firms exhibit these four characteristics. However, a striking feature of the New Zealand economy is the low number of large firms and the relative paucity of firms that are internationally engaged at scale.

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 uses definitions based on the distribution of productivity performance...

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%; other studies use different cut-off points. 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 telephones has supported strong productivity growth in that industry, whereas the technologies supporting house-painting have stayed relatively constant.

...but these approaches have limitations

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. In particular, industry-level and statistical data used in the Commission’s analysis are anonymised and so cannot be used to identify actual current or prospective frontier firms.

For this reason, the Commission has taken a pragmatic approach to what constitutes a frontier firm. Sections 3.2 to 3.4 follow the OECD method and use micro-level data to analyse the performance of New Zealand firms relative to their industry and international counterparts. Section 3.5 draws upon insights from the Commission’s engagements and other research, and considers the characteristics and practices of leading firms.

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 whole economy. While this can be useful for illustrating wider trends, it masks how different firms in 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 researchers now enjoy to linked administrative and survey data for individual firms (microdata) can provide new and deeper insights into New Zealand’s productivity performance. This is a significant research and analytical development. Box 3.1 describes the microdata on individual firms that the Commission used in its research.

Box 3.1 Sources of firm-level data

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 approved 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 contain collections of national datasets on firms and 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. The LBD forms the New Zealand part of the CompNet dataset. CompNet also covers many of the SAEs 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.

The inquiry uses 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 are typically wide, even within narrowly defined industries. It also shows that the distribution of firms tends to be skewed to the left (ie, large numbers of firms tend to have relatively 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
- **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.

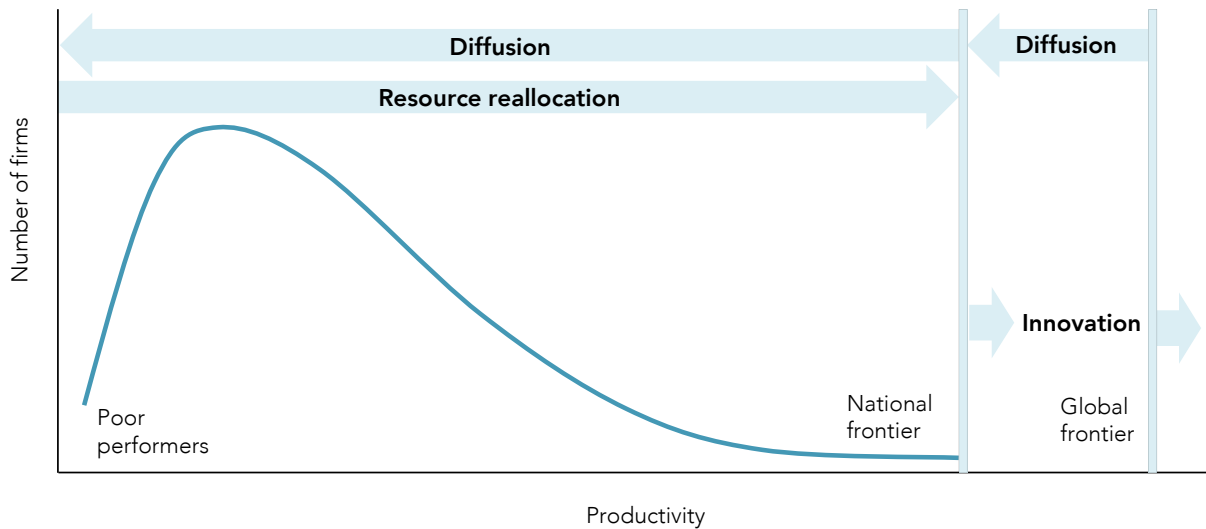
Of course, this stylised picture does not fully represent reality. Here are some examples of subtleties not well captured.

- Innovation can and often does 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.

Despite these complexities, a stylised picture is still useful. The purpose of models is to abstract from the complexity of the real world to highlight important relationships and insights. Given this inquiry is about 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); 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).

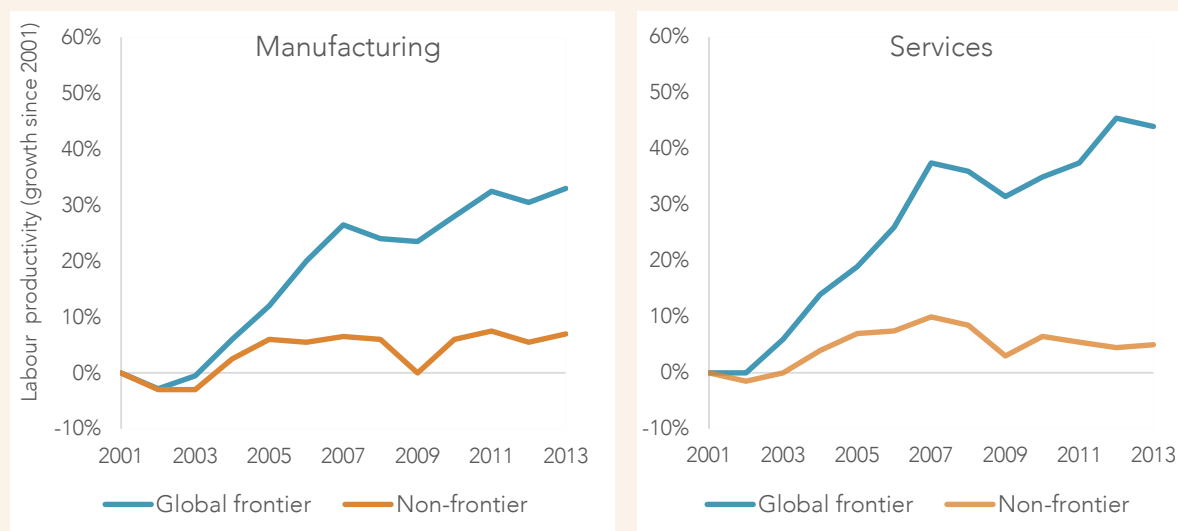
OECD research suggests that one plausible explanation for this widening is higher barriers to technology adoption and knowledge diffusion. Non-frontier firms, particularly in digital and skill-intensive industries, may struggle to catch up, as they do not have enough absorptive capacity to learn from 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 Global Financial Crisis 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 productivity is the average labour productivity of all the other firms in each industry and in the dataset.
2. Services are non-financial business services.
3. The dataset covered 24 OECD countries mostly in Europe but also included Japan, Korea and the United States.

3.3 A statistical picture of New Zealand’s productivity frontier

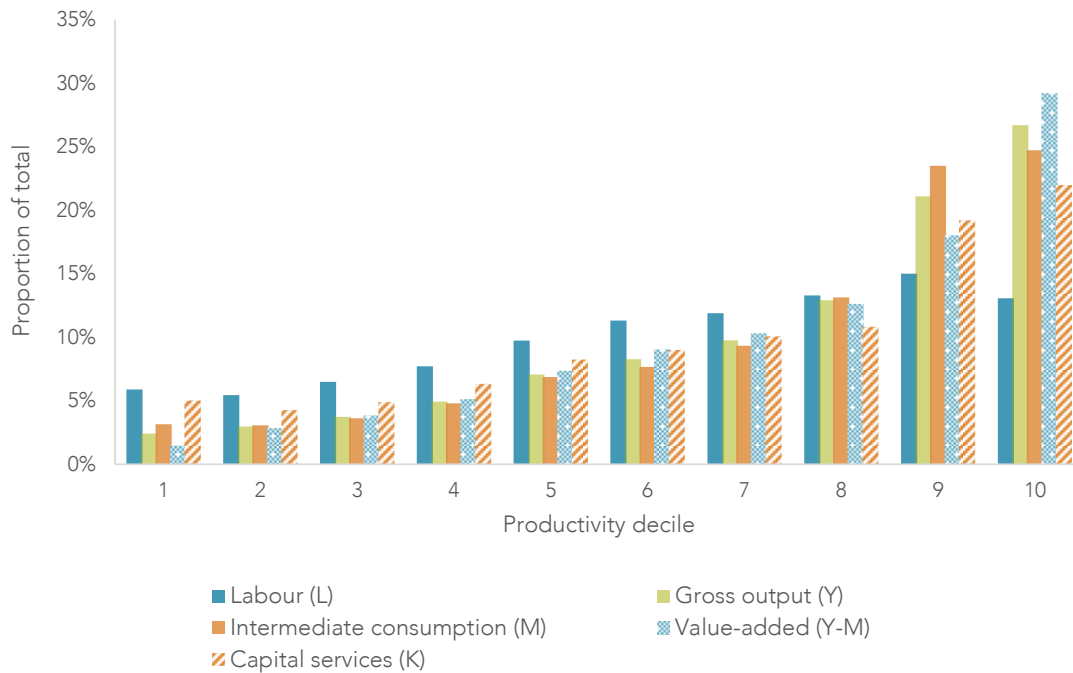
To help understand the characteristics and performance of New Zealand’s frontier firms, the Commission asked Richard Fabling, an expert in microdata research, to undertake a statistical analysis of these firms using Stats NZ’s LBD. Data in the LBD are anonymised.

Fabling (2021) 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 services, 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, higher-skilled workers, and pay a higher firm wage premium than non-frontier firms.

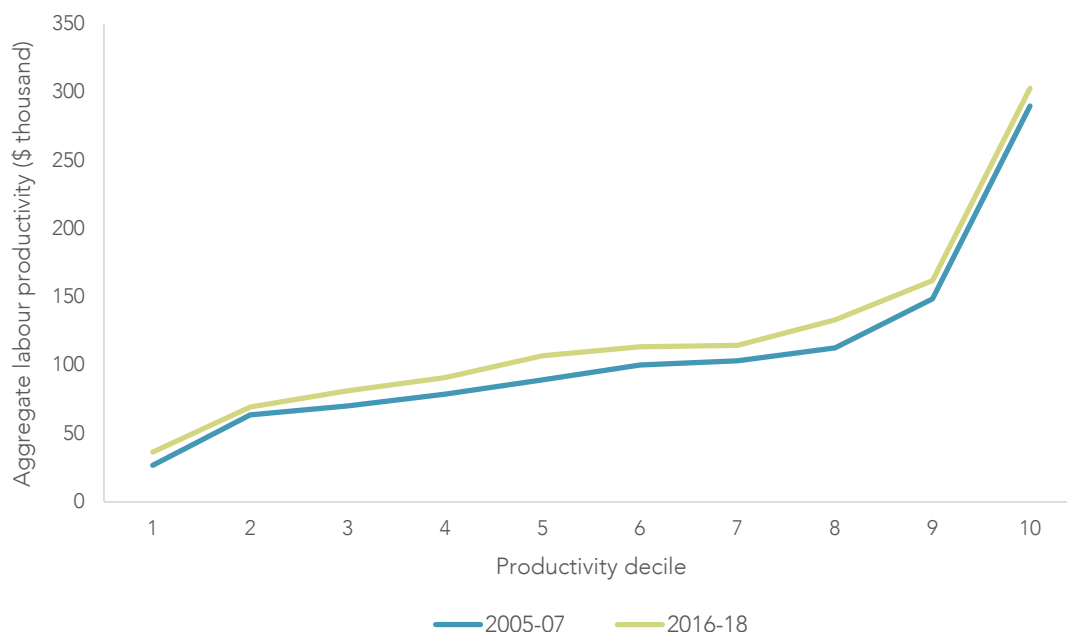
Figure 3.3 Distribution of selected totals across MFP “deciles”, 2005–18



Source: Fabling (2021).

Notes:

1. The figure shows, for example, how the total number of workers (L) is 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.

Figure 3.4 Labour productivity by MFP “decile”, 2005–07 and 2016–18

Source: Fabling (2021).

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 spend more on marketing and market research. They are more capital-intensive than non-frontier firms. Frontier firms are also more likely to be foreign-owned relative to other firms in New Zealand. Also, Zheng et al. (2013) found they are more likely to be foreign-owned than the frontier firms in a group of four European SAEs (Belgium, Denmark, Finland and Sweden).

Table 3.1 shows several characteristics of New Zealand frontier firms relative to non-frontier firms. The figures are averages or percentages for each 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 (2021).

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 is defined as the flow of capital services available per year per worker (also called the capital-labour ratio).
4. The results in this table are calculated for each characteristic and have not been cross-tabulated.

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

The 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, Denmark, Finland, the Netherlands and Sweden.⁴ 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 of firms 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, an average of the industry productivity frontiers in one industry over 2003–2016 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 small-advanced-economy industry 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 italics) were Ireland, Luxembourg, Norway, *Belgium, Denmark, Germany, United States, the Netherlands, Switzerland, Austria, Sweden* and France. *Finland* was 14th and *New Zealand* 24th (OECD, 2019).

Benchmarking frontiers

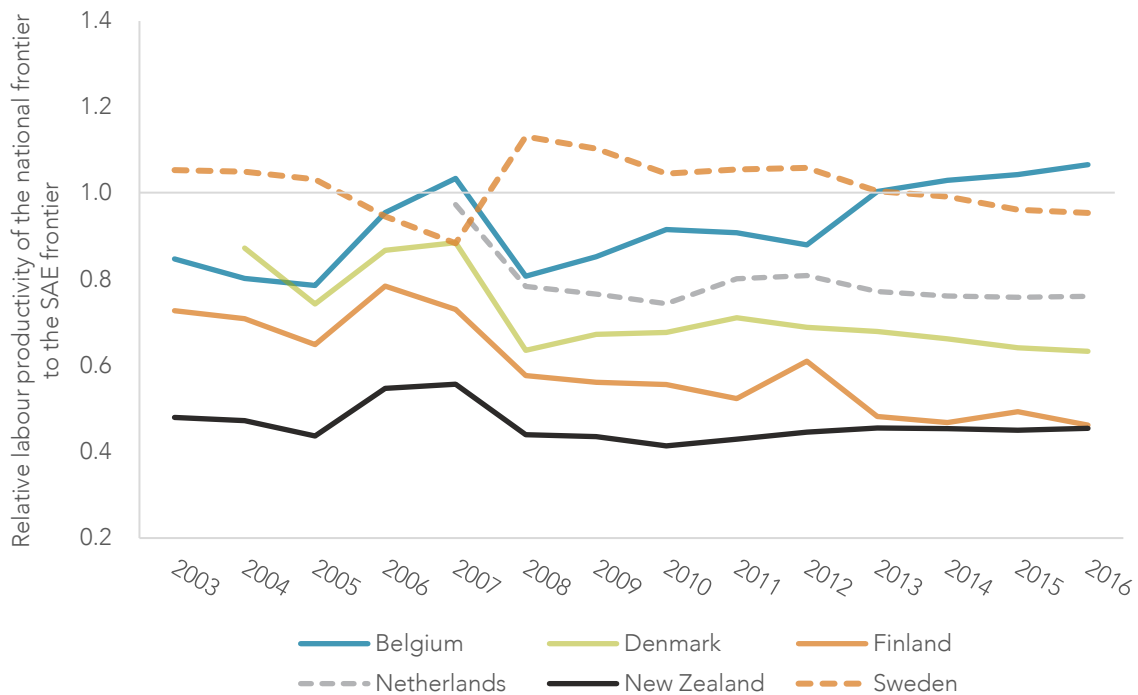
Figure 3.5 shows the ratio over time between countries' national productivity frontiers and the small-advanced-economy frontier. This shows that not only did the top firms in New Zealand have the largest productivity gap relative to the small-advanced-economy frontier, but that this gap increased over time. The New Zealand frontier declined from 48% to 45% of the small-advanced-economy frontier over 2003–16. On average, New Zealand frontier firms lag well behind the small-advanced-economy frontier. The large size of this lag – over 50% – is a central finding of the inquiry.

The lagging productivity of New Zealand's frontier firms exists across all nine industries, although with variation. Zheng et al. (2021) describe the industry results and other results of the Commission's joint research with the NUS.

⁴ The dataset did not cover all the countries the Commission would have liked to compare New Zealand firms against, so these countries were selected as the best available comparators.

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.

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



Source: Zheng et al. (2021).

Notes:

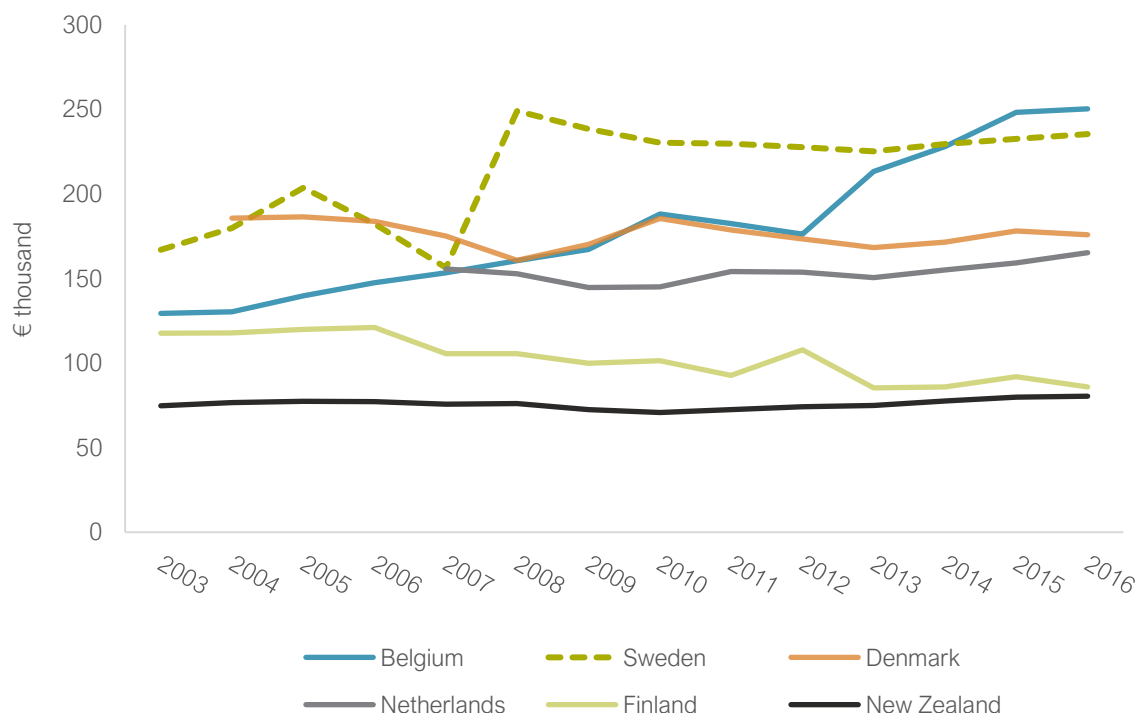
1. Each line is the ratio of the national productivity frontier (calculated as a weighted average of industry-level productivity) to labour productivity at the small-advanced-economy frontier. Industry weights are proportional to the number of firms in each industry.
2. The Denmark and Netherlands data 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

On average, New Zealand's frontier firms have labour productivity levels well below the frontier defined by the most successful frontier firms in the small advanced economies of Belgium, Denmark, Finland, the Netherlands, and Sweden. New Zealand's levels are over 50% below these firms.

Labour productivity growth rates of frontier firms

Figure 3.6 shows the labour productivity tracks of the national frontiers for 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, 2003–16

Source: CompNet data, NZPC calculations.

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). Labour productivity is measured in euros per worker per year.
2. The 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 under NACE2, a European statistical classification of economic activities.

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 to 2016, New Zealand frontier firms grew 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 in order 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 employees or more.

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 SAEs 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 (Box 2.1). 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.

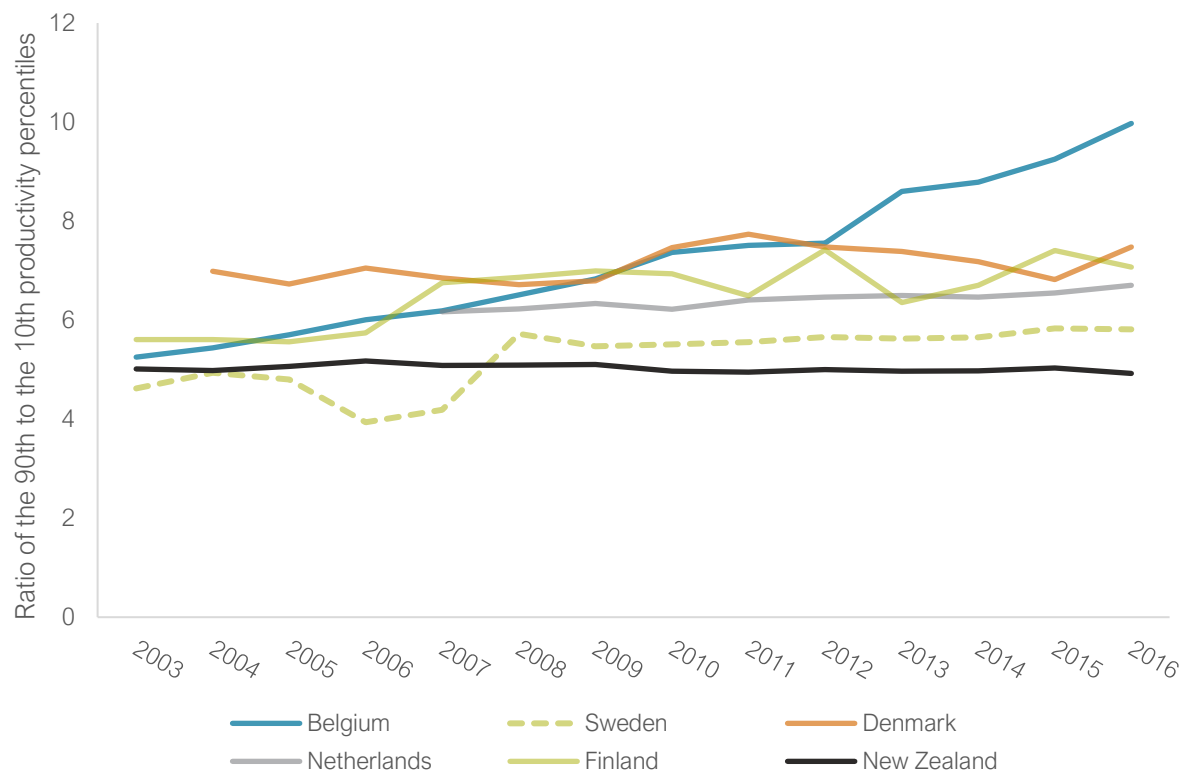
- A narrow distribution could suggest that diffusion is working well, whereas a wide distribution could suggest the opposite.
- A widening distribution over time indicates that the productivity of non-frontier firms is falling further behind that of the frontier firms, which may suggest that diffusion 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, 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 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) and labour productivity at the 10th percentile. 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 5.

Figure 3.8 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 datasets have estimated New Zealand's ratio as higher than 5 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: CompNet data, NZPC calculations.

The stable width of the productivity distribution in New Zealand reflects similar 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 0.6% per year, while firms at the 90th percentile in New Zealand averaged 0.4%. In contrast, among the SAEs, firms at the 10th percentile experienced an average productivity decrease of -1.1% per year, while frontier firms (at the 90th percentile) averaged 1.7% a year growth in labour productivity over this period (Zheng et al., 2021).

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 slow; and
- the productivity at the New Zealand frontier is less than 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 did not change significantly between 2003 and 2016. The gap is smaller and more stable than in several small advanced European economies (whose gaps generally increased 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 SAEs (Belgium, Denmark, Finland, 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 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 diffusion benefit did not happen in New Zealand (Zheng et al., 2021).

These results echo many international-study findings that the diffusion is more difficult 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, unlike non-frontier firms in the other economies, those in New Zealand do not absorb technologies directly from frontier firms internationally (or at least find absorbing them very 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 benefited 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 of improving the country's international connections.

Resources are more likely to be allocated to the top performers in SAEs

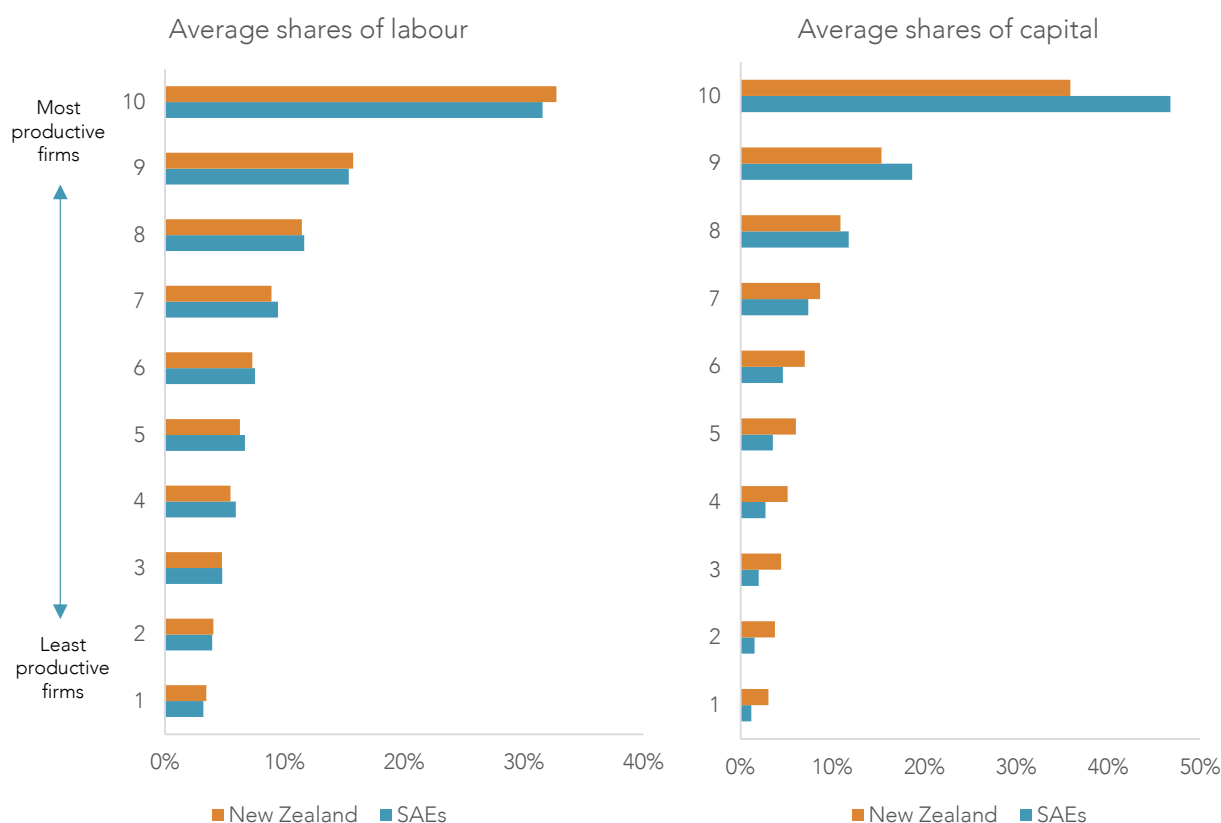
Even when no individual firm raises its productivity, the productivity of the whole economy will rise when productive firms gain market share and resources at the expense of less-productive ones. Indeed, much of the difference in aggregate productivity levels across countries can arise from differences in their ability to reallocate economic resources to more productive uses. This can also account for variations in productivity growth rates (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 larger on average (using the size measures of employment or capital stock), then more of an economy's resources of labour and capital will be employed productively.

Figure 3.8 shows the estimated allocation of labour and capital across MFP deciles in New Zealand and the European SAEs. 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 SAEs, a higher proportion of capital is allocated to the top two deciles in the European SAEs, and a smaller proportion to the lower deciles, than in New Zealand.

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



Source: CompNet data, NZPC calculations.

Notes:

1. The 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. The Denmark and Netherlands data start from 2004 and 2007 respectively.

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.⁷

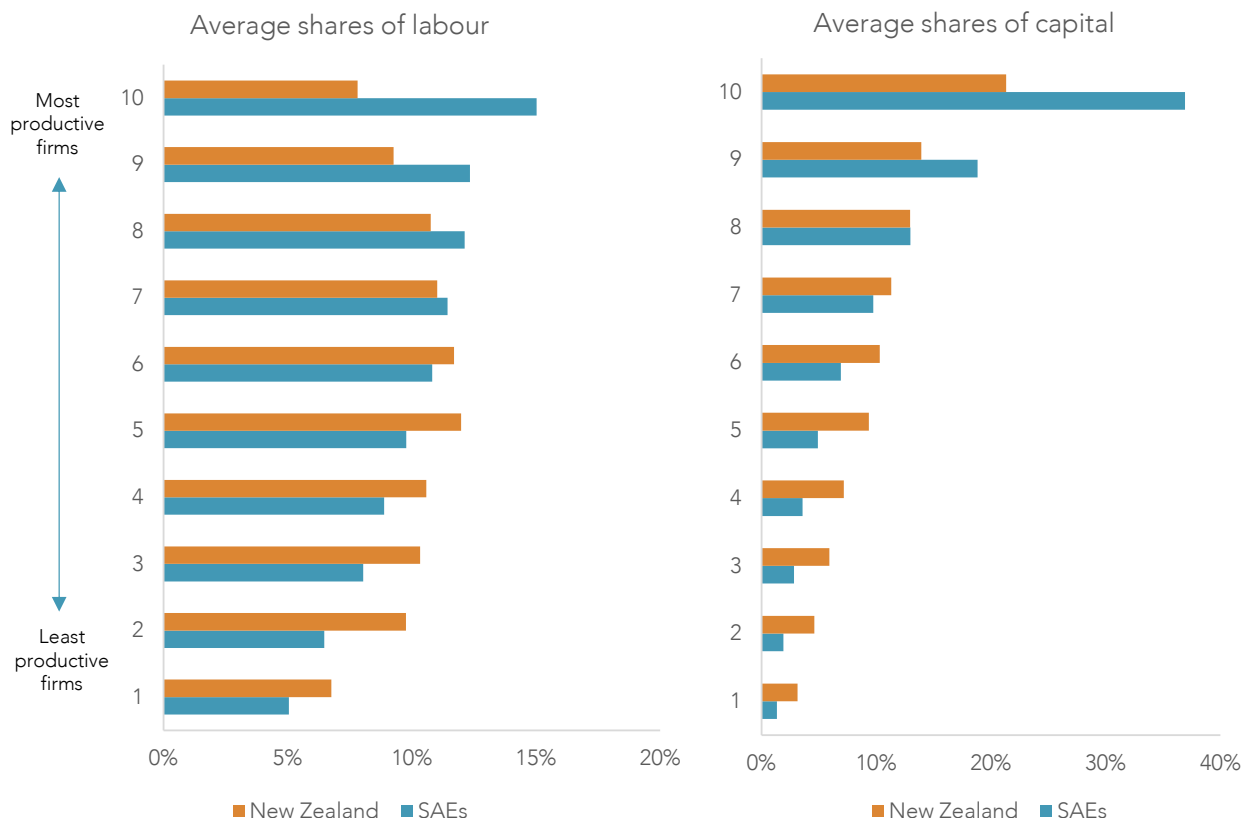
As noted in Chapter 2, New Zealand firms tend to have low capital intensity, much lower on average than the European SAEs such as Belgium, Denmark and the Netherlands. With this in mind, Figure 3.9 benchmarks the allocation of labour and capital across the labour productivity deciles in New Zealand and the European SAEs.

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 SAEs, 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 may well be serving the domestic market.

The least-productive firms in terms of labour productivity still have significant shares of labour in both New Zealand and the European SAEs. 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).

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



Source: Zheng et al. (2021).

Notes:

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

⁷ As a result, 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.

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

New Zealand’s large negative gap in average labour productivity is unsurprising considering the combination of Europe’s frontier firms being well ahead of New Zealand’s frontier firms in their levels of labour productivity *and* the European frontier firms being the largest firms in their country by employment.

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. However, the European countries allocated a higher proportion of capital to their frontier firms. This was also the case in comparing New Zealand and European firms on their labour productivity performance. This finding is consistent with European firms being more capital-intensive than their New Zealand counterparts.

European countries also allocated a higher proportion of labour to their frontier firms (measured in terms of labour productivity). This reflects the fact that European countries tend to have more large, capital-intensive and productive firms that employ many people.

3.5 Key characteristics of frontier firms

Quantitative analyses of the sort discussed above are useful for revealing patterns and trends, but are less helpful for understanding “what constitutes a frontier firm”. For example, some highly successful firms could be still in a development phase in which their profitability and productivity are currently not high – such as the highly regarded accounting software company Xero, which 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. Perhaps more importantly, analyses of patterns and trends are not very helpful for identifying individual firms, or can contribute to only some forms of policy insight.

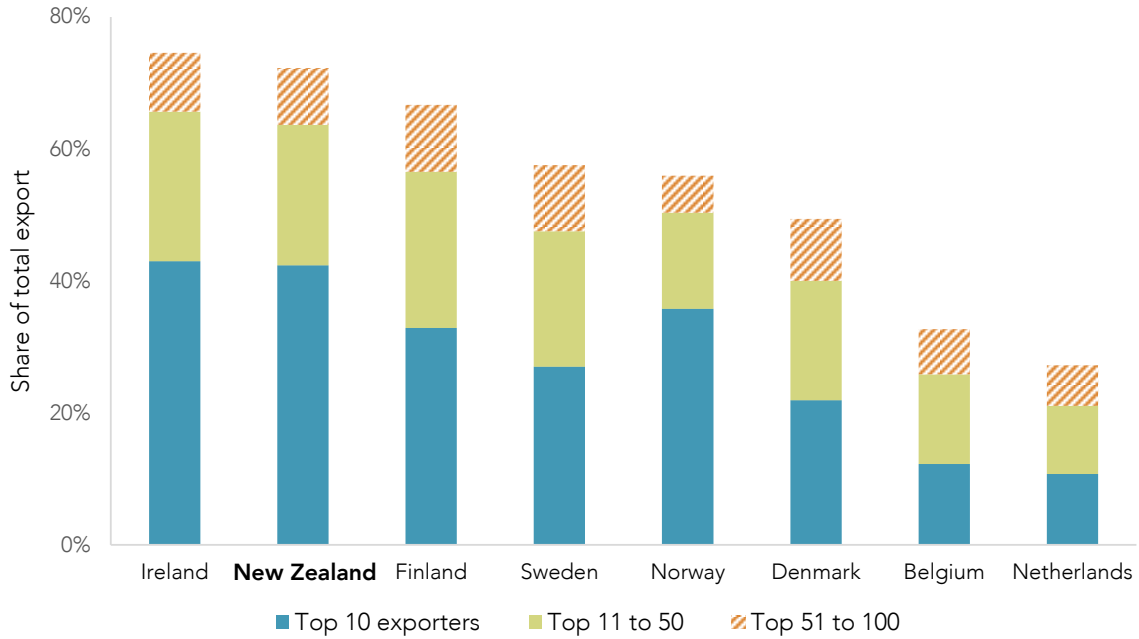
So what features make a business a “frontier firm”? While every firm has different origins, products, operating models and drivers, inquiry investigations point to four interrelated characteristics that distinguish leading firms from those behind the frontier: exporting prevalence, high levels of investment in innovation, scale and “dynamic capabilities”. Later chapters will explore these characteristics and their policy implications in more detail.

Frontier firms export more

Frontier firms are more likely to export than other firms, and tend to export more. Fabling’s (2021) use of Business Operations Survey (BOS) data to identify characteristics of frontier firms found that 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 have ownership stakes in overseas ventures (outward direct investment).

Exporting is highly concentrated in New Zealand (Figure 3.10). In some New Zealand industries, frontier firms dominate export activities and revenues. Indeed, for the horticulture, health technology and software sectors, the top 30% of firms contributed around two-thirds of all industry exports (Lewis et al., 2021).

Figure 3.10 Concentration of exports by top exporters, 2011



Source: NZPC analysis of OECD data.

Only a small number of firms export at any sort of scale: just 297 firms exported more than \$25 million a year, and the value of exports by New Zealand’s top exporters is low compared to other European small advanced economies (Figure 3.11).

Figure 3.11 Value of export by top exporters, 2011



Source: Productivity Commission analysis of OECD data.

This profile has changed little over the past 20 years. Some examples of large, established, internationally oriented Kiwi firms are Fonterra, Zespri, Fisher & Paykel Healthcare, Xero, a2 Milk and Datacom. 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 in early 2020.

- Four were domestic utilities (Meridian, Mercury, Contact, Vector).
- Two largely served domestic customers (Spark, Ryman Healthcare – although Ryman is expanding in Australia).
- Two were international infrastructure companies (Auckland Airport, Ports of Tauranga).
- Only two competed in global markets at scale (Fisher & Paykel Healthcare, a2 Milk).

The prevalence and importance of exporting among frontier firms in small advanced economies makes intuitive sense, for two reasons. First, in small domestic markets, exporting is an important mechanism through which firms can grow and achieve scale. Second, as is discussed in Chapter 5, exporting and innovation are intimately linked. By allowing firms to grow beyond the limits of the domestic market, exporting provides opportunities to recoup and spread the costs of innovation (eg, R&D, capital investments).

Frontier firms invest heavily in innovation

Frontier firms are also more likely to innovate – that is, they develop and introduce new or significantly improved products, processes, and methods that lift performance. These can include:

- new products (eg, Xero's cloud-based accounting software, in Box 3.4);
- new ways of delivering goods and services (eg, Mainfreight's approach to logistics, in Box 3.5); and
- new ways of organising business (such as the Te Tumu Paeroa-led investment vehicle that permits the establishment of new enterprises on Māori trust land without endangering ownership rights, in Box 4.2).

As discussed in Chapter 2, innovation often builds off a firm's existing goods, services and capabilities, and typically requires partnerships with suppliers, customers and other institutions to sustain and grow. Fisher & Paykel Healthcare provides an example of these evolutions and associations (Box 3.3).

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.

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).

Innovation also creates opportunities for specialisation and associated higher returns. Of New Zealand's major dairy processors, Tatua Co-operative Dairy Company earned the highest revenue per kilogram of milk solids in 2019 and the highest average return on capital employed over 2014 to 2019 (Barry & Pattullo, 2020). Tatua achieved these returns by focusing on new and sophisticated goods, such as nutritional products, specialty flavours and specialty ingredients (Lewis et al., 2021).

Large firms with substantial R&D investments can underpin wider ecosystems, promoting innovation spillovers and activities in other firms. Xero plays such a role in New Zealand's financial technology (FinTech) sector (Box 3.4).

Box 3.4 **Xero's FinTech ecosystem**

Xero is a FinTech company providing a cloud-based accounting software platform for small and medium enterprises (SMEs). It was founded in 2006 and listed in 2007. Xero now has more than 3 000 employees across many different office locations. Xero was founded in Wellington and its head office remains there.

It has grown rapidly. Revenue growth has averaged 34.5% per year for the past three years. Revenue in the 2020 financial year was \$718m – fourth among the Technology Investment Network (TIN). Demand for its product is strong, particularly in the context of Covid-19. Many businesses and accountants have realised the advantage of being able to access their financial information from anywhere, rather than being tied to a server in a fixed location. This trend has lifted the performance of many cloud-based companies.

Almost two-thirds of Xero's revenue comes from Australia and New Zealand, but its presence is growing in the United Kingdom, North America and other markets. While Xero's product is weightless, it faces some hurdles if it is to enter different markets. Its accounting software must be customised to the tax system and other regulations of the host country, and this requires a large one-off investment followed by constant updating.

Xero's role as an anchor firm in the FinTech ecosystem eases the path for businesses wishing to start up and grow. Xero has deliberately designed its platform so that other businesses can "plug and play" with the product they have created. This has spawned companies offering complementary products that build on Xero's system, a bit like Apple's App Store. This means that, in addition to Xero's 3 000 employees, around 150 000 developers are building to Xero's Application Programming Interface (API).

Firms can spot gaps in Xero's offering and fill those niches. Its customers can then pick and choose which add-ons they would like in addition to the main product. The ecosystem also provides a more diverse set of opportunities for people working in the sector. Some Xero employees might miss the start-up culture and leave to start new companies.

Businesses like Spotlight Reporting are a good example of this phenomenon. Its service builds on the information in Xero to provide integrated reporting and forecasting to help businesses gain insights and perform better. Spotlight has been able to follow Xero into international markets relatively easily.

Source: Xero (pers. comm., 16 February 2021).

Frontier firms have scale

Skilling (2020) argues that in SAEs, 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.

Size and scale allow firms to overcome the higher fixed costs involved in entering foreign markets (eg, having an in-market presence, marketing) and make investments in riskier ventures such as R&D more feasible. Scale can be achieved in several ways, including through collaborative ventures. Indeed, Fonterra and Zespri can be thought of as collective export vehicles for the large numbers of small firms in the dairy and kiwifruit industries (Lewis et al., 2021). Similarly, several industries in New Zealand have established collective mechanisms for funding and organising innovation (see Chapters 6 and 7).

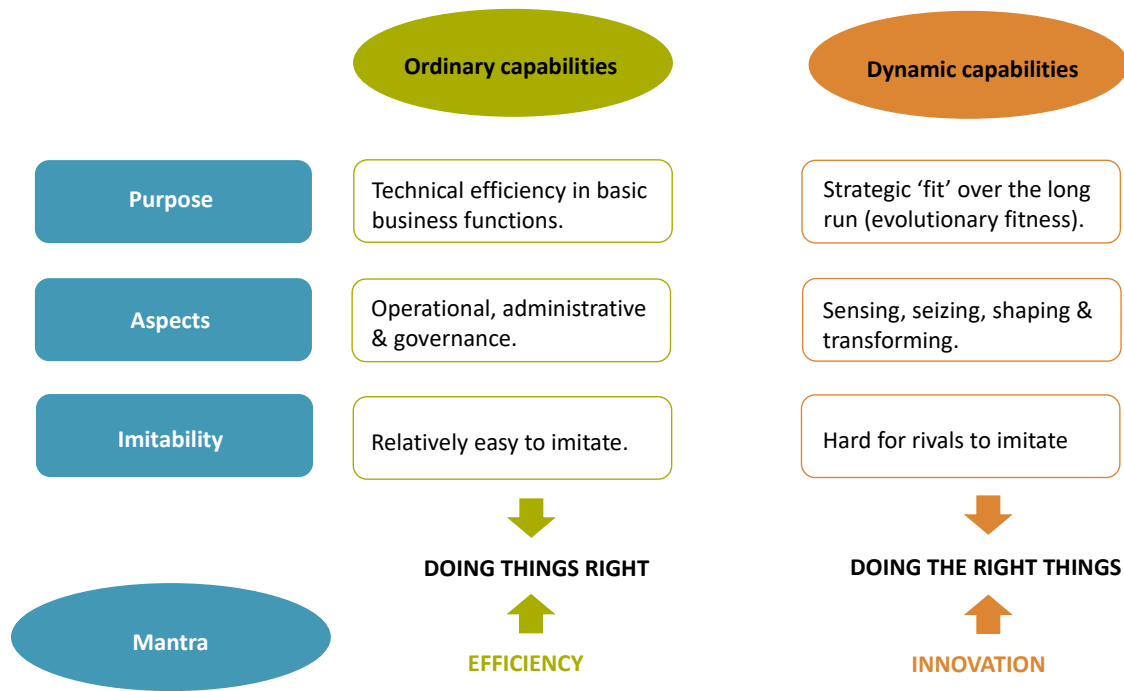
Large frontier firms are typically surrounded by an extensive ecosystem of small and medium sized firms, some of which may also be successful in international markets (eg, the example of Spotlight Reporting following Xero in Box 3.4). Indeed, the large firms enable the strong networks around them. These 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, matching 10% annual growth in a \$20 billion turnover firm requires 100% annual growth in 20 firms with \$100 million turnover.

Frontier firms exhibit "dynamic capabilities"

To reach and sustain scale, high levels of innovation and strong international connections, firms require sophisticated governance and leadership, risk management processes, and the ability to detect and pursue new opportunities. Teece (2017, 2019) describes this bundle of skills, abilities and resources as "dynamic capabilities".

Teece and others distinguish "dynamic" from "ordinary" capabilities (Figure 3.12).

Figure 3.12 Ordinary vs dynamic capabilities



Source: Teece & Brown (2020)

Too much emphasis on ordinary capabilities can inhibit the development of dynamic capabilities.

The adoption of managerial best practices (ie, strong ordinary capabilities) can measurably raise productivity, but it doesn't guarantee future growth. A narrow management focus on best practices alone can stand in the way of innovation that dynamic capabilities seek to foster, because best practices are about optimisation and efficiency (doing things right). By contrast, dynamic capabilities are forward-looking and strategic in nature. They are integral to selecting, developing and coordinating ordinary capabilities and help determine where and how companies allocate their financial, technological and organisational resources to shape and respond to markets (doing the right things). The management of successful frontier firms must be able to balance both efficiency now and effectiveness for the future. (Teece & Brown, 2020, p. 8)

Research into the governance of New Zealand firms for this inquiry found that directors play an important role in fostering the dynamic capabilities needed for "radical innovation". (J. Smith & Garden, 2020). Examples exist of leading New Zealand firms demonstrating dynamic capabilities (Box 3.5). Also, Fabling's (2021) findings are consistent with those firms having dynamic capabilities and deploying them. He found that New Zealand frontier firms are more likely to report that:

- their core equipment is up to date in terms of the best commonly available technology;
- they have better human-resource management practices than non-frontier firms;
- they have ultrafast broadband; and
- they are more likely to report that they have no competitors (which could reflect their ability to produce distinctive products).⁸

⁸ Note, however, the incidence across all firms of firms reporting they have no competitors was low.

Chapter 9 considers options for strengthening the performance and capabilities of business leaders.

Box 3.5 **Mainfreight: a global Kiwi firm with a 100-year vision**

New Zealand company Mainfreight has grown from modest beginnings to become a global logistics supply company. Its route to success illustrates many important characteristics of frontier firms, and shows what dynamic management capabilities can look like in practice.

The company was established in 1978 by Bruce Plested. It focuses on providing high-value products and high-quality services, for clients who are prepared to pay for them. It does this by providing a complete logistics strategy with hard-to-imitate features, and an emphasis on reliability. The company aims to maximise margins by lifting quality and improving efficiency, rather than through cost-cutting.

Mainfreight has seized opportunities for efficiencies and growth from technological innovation. This has included adopting technologies from the global frontier. For example, in the late 1980s the managing directors had an eye-opening tour of an American peer company, which prompted them to adopt computerised track-and-trace technology years ahead of their domestic counterparts (Davies, 2013).

From the outset, Mainfreight has distinguished itself through its corporate culture and values. The company's ethos comprises three "pillars" of culture, family and philosophy. The company promotes openness and transparency. Workplaces are open-plan, and company financials are visible for all to see. Team members are rewarded through a profit-sharing scheme.

The company has a clear goal to "make more money than last year". Together with global growth ambition, this has provided pressure to improve and innovate (Davies, 2013). This ambition is couched in a multiple bottom-line approach. The company has a long track record of environmental sustainability and social responsibility. It is currently focusing on demonstrating best practice in reporting and lowering its greenhouse gas emissions (Mainfreight, 2020).

Decisions are taken in the context of a 100-year vision for global growth. This long-term perspective lifts the aspiration of decision-makers beyond short-term profits, and enables them to learn from failures (rather than avoid them). Management is decentralised, with branch managers empowered to take decisions to maximise their margins. "Fierce debate" is encouraged.

The long-term vision came into play when Mainfreight sought to expand internationally, starting with Australia. There it faced a ruthlessly competitive environment, as many other Kiwi companies have found, and it took a decade to successfully establish itself. The company subsequently experienced numerous setbacks and challenges in its bid for global reach. Mainfreight is now one of New Zealand's largest listed companies. It operates 282 branches across 26 countries. Total group revenue in 2020 was \$3.1b, and it has a target of reaching \$5b in sales revenue by 2024 (Mainfreight, 2020).

Source: Bowley (2020); Braid (2013); Davies (2013); Mainfreight (2020).

3.6 Conclusions

The Commission's empirical investigation of New Zealand's most productive firms reveals interesting patterns about their relative performance over time, levels of diffusion between New Zealand firms, and the distribution of labour and capital across frontier and non-frontier businesses.

- The labour productivity levels of New Zealand frontier firms are well below the levels of firms at the SAE frontier.
- Average growth rates of labour productivity in New Zealand's frontier firms have been slow over 2003 to 2016 – 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 New Zealand firms' productivity distribution 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 European SAEs, 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 lower average capital intensity compared with the European firms.

While this quantitative analysis is useful for revealing patterns and trends, it is less helpful for understanding "what constitutes a frontier firm". In the course of the inquiry, the Commission has identified four interrelated characteristics that distinguish leading firms from those behind the frontier: exporting, high levels of innovation, scale and "dynamic capabilities". Some New Zealand firms exhibit these features, but their numbers are small.

Much of the remainder of this report will look 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.

4 Insights from Māori firms

Key points

- The Māori economy exhibits many of the characteristics needed for firms to innovate, grow and support higher living standards and improved wellbeing. Employment in Māori authorities and SMEs has been growing faster than in the wider economy, and a high proportion of Māori SMEs have invested in expansion. Māori authorities and SMEs are more likely to export than New Zealand firms generally, and also have higher rates of innovation and R&D.
- The need to serve multiple objectives (“multiple bottom lines”) can be a strong driver of ambition in Māori firms, 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.
- 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.
- Māori values such as kaitiakitanga, kōtahitanga and whanaungatanga help differentiate Māori goods and services and provide added brand value overseas. These values 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 firms offer significant potential to contribute to sustainable and productive economic growth. However, they face a number of barriers and challenges that are constraining their potential. The Government should act to reduce these constraints, to unlock the potential of actual and potential Māori frontier firms, and help the Crown better meet its Treaty obligations.
- Existing and prospective Māori land-based businesses face constraints from the land tenure and compliance requirements of Te Ture Whenua Māori Act 1993, which are stifling productivity. The Government should continue to explore and consider practical steps it could take to reform the legislation, alongside improved coordination of government services and support to Māori landowners for land development purposes.
- Mātauranga Māori and Māori brand distinctiveness are significant assets that require adequate legal protections and processes. The Wai 262 report made recommendations for changes to legislation, policies and process relating to mātauranga Māori and intellectual property. The Government should prioritise and accelerate action to protect mātauranga Māori and intellectual property.
- Government procurement processes offer potential for stimulating Māori business growth. The new 5% target for the number of public services contracts awarded to Māori businesses is a good start but needs to be supplemented with capability-building support for suppliers and process improvement for procuring agencies.
- The Government should provide support and resourcing for a Hui Taumata of iwi and Māori business stakeholders. The Hui Taumata would enable a national discussion by Māori for Māori, to identify actions to optimise the Māori business ecosystem.
- 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.

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 has 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 Māori organisations (such as the Federation of Māori Authorities (FOMA), Te Tumu Paeroa 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

A Māori firm or business can be defined in various ways. 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, 2020d).

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 Māori 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.⁹

This work, *Te Matapaeroa*, identified a much larger number of Māori businesses than the Stats NZ definition. In addition to the nearly 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

⁹ 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 2013,¹⁰ representing 5.6% of national GDP (Nana et al., 2015). A recent update placed this value at \$17 billion or 6.8% of national GDP in 2018, showing the Māori economy has been growing faster than the overall economy (BERL, 2021). This growth has been driven by the manufacturing and construction sector.

The 2015 BERL work estimated 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). The most recent estimates prepared by BERL put this figure at \$68.7 billion and show increasing diversification of the asset base (BERL, 2021).

F4.1

The Māori economy comprises a range of organisational forms, structured under various legal frameworks. There is no single or agreed definition of a Māori business or "Māori firm". 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 products (goods or services), and whether the business has a kaupapa Māori focus or has adopted Māori values in the way it operates.

4.2 Activities and performance of Māori firms

Growing and diversifying

In recent decades the Māori economy has grown and diversified significantly. According to the definition of Māori businesses used by Stats NZ, 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, 2020d).

While the business interests of Māori authorities remain dominated by resource-based industries,¹¹ 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, 2020d).

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 SMEs¹² were involved in goods exporting in 2019, compared to 26% across all New Zealand businesses. Goods exports by Māori authorities totalled

¹⁰ BERL used a broad definition, capturing Māori collectively owned enterprises and entities, as well as individually owned businesses and SMEs.

¹¹ 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 Māori authority's asset base; and business that is at least 50% owned by a Māori authority.

¹² According to the Stats NZ definitions.

\$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)¹³ (Stats NZ, 2020d).

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

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 (excluding Māori authorities) found that they operate similarly to non-Māori firms. This research showed that 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 combine and leverage these factors to gain success over their competitors.

¹³ A breakdown of Māori SMEs' exports by commodity is not available.

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.

In work for this inquiry, Mill and Millin (2021) 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 they would make a difference – and to what extent.

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 Houpapapa, 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)

Professor Ekant Veer submitted that tikanga Māori and being Treaty-centred are important principles for all New Zealand firms (sub. DR68). And Te Au Rangahau submitted that,

how well Māori businesses are operating should also make a difference in sustaining and encouraging collective and holistic wellbeing of Māori and Aotearoa New Zealand as a nation. (Te Au Rangahau, sub. DR81, p. 12)

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 (2021) 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 need 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[s] 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 Tawapata 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; and
- an ag-research model using MBIE’s [Ministry for Business, Innovation and Employment] 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)

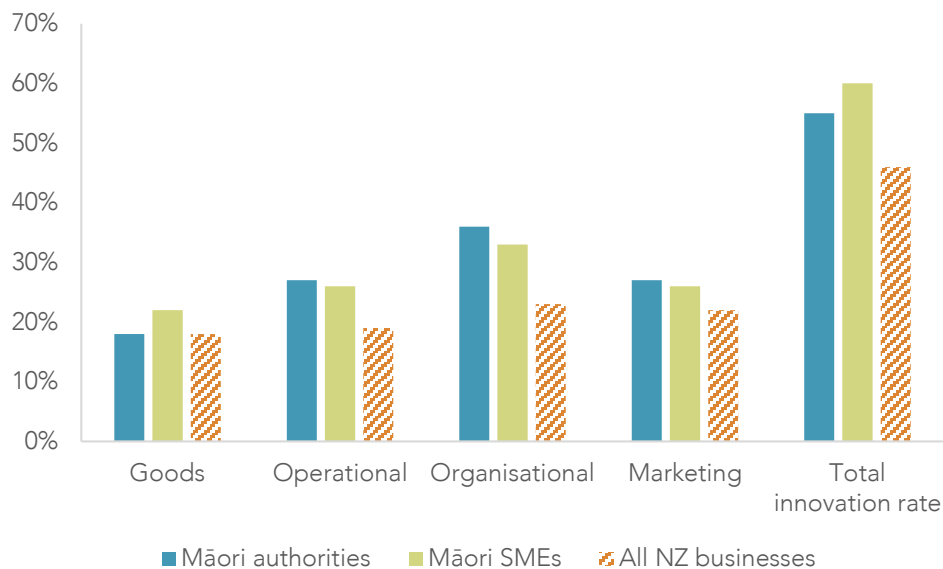
Source: Mill and Millin (2021).

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, 2020d).

Figure 4.1 Innovation rates, by type of innovation, 2019



Source: Stats NZ (2020d).

Note:

1. "All NZ businesses" includes 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).

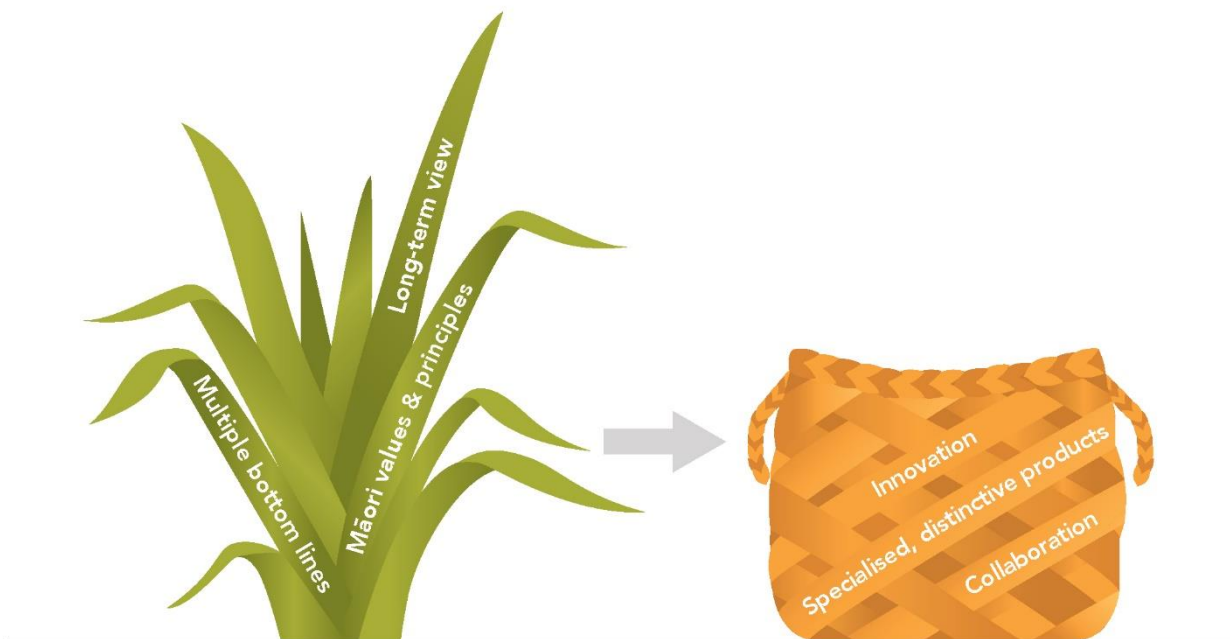
The drive to balance multiple bottom lines can help spur innovation. For example, Dewes distinguished between low appetite for risking the underlying assets, but high appetite for innovation and trying new things. And Jason Ake told Mill and Millin that,

[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 need to serve multiple objectives (“multiple bottom lines”). This 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 showing that self-reported rates of innovation and R&D are higher for Māori firms compared to all New Zealand firms.

Figure 4.2 Multiple bottom lines and a long-term view can spur innovation



Opportunities in meeting demand for sustainable, ethical products

Māori 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, several participants commented that kaupapa Māori firms resonate well with consumers looking for products with strong environmental credentials, and features such as provenance and authenticity.

Many examples exist of successful Māori firms that focus on kaupapa Māori values and approaches, and are 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). Its 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).

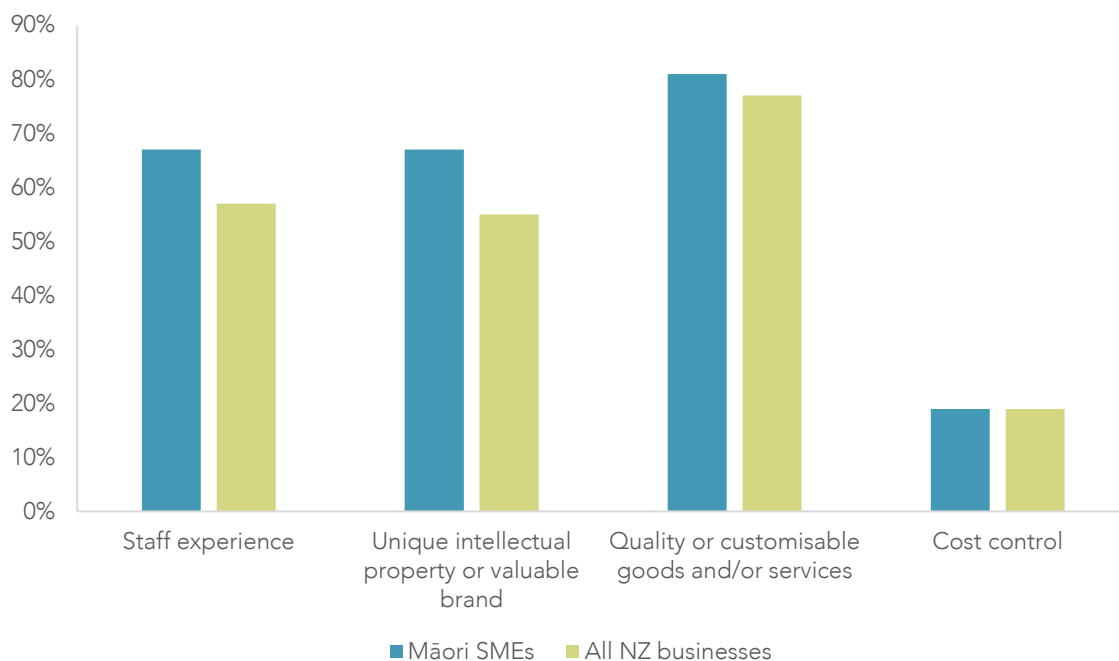
F4.6

Māori 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 traditional knowledge and brand distinctiveness are significant assets

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 4.3 Factors that helped exporting businesses compete overseas, 2019



Source: Stats NZ (2020d).

Notes:

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

Harmsworth and Tahi (2008) found that indigenous brand distinctiveness is becoming a significant asset globally, 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 1991, six claimants lodged a Treaty of Waitangi claim on behalf of themselves and their iwi.¹⁴ The claim was a “contemporary” claim, in that it focused mainly on the Crown’s existing laws, policies and practices rather than historic Crown actions. It related to te tino rangatiratanga o te Iwi Māori in respect of indigenous flora and fauna and all their taonga. It included Māori symbols and designs, and their use and development, and associated cultural and customary heritage rights in relation to such taonga. The 2011 Waitangi Tribunal’s *Ko Aotearoa Tēnei* report (known as the “Wai 262 report”)¹⁵ included recommendations for changes to legislation and government policies and practices relating to indigenous flora and fauna, intellectual property and science (among other things).

Progress to address some of the major recommendations of the Wai 262 report has been slow. The Government has acknowledged that little has been done to protect mātauranga Māori in particular since the report was issued, and is developing a whole-of-government approach to responding (Te Puni Kōkiri, 2021). TPK’s submission highlighted the innovation opportunity from protecting mātauranga Māori, and advocated for speedier resolution of the outstanding issues raised by the Wai 262 report (Te Puni Kōkiri, sub. DR76).

Chrissie Hape told Mill and Millin that,

integral to the successful trade and economic growth for Māori export businesses is the ratification of Wai 262. Many products [for which] Māori have developed supporting IP and businesses relate to Māori culture, identity, rongoā and mātauranga Māori. As we have seen with mānuka honey, unless there are mechanisms put in place to protect and uphold these as unique [to] Aotearoa and Māori, then our point of difference and advantage will be overwhelmed by large overseas companies. (Chrissie Hape, Ngāti Kahungunu)

F4.7

Mātauranga Māori and Māori brand distinctiveness are significant assets that require adequate legal protections and processes. The Wai 262 report made recommendations for changes to legislation, policies and process relating to mātauranga Māori and intellectual property. The Government’s progress to directly address these recommendations has been slow.

R4.1

The Government, led by Te Puni Kōkiri, should take an all-of-government approach to address the recommendations of the Wai 262 report, and prioritise and accelerate action to protect mātauranga Māori and intellectual property.

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)

¹⁴ The claimants were Haana Murray (Ngāti Kuri), Hema Nui a Tawhaki Witana (Te Rarawa), Te Witi McMath (Ngāti Wai), Tama Poata (Ngāti Porou), Kataraina Rimene (Ngāti Kahungunu) and John Hippolite (Ngāti Koata).

¹⁵ Because it was the 262nd claim lodged with the Waitangi Tribunal.

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 innovation 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 Atihau-nui-a-Pāpārangi)

Project Whetu was set up to help settlement entity commercial arms 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)

F4.8

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, 2021). Interviewees explained that 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)

Some interviewees said that 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 kāwanatanga. (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 Māori 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)

Several interviewees expressed the importance of good communication and transparency with shareholders.

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 government can help grow Māori frontier firms

Better coordination of government engagement and support

Māori interviewees expressed concerns about the difficulty of navigating government agencies and supports for business, including those for Māori business.

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 ... 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)

Non-Māori inquiry participants expressed similar concerns, finding government supports for business innovation to be fragmented and cluttered, with both duplication and gaps. In Chapter 6, the Commission recommends that the suite of programmes to assist firms with innovation and exporting be reviewed, in order 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 support. This review should consider ways to improve the connectivity between Māori businesses and government supports for innovation and exporting.

These improvements to the innovation ecosystem will benefit both Māori and non-Māori firms, but specific efforts are needed to further improve government supports for Māori business. Te Au Rangahau submitted that little guidance exists to help policymakers and providers understand the needs of indigenous entrepreneurs. Their submission cited research by Jason Mika, that points to seven main elements of ideal enterprise assistance for Māori entrepreneurs. These elements include delivery by Māori, long-term

relationships with Māori enterprises, partial government funding, and a focus on cultural authenticity, flexibility and responsiveness (Te Au Rangahau, sub. DR81).

Te Puni Kōkiri has developed a Māori Economic Resilience Strategy to help Māori households, whānau and firms recover from the impacts of Covid-19, and build their resilience against future economic shocks. The strategy comprises three pou, to focus efforts in the areas of skills and workforce, community resilience and infrastructure, and enterprise. Activities within the enterprise pou will aim to grow Māori business, help advance Māori exporters, and ensure a pipeline of support for Māori enterprise. MBIE has commenced preliminary work to identify the range of support currently provided to Māori economic development, including Māori enterprises. This will help provide a foundation for further work across government, including the Māori Economic Resilience Strategy.

A couple of interviewees called for government support and resourcing for Māori to design work to optimise the Māori business ecosystem.

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)

One idea from interviewees 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 government and Māori business networks can work together to encourage and promote productivity and growth in the Māori economy.

F4.9

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 optimising the Māori business ecosystem, to better promote productivity, innovation and growth in the Māori economy.

F4.10

The Ministry for Business, Innovation and Employment has commenced preliminary work to identify the range of support currently provided to Māori economic development, including Māori enterprises. Once completed, this work will help provide a foundation for further work across government, including the Māori Economic Resilience Strategy.

R4.2

Government should provide support and resourcing for a Hui Taumata (national Māori business summit) of iwi and Māori business stakeholder organisations. 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;
- formulate actions to improve the Māori business ecosystem; and
- develop ideas for how government and Māori business networks can better work together.

The Government should invite the Iwi Chairs Forum, the Federation of Māori Authorities, the Māori Economic Development Advisory Board, and other key iwi and Māori business stakeholder organisations to establish a clear kaupapa/purpose, format, location and date for the Hui Taumata.

Te Puni Kōkiri would lead government support for the Hui Taumata, working closely with the Ministry for Business, Innovation and Employment, the Treasury, the Ministry for Primary Industries, New Zealand Trade and Enterprise, and Callaghan Innovation.

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 leverage the Māori–Crown relationship and the Crown’s Treaty obligations. They pointed to government procurement 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 Māori... 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)

Interviewee Matthew Tukaki identified barriers for Māori businesses to participate effectively in public procurement processes, including:

- difficulty navigating Crown procurement processes;
- a government focus on value for money driving down prices below what is required for fair value cost, and quality service delivery;
- a cashflow lag between tendering and award of contracts, to payment to suppliers; and
- a lack of capacity in Māori service providers.

He pointed to the Supply Nation model, which supports Aboriginal and Torres Strait Islander businesses, as an efficient and effective way of working with the indigenous business sector. Supply Nation is funded by

government, corporate and not-for-profit organisations. It provides a verified database of indigenous businesses, and provides business improvement support, awards and recognition for success, and business networks for those businesses.

Since 2009, Supply Nation has worked with Aboriginal and Torres Strait Islander businesses along with procurement teams from government and corporate Australia to help shape today's emerging and rapidly emerging Indigenous business sector... This is based on building partnerships to create supplier networks not just with Government agencies but also business and industry – this centralised and coordinated approach makes it easier for Indigenous businesses to be engaged while at the same time providing a central repository for networking, knowledge and information sharing. (Matthew Tukaki, Executive Director New Zealand Māori Council)

Pelenato Sakalia said that building business capability is essential to enabling Māori and Pacific businesses to participate effectively in government and private sector procurement processes. He said this support needs to comprise a business community platform, well-designed and responsive support services, and quality data. The Pacific Business Trust (PBT) provides a local model for this, which is tailored to the New Zealand procurement environment (see Box 4.2).

Social procurement isn't about a lowering of the requirements of the buyer. It's about raising the capability of businesses to participate more effectively. (Pelenato Sakalia, CEO Pacific Business Trust)

This sentiment was echoed in the finding of a 2019 evaluation of Australia's Indigenous Procurement Policy, which involves targets for the volume and value of contracts awarded to indigenous businesses. Undertaken by Deloitte, the three-year evaluation found that the policy had been successful in increasing government purchasing from indigenous businesses. But it highlighted the need for capacity building for both suppliers and purchasers, to better enable indigenous businesses to participate in procurement processes (Deloitte, 2019, 2021).

As discussed in Chapter 6, the Government has recently made changes to its public procurement rules. The changes include a new 5% target for the number of public service contracts awarded to Māori businesses and enterprises. TPK submitted that these current policies have significant potential for building enterprise management and stimulating Māori SME growth, and for addressing talent and leadership gaps, building a pipeline of commercial management capability and fulfilling Crown Treaty obligations (sub. DR76).

Dr Barbara Allen, Professor Margreet Boersma, Nic Naismith and Dr Anne Steel submitted that training and upskilling in public procurement organisations would also be needed. They noted that early market consultations can provide a useful opportunity for Māori firms to learn more about the purchasing organisations (sub. DR66).

The Government acknowledges the 5% target is "aspirational" (Minister for Economic and Regional Development (Hon Stuart Nash) & Te Minita Whanaketanga Māori (Hon Willie Jackson), 2021). It has appointed Amotai as an intermediary, to verify supplier businesses are Māori, act as a broker between buyers and suppliers, and connect suppliers with business support services.

Access to a range of tailored, culturally appropriate capability-building supports will be important for helping Māori businesses participate in government procurement, and therefore to achieving this target. Supports should include help to meet prequalification standards, participate in tendering processes and establish joint ventures/consortia. Any additional supports for Māori business must be easy to navigate, and not exacerbate the current confusing clutter of programmes.

Box 4.2 Procurement support and services for Pacific businesses

The Pacific Business Trust provides a database of registered Pacific-owned businesses. Participating businesses have access to a network of providers offering technical and business advisory supports, as well as workshops and events, and an online community platform with around 3 000 member businesses.

In 2019, the PBT engaged Deloitte to develop an evaluation and diagnostic tool for assessing Pacific business capability. This tool assesses a business's readiness to participate in mainstream procurement processes. It informs the provision of tailored, culturally appropriate support plans for each business so they can meet procurement prequalification standards. Procurement support services cover aspects such as health and safety, environment and sustainability, legal advice, risk management, tendering and pricing, and management system development.

The PBT is funded by central government, and private sector partners. The services are free for participating businesses, but they must complete a business profile and provide up-to-date information about their engagement and process (such as the impact of services on their capability and ability to secure contracts). The PBT uses data from its business platform to provide quarterly insight reports to inform the MBIE procurement team's policy development. The insights include how businesses engage with PBT's interventions, the impact on their capability, and their ability to secure contracts and work from buyers.

Source: Mill and Millin (2021); Pacific Business Trust (2021).

F4.11

Government procurement processes offer potential for stimulating Māori business growth. The new 5% target for the number of public service contracts awarded to Māori businesses is a good start. But to achieve its objectives, it will need supplementing with capability-building support for suppliers and procurement process improvement by procuring agencies.

R4.3

The Government, led by Te Puni Kōkiri, should provide culturally appropriate supports to build the capability of Māori businesses to participate in government procurement processes. Supports should include help to meet prequalification standards, participate in tendering processes and establish joint ventures/consortia. Any additional supports for Māori business must be easy to navigate, and not exacerbate the current confusing clutter of programmes.

R4.4

The Government should undertake further work to explore how the Māori–Crown relationship can be better utilised and enhanced, to unlock the potential of actual and potential Māori frontier firms, and help meet the Crown's Treaty obligations.

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 around 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-around we have explored with another Māori incorporation is to jointly establish a limited liability company to combine our cash resources to buy and use neighbouring private land. The company will give us the agility to take further opportunities through more streamlined decision-making and allow us to use its freehold land asset 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. An expert panel reviewed Te Ture Whenua Māori Act in 2012. 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.

Cabinet approved the panel's reforms, and a Bill was introduced to Parliament in 2016. In 2017 the Bill was withdrawn. The Government provided funding to improve the administration of Māori freehold land, and to support the development of Māori land and improve governance capacity. Parliament passed targeted changes to the legislation in 2020, to simplify and improve Māori Land Court processes for landowners (Te Puni Kōkiri, 2016).

The recent amendments do not address the fundamental issues tackled by the 2012 review. It is a challenge to balance land retention and protection with effective governance and management to raise productivity and returns for Māori landowners. The Government is currently considering further reform of the legislation, and also has the option to continue improving services to Māori businesses.

The Government should explore and consider practical steps it could take to reform the legislation, alongside improved coordination of government services and support to Māori landowners for land

development purposes. The overarching goal should be to rebalance Te Ture Whenua Māori Act 1993 to allow for more land utilisation and development, while recognising the importance of retaining Māori land in the hands of its owners and their whānau and hapū. The approach to change needs to be more ambitious than before, and properly informed by all reviews carried out in the last decade.

F4.12

Māori land-based businesses are constrained by the land tenure and compliance requirements of Te Ture Whenua Māori Act 1993. It is a challenge to balance land retention and protection with effective governance and management to raise productivity and returns for Māori landowners. To address these matters, the Government is currently considering further reform of the legislation. The Government could also consider continued improvement of services to Māori businesses.

R4.5

The Government, led by Te Puni Kōkiri, should explore and consider practical steps it could take to reform Te Ture Whenua Māori Act 1993, alongside improved coordination of government services and support to Māori landowners for land development purposes. The overarching goal should be to rebalance the legislation to allow for more land utilisation and development, while recognising the importance of retaining Māori land in the hands of its owners and their whānau and hapū. The approach to change needs to be more ambitious than before, and properly informed by all reviews carried out in the last decade.

Access to capital remains a significant constraint

In addition to the legislative constraints faced by Māori land-based businesses, Māori enterprises and entrepreneurs more generally face difficulties in accessing capital. Reasons for this include:

- systemic bias in the financial system, partly due to financial institutions' lack of understanding of Te Ao Māori;
- low financial literacy, and skills to navigate the financial system; and
- relatively low incomes, lower home ownership rates, and the lack of a business track record (NZIER, 2003; Te Puni Kōkiri, 2014; Te Puni Kōkiri & Federation of Māori Authorities, 2006).

Māori financial capability has been growing over time, as has financial institutions' interest in Māori business. For example, most banks and financial institutions have put in place dedicated personnel familiar with Māori Freehold Land Incorporations and Trusts. However, this hasn't necessarily translated into improved services for Māori business, and barriers to accessing capital remain a significant problem across the Māori economy (BERL, 2021). The 2020 BDO Māori Business Survey found that funding and access to capital are two of the top three challenges for Māori businesses (BDO, 2020).

The Reserve Bank is leading work to explore the access-to-capital landscape for Māori. This will take into account work currently being led by MBIE and The Treasury on access to capital for small to medium enterprises.

F4.13

Māori businesses and entrepreneurs face challenges accessing capital. The Reserve Bank is leading work to explore the access-to-capital landscape for Māori. This will take into account work currently being led by the Ministry for Business, Innovation and Employment and The Treasury on access to capital for small to medium enterprises.

Box 4.3 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 landowners did not need to carry the financial risk?

In the kiwifruit industry, Te Tumu Paeroa is managing the financial risk and establishing new enterprises without taking land out of the hands of the Māori landowners.

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 landowners. 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 landowners 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 landowners 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 example of the potential 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, IWLinvestor)

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. He also recommended using his survey dataset to provide more descriptive analysis of the characteristics and performance of Māori firms.

Te Au Rangahau submitted that further research should also look at

the aspects and characteristics of successful firms compared with others and how to measure the performance of Māori firms in a way that is consistent with Māori values, including multiple outcomes beyond the fiscal. This can contribute to more reliant [sic] information, which can be used to develop and grow Māori enterprises. (Te Au Rangahau, sub. DR81, p. 20)

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. The current Māori Economic Resilience Strategy will produce further data and analytical work.

Chrissie Hape told Mill and Millin that iwi should be involved from the outset of any further research into Māori firms, commissioned by government agencies.

I would advocate that the [Productivity] Commission work with the National Iwi Chairs Forum Pou Tāhua chairs to scope this up. Many forums have been established by Crown agencies with a Crown agenda... As a Treaty partner, Iwi should be involved in this at the forefront and the kaupapa be jointly determined. (Chrissie Hape, Ngāti Kahungunu)

More work is desirable to produce agreed authoritative definitions of Māori businesses. Stats NZ has a project under way to improve its data products on Māori business and develop standard definitions of Māori business. The latter includes collating the various definitions of a Māori business already in use across different organisations, and developing a consistent measurement framework that can be used across government agencies. Stats NZ is establishing a Working Group of government and non-government members to progress the work, and has started engagement across a range of Māori business interests. The project is due to be completed in mid-2022.

F4.14

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.

F4.15

Stats NZ is leading work to develop a consistent measurement framework for Māori businesses and improve its data products on Māori businesses. This is important groundwork for future research and analysis into the performance of Māori firms.

R4.6

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 on the Government's Māori Economic Resilience Strategy.

Helping to build governance and management capability for Māori businesses

Those interviewed by Mill and Millin (2021) 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 (but growing) 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.

One inquiry participant commented that while many Māori have the skills to govern all aspects of Māori business, the same few people tend to get repeatedly shoulder-tapped. They said this places pressure on a small group of individuals (Aubrey Wilkinson, member of the Rūnanga of the New Zealand Council of Trade Unions Te Kauae Kaimahi).

Te Au Rangahau submitted that,

Māori firms – frontier and non-frontier – will need an expanded pool to contribute to Māori wellbeing over the long term, and to do so in ways that remain competitive in te ao whānui (wider world) and culturally grounded in te ao Māori. This, successful growth and development of Māori frontier firms require Māori managers that possess dual competencies (Māori and Pākehā) and the capability and confidence to deploy them... Several Māori-specific business and leadership programmes have been devised in universities, wānanga, and polytechnics, which are laudable, but there is a need to

incorporate within mainstream management education and qualifications elements of te ao Māori to allow Māori and non-Māori to access this knowledge and practice. (Te Au Rangahau, sub. DR81, p. 24)

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. Initiatives to build capability for Māori businesses to participate in public procurement processes would be one avenue for providing such mentoring.

F4.16

A small but growing talent pool of Māori have 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.

Initiatives to build capability for Māori businesses to participate in public procurement processes are one way of helping grow the pipeline of Māori business talent.

5 Exporting and innovation

Key points

- In other small advanced economies, large firms exporting specialised, distinctive, high-value products at scale make a large contribution to 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 back into the local economy.
- By comparison, New Zealand's largest exporters tend to export commodities based on natural resources. Continued growth in these products is constrained by environmental limits. Innovating and exporting specialised, distinctive, high-value products at scale is key to more New Zealand firms reaching the global productivity frontier.
- Moving into export markets brings upfront costs such as obtaining market intelligence, branding, and developing distribution networks. Innovation also requires an upfront investment.
- The small size of the domestic market means New Zealand's firms must face these costs when they are still small by international standards. This makes innovating and expanding overseas even more difficult, expensive and risky for New Zealand firms.
- In some ways, information technology is helping to reduce these hurdles. Weightless industries such as software are promising as they seem to face lower hurdles to exporting and have lower environmental impacts than traditional primary industries.
- New Zealand needs more firms exporting specialised, distinctive, high-value products at scale. To achieve this, government needs to support firms to overcome these hurdles to exporting, attract high value-adding, export-oriented foreign direct investment (FDI) with rich links to the local economy and to help firms build scale through networks (known as "innovation ecosystems" – see Chapters 6 and 7).
- The government supports exporting and attracting FDI through New Zealand Trade and Enterprise (NZTE) and other partners. This support should be better evaluated and successful programmes scaled up.
- High-quality FDI that is innovative, oriented to exporting, likely to stay long term and a source of spillover benefits will be more easily attracted by healthy innovation ecosystems. FDI attraction should be part of a focused innovation policy (Chapter 7). The same measures that can be used to upgrade an innovation ecosystem could also be part of a negotiated package to attract high-quality FDI.
- Focused innovation policy (Chapter 7) would see NZTE diverting some of the resources it devotes to internationalisation away from assisting individual firms to building the innovation ecosystems in areas of focus.

Exporting is a powerful means for countries to increase their prosperity. It enables countries to specialise in products they are good at making, and which trading partners desire, and then expand 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 explores 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 sections of the chapter describe and assess the current arrangements in New Zealand for attracting foreign direct investment (FDI) and 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 to export successfully are central to New Zealand's economic success. The mix of exports and the extent to which the exports possess an enduring competitive advantage reflect the capabilities in New Zealand's innovation ecosystems (Chapter 2). In any country, these capabilities (broadly understood) evolve and refine themselves over decades of experience in producing and exporting (Chapter 6). They reflect the history of economic development and the process of market selection in which non-frontier firms go out of business and resources get re-allocated to growing firms with higher productivity. International links formed in the course of exporting are also an important channel for accessing new technologies and ideas and diffusing them to New Zealand firms.

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

As noted in Chapter 2, successful small advanced economies (SAEs) tend to have developed a significant number of large, internationally-connected companies. Thanks to their scale, these firms can invest more in research and development (R&D), innovate more and export more.

Compared to the successful SAEs, New Zealand lacks large businesses exporting specialised, distinctive, high-value products at scale (Chapter 2). 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 (especially land) (Deloitte Access Economics, 2020).

The scope to continue increasing living standards through increasing exports of natural resources is constrained by environmental limits. For example, in many areas more intensive use of existing agricultural land, or bringing new land into production, will make it difficult for the country to achieve its low-emissions and water quality goals. Adding value without increasing environmental impact is another reason the "weightless" sector¹⁶ holds such promise for New Zealand (Greenaway-McGrevy et al., 2020).

Fonterra is New Zealand's only firm that clearly operates at a global scale. If it were publicly listed, it would likely earn a position in the Forbes Global 2000. The original intention of forming the giant cooperative was to leverage this size into innovation and the export of specialised, distinctive, high-value products at scale, becoming the "Nokia of the South". This has not materialised (Hickey, 2019). Some of the reasons for this are examined in Chapter 10.

Few New Zealand businesses export at scale without natural resources as their base. These businesses can be divided into two groups: well-run local businesses that have expanded into regional markets (eg, EBOS, Datacom, Beca), and businesses that are "born global" with world-leading, innovative products (eg, a2 Milk, Fisher & Paykel Healthcare, Xero) (Campbell-Hunt, 2001). In this latter group, the firms get most of their revenue from exports. This allows them to achieve the scale of sales needed to realise the benefits of their investment in innovation. Fisher & Paykel Healthcare and Xero have market values that would make the Forbes 2000, but they do not yet qualify on revenue, profit and asset criteria. This indicates that markets are predicting these companies will continue to grow to Forbes 2000 size, which bodes well for the future.

Exporting, innovation, scale and productivity are intertwined

Developed economies must predominantly rely on innovation to gain competitive advantage. This avoids the other route of competing directly with low-wage economies by producing standard products that can be easily replicated. Specialised, distinctive, high-value 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 – as the scale of production expands, unit costs are driven down and productivity is driven up (Haskel & Westlake, 2018).

The scope for selling specialised, distinctive, high-value products in a small domestic economy is limited. It is necessary to export to get the volume of sales required to recoup the initial investment in innovation.

¹⁶ Weightless industries are those that produce knowledge-intensive goods and services whose value is high relative to their transport costs.

Frontier firms need to innovate and export at scale to raise their productivity closer to the global frontier. By doing so, they can make a significant contribution to national living standards and wellbeing. This outcome is observed in other SAEs (Skilling, 2020).

Frontier firms are more likely to export, and export in greater quantities than non-frontier firms (Fabling, 2021). Some of their competitive advantage is developed prior to exporting, as firms need to be productive to succeed in international markets. Superior productivity before exporting explains much of the productivity gap between exporters and non-exporters (Fabling & Sanderson, 2013). Even so, 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).

So, exporting provides firms with opportunities to continue innovating and improving their productivity over time. New Zealand’s internationally connected firms have relatively higher productivity levels and growth rates. Labour productivity is 6% higher among exporters in the same industry (Fabling et al., 2008). Exporting firms are larger on average than other firms and there is a link between exporting and innovation (Stats NZ, 2012).

Exporting provides more opportunities for firms to participate in global value chains (GVCs) (defined in Chapter 2). This participation allows firms to specialise in niche products, scale up and raise productivity. 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 also “facilitate knowledge spillovers through domestic supply chains” (Criscuolo & Timmis, 2017, p. 63).

New Zealand firms participate in GVCs at relatively low 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 in New Zealand of understanding, building, and using the capabilities that underlie product specialisation.

Scale is important to innovation and exporting, but small and medium enterprises (SMEs) also have an important role. In successful SAEs, large companies tend to provide “canopy cover” for an innovation ecosystem that includes researchers and smaller businesses (Box 2.2 in Chapter 2). Large firms provide a ready market for SMEs, who also benefit from the diffusion of global innovations. In return, SMEs can provide the dynamism and agility that large firms lack.

F5.1

Developed countries must innovate to create and keep a competitive advantage. Small advanced economies (SAEs), including New Zealand, must expand into export markets to achieve economies of scale. Exporting specialised, distinctive, high-value products at scale is the way that a SAE can significantly lift national productivity.

5.2 Exporting has high fixed costs which emphasises 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, making the leap from a small distant country like New Zealand can be risky.

Expanding overseas can be difficult, expensive and risky

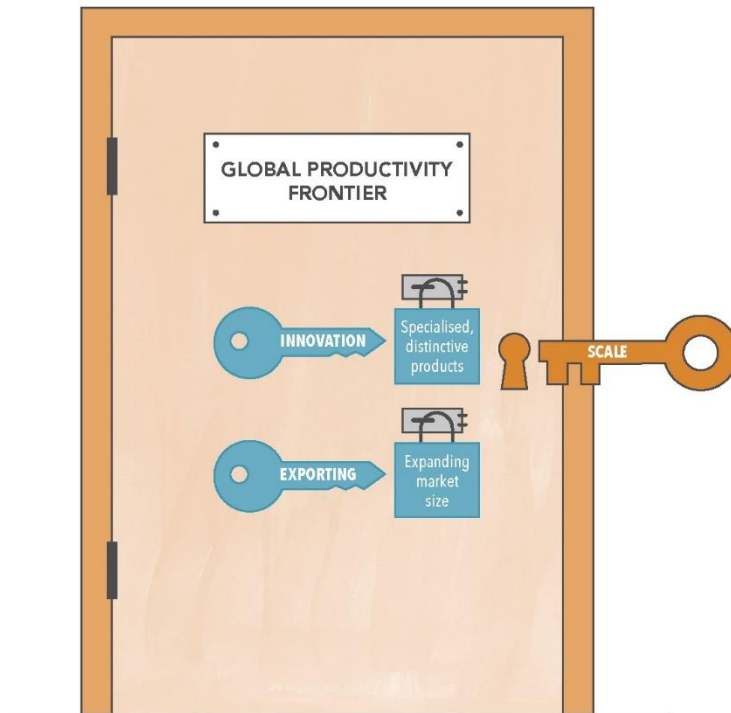
Having dealt with one set of fixed costs in developing an innovative, knowledge-intensive product, New Zealand firms can face substantial hurdles when looking to expand overseas and export. Entering international markets can be a difficult, lengthy and expensive process, with no guarantee of success (Figure 5.1). It can involve many years of research and planning, including work to understand target markets, develop partners (eg, distribution), build brand awareness, and tailor product offerings (Simmons, 2002).

Given the small size of the domestic market, Kiwi firms often go global relatively early in their lifecycle. Firms in larger domestic markets or adjoining markets within free-trade blocs are usually much larger before

needing to take this risky step. As a result, New Zealand firms often face a significant step-change in cost, effort and risk when they are still relatively small. Fulfilling an export order often involves a step-change in production, which means firms must rapidly scale up operation. Hiring new employees and investing in plant and equipment can be particularly challenging for entrepreneurs who are risking their own capital (such as the family home) to make the leap offshore.

Given these challenges, it is not surprising that many New Zealand firms 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 under-estimate 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 was 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.¹⁷ Exchange rate volatility, exchange rate level, distance from markets and limited managerial time or resources are the other most frequently listed difficulties (Lewis et al., 2021).

Text-mining work by Sim, Bull and Mok (2021) similarly found that competition was one of the most common challenges facing exporting firms. Analysis of correspondence between NZTE and its Focus 700 (F700) firms found that the top challenges facing these firms were competition, brand awareness, partners and channels (intermediaries such as distribution channels), market understanding (how overseas markets work and what foreign consumers want), and cost and pricing.

Sim, Bull and Mok found that the challenges vary 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:

- firms targeting Australia and North America are more likely to contend with challenges around brand awareness, partners and channels, and competition;
- firms entering China and Taiwan face challenges with brand awareness, partners and channels and cost and pricing, while for other East Asian markets competition replaces partners and channels;
- in EU markets (including the UK), the key challenges were brand awareness, partners and channels and market understanding;
- in Latin American markets, the leading challenges were competition, market access, and regulation and certification; and
- in Indian, Middle East and African markets, the key challenges were competition, cost and pricing and partners and channels.

In terms of industries:

- manufacturing firms faced most challenges in brand awareness, partners and channels and competition;
- food and beverage firms' biggest challenges were in brand awareness, partners and channels, and cost and pricing, with consumers being particularly sensitive to prices; and
- services and tech firms faced most challenges in brand awareness, competition and presence and recruitment, with technical specialists with local knowledge in great demand (eg, to do after-sales service).

While New Zealand firms report facing these hurdles, they may simply be describing symptoms rather than diagnosing the underlying cause. For example, exchange rate volatility is a big issue for many firms, but this is in part due to the country's historical reliance on commodities which tend to have higher swings in prices over time than manufactured goods (Steenkamp, 2014).

Many of these problems are also likely to be a symptom of firms making the leap into exporting at a relatively earlier stage of their development. New Zealand firms are likely to be smaller when they start exporting due to the small domestic market and so are more vulnerable to problems like competitive pressures, creating brand awareness and a volatile exchange rate (Skilling, 2001).

“Weightless” industries may face lower hurdles

While not substituting for physical presence, the accelerated uptake and normalisation of digital technologies / ICT is helping to remove the disadvantages of distance and “flatten the world”. As noted in Chapter 9, 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). New Zealand firms seem to be investing more in ICT than their counterparts overseas. However, there is a need for greater

¹⁷ Reported by exporting firms in the International Engagement module of the 2015 Business Operations Survey.

investment in the relevant technical and management skills to allow businesses to make the most of these technologies (Conway, 2020).

The Covid-19 pandemic has accelerated the process by normalising the use of digital technology such as online videoconferencing. A foreign firm dealing with a New Zealand firm is currently not very different from dealing with a firm in its own country, as face-to-face contact is limited. The impact of this change is likely to be even greater for “weightless” exports where little shipping is required. As noted above, most weightless industries also have the advantage of lower environmental impacts compared with New Zealand’s traditional agricultural exports.

The software industry provides an example of how “weightless” industries can overcome the hurdles of exporting from a small, distant economy. Software firms are well connected internationally and have high rates of exporting (Lewis et al., 2021). Once a software product is created, it can usually be replicated with minimal marginal cost, creating large scale economies. The industry is notable for taking a collaborative approach where firms can piggyback on each other’s technology. Digital platforms have also reduced or eliminated the use of intermediaries between producers and consumers in the publishing process, making the distribution of unique products much easier (Box 5.1). These unique factors may help explain why technology firms are less likely to report cost and pricing or partners and channels as export challenges (Sim et al., 2021). This may also explain why ICT is the only broad industry where New Zealand’s frontier firms are growing their productivity faster than their counterparts in other SAEs (Zheng et al., 2021).

Box 5.1 “Game On”: Going digital takes New Zealand’s game industry global

Games are now serious business. New Zealand’s game industry has grown \$120m during the Covid-19 pandemic, topping \$324m in revenue in the year to April 2020. While starting from a small base, growth has averaged 42% a year for the past six years – since well before the start of Covid-19. The vast majority of that revenue (96%) comes from exports. The industry includes 42 companies employing over 740 skilled staff. Like software more broadly, finding experienced staff is the most often cited barrier to growth in the industry (New Zealand Game Developers Association, 2020).

The rapid growth of the industry is equally due to Kiwi creativity and early adoption of digital business models. Several factors have allowed this hi-tech creative industry to take flight.

First, like many modern software and creative products, games software is an intangible asset. Creating the product comes with upfront costs – many hours of input from highly skilled technical and creative people to create the intellectual property. Once the product is created, it is highly scalable and can be sold to unlimited numbers of users at little additional cost. Crucially for a country in a remote part of the Pacific Ocean, there are no shipping costs.

Second, retaining the creative intellectual property in New Zealand has enabled more businesses to benefit from licensing deals with new markets and reinvest profits in further product development and jobs.

Third, digital platforms offer a direct route to millions of users around the world. In addition to Apple and Google’s app stores, the entertainment industry has international platforms such as the PlayStation store, Xbox store, Fortnite’s Epic Games Store and Steam. These platforms innovate with new business models, such as selling optional micro-transactions inside a game, selling additional services or Netflix-style monthly subscriptions.

Of course, these platforms have significant power. They tend to take 30% of the revenue for sales on their site. The marketplace is also crowded, and the platforms can choose which games get featured and are therefore more likely to succeed. This is where Kiwi ingenuity comes in. This can provide a unique take on an established genre which gets noticed and grows organically.

One example of this potential is Path of Exile, a fantasy role playing game. Chris Wilson, Jonathan Rogers and Erik Olofsson started development of the game 14 years ago in a West Auckland garage. Key to their market success was creating a community of players, measured in the tens of millions. To

do this they made the game free to play and therefore easy to trial. Players can buy cosmetic weapons and armour sets on top of the initial free access to dress up their characters in the game, yet these purchases do not offer any in-game advantage.

This business model is somewhat like the software-as-a-service model used by Xero (Chapter 3), which has standard and premium offerings. Like Xero, Path of Exile's intellectual property is measured in their audience numbers, with millions of people accessing the game each month. The massive Chinese game company Tencent (owners of games like Fortnite) bought the company for over \$100m in 2018. The company is still based in West Auckland and continues to grow – now with 155 staff.



What is the path to having more games like Path of Exile? Similar to other industries where intangible capital dominates, early-stage funding is a key barrier. Once a company has a prototype for a game it can then seek development funding from platforms or investors, but industry participants report that funding to build the prototype can be difficult to raise. While game development includes sophisticated technology, its value comes from innovative design. Such design is an example of value creation in a digital, weightless industry but it does not meet the criteria for technology-based R&D tax credits or grants (Chapter 6).

Source: Stephen Knightly (pers. comm., 11 March 2021).

Effective scale can be built through three actions

New Zealand's challenge is to build firms or networks of firms that can export at sufficient scale to approach the global productivity frontier and in turn substantially enhance national productivity. As noted above, local firms must overcome significant hurdles to reach that scale. They face high fixed costs from investing in innovation and exporting, and must make these large investments when relatively small. Drawing on best practice from SAEs, effective scale is achievable through three broad actions.

1. Attract foreign direct investment (FDI) that wants to use New Zealand as a base to export high value-added products to the world. For example, bringing in large multinationals can provide instant scale, acting as "canopy cover" for SMEs while helping to expose domestic firms to the global frontier. This approach requires courting potential foreign investment and/or investing in a first-class domestic environment: skills, research, infrastructure, regulation and liveable cities to make New Zealand a magnet for FDI firms and their staff. This is explored more in section 5.3.
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 discussed in section 5.4.
3. Build networks around firms to create world-class innovation ecosystems. These networks can help businesses share the fixed costs and risks associated with innovation and, to a lesser extent, exporting. This concept is examined in more detail in Chapters 6 and 7.

5.3 Attracting the right kind of Foreign Direct Investment

FDI 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 would provide many of the same spillover benefits of having large domestic exporting firms. The right sort of FDI invests in innovation, grows new export markets, creates a demand for skills, encourages more training, attracts international talent and builds career paths that help keep skilled people in New Zealand. The right sort of FDI provides access to GVCs and, through the diffusion of innovation, can help domestic firms raise their productivity. Investments by foreign investors can also help develop a network of specialised partners such as suppliers and researchers.

However, not all FDI results in positive spillovers, and not all potential spillovers are realised. For example, while the revenue is generated in the host country, the profits accrue to foreign shareholders. This can be seen in Ireland with its growing gap between Gross Domestic Product (GDP) and Gross National Product. Ireland's GDP is also overstated due to United States multinational corporations (MNCs) shifting profits to make the most of Ireland's favourable corporate tax rate (Damgaard et al., 2019).

The key is making New Zealand an attractive destination for "high-quality" FDI and creating an environment where positive spillovers are more likely. The latter means attracting FDI (whether in the form of entrepreneurial individuals, SMEs or MNCs) that develops rich links into the local economy, invests in innovation and grows new export markets from New Zealand. This has not been the case historically for New Zealand. The level of foreign ownership of New Zealand's Top 200 firms has grown over time (Deloitte Access Economics, 2020), but has tended to supply the domestic market rather than export (Skilling, 2020). The profile of MNCs in New Zealand accords with the description of large firms generally in section 5.1. The majority do not export at all; those that do tend to export natural resources.

Of the few foreign-owned businesses exporting specialised products, all started as New Zealand businesses. This sort of FDI can improve international links and give existing New Zealand products the scale to enter global distribution networks, but it does not create new, innovative exports. A good example of this is the Haier purchase of Fisher and Paykel Appliances. Haier moved manufacturing offshore, but invested in scaling up R&D in Auckland, providing 120 new skilled jobs (Underhill, 2018).

To help attract higher-value FDI and increase the likelihood of positive spillovers, New Zealand can learn lessons from the experience of high-performing SAEs such as Singapore, Denmark, Israel and Ireland.

Box 5.2 Overseas lessons for attracting high-quality Foreign Direct Investment

Attracting FDI can be an expensive and high-stakes game, especially when positive spillovers are not guaranteed and MNCs can move on if another country offers a better deal. Although different countries have different advantages and approaches, the countries that are successful in attracting high-value FDI seem to have a few things in common.

First, high-quality FDI destinations have strong innovation ecosystems. The skills, capacity and knowledge networks of the local population are major location drivers for foreign investment (Guimón, 2008). To facilitate a shift towards a knowledge-based economy and attract MNCs likely to perform and encourage innovation, policymakers in Singapore focused on developing local firm capabilities and clusters (Prime, 2012). In fact, some analysts argue that sustained innovation from FDI is unlikely to occur *without* innovative local firms (Prime, 2012). Efforts like Singapore's improve the absorptive capacity of local firms and reduce the risk of foreign activity displacing local innovative activity and profits.

Second, destinations that attract high-quality FDI focus their efforts and resources on target areas. For example, Singapore's FDI policies have consistently identified and focused on a few high-growth, high

value-added niches (such as biotechnology) to maximise the effectiveness of their investment in FDI attraction (Ministry of Economic Development, 2011).

In Denmark, acoustics is an area of competitive advantage. Danish companies such as Bang & Olufsen and Oticon hold valuable intellectual property and provide research and education in engineering acoustics. RAE Systems based in California's Silicon Valley chose to establish its European headquarters in Denmark because of the opportunity to tap into Denmark's scientific skillset and specialist knowledge in acoustics (Smart State Council, 2008).

Israel has successfully created and promoted an attractive ICT innovation ecosystem to foreign investors. Around 300 multinational companies with R&D centres were in Israel in 2016, including IBM, Intel, Apple, Cisco, Motorola and Microsoft. Getz & Goldberg (2016) identified a combination of government investment incentives and the availability of skilled human capital as attractive factors for these leading ICT multinationals.

Third, high-quality FDI destinations work hard to blow their own trumpet. Ireland's inward investment promotion agency, the Industrial Development Authority (IDA), is possibly the best in its class for its aggressive promotional approach. The IDA also has the capacity to directly negotiate R&D grants with foreign investors, and has financed the creation of new research infrastructure.

Denmark's Ministry of Foreign Affairs advertises the country's competitive advantage to foreign investors. Specifically, it advertises Denmark as an "ideal living lab" for testing new technologies due to its small and homogenous society and quick technology adoption rate (Ministry of Foreign Affairs of Denmark, 2021).

In short, countries successful in attracting high-quality FDI do it as part of an integrated package to help create, build and market the local innovation ecosystem, rather than as an end in itself.

Policies to attract high-quality FDI and maximise positive spillovers

Most discussion of FDI attraction focuses on fiscal incentives, but these tend to have only limited effectiveness in attracting high-quality FDI (Blomström, 2002). Given FDI attraction can be a game of global competition, fiscal incentives such as tax exemptions, credits or grants can play a role in attracting some investors, particularly in the final stages of the decision-making process. The risk of this approach is that it creates a bidding war between countries competing for FDI and leads to a "race to the bottom". This approach may attract FDI, but the costs of the incentives may end up outweighing the positive spillovers associated with the investment. As a result, the overall net effect may be zero or even negative. In short, a country should use fiscal incentives carefully and sparingly, and evaluate them regularly. International evidence suggests that the benefits of fiscal incentives are stronger when they apply to domestic firms as well (eg, an R&D tax credit).

The better way to attract high-quality FDI and extract positive spillovers is to provide an environment in which foreign companies want to locate. This crucially includes building innovation ecosystems with deep networks between industry, researchers and government. Policies to achieve this include support for R&D, skills development, balanced regulation and high-quality infrastructure. Focused innovation policies will be explored more in Chapter 7, but it is worth noting here that such policies could be part of a negotiated package of measures to attract high-quality FDI. Having a strong innovation ecosystem benefits international and local firms alike, and improves the ability of locals to absorb spillover benefits that FDI might bring (Blomström, 2002). A strong innovation ecosystem also improves the "stickiness" of FDI within the host country.

Singapore and Israel are examples of countries that have invested heavily and selectively in research universities to recruit top academic talent and attract international private sector investment. Greenaway et al (2020) note that key thought leaders in academia are key to encouraging major international companies to invest in a country or region. (Tertiary Education Commission, sub. 45, p. 2)

All this may create a sequencing problem. As noted, MNCs help provide “canopy cover” for smaller firms, allowing deeper networks to build within the innovation ecosystem. Yet only when an innovation ecosystem is in place are MNCs likely to invest in the first place. So, efforts to attract FDI must be integrated with innovation policy (Guimón, 2008). In SAEs, innovation policy that is focused is likely to achieve the best results; that is, putting efforts into a few target areas of existing domestic strength (Chapter 7). ExportNZ and BusinessNZ support this approach.

These policy settings also need to make New Zealand attractive to investors by ensuring its innovation ecosystem is world-class. But to ensure their success, they must be carefully and strategically set. Given New Zealand’s distance from markets and customers, attraction policy should focus on areas where the country has a natural competitive advantage, - the future of food, weightless exports, such as R&D and IP [intellectual property] creation, or investment in high tech areas compatible with a large land mass and small population, e.g., autonomous vehicle testing and rocket launching...

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. (ExportNZ and BusinessNZ, sub. 52, pp. 5 & 10)

Finally, governments play an important role in promoting inward investment through disseminating information and providing investment services for prospective investors. In some countries (Singapore and Ireland) the investment promotion agencies also directly negotiate incentives with investors.

New Zealand Trade and Enterprise (NZTE) currently leads this inward investment promotion function on behalf of the New Zealand Government. Its work is partly reactive and partly targets sectors where opportunities are identified. The targeting is not currently aligned across other government agencies. Many inquiry participants and submitters agreed that clarifying priorities across Government to inform targeting for FDI would be helpful. If FDI attraction were integrated with cross-government activity to build targeted innovation ecosystems, careful use of fiscal incentives may be warranted.

New Zealand has many examples of existing strengths that set the country apart and could inform targeted areas for FDI. These include the country’s long history of producing high-quality food products and te ao Māori features that shape the Māori economy (Chapter 4). New Zealand has also been successful as a testing ground for new technologies (eg, Rocket Lab). The Government’s Innovative Partnerships programme pursues such opportunities. It is currently run out of MBIE rather than NZTE, despite being a form of FDI attraction.

F5.3

Foreign direct investment (FDI) that is innovative and oriented to exporting can provide spillover benefits to a local economy. Historically, New Zealand has struggled to attract this kind of FDI. High-quality FDI is attracted to locations by several factors, particularly the strength of local innovation ecosystems.

R5.1

The Government should take a more proactive and deliberate approach to attracting foreign direct investment (FDI) that is innovative, oriented to exporting, likely to stay long term and a source of spillover benefits. It should integrate FDI attraction with a focused innovation policy. The measures that can be used to upgrade an innovation ecosystem can also be part of a negotiated package to attract high-quality FDI. Such a programme requires careful monitoring, evaluation and adaptation to New Zealand circumstances to ensure it produces net benefits.

5.4 Export assistance in New Zealand

Gaining market intelligence and connections

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

Before the Covid-19 pandemic, having a dedicated physical presence in overseas markets was important for building market understanding and making connections. This is likely to become the case again, though perhaps not to the same extent. Local knowledge is important for in-country distribution chains and logistics. Attracting "smart money" (investors with the right experience and connections) can help build networks and open doors.

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 and submitters described scope for greater collaboration among New Zealand firms, to assist each other 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 that support provided by NZTE for aspiring exporters was a help. Also, internationally experienced directors can help firms overcome challenges and avoid common pitfalls when expanding overseas (see Chapter 9).

New Zealand Trade and Enterprise

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. The emphasis is on the first. Government funding for NZTE is \$208 million for the 2020-21 financial year (New Zealand Government, 2020, p. 29).

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 and manufacturers.

The majority of NZTE's efforts (about 80% of its total funding) are put into its Focus portfolio of firms. Focus firms 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 employment or revenue. In the Focus portfolio, 50% of firms have a turnover of less than \$3 million a year.

In Budget 2020, NZTE received an additional \$216 million (over four years) 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, economic recovery after Covid-19. The funding 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 been rising from 700 to reach a target of 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. The rest of NZTE's customers (known as "Foundation") are supported by one-to-many or online services.

NZTE works with New Zealand's other internationally facing and/or 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, overlap exists between Callaghan Innovation 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 6).

As explored in Chapter 7, most successful SAEs focus their support so they can build innovation ecosystems to help improve the performance of firms in their economy. While NZTE is willing to support self-selected coalitions of businesses, most of its services support individual businesses rather than build networks between businesses or improve the wider innovation ecosystem. For example, NZTE could encourage businesses to work together to attend trade shows or provide “boots on the ground” to help New Zealand businesses tap into relevant R&D hot-spots. These activities would be part of a focused innovation policy (Chapter 7).

In addition to NZTE, the New Zealand Export Credit Office (NZEC) works with exporters to help mitigate the risks they face with exporting and internationalisation. NZEC insurance covers risks, including commercial risks (eg, if the buyer goes bankrupt) and political risks (eg, if a buyer’s country restricts capital flows). This insurance allows firms to access debt finance to upscale their business to fulfil export orders. Many other countries have equivalents of the NZEC, and some provide additional services to particular sectors as part of a focused innovation policy.

NZTE measures the effectiveness of its services 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 (impact) 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 impact, it would be straightforward to “tag” NZTE-supported companies in the Longitudinal Business Database. This action, including identifying the type of support they receive, would allow the performance of NZTE-supported companies to be compared with a control group as part of a robust long-term impact evaluation 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 gaining consent would be the correct protocol for the existing 1 400 “Focus” firms, tagging could be made a condition of future assistance at the point firms apply to NZTE. This sort of quantitative evaluation should be part of a mix of evaluation approaches and methods, including qualitative methods and process evaluation.

F5.4

New Zealand Trade and Enterprise (NZTE) has a suite of reasonable performance measures in place which should be retained. Yet it is difficult to use them to accurately demonstrate NZTE’s added value. It would be possible to estimate its added value at relatively low cost by identifying in the Longitudinal Business Database the businesses that receive NZTE support.

R5.2

New Zealand Trade and Enterprise (NZTE) should regularly commission independent evaluations of their services. These evaluations should use a variety of approaches and methods to assess the effectiveness of their services, and to inform improvements and choices about the future mix, design and delivery of services.

To facilitate quantitative evaluation of impact, businesses receiving NZTE support should be identified in the Longitudinal Business Database (including the type of support they receive) to allow for more robust, long-term assessment of NZTE’s performance.

6 Innovation ecosystems and firms

Key points

- Innovation is pervasive in successful economies. Leading firms innovate to reach the global technology frontier, while best domestic practice diffuses to other firms. The case for government support for innovation is well established given the spillover benefits involved.
- A firm has many different ways to innovate, ranging from how it organises its business, through what it offers, to how it serves its customers' ongoing needs. Successful innovation usually involves a combination of these different complementary elements.
- Innovation is complex, risky and takes time. 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.
- The growing importance of intangible capital (such as intellectual property) is leading to more spillovers, sunk costs and synergies, and is increasing the importance of scale. Government can best maximise the opportunities through supporting innovation ecosystems.
- Governments have an essential role in shaping and contributing 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 regulatory and social assistance frameworks that affect the risks and rewards for both firms and workers that innovate. And governments can provide scale and resources to support innovation when they purchase goods and services.
- New Zealand's innovation performance is mixed. While government resources for research are comparable with other countries, business and overall R&D is low, and links between firms and public research institutions are mostly poor. To emulate small advanced economies, the Government must shift the research, science and innovation strategy to boost innovation ecosystems, in particular by encouraging better links between firms and researchers.
- 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.

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 (Chapters 2 and 3). Innovation is central to firms reaching the productivity frontier – whether international or national. This chapter looks at innovation, innovation ecosystems, and the integral role of government in supporting them. It describes and assesses the strengths and weaknesses of the New Zealand Government's system of support for firm-level innovation.

6.1 Innovation

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, 2019c, 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 product innovation on its own provides the lowest return on investment and the least competitive advantage. Sometimes competitive advantages involve 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 commercialise unique varieties of kiwifruit. This gave it a secure hold in international markets (Box 6.2).

The rationale for government innovation support is well established

The justification for public subsidy of innovation is well established. Bloom, Van Reenen, 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 demonstrates 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 the view held by many (including the Ministry of Business, Innovation and Employment (MBIE)) that the spillovers from basic academic research are larger than those from near-market applied research (MBIE, 2019c). The evidence does not appear to entirely support this view, because 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, Van Reenen, 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, Van Reenen, et al. (2019) find that evidence for the importance of skilled migration is high, and moderately strong for the university supply of skilled workers. Evidence on IP protection is mixed, reflecting the balance it must strike between providing rewards to innovators and not 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), raising the question of how governments should support such innovation. The experience of Singapore's Productivity and Innovation Credit shows that it is difficult for governments to support

innovation more broadly through demand-led schemes such as tax credits because it becomes too easy to exploit the broader definition. Government subsidies for venture capital, and for education and training, are examples of policies that support innovation in areas of the economy that are not R&D-intensive.

F6.1

Innovation has spillover benefits. These provide the rationale for broad government support for innovation through policies like R&D tax credits, research grants and intellectual property regulation; 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).

It is challenging for New Zealand firms to innovate at the global frontier

MBIE distinguishes innovating towards the frontier (“the leading edge of what the world knows”) from innovation behind the frontier (“the adoption of existing technologies”) (2019c, p. 18). Both are important for productivity growth. Yet the distinction is not clear-cut; as mentioned above with the Zespri example, several incremental innovations can combine to create leadership in a global niche (Box 6.2). Factors that encourage and support firms to innovate will also encourage them to seek out and make use of international innovations to improve their business outcomes (discussed further in section 6.2).

New Zealand faces 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 9).

The challenge is even greater for firms in industries that do not trade internationally. Firms that trade domestically (ie, are non-exporting) are a large part of the economy and often supply inputs for exporting firms, so are also very important for New Zealand’s national productivity. 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 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 outputs.

Other SAEs face similar disadvantages to New Zealand in terms of size and, to a lesser extent, distance. Some of these countries promote international connections through 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). These programmes usually operate in specific industries as part of a focused innovation policy (Chapter 7).

The Scandinavian countries have a long history of 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 (RSI) strategy signals an intention to move in a similar direction, but without providing detail on how such policies would be implemented (MBIE, 2019b; Chapter 8).

Supporting innovation will also speed diffusion of new ideas to other firms

Evidence suggests that the large productivity gap between national frontier firms and firms at the global frontier is a substantial component of New Zealand’s relatively poor productivity performance. The current distribution of productivity among firms behind New Zealand’s national frontier appears relatively compact, which may indicate 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 advances would flow through 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 higher average skill levels had greater absorptive capacity. However, 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 support for R&D, improving the supply of skilled workers, and alleviating financial constraints to investments (Berlingieri et al., 2020).

Firms can boost their productivity by adopting new technologies, a recent example being cloud-based computing. As noted in Chapter 5, Covid-19 has increased the importance of this technology as a channel for doing business, but complementary innovations are usually needed to get the full benefits of technology. 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).

6.2 Innovation ecosystems

The rationale for government support of innovation is well established. In recent years understanding has grown about the importance of innovation ecosystems and the role for government within them. This section will look at what innovation ecosystems are, and the default role for government within them. It will then look at the potential for greater government involvement and the rationale for it.

Innovation happens within ecosystems

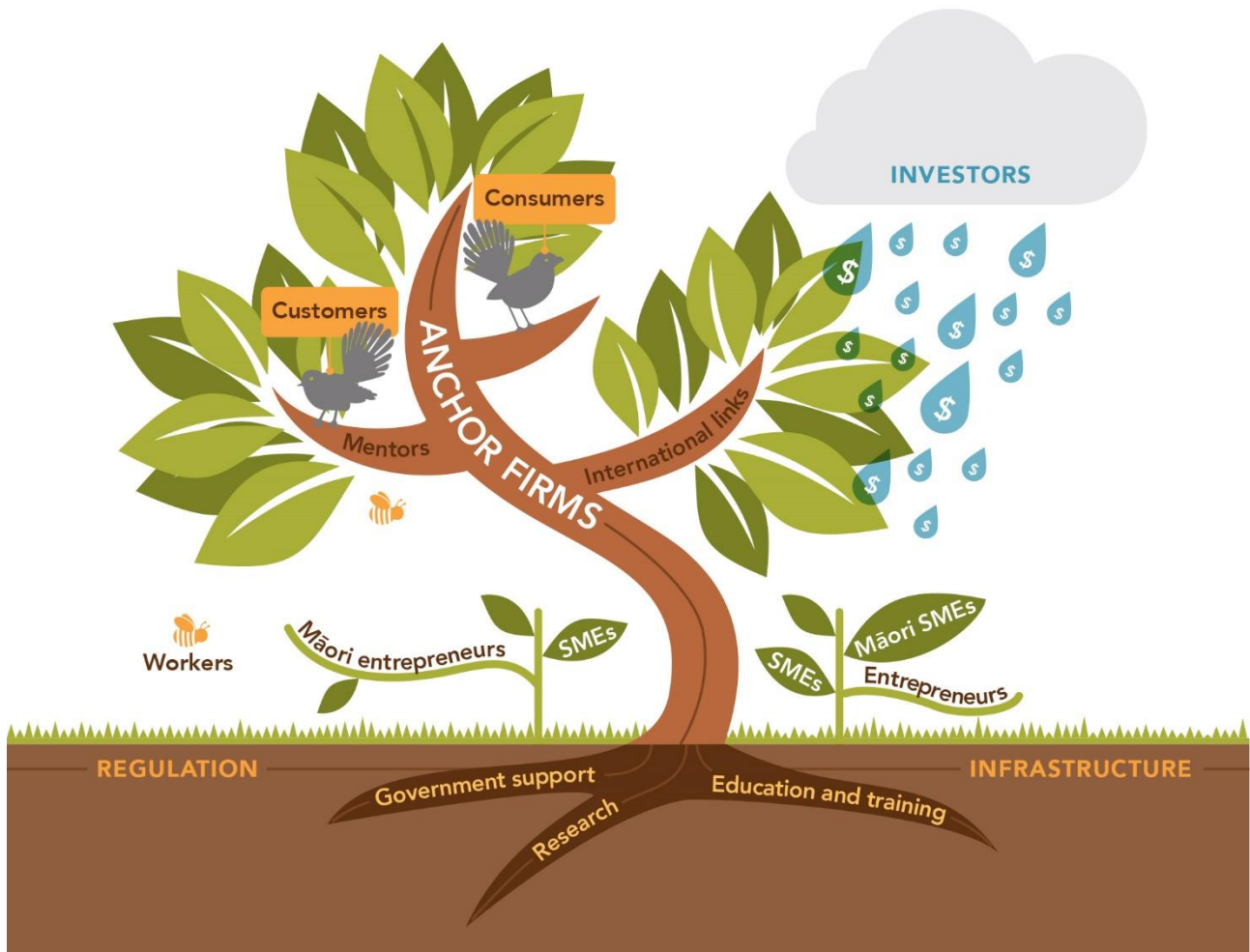
Innovation is complex, cumulative, risky and path-dependent. A wide range of factors directly or indirectly impact on innovation by firms – together, these factors form an innovation ecosystem (Figure 6.2). An innovation ecosystem comprises many players, their capabilities, and the networks between them that together shape the rate and direction of innovation. Firms are at the centre of the ecosystem, with larger “anchor” firms (with the scale to invest in R&D and exporting) providing “canopy cover” (Chapter 5) to small and medium enterprise (SMEs) and entrepreneurs. As noted in Chapter 4, many Māori firms operate within their own unique business ecosystems but, in this representation, they are included as part of the wider ecosystem. The network of relations within and between firms, international links, research bodies, education and training providers, providers of capital, and the wider regulatory, tax and institutional framework are all relevant. Workers also move between firms, helping diffuse innovations as they go. Together, these factors make up the environment that supports risk-taking along the often long and twisty path to successfully implementing an innovation (Ridley, 2020).

There is no clear boundary to define an innovation ecosystem: it will look different from the perspective of different firms. For example, firms are likely to have stronger links to other firms in similar or complementary industries, especially those that are geographically proximate.

The next section focuses on how government is involved in innovation ecosystems and the argument for taking a greater role. However, several inquiry participants emphasised that government policy levers can only achieve so much, and that the private sector must take responsibility for driving the success of an innovation ecosystem. For example, in the absence of a dedicated large-scale public research institution,

people from the software industry said that commercially led founders play a key support role in the software innovation ecosystem.

Figure 6.2 An innovation ecosystem



F6.2

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.

Government has many roles in innovation ecosystems by default

Government goods and services are an integral part of innovation ecosystems. 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 business R&D (through grants and tax credits);

- 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, and determine their incentives through governance and funding arrangements;
- subsidise venture capital;
- procure innovative goods and services (Box 6.1);
- regulate IP to balance 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.

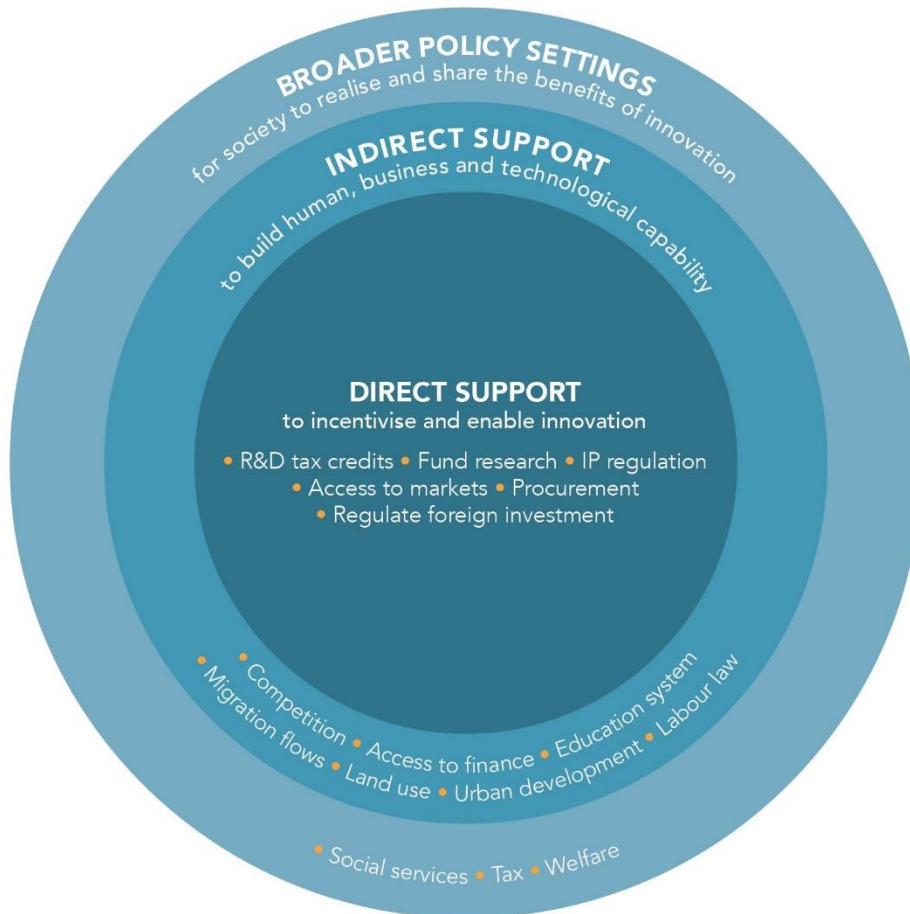
Less directly, governments provide other goods and services that contribute to innovation ecosystems, including through mitigating the risks of innovation. For instance, they:

- provide or otherwise fund basic and post-school education and training that build the skills of workers (Chapter 9);
- regulate flows of skilled and other immigrants (Chapter 9);
- 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; and
- 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**F6.3**

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

Box 6.1 Government procurement can support innovation

Internationally, government procurement is gaining increasing prominence in innovation ecosystems (OECD, 2017d). That is because when it purchases goods and services, government can provide the scale and resources needed to stimulate and progress innovation, particularly in emerging industries or technologies.

The Commission has heard from inquiry participants – especially those in the software industry and in health technology – that government is a major purchaser, and thus demonstrator of new technologies. By supplying to government, firms can demonstrate the feasibility and effectiveness of their innovations, and therefore increase their attractiveness to other clients. Inquiry participants were also concerned that public procurement rules do not adequately encourage purchasing new and innovative local products. Rather, local firms feel they must compete unequally with large foreign brand-name companies.

Even if encouraging innovation is made an explicit objective of government procurement, a significant problem is that innovation is often uncertain and risky. This can conflict with traditional procurement goals such as purchasing quality goods and services, and ensuring value for money. If innovation is elevated above, or even equal to, other more proximate goals of public procurement (such as

delivering quality and value for money), there is a risk that neither objective will be met (Uyarra & Flanagan, 2010).

The effectiveness of using procurement for innovation depends on the skills and capacity of procurers. The kinds of procurers who are skilled at managing risk and uncertainty are unlikely to be the same as procurers who are skilled at recognising opportunities for innovation (Haskel & Westlake, 2018). Haskel and Westlake (2018) argue that government needs to show leadership, both in resources and politically, about being comfortable with the risk of failure.

The skills and capacity of suppliers to navigate the procurement system and to deliver on what procurers need is also important. Early interaction with procurers is of “paramount importance” for suppliers. Early signals and interactions at the pre-procurement stage can give suppliers confidence to take on the risk of innovating (Edler et al., 2014). Early interactions can also give suppliers the information and lead-time they need to ensure they can meet the expectations of procurers.

The government procurement charter (along with other expectations) directs agencies to look for new and innovative solutions when contracting for goods and services, and not to overprescribe the technical requirements (MBIE, 2021b).

Recent changes to the government’s procurement policy framework might encourage more local innovation. In 2018, Cabinet noted that “while New Zealand’s free trade commitments prohibit ‘buy local’ rules, there is an opportunity to be more explicit in supporting New Zealand business and to use procurement to support additional outcomes” (Cabinet Office Wellington, 2018). To give effect to this, a new procurement rule (Rule 17) requires agencies to consider how they can create opportunities for New Zealand businesses through their procurement opportunities. It also encourages agencies to involve Māori, Pasifika, regional businesses and social enterprises in contract opportunities (MBIE, n.d.). Government contracts in ICT services/computer software have been designated as an initial priority for this new rule (MBIE, 2021a).

The new procurement rules came into force in late 2019. It is too early to tell whether the changes have increased contracts awarded to local businesses, or the level of local innovation.

F6.4

Recent Government changes to procurement policy are a step in the right direction. However, both sides will need to build innovation-specific capacity to ensure they lead to increased innovation:

- within the public sector procurement profession to balance the competing interests of innovation with traditional procurement goals; and
- within local firms to understand how to access opportunities when they arise and meet delivery expectations.

R6.1

The Government should adequately resource and support public sector procurement professionals and local firms to build innovation specific capacities. This will help both parties make the most of mutually beneficial opportunities to support innovation, and to achieve wider benefits from public sector procurement budgets.

The case for government support of innovation ecosystems is growing

The global economy is changing. This is increasing the importance of not only innovation but also innovation ecosystems. This shift has big implications for the way that government supports innovation.

Haskel & Westlake (2018) describe this shift as one from tangible capital (things that can be touched such as machines and land) to intangible capital (things that can't be touched such as IP and software). They argue that investment in intangible capital overtook that in tangible capital for the first time in the United States in 2008. Even investment in manufacturing is now focused on intangible capital.

A shift to intangible capital has major implications for the economy. Haskel & Westlake (2018) characterise these as the "Four Ss":

- **Scale** – the modern economy is characterised by large upfront investments; for example in research, design or software programming. Once these investments are made, products can often be made for low (or even zero) marginal cost. This is largely because the investment in intangible capital creates things that are non-rival; in other words, they do not get "used up" when someone uses them. Software is a great example of this; once developed, a software programme can be simply reproduced for many people to use at the same time. Scale is needed to make a return on the large upfront investment and fully exploit the benefit of the innovation. Large firms have scale by definition. Yet, as noted in Chapter 5, smaller firms can work with each other and with research institutions within innovation ecosystems to achieve the scale they need to invest in the fixed costs of innovation, such as intangible capital.
- **Sunk costs** – investments in tangible capital can usually be recovered; the capital can be sold and used for another purpose. Unless there are IP protections, this usually isn't the case with intangible capital. This makes it a riskier investment, and it is more difficult for firms to fund the investment with debt. Specialised, smart venture capital that is willing to take on such risks is an important part of an innovation ecosystem.
- **Spillovers** – this aspect is familiar and was explored in the innovation section (6.1) above. Because firms don't capture all the benefits from investment in innovation, they will underinvest as a result. The point to note here is that spillovers tend to be greater within an innovation ecosystem.
- **Synergies** – ideas are often more powerful when combined with other ideas. Similar to spillovers, firms do not capture all the benefits of their ideas, with some ideas being picked up and combined with other ideas by related or unrelated other businesses. As a result, firms may underinvest in innovation. Xero is a good example of exploiting synergies – by bringing together the ideas of cloud-based computing and double entry book-keeping. Again, innovation ecosystems are places where the different players are more likely to be able to exploit the synergies between ideas. As described in Chapter 3, Xero's success has established an ecosystem in which other firms can create complementary products.

Together the Four Ss can create "winner-takes-all" markets, where the firm or innovation ecosystem at the cutting edge can dominate the global market. This can be an opportunity to extract higher-than-normal profits and increase the living standards of the host country (as noted in Chapter 1, how the benefits of improved productivity are shared among society is a separate conversation). Firms will tend to underinvest in intangible capital because of the risks of acting individually, and because of spillovers.

Government support for innovation ecosystems can help to overcome the tendency of firms to underinvest. This can happen in several ways. As noted, government agencies play multiple roles in innovation ecosystems, and support can be direct or indirect. For instance, funding a research institute for a certain industry would be a direct form of support while reforming regulations that impact the industry would be indirect. Even so, both these forms of ecosystem support are broad-based in that they potentially benefit the whole industry. These broad forms reduce the risk of rent-seeking associated with governments supporting individual firms.

Governments may have reasons for supporting innovation ecosystems beyond raising productivity and national income. For example, a government might wish to bolster its investment in an innovation ecosystem comprising technologies that will help New Zealand transition to a low-emissions economy.

The remainder of this chapter looks at how direct government support for research, science and innovation is working for New Zealand firms. Chapter 7 looks at the benefits of taking a focused approach in innovation policy as a complement to the broad-based measures covered in this chapter. Chapter 9 covers policies that influence the skills and capabilities available to innovative firms, while Chapter 10 investigates the effect of regulation on innovation in selected areas of the economy.

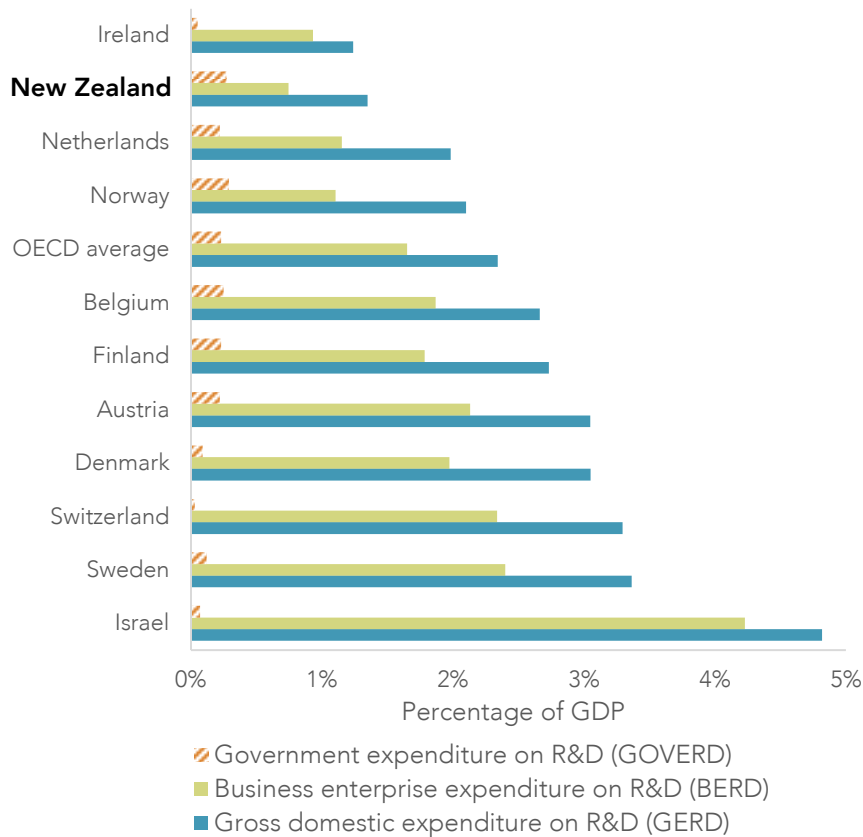
F6.5

The rapid growth of intangible capital means that innovation ecosystems are increasingly vital. This adds to the reasons for government to support innovation ecosystems. Government can support innovation ecosystems indirectly, through for instance broader education and social policies, or directly, with policies that strengthen specific parts of an innovation ecosystem.

6.3 The performance of New Zealand’s research, science and innovation system

This section compares New Zealand’s research, science and innovation performance with other SAEs, using readily available but limited measures. Some measures are about inputs to research and innovation such as R&D expenditure, while others capture intermediate outputs such as patents and research publications. New Zealand’s innovation performance is weaker on some dimensions compared with other SAEs. While government R&D spending in New Zealand is on a par with other countries, total 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%). The difference is mostly in business enterprise expenditure on R&D (BERD), which in New Zealand is well below the SAE average (0.7% of GDP vs 1.9%) (Figure 6.4). However, there are positive signs of change: New Zealand’s BERD doubled between 2012 and 2019, strongly driven by the ICT and health sectors (Stats NZ, 2020c).

Figure 6.4 Expenditure on R&D, 2017



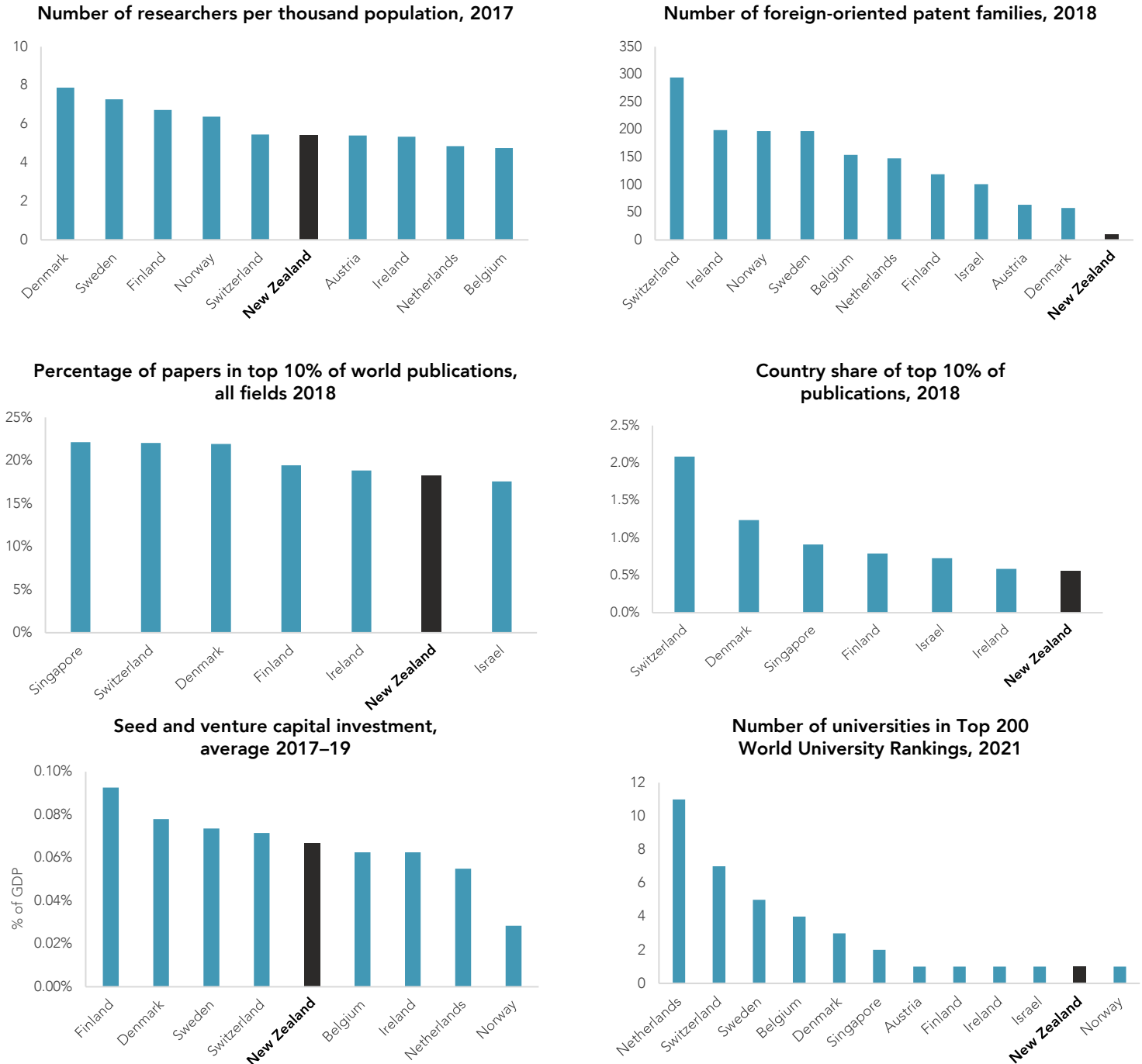
Source: OECD (2020a).

Notes:

1. Expenditures on R&D include all expenditures within a sector, regardless of source of funds.
2. R&D undertaken by the higher education sector is part of GERD but not included in GOVERD.
3. The definition of GOVERD differs in the Netherlands, Switzerland and Israel. Definitions of BERD and GERD only differ in Israel. OECD averages are estimated values.

The number of researchers in New Zealand is above the OECD average and on a par with other SAEs. Seed and venture capital investment is also comparable with other SAEs. However, New Zealand performs poorly on several other measures, such as 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 6.5).

Figure 6.5 Recent innovation performance in New Zealand and other small advanced economies



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

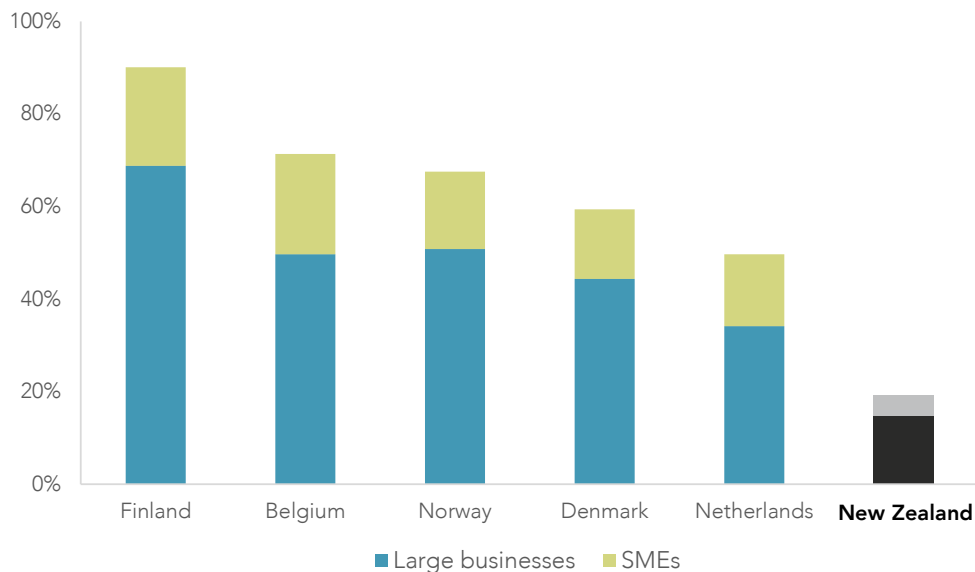
Notes:

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.

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, 2019c).

The starkest comparison with SAEs relates to collaboration between firms and researchers. Compared to other SAEs, links between New Zealand's firms and researchers in universities and research institutes have been very weak (Figure 6.6). New Zealand's low levels of business R&D are part of the explanation, which may in part be due to the country's industrial composition. However, other SAEs appear to have longstanding and better developed institutions and processes, and more deliberate policies to forge links between businesses and researchers.

Figure 6.6 Percentage of innovating businesses collaborating with researchers, 2012–14



Source: OECD (2017c).

Notes:

1. Data represent the percentage of product and/or process-innovating businesses that collaborate with researchers.
2. Researchers include those in 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.

The Government's draft RSI strategy reported other measures of weak links between businesses and researchers in New Zealand.

New Zealand researchers also appear less well connected with potential users of their research. Access to knowledge for the industry sector and mobility of staff between the research sector and industry are limited... There is also evidence that the participants in the New Zealand innovation system are not very well connected among themselves. (MBIE, 2019c)

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 Crown Research Institutes (CRIs) (MBIE, 2019b).

This problem of weak links and poor collaboration in New Zealand's innovation ecosystems is backed up by qualitative data. Inquiry participants commented that New Zealand firms rarely collaborate, resulting in rivalry rather than the kind of cooperation that would assist commercialisation and export success. A notable exception is the kiwifruit industry (Box 6.2). 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 support this innovation and diffusion in the kiwifruit industry include strong IP protections, the structure of the industry, and a culture of collective action after past instances of the near collapse of the industry. The healthtech industry is also widely recognised as having a well-functioning innovation ecosystem (Lewis et al., 2021).

Box 6.2 Kiwifruit demonstrates the value of IP, IP protection, and research partnerships

The story of kiwifruit illustrates the vital roles of IP, the protection of IP, and of long-running research partnerships.

Things weren't always so golden

New Zealand was the first country to commercialise kiwifruit. However, despite establishing the first successful commercial cultivar (the green Hayward variety) and the name “kiwifruit”, neither were protected by a Plant Variety Right (PVR) or a Trade Mark. This allowed increased production in competitor countries in the 1980s, and the subsequent global oversupply and price crash. A raft of other international and domestic challenges hit the industry, including the enforcement of Maximum Residue Levels for pesticides in European trading partners, and rises in the New Zealand dollar and interest rates (Campbell, 2018).

In 1987, a kiwifruit producer board was formed as a “single-desk” buyer of New Zealand kiwifruit, to replace the competitive model of the Kiwifruit Authority. An Industry Review in 1993 then resulted in the industry being completely re-shaped. Major changes included grower control of the industry and its IP; grower-directed marketing and research; the creation of a new single brand and single-desk marketing entity (Zespri); the development of new consumer-driven varieties; and a new approach to crop and orchard management, emphasising environmental sustainability (now known as the Zespri System).

In 2015, 97% of growers supported the single-desk model (NZKGI, 2019). This model helps provide certainty to support a long-term investment horizon, focused on future market trends.

By licensing growers, Zespri controls the supply of New Zealand-grown kiwifruit for which it owns the PVRs (eg, the SunGold™ variety). It also retains exclusive rights to export New Zealand-grown green kiwifruit to all countries other than Australia, as well as its own cultivars. Zespri releases new licences for a limited number of additional hectares of its PVR-protected varieties to be grown each year, to ensure the industry avoids the commodity trap of the past. Instead it makes sure to build demand ahead of supply. Kiwifruit's success is also underpinned by consistently high quality delivered across the industry. Zespri has developed reliable measures of ripeness, quality and taste, which signal optimum harvest times and enable differentiated payments to growers. Growers can only harvest when testing shows their fruit has reached the required taste, ripeness and food safety standards. Zespri also places strong emphasis on quality control, including post-harvest in logistics and supply chains. All these underpin its reputation for quality and hence the price premium it can command.

Another key driver of success is the creativity and open innovation model that operates among New Zealand growers. This can take a new, protected variety, and quickly develop and share best growing and vine management practice across the industry.

The transformation of the kiwifruit industry represents “a textbook case of how to turn a worthless food commodity into a high-value product” (Campbell, 2018, p. 88).

A long-running research partnership has been critical

The development of the Zespri SunGold variety has played a critical role in the industry's transformation. Its development came out of significant investment in research by both the industry and government over two decades, successful commercialisation (including marketing and investing in a strong brand) and robust IP protection. A critical component was intensive investment in gaining insights about consumers (“What will consumers want in 10 years' time?”), and working back from there to find varieties that work on-orchard and through the supply chain.

Zespri has a key long-running research partnership to develop new cultivars with the CRI, Plant & Food Research (and its predecessor organisation, HortResearch). Past research into new varieties fortuitously resulted in a major additional benefit to the industry. The Zespri SunGold variety, developed before the Psa disease struck the industry in 2010, turned out to be tolerant to the disease, and saved the industry from collapse. SunGold accounted for around 44% of the crop by volume in 2019/20, with an average orchard-gate return to growers of \$161 660 a hectare, compared to \$67 295 a hectare for the non-PVR Green variety (Zespri Group Ltd., 2020).



Zespri is likely at or close to the global frontier

The industry set-up of Zespri, its systems and the innovation model are likely at the global frontier or close to it (though it has few international counterparts). Zespri performs many of the roles that large firms can play in innovation ecosystems. It helps generate and protect the intangible assets of the industry, acts as an anchor for the myriad of growers and other supporting firms such as post-harvest operators, and provides sufficient scale for the industry to be at the global frontier in productivity.

Zespri's approach to innovation and diffusion, underpinned by a strong customer focus and long investment horizon, provides key lessons for other industry organisations. Having Zespri invest on behalf of the whole New Zealand industry over decades allows the large and long-term investments required to develop new cultivars. Zespri also has the scale to invest in protecting and defending the industry's IP.

The industry's two "near-death experiences" of the price crash and Psa appear to have galvanised it. Industry stakeholders told the Commission that these events contributed to cooperation across the industry, and to the drive to maintain quality and price premiums. Future success will require ongoing innovation in the breeding programme, including new cultivars that can pick up from Zespri SunGold when its IP protections expire in 2039.

A workable solution must also be found to address unauthorised SunGold kiwifruit plantings in China, which are now thought to cover around 4 000 hectares (compared to 8 000 hectares in New Zealand). Zespri considers the main threat to be from good-quality fruit, which could compete with New Zealand fruit and lower prices (as opposed to poor-quality fruit that could tarnish the brand). While the Chinese government recognises New Zealand's PVRs, taking proceedings against growers in rural China is difficult (Hutchings, 2019; RNZ, 2020).¹⁸

F6.6

New Zealand's innovation performance is mixed. On some measures the country is average; on others it is notably weaker than comparator small advanced economies. The areas of weakness include:

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

The areas of weakness suggest that building successful innovation ecosystems should be a strong focus for government.

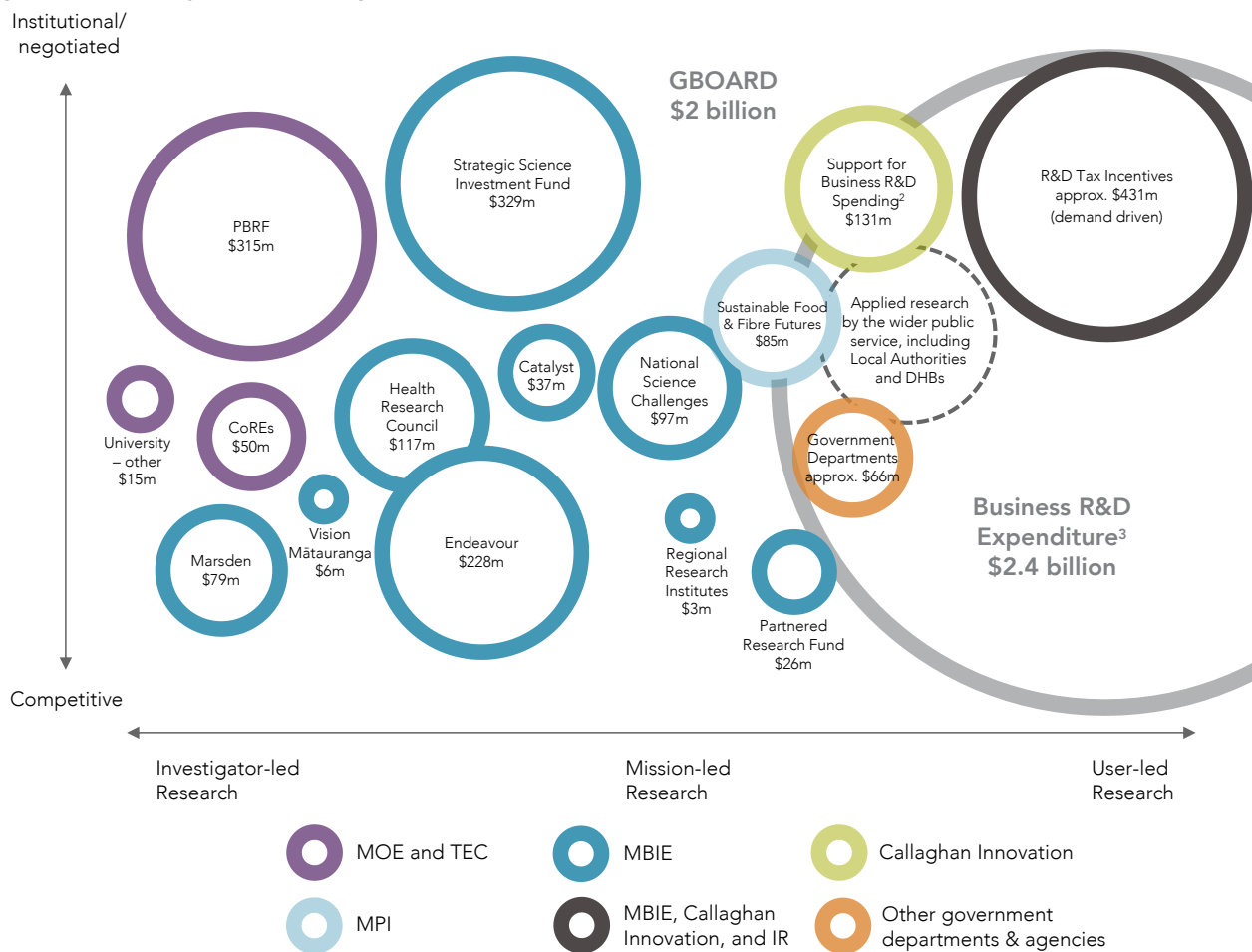
¹⁸ Zespri has been seeking a "win-win" approach to the issue. However, at the time of writing, Zespri's proposal to enter a trial commercial relationship with a Chinese state-owned company had been rejected by Kiwifruit NZ (the regulatory body for the industry in New Zealand). The arrangement would have involved Zespri buying and branding unlicensed kiwifruit from Chinese growers. The proposal is being reworked before seeking approval from Kiwifruit NZ and New Zealand growers (Manch, 2021).

6.4 Public funding and institutions for research, science and innovation

New Zealand government funding for research, science and innovation is spread across many varied funds. The funding supports different forms and stages of research (Figure 6.7). The figure shows the different sources of funding in two dimensions. The horizontal axis moves from investigator-led research funds on the left (known as “science push” because the ideas come from the researchers), through mission-led funds in the middle, to user-led funds (mostly business-led, otherwise known as “industry pull”) on the right. The vertical axis differentiates whether the funding is allocated competitively (ie, by contest between projects) or through institutions or agencies.

The R&D tax incentive (RDTI) for firms comprises a substantial proportion of total public funding. Firms can 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, CRIs and other research institutions. These schemes and institutions are described in more detail below.

Figure 6.7 Projected funding for research, science and innovation, 2021–22



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

Notes:

- 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 funding in response to Covid-19.
- 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.
- Business Expenditure on R&D is based on the Business R&D survey.
- Investigator-led research funds mostly go to universities and research institutes, and user-led funds to innovative firms.
- 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, 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 will need to increase from \$2.2 billion in 2019 to almost \$5 billion in 2027 (MBIE, 2019c).

The R&D tax incentive scheme

The RDTI for firms, at about \$430 million a year (demand-driven), comprises a substantial proportion of total public funding for R&D. Introduced in 2019, the RDTI is based on strong evidence that such a policy can stimulate innovation by firms and raise productivity (section 6.1). The RDTI replaces the Growth Grants programme, previously administered by Callaghan Innovation, and is intended to provide benefits to a greater number of firms than received Growth Grants. Firms undertaking R&D can now get assistance without having to rely on the discretion of a grant-awarding agency. Unlike grants, the RDTI is a demand-driven programme. Defining and administering eligibility is a key part of controlling future costs.

MBIE and Inland Revenue (IR) are jointly responsible for the RDTI policy. IR has the primary responsibility for administering the programme, while Callaghan Innovation provides advice to IR on whether applicant firms' R&D meets statutory definitions. Callaghan Innovation also advises previous recipients of Growth Grants on whether and how they may be eligible for the RDTI.

Recent OECD research shows that research grants and tax credits for firms performing R&D play complementary roles (OECD, 2021). The impacts of these two funding mechanisms differ, and many countries now use both, including New Zealand (International Monetary Fund, 2016). Grants are better for incentivising longer-term, high-risk research and for targeting specific areas in accordance with government priorities. Tax credits are more effective at incentivising firms to "develop applications with the potential to be brought to the market within a reasonable timeframe" (OECD, 2021, p. 105). SMEs, and less R&D-intensive firms, respond more strongly to tax credits than large firms or R&D-intensive firms. Effects vary across countries, reflecting both differences in design and in industrial structures and regulation.

In broad terms, New Zealand's approach requires firms to take a systematic approach to R&D, to aim to resolve a scientific or technological uncertainty, and to have the purpose of producing new knowledge, or new or improved processes, services or goods. Guidance explains that novelty is to be assessed on a "worldwide basis". These provisions reflect the intention to incentivise business activities that are likely to have significant spillovers. These provisions resemble those used in some other jurisdictions that offer R&D tax credits.

The New Zealand RDTI is still in its early stages of implementation. To receive the RDTI at the end of a tax year, firms must first apply to IR for General Approval.¹⁹ General Approval is binding on the Commissioner of Inland Revenue and establishes that a firm's R&D activities meet the statutory definition. New Zealand has followed Norway in requiring this pre-approved eligibility. The alternative (ie, self-assessment) risks firms receiving tax credits, only to find some years later that they were not eligible and have to make repayments. In New Zealand, General Approval is valid for up to three years.

Currently some firms applying for General Approval are having difficulty establishing their eligibility. Some are businesses previously receiving Growth Grants who wish to transition to the RDTI. Complaints focus on the requirement to demonstrate scientific and technological uncertainty, and to demonstrate novelty (and the costs of doing so). These problems may be transitional and are acknowledged by the relevant government agencies, who are working on solutions.

Solutions could involve amending statutory provisions governing eligibility (which can to some extent be put in place through Orders in Council). They could also involve amending guidelines and how officials interpret those guidelines. Or some difficulties could be resolved by continuing grants in some form for some types of firms.

¹⁹ Alternatively, firms expecting to perform more than \$2 million of eligible R&D may have their criteria and methodologies for identifying such R&D certified for a period of up to three years.

Later this year the agencies will have better information on how well the RDTI is fulfilling its policy intentions, and how well the administration of the programme is working. In the Commission's view, the agencies should carry out a stocktake of the General Approval policy and administration to identify solutions that can be readily put in place for subsequent tax years. Legislation prescribes that the RDTI be independently reviewed every five years, with the first review due as soon as practicable after the end of the 2023–24 tax year.

F6.7

Some firms applying for the new Research and Development Tax Incentive (RDTI) are having trouble establishing the eligibility of their R&D activities. Complaints focus on the requirements to demonstrate scientific and technological uncertainty, the tests for novelty (eg, demonstrating it on a “worldwide basis”) and the costs of doing so.

Also, the switch from grants to the RDTI may be leaving gaps for some types of firms and R&D projects.

These problems may be transitional and are acknowledged by the relevant government agencies, who are working on solutions that can be readily implemented in the next tax year. Solutions could involve adjusting statutory criteria, changing guidelines issued by Inland Revenue, or changing how officials interpret these provisions.

R6.2

By the end of 2021, Inland Revenue, the Ministry for Business, Innovation and Employment, and Callaghan Innovation should carry out a stocktake of the operation of the Research and Development Tax Incentive (RDTI) from its start to the end of the 2020–21 tax year. The stocktake should:

- assess the causes of difficulties that some firms have found in establishing the eligibility of their R&D activities for the RDTI;
- assess whether the RDTI is on track to meet its policy objectives;
- identify and implement amendments to statutory eligibility criteria, guidelines and administrative procedures that will best resolve identified problems; and
- consider supplementing the RDTI with the use of grants to fill eligibility gaps, to help the RDTI better meet its policy intentions.

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 (Table 6.1). Inquiry participants noted that GNS has strong industry links in geothermal energy.

Table 6.1 Crown Research Institutes science revenue by source, 2018–19

Crown Research Institute	Science revenue		
	Total revenue (\$m)	Share from public funding (%)	Share from industry (%)
Plant & Food	167	48	52
AgResearch	147	50	50
GNS	95	76	24
Scion	56	80	20
NIWA	161	80	20
Manaaki Whenua – Landcare Research	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 review CRIs, focusing 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 enable them to be organisationally and financially resilient, while remaining accountable for performance. This implies a greater reliance on core rather than contestable funding, making CRIs no longer subject to the Companies Act, and developing an organisational and governance model “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. Greater collaboration is needed on investment planning, providing a “single door” to those wanting to access their services. Pooling commercialisation opportunities would diversify risk, tackle emerging skills shortages, and make it easier for researchers to move to areas within the science system where they can best deploy their skills.
- CRIs should work together to build a Treaty-based partnership with Māori and to provide a supportive environment for Māori researchers.

The panel observed that policy on 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).²⁰ The clustering comprised 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. Box 7.2 on the New Zealand food and beverage innovation system is a good example of this. 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 (Chapter 8).

Callaghan Innovation

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

For historical reasons, Callaghan Innovation is unusual in having this mix of services. When it was established, it was merged with the former CRI Industrial Research Limited. 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 argues it has resolved these issues.

In 2020, Callaghan Innovation received \$96m of funding from the Government for its operations, and over \$25m in commercial revenue. It administered \$255m in grants. The grants include Growth Grants (which are being phased out in favour of the RDTI), Targeted Business R&D Grants, and repayable Grants for Start-ups.

Tertiary Education Organisations

Tertiary Education Organisations (TEOs) undertake a wide range of research, including much that has the potential to lead to innovation by firms, or which directly supports innovation. The Performance-Based Research Fund (PBRF), at around \$315 million a year, funds TEO capability and is calculated on the basis of the assessed research performance of organisations. Government (through contestable and departmental sources) and businesses fund 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 Zealand and 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 more transparent and comparable (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).

²⁰ Comparator countries included Australia, Canada, Denmark, Germany, Singapore, the United Kingdom and the United States.

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 of world-class quality in an area of importance to New Zealand. Each CoRE has a host university, but other universities and their researchers also make up the CoRE. Crucially, CoRE funding places strong incentives on participant universities to build wide networks with national and international research communities.

The Royal Society Te Apārangi administers CoRE selection 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 6.2).

Table 6.2 Centres of Research Excellence funded from 2021 until 2028

Centre of Research Excellence	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 CoREs. 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.

The NZProduct Accelerator

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. Rather than relying on “science-push” approaches such as investigator-led funding, the NZProduct Accelerator takes an “industry-pull” approach. It works with manufacturing businesses to understand the challenges or opportunities faced by the business and turns them into research questions. It then leverages its networks across universities and CRIs (and the private sector) to bring together teams of specialists and industry experts to answer those questions in a short, commercial timeframe. The businesses pay for the research on their questions. From around \$13 million of government funding, the NZProduct Accelerator has facilitated projects with over 400 companies, usually involving researchers from 8 institutions. The solutions have generated revenue for New Zealand companies of over \$200 million. As a result of this success, Budget 2019 expanded funding for the NZProduct Accelerator to develop regional hubs and broaden the network of researchers involved (NZProduct Accelerator, sub. 60, pp. 13–14).

The Performance-Based Research Fund

The PBRF is the Government's primary means to fund research capability in TEOs. It rewards TEOs for "excellent" research performance. The fund's design creates strong incentives for research in TEOs. The PBRF currently distributes \$315 million a year.

The PBRF has a strong emphasis on research excellence and awards greater funding for research that reaches a "world-class" standard. This strongly incentivises researchers to seek publication of their research in highly ranked international journals. Several submitters argued that such journals are relatively uninterested in publishing research on New Zealand-specific topics or on applied research. The submitters argue that this means, among other things, that researchers in New Zealand universities tend to be uninterested in researching areas relevant to innovation by New Zealand firms.

CRI and universities are not easy for the business community to work with. For example, the funding model for Universities incentivises research and publication in academic journals. Academics are rewarded for publishing, but publishing can be at odds with the protection of intellectual property which needs to be kept secret until properly protected. Furthermore, businesses can find working with academics difficult because the latter are primarily focused on teaching and publishing, so the work cannot always be done promptly. Academics are not incentivised or rewarded for working with businesses and cannot easily move between academia and industry. (ExportNZ and BusinessNZ, sub. 52, p. 4)

Our public sector is very poor at measuring the economic benefits derived from spending on science and innovation. Assessing the value of academics' research based on whether it is put to good use by NZ companies would put an end to low-value research. PBRF is a funding scheme that does the opposite: it values publications and citations a lot and productive research very little. (Anne French Consulting Ltd, sub. 44, p. 10)

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. These researchers 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 on 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 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 did, however, recommend changes 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. It also recommended putting more weight on the most meaningful contributions to the sustainability and vitality of the research system. The panel thought this should include researchers making a wide range of contributions, including sustained engagement with industry.

Proposed removal of the reward for external research funding in the PBRF

The panel recommended a significant shift in weights across the main criteria that determine PBRF scores. Currently the three criteria categories and their weights are: Quality of Research 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 (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 be considered as part of a comprehensive independent review of innovation policy. It also recommends considering the broader issue of collaboration between universities and businesses (Chapter 8).

It is our view that with the right government support models, there is large potential in our universities to further increase our contribution towards increased innovation in our economy, interact more effectively with the current base and catalyse the establishment of new knowledge-based industries. (University of Auckland, sub. 46, p. 2)

The Ministry of Education has recently finished consulting on the review panel's recommendations, before preparing advice for Ministers on changes to the PBRF.

The National Science Challenges

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

- The University of Auckland leads the High-Value Nutrition Challenge. With \$84 million over 10 years, it 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. With \$97 million over 10 years, it “aims to enhance primary sector production and productivity while maintaining and improving our land and water quality for future generations” (p. 28).
- Callaghan Innovation leads the Science for Technological Innovation Challenge. With \$106 million over 10 years, it 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 million²¹ to help establish four Regional Research Institutes (RRIs), including Bragato Research Institute in Marlborough (grape and wine research) and PlantTech Research

²¹ The \$65 million is made up of \$25 million in Budget 2015 and a further \$40 million in Budget 2016.

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 expects that the RRI will become financially self-sustaining (MBIE, 2020c).

The Food Innovation Network (NZFIN) comprises four open-access food and beverage and scale-up facilities. In addition, FoodHQ in Palmerston North is a food research and innovation hub (Box 7.2). 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, with proportions varying 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 proved 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, 2019; 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 commercialise research and increase the scale and impact of innovation based on 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).

Feedback from inquiry participants

Some researchers who participated in the inquiry said that the innovation funding system is unhelpfully competitive and has resulted in sub-scale investments. They said the contestable and often short-term nature of funding is not conducive to long-term research programmes and can be a barrier to attracting top talent. People also said that overly bureaucratic application processes absorb large amounts of a senior researcher's 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.

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 or to CRIs and universities, rather than promoting the industry good.

Firms find dealing with NZ's extensive and highly sophisticated science and technology capability so difficult and expensive that they avoid it, choosing instead to recruit their own specialist advisors – mostly from overseas – or look to customers for assistance. To compound the difficulty firms find in dealing with the Science system, there has been a slow creep in what is judged "good science" amongst governance of the Science System, away from outcomes that have immediate potential commercial applications towards "stretch" blue skies, far horizon science. (Product Accelerator, sub. 60, p. 3)

Participants asked for better incentives for cooperation and collaboration across research institutions, and a greater focus on research translation and transfer to firms. University courses could also be better aligned to industry needs, such as offering opportunities for industry to feed into curriculum design and work-integrated learning. Industry stakeholders also identified a need to either make funding application systems simpler and lower-cost, or provide larger funding allocations over a longer funding horizon to justify the overheads.

The Government's draft RSI strategy noted the tensions between security of funding and competition. "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, 2019c, p. 14).

Several inquiry participants, including industry stakeholders in the Commission’s industry case studies, commented that the CoRE model is working well. This contrasted with their views on universities and CRIs, which they regarded as disconnected from industry needs (except in the land-based industries). 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 (including international linkages). In other words, they help strengthen an innovation ecosystem. This feedback was most marked in relation to the MedTech CoRE. This CoRE has played an important role in fostering the healthtech innovation ecosystem, but it did not receive funding in the recent (2020) CoRE funding round.

Strengthening links between firms and public research institutions

Evidence already cited and international comparisons point to considerable weaknesses in links between firms and public research institutions, including universities (though the relationship works well in some areas such as CoREs). Land-based CRIs attract a substantial proportion of their revenue from industry sources, suggesting a closer relationship between business and researchers. By contrast, other knowledge-based industries have only small pockets of dedicated public research effort to support innovation effort in firms. This suggests a weakness in New Zealand’s innovation ecosystems.

In particular, linkages need to shift towards more “industry pull” (research that responds to industry needs) rather than “science push” (trying to commercialise the results of research). Ultimately a balance is needed between these two modes, but the balance is currently tipped too much in favour of “science push”.

...even if blue skies thinking associated with Marsden is the central kaupapa a statement on what potential benefit to society and economic growth is expected from the research would encourage a mindset that is focused on engaged and relevant research to our business sector. (Canterbury Knowledge Commons, sub. 68, p. 1)

New Zealand could improve linkages and shift the balance towards “industry pull” with some general changes to the incentives and capabilities within its research, science and innovation system. However, it is not realistic to build strong linkages and world-class innovation ecosystems across the board. The feasible alternative is to focus effort on selected innovation ecosystems, which is the subject of Chapter 7.

F6.8

Compared to other small advanced economies, links between public research institutions and businesses in New Zealand are generally weak and emphasise “science push” rather than “industry pull”. This reflects system-design, 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, this subset is focused on land-based industries and geothermal technologies.
- Given weaknesses in core funding, and substantial reliance on contract income or contestable funding, CRIs likely do not invest enough 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 emphasis on forging collaborative innovation efforts between public research institutions and businesses, except in the land-based and geothermal industries.

R6.3

In implementing its research, science and innovation (RSI) strategy, the Government should allocate a significant part of its RSI budget to invest in supporting linkages within innovation ecosystems by:

- building business-oriented research capabilities in public research institutions (Crown Research Institutes and universities);
- incentivising more and better links between businesses and public research institutions (Crown Research Institutes and universities); and
- strengthening international connections.

6.5 A firm's eye view of support for innovation

From the Commission's engagement and case studies, as well as submissions, a strong theme was that the plethora of government supports for innovation makes for a siloed, fragmented, cluttered and confusing system (Figure 6.8). The Commission was told some firms find it so difficult to navigate, they give up on seeking assistance. Similar concerns were expressed by Māori businesses (Chapter 4). In the Commission's view, these are valid concerns.

Government support for firms needs to be better coordinated and more accessible

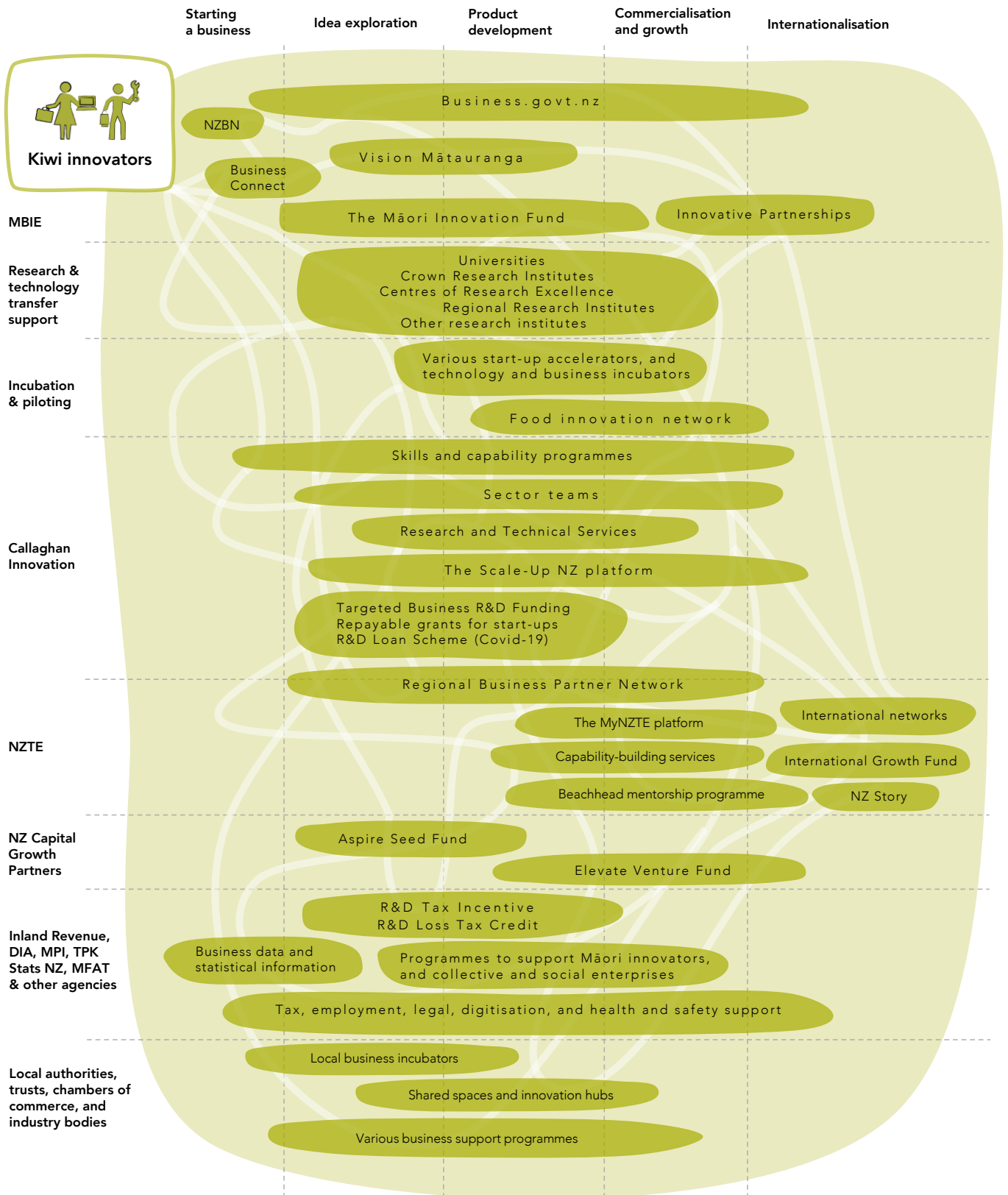
Inquiry participants said that government support needs to be better aligned across agencies. Creating new funds without shutting down old ones results in scattered, sub-scale support. Instead, existing funding and some programmes should be consolidated, to provide sufficient scale to be transformative.

Participants also suggested better road-mapping, so firms can understand what support is available and how to access it.

...there is significant room for improvement in the coordination, measurement, discussion and orchestration in the innovation ecosystem between innovation policy makers (MBIE), innovation execution agencies (Callaghan Innovation and NZTE) and real-world founders and leaders at firm level... Firms can be bewildered with the choices. (The Icehouse, sub. 48, p. 3)

Initiatives designed to improve accessibility add to the proliferation of programmes and can end up confusing firms even more. Initiatives are provided, 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 jointly (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 and generate on its website.

Figure 6.8 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 briefly describes 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 have different projects at different stages at the same time.
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.

F6.9

New Zealand firms that seek government assistance for innovation and exporting have a bewildering choice of programmes and points of contact. This can make it difficult for:

- firms to access the assistance they desire; and
- government agencies to apply assistance in a way that best achieves the Government's objectives.

R6.4

The Government should review the suite of programmes designed 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.

This review should consider ways to improve the connectivity between Māori businesses and the government supports for innovation and exporting.

7 Focused innovation policy

Key points

- Small advanced economies (SAEs) like New Zealand develop by finding new areas of specialised production that give firms a competitive advantage in international markets. Firms find these new areas by building on existing capabilities in their innovation ecosystems that make successful and impactful innovation more likely. With scope for only a limited number of specialisations in a small economy, governments of SAEs can assist by bringing public resources to bear in areas of promise.
- Governments in most SAEs focus some support for innovation in areas of potential export strength. These could, for instance, be technologies spanning more than one industry, diverse technologies serving specific industries, or innovation in linked upstream and downstream industries. To focus support, these governments create platforms of research, and make associated investments in skills and the national science system. They also help 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.
- Governments can employ adaptive processes to elicit information from firms and other economic actors about emerging possibilities for innovation, in chosen areas. Through such processes, stakeholders can identify ways of collaborating and making complementary investments that will get the ball rolling faster and overcome bottlenecks and barriers.
- Focused innovation strategies require effective governance, implementation, monitoring and evaluation, and sometimes new institutions, if they are to succeed.
- New Zealand's past and present attempts at focused innovation policy have lacked enough scale, resources and durability to be effective. They have also tended to arise out of government-driven processes, whereas shared design and governance with multiple stakeholders would likely generate greater momentum and make better use of dispersed knowledge and capabilities. International examples demonstrate how governance of well-resourced initiatives can be devolved to independent multiple-stakeholder entities. The Government should take stock of its current approach and draw lessons from New Zealand and international experience.
- Government must be patient and stay the course with its investments, but also be prepared to cease support for initiatives that are clearly unsuccessful. This will require rigorous, independent and transparent monitoring and evaluation.
- Callaghan Innovation and New Zealand Trade and Enterprise provide the bulk of direct government support for firms to innovate and export. Their services could be further shaped to bolster support for innovation ecosystems in the focus areas selected in the Government's industry strategy.

Chapter 6 looked at broad-based innovation policy using a model of firms operating within a network of innovation relationships – an innovation ecosystem. That chapter considered the impact on New Zealand firms of government policies most directly targeted at science and innovation outcomes. These policies include research grants and the Research and Development Tax Incentive, as well as policies and institutional arrangements to forge better links between researchers and firms.

This chapter looks at the arguments for and experience with innovation policies focused on chosen areas of the economy, in New Zealand and elsewhere. Such focused innovation policies complement broad-based innovation policy.

- Sections 7.1 and 7.2 cover the rationale for focused innovation policy and a broad strategy for implementing such a policy.
- Section 7.3 briefly looks at evidence on the effectiveness of such policies.
- Sections 7.4 and 7.5 draw out some common themes and recurring issues from SAEs' experience with focused innovation policy.
- Section 7.6 describes past and current approaches to focused innovation policy in New Zealand.
- Section 7.7 sets out the lessons for New Zealand policy makers from international and domestic experience.
- Section 7.8 looks at how New Zealand Trade and Enterprise (NZTE) and Callaghan Innovation could complement their firm-focused services with services to strengthen the innovation ecosystems within which their customer firms operate.

7.1 Focusing where innovation potential is high

Where the next economically important innovations will appear is uncertain. Broad-based innovation policy is “blind” to which firms or areas of the economy benefit, which keeps options open (Chapter 6). Even so, policies that appear neutral across the economy do have stronger impacts in some areas than in others (Hausmann & Rodrik, 2006). R&D tax credits, for example, work for R&D-intensive firms, but do nothing to support innovation in areas of the economy that are not R&D-intensive (Chapter 6).

Economic development for a small trading nation like New Zealand involves finding new areas of specialised production that give firms a competitive advantage in international markets (Chapter 2). Evidence shows that, for the most part, firms find such areas by building on existing capabilities in their innovation ecosystems that make successful and impactful innovation more likely (Harvard Growth Lab, 2020; Hausmann & Rodrik, 2006).

As a result, it makes sense for SAEs to focus some innovation policy support on promising areas of the economy where substantial capabilities already exist. 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 may also take a more active role in areas of innovation relevant to tackling societal challenges (such as those arising from climate change) (Crawford, 2021).

Government, the private sector, and research and education institutions will need to work with each other to understand what policies and interventions are likely to have the most impact on innovation in specific parts of the economy (section 7.2). Governments have limited resources and expertise to undertake the intensive engagement required to improve understanding, and to work out successful interventions and implement them. Limited government resources reinforce the need to choose areas for more intensive engagement.

Governments can employ adaptive processes to elicit information from firms and other economic actors about emerging possibilities for innovation, in chosen areas. Through such processes, stakeholders can identify ways of collaborating and making complementary investments that will get the ball rolling faster and overcome bottlenecks and barriers (Rodrik, 2004).

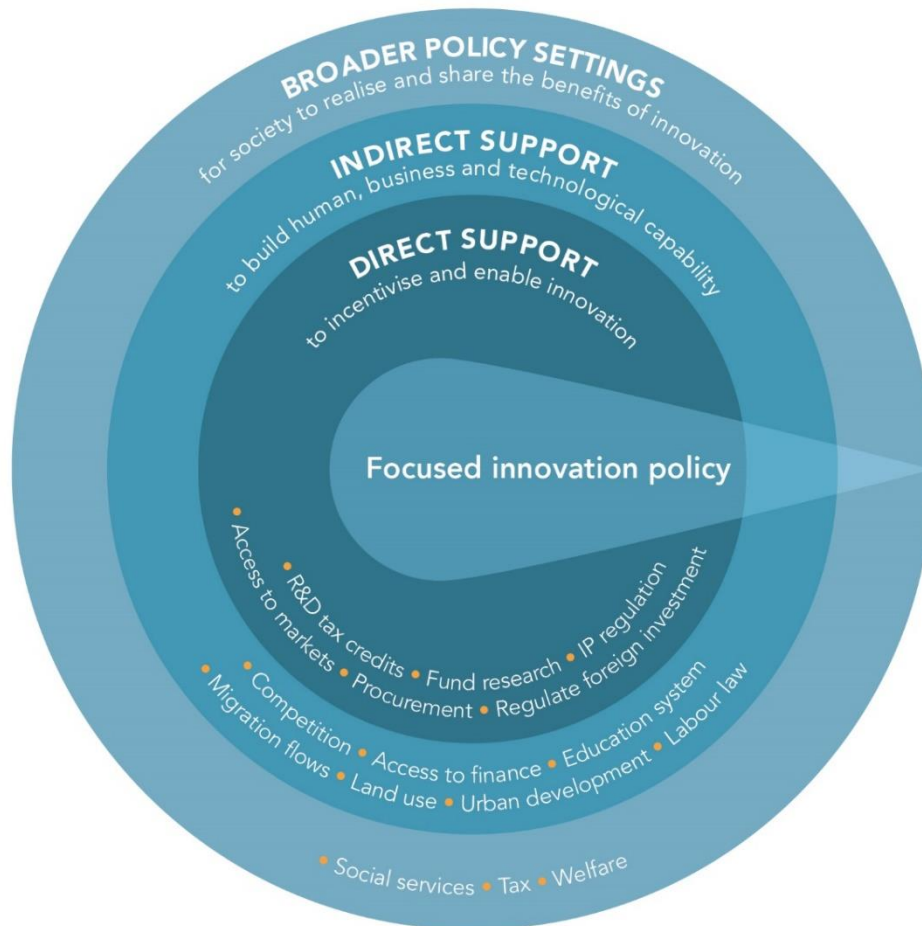
Focused innovation policy could entail, for example:

- 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;

- setting up and/or funding specialised training, applied research and innovation centres or funding key infrastructure or technology; and
- government encouraging the development of whole-of-sector research or exporting strategies, and possibly co-funding them.

Figure 7.1 shows how focused innovation policy includes policies that both directly and indirectly affect innovation. Governments are most likely to devote direct support for science and innovation to their chosen areas for focus. Yet they may also bring wider support to areas of focus, including, for instance, developing skills, migration and labour market policy settings, and providing infrastructure.

Figure 7.1 Focused innovation policy



Choosing 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. 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 (Chapter 6). 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).

Building on the insights of Hidalgo et al. (2009), 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). This approach has limitations because it covers only trade in goods. While relatively fine-grained (using 6-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 (Chapter 10). 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). As a result, it makes sense 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 7.2).

7.2 Designing an effective focused innovation policy

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 with sufficient capability can reduce these risks 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 among 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 (Chapter 3).

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, including suppliers of inputs, consumers, researchers, innovators and educators. And innovation happens

through iteration, trial and error. Processes need to elicit information about promising opportunities and conditions affecting their realisation, and provide incentives for firms to increase their innovation effort.

Researchers studying focused innovation strategies suggest that the strategies 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 (Chapter 6). 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, participants can measure success in raising firm-level productivity, expanding exports, and diffusing innovation. Intermediate indicators, such as the intensity of collaboration and research and innovation effort, will provide assurance at an early stage that the strategy is on track.
- Innovative effort requires enough time to play out and demonstrate success. On the other hand, the Government needs to be willing to cease supporting initiatives that are clearly unsuccessful.

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 governance 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.

Transparency, 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 in 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 completely understands the 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 7.4). 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 9). 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 has long-established, dense and stable interpersonal linkages across industry, academia and government. Consequently, it 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).

F7.1

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, marshal the resources needed for success, and provide durable strategic direction across successive governments;
- governance of specific initiatives that gives participants “skin in the game”, and which oversees 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 focus on new activities (rather than support for business as usual) combined with a willingness to take an experimental “portfolio” approach, accepting that not all initiatives will succeed;
- transparency about what the key judgement calls are on where to focus effort;
- transparency about the nature, extent and target of government assistance;
- transparent monitoring and evaluation of initiatives, adjusting the mix over time; and
- a consistent but adaptive approach to strategic direction that allows sufficient time for innovative initiatives to bear fruit.

A geographic dimension to focused innovation policy

Firms that operate together in a geographic cluster are more innovative than firms that operate in isolation (Beaudry & Solar-Pelletier, 2020). Such firms are more likely to share ideas and enjoy a strong common supply of skilled workers and capable suppliers. Proximity makes it easier to coordinate investments in supporting infrastructure and distribution chains. For these reasons (and the presence of natural resources), geographic regions tend to specialise in technologies and in production.

A large body of international experience has developed with “clusters” policy that aims to reap the innovation advantages of geographic proximity (Cluster Navigators, sub. 20; Ifor Ffowcs-Williams, Doug Galway & David Wilson, sub. DR63) (Foray, 2016; Wood, 2019). Consistent with this, some submitters stressed the important role that regional economic development agencies should play in realising national innovation goals (Economic Development New Zealand, sub. DR72; Auckland Unlimited, sub. DR77; Venture Taranaki, sub. DR57).

Yet proximity has different dimensions – it can encompass local labour markets and suppliers, or it can extend to more distant networks among firms and researchers focused on similar technologies. Evidence suggests that networked clusters of firms and other institutions are more important for innovation than simple geographic proximity (Warwick & Nolan, 2014). Beaudry and Solar-Pelletier put it another way: “Although some view proximity as an advantage in facilitating collaboration, it is neither sufficient nor necessary for successful collaboration” (2020, p. 9). They argue that more distant partners can share many of the benefits of geographic proximity through short trips to meet in person, through sharing a common knowledge base and through social links. In practice, geographically based initiatives need to solve the problems of taking advantage of synergies across regions and achieving alignment with national priorities (Wood, 2019).

Successful clusters and regional development policies involve granular engagement between firms, knowledge institutions, and other central and local government and non-government entities (Ifor Ffowcs-Williams, Doug Galway & David Wilson, sub. DR63). Tapping into this experience and expertise should have pay-offs for national focused innovation policies.

7.3 Evidence on the effects 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 societal 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. It is also 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 positive effects on innovation and productivity (on average), both in general and in selected sectors (Bloom, Van Reenen, et al., 2019; Warwick & Nolan, 2014).
- Policies focused on strengthening business networks and links with research institutions have positive impacts on firm-level collaboration and innovation (Warwick & Nolan, 2014). Networks are often in a defined geographic area.

Researchers do not usually include the effects of transport infrastructure, land-use planning, migration policy and skills acquisition in evaluating 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: a direct impact on growth in production and employment in the targeted sectors (compared to other sectors), and an indirect impact 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 applicants in provinces that did not benefit. 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, 2017b). Typically, experts with a good knowledge of international innovation policy and practice undertake such reviews. They bring together a range of evidence, such as 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.

7.4 Most small advanced economies employ focused innovation policies

Most SAEs employ some version of focused innovation policy adapted to their circumstances. 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.

More recently, countries have been adapting policies and experimenting with new approaches, in response to changes in the global innovation landscape. Changes in that landscape include:

- competitive challenges from new centres of innovation in emerging economies (like China);
- the increasing importance of technologies that exhibit economies of scale and underpin “winner-takes-all” markets;
- the rising importance of intangible investments to underpin innovation (Chapter 6); and
- the increasing concentration of innovation effort in large firms and geographic locations.

No one SAE model for focused innovation policy is likely to be a perfect fit for New Zealand. Rather, each country’s experience shows the issues that focused innovation policy must grapple with, and a potential range of solutions that New Zealand might adapt to its own circumstances, culture and capabilities (Crawford, 2021).

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 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. Of this, €130 million (NZ\$222 million) was new funding each year to support the development and operation of 19 “top consortia for knowledge and innovation” (TKI) that

underpin the Top Sector Policy. Private funding for TKIs was four times larger than public funding. TKIs are responsible for identifying and funding projects to pursue an innovation agenda.

In 2017 evaluators 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 (RIC) (and its predecessors), chaired by the prime minister, has taken the lead in shaping overall strategy. Business Finland 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).

From 2008 to 2015, Tekes (a forerunner of Business Finland) funded six industry-research collaborations, with annual public funding totalling €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. One notable issue was the weak engagement of university researchers in the process, and a tendency for programmes to reinforce traditional strengths through incremental innovation rather than search for more radical innovative approaches (Lähteenmäki-Smith et al., 2013).

With 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. Yet many of the collaborations were reorganised and continued successfully under alternative funding and governance arrangements.

Tekes, for example, 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).

More recently, the government has developed collaborative mission-led strategies to find knowledge-based solutions to societal challenges, including climate change (OECD, 2017a). The RIC has recently signalled a refreshed approach to priority areas within research and innovation policy. It is developing criteria and stakeholder processes for identifying and governing initiatives in those areas (Research and Innovation Council Finland, 2020).

Sweden

Since the 1940s, Swedish universities have played a central role in applied industrial research involving cooperation with firms. Most of this effort has been focused on “development pairs”, involving a select group of university research facilities and a few large Swedish technology companies with international reach.

From 2012, the government put in place initiatives aimed at bolstering Sweden’s once leading global innovation performance. Among these, it 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. Each of the resulting 17 “strategic innovation programs” (SIPs) has its own board and management team located in one of the collaborating partners – usually a university, industry association or private company. Boards have a substantial role in defining the scope of SIPs and in bringing forward

projects for funding under criteria established by the funding agencies. Independent experts reviewed the proposals for SIPs, and for projects within the SIPs.

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). More recent evaluations have shown positive results in achieving programme objectives. The budget for these initiatives has totalled around SEK600 million (or NZ\$107 million) a year.

More recently, through Vinnova (the Swedish government 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 (NIC), headed by the Prime Minister, to achieve better coordination and responsiveness among the public actors involved in innovation policymaking and delivery (Edquist, 2019; Fagerberg & Hutschenreiter, 2020). The NIC has wide representation from unions, industry, and research and educational institutions, though members participate in a personal capacity. The NIC focuses mainly on broader innovation policy (including labour markets, public procurement, energy, transport, healthcare, environmental and regional policies). The Swedish Research Policy Council oversees research policy, though there is some overlap with the NIC (Edquist, 2019).

Denmark

The Danish economy has export strengths in transport, ICT and pharmaceuticals, 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 translating it into commercial results.

Institutions supporting collaborative research and innovation include universities, other higher education institutions, and seven research technology organisations (RTOs), enjoying both public and private sector funding support. The RTOs are self-owned and not-for-profit. The Danish Technological Institute (DTI) is the largest of the RTOs, with over 1 000 employees, more than 70 labs and over 10 000 customer firms. It is multidisciplinary (spanning seven specialties) and promotes firms taking up new technology. The DTI serves a mix of Danish and international customers (Danish Technological Institute, 2021).

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.

The number of regional networks and clusters was previously much larger. 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). Independent secretariats support the operation of each cluster under the auspices of a stakeholder entity such as a university or cluster organisation established for the purpose.

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 to help businesses and individuals realise 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;
- strengthening cybersecurity in businesses; and
- developing broader digital skills and awareness in the population.

Private foundations, such as the Novo Nordisk Foundation (NNF), account for a significant share of innovation funding. The NNF alone will contribute about €671 million (NZ\$1.12 billion) in funding for research in 2023. The foundation specialises in chosen focus areas – for instance, the NNF invests mostly in life science R&D and innovation projects.

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 covered 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 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 five years. The funding is separate from funding for research, and detailed expenditure is to be decided as the ITMs develop. (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 across related industries (for instance, in common technology supply chains or skill requirements) (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 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.

7.5 Common themes and recurring issues in small advanced economy experience

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

Scope and scale of focused innovation policy

At a broad level, countries vary considerably in how selective they are in choosing areas for focus. Singapore and the Netherlands have each chosen sectors that together cover sizeable chunks of the economy. Even so, governance arrangements mean that in practice they implement projects or initiatives that focus more narrowly on chosen technologies, subsectors, or policy instruments (such as training or regulation).

Countries also vary in the scope of policy instruments brought to bear in the focus areas. Some are centred on support for R&D and its translation into business and societal applications. Some (Singapore and the Netherlands) use a broader range of policies (eg, skills, regulation, international relations, physical infrastructure) that contribute to successful outcomes in chosen areas. Others (eg, Denmark) take a mixed approach across different strategies.

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 around NZ\$1 billion. Even so, these totals include existing expenditure located in related portfolios and signal an intention to focus this expenditure. Across all countries, and within the broad aggregates, programmes focused on given areas also receive substantial funding (certainly much more substantial than New Zealand's current Industry Transformation Plans attract – see section 7.6).

High-level governance of research and innovation policy

The governance of broad innovation policy sets the context for the governance of focused initiatives. Finland has long had a peak body for this purpose, headed by the Prime Minister. A main purpose of the peak body is to bring together government leaders, industry experts and researchers to prioritise areas of the economy, technologies and societal challenges for focused effort. Multiple-stakeholder peak bodies of this type give transparency to strategic decisions, and broad ownership of them, sustaining effort across electoral cycles (Fagerberg & Hutschenreiter, 2020).

Sweden adopted such a model in 2015 and the Singaporean Future Economy Council plays a similar role. 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; OECD, 2015a).

High-level governance arrangements often play a central role in generating stakeholder consensus on areas for focus. Some countries (eg, Sweden) use explicitly designed “bottom-up” processes to generate proposals; other countries (eg, the Netherlands and Singapore) rely on multi-stakeholder forums backed by informal networks to gain acceptance of choices.

Governance of collaborative, focused innovation initiatives

As well as having an overall governance body, many countries also devolve governance in areas of focus to independent multi-stakeholder entities. These oversee the development and resourcing of specific projects within areas of focus. Some countries reinforce active stakeholding by encouraging “bottom-up” initiatives, and requiring substantial industry co-funding. Often boards comprising government, industry partners and research institutions govern initiatives.

Ensuring that bottom-up initiatives are developed in 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

All the European countries covered in this chapter use comprehensive and well-established approaches to evaluating strategies and initiatives (Borrás & Laatsit, 2019; Independent Experts Panel, 2019; OECD, 2014, 2017a; Vinnova, 2020). 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 discussed have moved in recent years to adopting mission-oriented, government-led innovation strategies to tackle societal challenges. These sometimes take the form of a dimension added to existing focused innovation strategies (as in the Netherlands); 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 technology to reduce greenhouse gas emissions in the energy sector.

F7.2

Small advanced economies (SAEs) develop by finding new areas of specialised production that give firms a competitive advantage in international markets. Firms do so by building on existing capabilities in their innovation ecosystems that make successful and impactful innovation more likely. With scope for only a limited number of specialisations in a small economy, governments of SAEs can assist by bringing public resources to bear in areas of promise. They use these resources to support programmes of research and innovation, with associated investments in skills, the national science system, and building links between firms and researchers.

F7.3

The areas of the economy that governments select for focus often do not correspond to industries defined by standard classifications. For instance, they may 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, which may not feature raising productivity at the frontier (Fagerberg & Hutschenreiter, 2020; Mazzucato et al., 2020; Meyer-Stamer, 2005). Examples are policies that variously aim 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” technologies (eg, to mitigate climate change).

Innovation policy necessarily has a range of objectives, but synergies likely exist between objectives. Moreover, policies to enhance productivity also need to 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).

F7.4

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 a country’s environmental and social objectives.

Recurring issues in implementing focused innovation policy

Reviews of country experience identify common tensions in the design and operation of focused innovation policy. Usually, resolving these tensions requires stakeholders to come to shared judgements about matters which intersect, such as:

- the selection criteria for areas of focus;
- how narrowly to focus effort;
- the selection and funding of initiatives in these areas;
- the time horizons for funding;
- the range of policy areas that are brought into focus (eg, skills formation, regulation, infrastructure, as well as more direct policies to accelerate technology development);
- the degree of focus on market outcomes and on other impacts (such as those that tackle societal challenges);
- how deeply initiatives reach into long-range scientific research effort;
- how to design processes and governance arrangements that generate initiatives with wide support among stakeholders, but which are not overly cumbersome and slow;
- how to strike a balance between generating many bottom-up initiatives and achieving sufficient focus and critical mass to achieve strategic objectives;
- the degree to which decisions on public resources are devolved to stakeholder entities;
- the balance between incremental innovation (building on existing technologies close to market) and the search for more disruptive sources of innovation; and
- the balance between large and small firms in fostering innovation effort.

Working through these issues at a national level requires clear and widely supported strategic objectives, and high-level governance arrangements involving major stakeholders. It also requires a skilled public sector that is willing and able to develop shared judgements and decision making with other stakeholders; and to be flexible and adaptive as evidence on success emerges. Experience in the countries studied shows that these skills and orientations develop over time as they are exercised. It will take time and good monitoring and evaluation for New Zealand to develop and refine similar capabilities.

Each of the countries studied has made its own judgements on the scope and design of focused innovation policy, though some have learnt from the experience of others. Most have commissioned independent expert reviews of their innovation policies that aid judgements about system architecture (Chapter 8).

The Canadian Innovation Superclusters Initiative has characteristics of the Nordic approaches to selection and governance of focused innovation policy (Box 7.1).

Box 7.1 **Canada's Innovation Superclusters Initiative**

Canada's Innovation Supercluster Initiative (ISI) aims to realise Canada's potential as a global leader in innovation. The ISI is an experimental approach with devolved administration centred on five areas of existing technology strengths in the Canadian economy. These areas of strength each span a range of industries.

Each of the five Superclusters is an independent not-for-profit corporation with an industry-led board of directors that is accountable for its operations and activities. Each Supercluster sets its own strategy and funds projects to support this strategy. Members include businesses, academic institutions and not-for-profit organisations. The Canadian government will monitor outcomes for effectiveness and alignment with policy objectives.

Innovation, Science and Economic Development Canada used expert reviewers to select Superclusters from industry-led applications in 2017. Criteria for selection included the potential contribution to innovation and competitiveness outcomes, growth in jobs and output, and planned increases in women's participation in Supercluster leadership and skilled work. The ISI aims to build connections between large and small businesses.

The five selected Superclusters were:

- The Digital Technology Supercluster based in British Columbia, with a focus on improving service delivery and efficiency in the natural resource, precision health and manufacturing sectors.
- The Protein Industries Supercluster based in the Prairie Provinces, including a focus on plant genomics to improve nutrition, plant-based meat alternatives, and novel processing technologies.
- The Next Generation Manufacturing Supercluster based in Ontario, including a focus on building manufacturing capabilities through advanced robotics and 3D printing.
- The SCALE.AI Supercluster based in Quebec on the Montreal–Waterloo corridor, with a focus on building intelligent supply chains across the retail, manufacturing, transportation, infrastructure and the ICT sectors.
- The Ocean Supercluster, based in Atlantic Canada, covering marine renewable energy, fisheries, aquaculture, oil and gas, defence, shipbuilding, transportation and ocean technology, with a focus on improving efficiency, sustainability and safety.

The Canadian government is funding the ISI with up to C\$950 million (NZ\$1.03 billion) over five years to 2023. Industry must at least match this funding with cash and in-kind contributions (up to 25%).

Superclusters may use this funding for administration and for specific projects. With some exceptions (because of Covid-19 initiatives), project funding is only for new initiatives (not business as usual) and is awarded to consortia rather than individual companies. All consortia must include a small or medium enterprise. In practice, over 50% of project partners are small or medium enterprises.

The ISI sees Superclusters as entities that will build on the critical mass and innovation networks of existing clusters, to strengthen connections and build global brand recognition. Like clusters, Superclusters share a reliance on specialised inputs, including technologies, talent and infrastructure. They will aspire to be a magnet for ideas, talent and capital. While centred in identifiable locations, the Superclusters will involve networks across Canada and even globally.

The ISI has innovation and economic outcomes as its major focus. These include fostering start-ups, commercialising R&D and participating in global value chains. It is not primarily focused on fundamental research but draws on the outcomes of such research in its innovation effort.

Source: Government of Canada (2020a, 2020b).

7.6 Focused innovation policy in New Zealand

Section 7.1 set out the 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 Crown Research Institutes (CRIs) on land-based industries demonstrates (Chapter 6). 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 the outcomes of this research, the Department of Agriculture’s “farm extension service” identified and spread good practice.

Currently a substantial cluster of research institutions is focusing on research in food products (Box 7.2).

Box 7.2 The New Zealand food and beverage innovation ecosystem

The food and beverage sector has an extensive array of R&D institutions and funding for innovation.

Research institutions include CRIs (Plant & Food and AgResearch), the Riddet Institute (a CoRE), two Regional Research Institutes (Bragato Research Institute and PlantTech) and the Food Innovation Network (NZFIN). NZFIN comprises four open-access food and beverage pilot and scale-up facilities. In addition, FoodHQ in Palmerston North is a food research and innovation hub. It is an open collaborative partnership that includes partners from CRIs, universities, Economic Development Agencies and Industry Training Organisations.

The Sustainable Food and Fibre Futures is a co-investment fund that resulted from a merger of two pre-existing funds: the Primary Growth Partnership and the Sustainable Farming Fund. The fund aims to support the sustainable development of New Zealand’s food and primary sectors. The National Science Challenges include a focus on primary sector productivity and exporting. In particular, the High-Value Nutrition Science Challenge focuses on developing high-value food products.

Palmerston North has a substantial geographic cluster of research institutions, including the Riddet Institute, AgResearch, Plant & Food Research, Massey University’s School of Food and Advanced Technology, and the New Zealand Food Safety Science and Research Centre. It also has the R&D centres of firms such as Fonterra and Synlait, and the headquarters of FoodHQ. A joint AgResearch, Massey University and Riddet Institute building opened on the Massey campus in 2020. This has enabled all AgResearch’s food-focused researchers from across New Zealand to be co-located with Massey and Riddet Institute staff. The Finistere Aotearoa Fund - a subsidiary of Silicon Valley venture capital fund Finistere Ventures – is also located in Palmerston North on the Massey campus, as are some of the early-stage agritech companies in which it has invested such as BioLumic.

Inquiry participants described Massey University’s critical anchoring role, providing a strong knowledge base and a magnet for students. However, participants identified opportunities for greater integration and connectivity across the food and beverage innovation ecosystem, and a need for greater critical mass and deep expertise. Some pointed to Foodvalley in the Netherlands, where the top-rated Wageningen University and Research is located, as an example of how coordinated investment at scale can help develop world-class capabilities and facilities.

In recent decades, broad government economic development strategies have included sectoral approaches.

- The Growth and Innovation Framework (GIF) (2002–2008) targeted the ICT, 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).

However, 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 (section 7.4).

Varying approaches to focus exist in New Zealand

Two suggested approaches to defining areas of focus in the New Zealand economy are below.

- 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 research, science and innovation (RSI) strategy suggested a focus in about five areas that build on existing strengths and advantages. They would 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 (MBIE, 2019c).

Any choice of focus needs to account for a range of objectives for focused innovation policy (section 7.4). This section concentrates on the objective of raising the productivity and exporting performance of frontier firms.

The draft RSI strategy signalled an intention to focus RSI effort on building scale “in areas of emerging opportunity, disruption, or critical need to New Zealand” (MBIE, 2019c, p. 34). The strategy outlined possible areas for focus and sought feedback on them. These included the sectors marked out for industry transformation plans (ITPs) in the Government’s industry strategy (see below), but also identified aerospace, renewable energy and health technologies as possibilities. Yet the draft strategy did not set out what “building scale” might mean in practical terms.

The Government’s industry strategy

The Government has recently refreshed its industry strategy and is developing ITPs (MBIE, 2020a, 2020b). 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 “high potential” sectors that “could become a highly productive and internationally competitive cluster of businesses” (p. 2; Box 7.3).²²

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” (Minister for Economic Development (Hon Phil Twyford), 2020, p. 7). Even so, only modest provision has been made for resourcing such initiatives.

²² 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.

Governance of the Government's industry strategy rests with the Economic Development Ministers Group. A Tripartite Oversight Group (currently involving the Government, Business New Zealand, and the New Zealand Council of Trade Unions) provides advice across the strategy. The Government is seeking a way for Māori interests to join the Oversight Group.

Box 7.3 **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 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 (MPI) 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, which 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 developing 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); Bio Pacific Partners (2020); The Forestry and Wood Processing Workforce Action Plan Working Group (2020).

F7.5

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.

F7.6

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.

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 (sections 7.1 and 7.2). However, current policies have weaknesses.

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. For instance, New Zealand has always had a strong focus on innovation in the primary industries (see above). Even so, it is not clear how well the many separate initiatives are connected. Inquiry 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. For historic reasons, Callaghan Innovation 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, a CoRE, focuses on advanced materials. One of the National Science Challenges focuses on using advanced technologies for economic growth.

Consistency of focus across various areas of innovation (and economic development) 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, 2019c, 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.

Weak stakeholder involvement in selecting areas of focus and their governance

Other countries have used high-level stakeholder advisory boards to help governments select areas for focus. Some have also relied on inviting proposals that engage consortia of stakeholders in setting out strategic directions for the areas of innovation in which they are engaged. Crucially these arrangements link firms seeking to innovate with knowledge institutions and other researchers, and involve a substantial commitment of private resources to at least match public funding. These consortia then form the entities that oversee the development and implementation of the funded initiatives (section 7.4).

New Zealand has used elements of these approaches in past initiatives. For instance, MPI approved competitive funding proposals under the Primary Growth Partnership (PGP) based on the independent advice of an Investment Advisory Panel. Each of the funded programmes was overseen by a steering group involving officials, participating firms and sometimes an independent chair (Battell, 2018). The National Science Challenges employ a devolved funding structure (MBIE, 2019b).

The current government also set up the Primary Sector Council (with a life of two years), comprising senior independent industry experts, to develop a high-level strategy for innovation in the sector. The outcome was the *Fit for a better world* vision and roadmap that forms an umbrella for developing two of the ITPs (Primary Sector Council, 2020). An earlier government established a cross-sectoral Growth and Innovation Advisory Board (GIAB), led by senior industry figures (Box 7.4).

Box 7.4 The Growth and Innovation Advisory Board

The GIAB existed from 2002 to 2009. The GIAB's purpose was to provide ministers with high-level, independent strategic advice on growth and innovation issues, including the implementation of the Government's GIF.

The Board consisted of around 15 government-appointed members, including from BusinessNZ, the New Zealand Council of Trade Unions, leaders from major New Zealand businesses, New Zealand Trade and Enterprise and universities. Chairs included business leaders Stephen Tindall and Rick Christie.

The Board met bi-monthly. It worked through action groups tackling issues of interest. The Ministry for Research, Science and Technology first provided secretarial support, followed by the Ministry of Economic Development. The Government provided \$110 million over four years to implement GIF initiatives (OECD, 2007).

GIAB sponsored a forum in 2002, involving the Prime Minister, senior ministers and business stakeholders, to find ways to accelerate economic growth. In 2003 a similar forum focused on the contribution of infrastructure to meet growth goals. It also completed work on agribusiness, on the cultural underpinnings of growth and innovation, and on skills.

Some members of GIAB were disappointed that the Board did not have a stronger influence on policy. The then Opposition argued that the advice of GIAB would have been more influential if it had been made available to the public (Oliver, 2004).

If the Government had engaged widely with stakeholders and invited proposals to be assessed by independent experts against agreed criteria, the current ITPs might have been the result. Such a path would likely have achieved greater recognition among stakeholders and elicited more enthusiastic support from them. With wide engagement, confidence in implementing the Government's strategy would increase. Yet clearly such a process for selecting and developing areas for focus would only be justified if the Government was bringing substantial resources to play.

The Government's industry strategy has limited access to resources

The Government has allocated a relatively small resource to support the operation of its industry strategy for "high-potential" sectors (Box 7.3). 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).

Other resources (for example in the RSI portfolio) may currently be available to support initiatives identified through the ITP processes. However, the processes by which this could happen and how relevant decision makers would respond to requests for support are not clear. The current lack of alignment between the draft RSI strategy and the industry strategy in identifying areas for focus compounds this difficulty (Chapter 8).

The broad scope of policies relevant to implementing ITPs is a further issue (see above). The NZProduct Accelerator, for instance, provided examples of the wide range of policies that should be brought to bear in advanced manufacturing sectors (sub. DR60). More generally, such policies could arise in education, infrastructure provision, capital market development or immigration – but a well-defined and efficient mechanism for bringing these policies and resources to bear within ITPs is lacking. Industry partners risk spending time and resources engaging with officials to develop ITPs and plan their own investments only to be disappointed if complementary government investments and initiatives are not forthcoming. Industry partners will be less likely to participate unless they see that the Government has committed a substantial and durable resource to support initiatives.

Some SAEs (eg, Singapore and the Netherlands) pre-commit substantial resources (in the order of \$1 billion each year) for focused innovation policy. This includes existing resources in relevant portfolios which are nominally tagged to support initiatives. The resources are released to fund initiatives that meet agreed

criteria. This approach has the advantage of signalling the Government's intent to other stakeholders and is therefore likely to elicit a stronger response in support of initiatives.

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 (section 7.4). Effective governance also needs active participation from 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

Provision for monitoring, review and evaluation is a core part of designing a successful focused innovation strategy. By their nature, such strategies are 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 (section 7.2).

Publicly released summary documents on the Government's industry strategy do not reference the monitoring, review and evaluation of the overall strategy. The Agritech ITP describes indicative measures of outcomes that could be the basis for evaluation, and signals an intention to develop a detailed approach (MBIE, 2020b). An evaluation approach proportionate with resources expended on initiatives should be advanced with urgency.

More widely, the Government has recognised the importance of evaluating impact in its innovation policies. The Government's draft RSI strategy signals an intention to monitor progress towards achieving the Government's vision and towards achieving targets (such as raising all 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, 2019d, p. 9).

The possibilities for evaluating business-led innovation investments in New Zealand have been illustrated by the evaluation of the former PGP programmes (Battell, 2018). Each of the constituent programmes had its own evaluation at mid-point and on completion. The summary evaluation drew on these to assess the benefits and outcomes of individual programmes and the overall success to that point of the partnership, and made recommendations for increasing its impact.

F7.7

While the Government's industry strategy is framed ambitiously and has elements of a successful approach, interacting weaknesses exist:

- few public resources are explicitly associated with the strategy, and the strategy is only weakly aligned with policy arenas controlling substantial resources;
- the choice of areas for focus seems to have arisen through interactions between officials, government ministers and bilateral engagements with selected industry representatives, rather than through a visible wider multi-stakeholder process;
- administration of the programme is largely in the hands of officials, when emerging international practice favours devolved multi-stakeholder governance of strategy and specific initiatives in the chosen focus areas; and
- a strong commitment to monitoring, review and evaluation of the strategy and its component parts is lacking.

7.7 Lessons for policymakers in New Zealand

Lessons for New Zealand policymakers emerge from the rationale for focused innovation policy (sections 7.1 and 7.2), the experience of other SAEs (sections 7.4 and 7.5) and New Zealand's own attempts to introduce such policies (section 7.6).

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. Rather than being transformational, the current initiatives risk a similar fate.

Figure 7.2 Success requires a large step up in resources, leadership and focus



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, establishing effective governance, institutions and processes and allocating substantial resources to chosen areas over a sustained period of time (Figure 7.2). 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 devolved governance arrangements for specific initiatives (section 7.4). These arrangements must be both transparent and genuine in sharing decision making across government, Māori, industry (firms and workers) and research leaders. Shared decisions should cover the choice of areas for focus, and the resourcing, implementation, monitoring and evaluation of focused innovation policy.

Māori participation in decision making requires care in establishing a mandate from among iwi and Māori interests. Willingness to participate will be influenced by the weight given to the process by the Government and other stakeholders, and the potential value for Māori in terms of the economic, social, cultural and environmental outcomes sought. Adequate resources are needed to support meaningful participation.

Choosing, resourcing and implementing focused innovation policy

Submitters generally expressed support for focused and collaborative innovation effort across government and other stakeholders. Both NZTE and Callaghan Innovation argue that support should coalesce around

the selected areas of the Government's current industry strategy (with both also arguing for more resources for the strategy) (subs. DR50 and DR74). Another submitter proposed that a citizens' assembly should be formed to choose areas for focus (Ben Wylie-van-Eerd, sub. DR43).

The Commission agrees with NZTE and Callaghan Innovation that future-focused innovation effort should build on the start that has been made in the shape of the Government's industry strategy and resulting ITPs. The strategy is ambitious and has already attracted industry and research counterparts. International experience suggests that successful focused innovation initiatives often build on previous initiatives (section 7.4; Crawford (2021)). This in turn suggests that effective policies build productive relationships among stakeholders that endure beyond formal government-sponsored interventions.

However, the Government has yet to commit sufficient resources to the strategy; nor has it put in place governance arrangements and policy processes to draw forth a substantial contribution from private sector counterparts. Without these, the strategy will struggle to achieve its ambition.

The Government should draw lessons from the design of European and Canadian focused innovation initiatives to find a way forward (section 7.4, Box 7.1). The relevant characteristics and a possible New Zealand approach follow. Chapter 11 sets out an agenda for putting this in place.

- *A high-level process for bringing forward proposals to meet defined strategic objectives.* Independent experts assess proposals against established criteria, and proposals may be refined iteratively until they are accepted. In some cases, this process is governed by an independent high-level stakeholder national innovation council. New Zealand has already chosen areas for focus through the industry strategy. It would be opportune to confirm the relative importance and resourcing for these chosen areas through a deliberate high-level multi-stakeholder review.
- *Devolution of governance and resourcing of initiatives within each area chosen for focus.* Devolution is conditional on government providing substantial resources, and the private sector at least matching these. Typically, independent multi-stakeholder entities are set up for each broad area of focus to oversee and bring forward specific innovation initiatives. Entities may have an initial life of five to ten years and are subject to periodic performance reviews. Funding agencies audit the use of public funds against usual criteria. If the Government provides substantial resources for implementing ITPs, a devolved approach is likely to bring forth stronger stakeholder commitment and draw more effectively on dispersed expertise, knowledge and resources.
- *A strong commitment to monitoring, evaluation, review and adaptation of strategy and initiatives.* Focused innovation policy is necessarily experimental and should be designed to elicit learning and adaptation as it proceeds (section 7.2). This requires a clear evaluation and review strategy to be established from the outset. The strategy should have pre-set review points and a transparent process for making indicated adjustments to governance, process, design and implementation of initiatives.

R7.1

As part of its industry strategy, the Government has identified areas with "high potential" in which to develop industry transformation plans. As a complement to broad innovation policy, the Government take these areas as a starting point and should partner with stakeholders to:

- confirm the choice of a small number of areas of the economy to focus innovation effort, for the purposes of raising firm productivity and export success (while ensuring other wellbeing objectives are met); and
- support these focus areas with a substantial and enduring commitment of public resources, conditional on the private sector at least matching these resources.

Other small advanced economies provide examples of the required level and duration of public funding – in the order of \$20 to \$40 million each year for each broad area of focus, for periods of five to ten years.

R7.2

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 areas.

Overall governance and oversight of the focused innovation areas should include senior representation from Government, Māori, industry (firms and workers), researchers and educators. This governing body should be responsible for setting strategic directions, recommending areas of focus and overseeing the strategy as it proceeds.

Governance in each chosen area of focus should be devolved to independent multi-stakeholder bodies. Each devolved body will make decisions on resourcing, implementation, monitoring and evaluation of initiatives within its area of focus.

Focused innovation policy is difficult to implement...

International experience shows that countries often struggle to get the right institutions and processes in place, and, in any case, these need to adapt to a changing environment (section 7.4). Effort risks being diverted into supporting established approaches, and governments must also find ways to harness the knowledge that they do not hold themselves. Broad strategies and international experience in reducing these risks are available (section 7.2 and section 7.4). Yet, inevitably, uncertainty exists about where to land on the many design choices available, arguing for an experimental, adaptive approach with good monitoring, evaluation, and periodic review of strategy and of particular initiatives.

... and skills in the public sector and beyond are slow to develop

A key success factor for focused innovation policy is to have officials with knowledge and experience of stakeholder engagement processes, 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. This experience means that their public sectors and people in the wider innovation system have built the capabilities and organisational cultures to engage successfully with each other.

New Zealand public sector agencies engaging in focused innovation policy need to give close attention to building the same workforce capabilities here. They would be wise to draw on available experience from various sources. Devolved administration of focused innovation policy calls for a skillset beyond those typically employed in the central public service. New Zealand has people engaged in regional development policies, or who have engaged in implementing cluster policies in other countries (Economic Development New Zealand, sub. DR72; Auckland Unlimited, sub. DR77; Venture Taranaki, sub. DR57; Cluster Navigators, sub. 20; Ifor Ffowcs-Williams, Doug Galway & David Wilson, sub. DR63). Julian Wood told the Commission that he believed there was much to be learnt from experience with the Provincial Growth Fund, and that officials involved had thought carefully about how to implement such policies (pers. comm., 17 February 2021).

R7.3

The Government should partner with other stakeholders to develop and implement a strategy to build the skills and capabilities within the public sector and more widely to successfully implement its focused innovation policies. The strategy should draw on experience already available in New Zealand and internationally in the devolved governance and operation of multi-stakeholder economic development programmes.

7.8 Complementing firm-focused assistance with services to strengthen innovation ecosystems

Much of government assistance to firms to innovate and to export is, for good reasons, targeted at individual firms and aimed at building their capability. NZTE has the primary responsibility for building firms' exporting potential (Chapter 5). Callaghan Innovation has the primary responsibility for supporting innovation by firms (Chapter 6), and so emphasises its role in providing services to "customer" firms (Callaghan Innovation, 2020).

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 firms with the costs of developing domestic innovation networks or innovation services such as R&D. While NZTE cannot offer this help to all its client firms, offering it to firms in the Government's chosen areas for focused innovation policy makes sense.

Callaghan Innovation has a statutory role to:

- foster an environment that supports businesses to innovate;
- promote networking and collaboration among businesses and research providers; and
- facilitate knowledge transfer between businesses and research providers (Callaghan Innovation sub. DR74).

Callaghan Innovation told the Commission that a significant part of its services is devoted to supporting the development of the innovation ecosystem. This includes, for example, the online Scale-Up NZ platform, showcasing New Zealand innovation, building capacity in incubator and accelerator programmes, a programme to promote the benefits of robotics and digital technologies, support for the New Zealand Food Innovation Network, and support for the Bioresource Processing Alliance (sub. DR74). Callaghan also employs staff with a sector focus relevant to the ITPs (section 7.7).

Both NZTE and Callaghan Innovation support the concept of focused innovation policy and submitted that this should build on the Government's current industry strategy (section 7.7). Each sees itself as playing a significant role in this strategy. Callaghan strongly favours a mission-led approach to focused innovation policy, citing international examples that aim to tackle climate-change mitigation.

An important finding of this inquiry is that exporting specialised, distinctive, high-value products at scale is one way that an SAE can significantly lift national productivity (Chapter 5). This raises questions about the extent to which NZTE and Callaghan serve different client bases, and whether greater synergies could be achieved through focusing support for innovation more strongly on firms with export potential. Focused innovation policy provides an instrument for doing this.

Callaghan Innovation stands ready to devote more of its resources to chosen areas. It submitted that:

This could involve specifying a certain proportion of funding towards areas of focus; giving greater weighting to businesses in areas of focus when making decisions on applications for funding; using joint decision-making across agencies; and/or designing new support mechanisms for areas of focus. (sub. DR74, p. 17)

Callaghan Innovation notes (and the Commission agrees) "that such an approach needs to go well beyond Callaghan Innovation's and NZTE's resourcing" (sub. DR74, p. 17).

The Commission considers that both NZTE and Callaghan Innovation should develop policies and practices that place greater weight on strengthening innovation ecosystems in the areas chosen for focused innovation policy.

F7.8

Much of the government funding channelled through Callaghan Innovation and New Zealand Trade and Enterprise (NZTE) to support innovation and exporting by firms is targeted at individual firms. A significant proportion of Callaghan's assistance is targeted at firms in areas of the economy, or which use technologies, that the Government has chosen for focused innovation effort. Callaghan also devotes some resources to supporting initiatives that strengthen the innovation ecosystems in which its customer firms operate. Yet scope exists to apply more of NZTE's and Callaghan Innovation's resources to the Government's chosen areas of focus.

R7.4

The Government should:

- review its funding channelled through Callaghan Innovation and New Zealand Trade and Enterprise, including funding targeted at individual firms to support innovation and exporting; and
- design and implement policies and mechanisms to give greater weight to strengthening the innovation ecosystems in areas of focused innovation policy.

8 Strategic direction in innovation policy

Key points

- The Government has an ambitious draft research, science and innovation (RSI) strategy, covering how the large public resources devoted to RSI policy should be deployed and for what purpose.
- A smart strategy alone will not be sufficient; execution is crucial. The Government should over the next year partner with other stakeholders (the research community, industry (firms and workers) and Māori) to put in place effective arrangements for the governance, resourcing, implementation, monitoring and evaluation of its RSI strategy.
- In implementing the RSI strategy, the Government should conclude the current reviews of elements of RSI policy. These include the review of the effectiveness of the Performance Based Research Fund, and the role, governance, operating model and funding of Crown Research Institutes. Strengthening links between public researchers and businesses should be a key focus of implementing the strategy (Chapter 6).
- Focused innovation policy can make a strong contribution to achieving the objectives of the RSI strategy. The Government should align the relevant parts of the RSI strategy with the areas of focus it has chosen in its industry strategy.
- The Government should, over the next several years, 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 draw on expertise in New Zealand innovation policy and in mātauranga Māori and te ao Māori.

Innovation policies interact in complex ways with the multiple components and institutions that make up a country's innovation ecosystem as broadly defined. The effects of policies and institutions can evolve in ways that are unanticipated at the time they are put in place. Clear strategic direction is needed to guide policy adaptively as circumstances evolve. International experience shows that periodic reviews of the design and performance of innovation policy can help governments take stock and reset the course to better achieve their objectives.

This chapter briefly assesses the Government's draft research, science and innovation (RSI) strategy. It then sets out the case for a full independent expert review of New Zealand's innovation policies.

8.1 The Government's draft research, science and innovation strategy

The Ministry of Business, Innovation and Employment has consulted on a draft government RSI strategy to shape the direction of RSI investment (MBIE, 2019c). The strategy primarily covers the deployment of the large public resources (more than \$1.6 billion each year) that the Government spends on research, science and innovation (Chapter 6).

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 (Chapter 7), 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 businesses and internationally);
- strengthening support for start-ups to grow and access global markets;
- building scale in innovation effort in chosen areas of focus;
- creating conditions for Māori thinkers and researchers to thrive in the RSI system, and better resourcing and protecting mātauranga Māori (Māori knowledge); and
- increasing investment in the RSI system, improving coordination across the network of research providers, and increasing the quality of research infrastructure.

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, 2019c, 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 at what scale the various initiatives will be resourced. Neither does the strategy 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 over an extended period. 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 RSI strategy will therefore require strong and transparent overall governance arrangements. Chapter 7 discusses the arrangements that other small advanced economies (SAEs) use. The strategy will need an implementation plan that the Government has developed transparently through engaging with other stakeholders (researchers, educators, industry (firms and workers) and Māori). 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.

The RSI strategy and the Government’s industry strategy should align

Chapter 7 noted that a clear fit between the draft RSI strategy and the Government’s industry strategy is lacking. While the policy scope of the two strategies differs, they have very clear common ground. This is especially so in policies focused on the economic and societal impact of New Zealand’s research, science and innovation effort; and in the roles of NZTE and Callaghan Innovation in implementing policy. The draft RSI strategy has large public funds assigned to it (partly reflecting its broad scope across research and innovation policy) (Chapter 6). In contrast, the industry strategy has only a small allocation of public funding that does not match its ambitious objectives (Chapter 7).

The Commission has argued that focused innovation policy can only be effective if the Government commits a much larger and enduring amount of public resources to its industry strategy. To help achieve this, more of the Government’s RSI funding (as well as resources from other portfolios) needs to be aligned with that industry strategy.

F8.1

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, from within New Zealand and from overseas;
- improving connections among researchers and innovators, including business;
- 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, improving coordination across the network of research providers, and increasing the quality of 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.

The draft RSI strategy lacks a clear fit with the Government's industry strategy and the relatively small allocation of resources to the industry strategy risks undermining the industry strategy's effectiveness.

R8.1

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 RSI strategy (and a significant quantum of associated funding) should be clearly aligned with the Government's industry strategy.

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.

R8.2

The Government should engage with other stakeholders (researchers, educators, industry (firms and workers) and Māori) to develop a transparent implementation plan for its research, science and innovation (RSI) 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 RSI strategy will be resourced and over what timeline;
- how a significant quantum of resource under the RSI strategy will be aligned with the Government's industry strategy;
- proposed changes to policies and practices (including funding criteria) that will better achieve the objectives of the RSI strategy;
- which agencies will take the lead on the actions; and
- arrangements to monitor and evaluate initiatives and the overall success of the RSI strategy.

8.2 A full independent review of New Zealand's innovation policy

The evidence presented in previous chapters shows that New Zealand's innovation ecosystems are not strong or focused enough to propel frontier firms into exporting at scale in areas of enduring competitive advantage. New Zealand performs poorly on a suite of innovation measures and is trailing comparator SAEs in translating innovation into economic outcomes (Chapter 3 and Chapter 6).

New Zealand's lacklustre performance in part reflects challenges in size, distance from markets and history. Yet these challenges do not fully account for New Zealand's poor performance. Other SAEs have been much more active in shaping innovation policies for success and tackling some of the same challenges. New Zealand should treat these challenges as a spur to learn from other SAEs and put in place state-of-the-art innovation policies.

Periodic review of innovation policy is the norm in small advanced economies

The Commission has not had scope to undertake a full review of New Zealand's innovation policy and public innovation system settings. Many SAEs (and other countries) engage independent reviews of their innovation policy to identify changes that will better achieve strategic objectives. Sweden, Finland, Norway and the Netherlands (for instance) have all commissioned the OECD to undertake such reviews in the last six years (OECD, 2013, 2014, 2016, 2017a, 2017b). 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).

Recognised international experts typically lead periodic country reviews of innovation policy. Such experts are well placed to make comparisons of effective policy and institutions and emerging thinking across countries, learning from what has worked well and what has not. Of course, reviews must also reflect country-specific circumstances. The participation of Māori and the role of mātauranga Māori in New Zealand's innovation ecosystems are prime considerations for New Zealand.

The Government should complete current reviews and bring a "focused innovation policy" lens to decisions

The Government is considering recent reviews of parts of the RSI system (Crown Research Institutes (CRIs) and the Performance Based Research Fund) and has yet to finalise its draft RSI strategy. Understandably, none of these reviews has a primary focus on frontier firm outcomes.

A further comprehensive independent review of New Zealand's innovation policies would provide greater confidence around the coherence and aptness of the range of changes currently under consideration or already being implemented. Yet it will take time to set up and conduct a comprehensive independent review.

Given the time that a comprehensive independent review will take, the Government should complete its current suite of reviews on aspects of RSI policy and make decisions using the best available current information and judgements. In doing so, the Government should bring an "innovation ecosystems" and "focused innovation policy" perspective to its decisions and take into account the Commission's recommendations in Chapters 6 and 7.

The review of innovation policy needs to be broad

The comprehensive review of innovation policy should start with core science and innovation funding policies. Yet policies that impact innovation and successful exporting are much broader (Chapter 5 and Chapter 6), and a review should consider these as well.

The review should take full account of New Zealand's position as a SAE, and how this affects the best 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 identify which aspects of New Zealand's innovation ecosystem are weakest and what policy or institutional changes would strengthen them. The review should be comprehensive. The questions below focus on some of the issues that the Commission considers such a review should encompass.

Funding

- How much funding should the Government provide for RSI policy (including funding for 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 basic research and funding 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 for science infrastructure? How can the administrative and compliance burdens of operating 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?
- Do opportunities exist to improve the coherence and accessibility of public programmes designed to support innovation by firms?

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 Performance Based Research Fund 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 the current support 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 broad 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 achieve excellence and improve 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 evaluating the impact of innovation policy initiatives be improved?

Choice of reviewers

The OECD is experienced in undertaking comprehensive reviews of innovation policy 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 and on te ao 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 SAEs and from experts on mātauranga Māori and on te ao Māori.

A third approach would be to assemble an independent review panel with 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 draw on expertise on New Zealand's existing institutions and innovation policies, and on mātauranga Māori and te ao Māori.

R8.3

The Government should commission a comprehensive independent review of New Zealand's innovation policies. The review should consider:

- 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 draw on expertise in mātauranga Māori and on te ao Māori.

9 Talent and leadership

Key points

- The tertiary education system lacks responsiveness to industry and research needs, specifically in the supply of sophisticated postgraduate skillsets for research and development. Scope exists for better integration of work and learning at higher education levels to:
 - build the pipeline of postgraduate talent needed to support innovation; and
 - increase retention of postgraduates 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. Collaboration between research institutions and industry for the purpose of developing skills should be improved and scaled up as part of a focused innovation policy process (Chapter 7).
- 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.
- A range of government-funded supports for building management capabilities are already in place or being developed. Existing and pilot programmes should be evaluated for their effectiveness, so that the Government can focus its resources into proven initiatives. The Government should identify opportunities for improving its supports, collaboratively with industry.
- Despite large inflows of immigrants to New Zealand over the last 10 years, skilled labour shortages continue. This suggests an ongoing mismatch between the supply of labour and the needs of firms, that is not being met either by the domestic education and training system, or by skilled migration.
- A mismatch also exists at the lower-skilled end of labour supply. Some New Zealand industries, including in the primary sector, rely heavily on temporary migrant labour to meet their seasonal employment needs. This weakens the incentives on firms to invest in productivity-enhancing automation.
- The Government should commission a review of migration policy. The review should consider the optimal level and mix of permanent and temporary migrants to support innovation and productivity. It should also assess the role and objectives of migration policy, together with New Zealand's education and training system, in meeting the labour needs of current and future frontier firms.
- The Government should work collaboratively with industries that currently rely on seasonal migrant labour, to develop a planned transition away from such reliance, and determine the role of government in supporting that transition. This may include supporting 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 local workers.

9.1 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 postgraduates they need (including via postdoc support mechanisms²³). 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 to support innovation.

In its tertiary education and future of work inquiries, the Commission also 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 some of these recommendations, in a way that is consistent with the Government's Reform of Vocational Education and its draft Tertiary Education Strategy.

Callaghan Innovation currently provides some grant funding for Masters and PhD students to undertake advanced R&D for firms. Individual institutions also 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 Lerner, the former president of the Royal Society of New Zealand, has suggested more extensive use of collaborative PhD schemes (Royal Society Te Apārangi, 2020).

The University of Auckland submitted that the current government funding model encourages limited industry connections, through its focus on the three-year undergraduate programme. The university advocated for greater government support for postgraduate study, and for enhanced funding to develop new postgraduate programmes that both meet the needs of industry and provide career pathways for students. The university's suggestions included:

- providing an additional 12 months of funding for PhD students;
- creating a commercialisation post-doctorate or internship scheme;

²³ A postdoc is a temporary position that allows a PhD graduate to continue to build their skills and experience through further research.

- reviewing the support provided by government to starts-ups, for scaling up; and
- creating a “pre-doc” programme where the prospective PhD student spends time with a potential project sponsor and supervisor, to develop a relationship with industry and refine the research project (Auckland University, sub. DR46).

Focused innovation policy (as set out in Chapter 7) provides a mechanism to scale up collaborations between research institutions and industry, partly for the purpose of developing skills in the selected areas of focus. In addition, Chapter 6 contains recommendations for strengthening funding and capability building for business-oriented research in public research institutions, including universities (recommendation 6.3).

F9.1

Scope exists for a more systematic approach to:

- building the pipeline of postgraduate talent needed to support innovation; and
- increasing retention of postgraduates in New Zealand by developing career pathways.

F9.2

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.

F9.3

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.

R9.1

Collaboration between research institutions and industry for the purpose of developing skills should be improved and scaled up as part of focused innovation policy.

9.2 High-quality management matters for productivity

High-quality management is an important driver of productivity

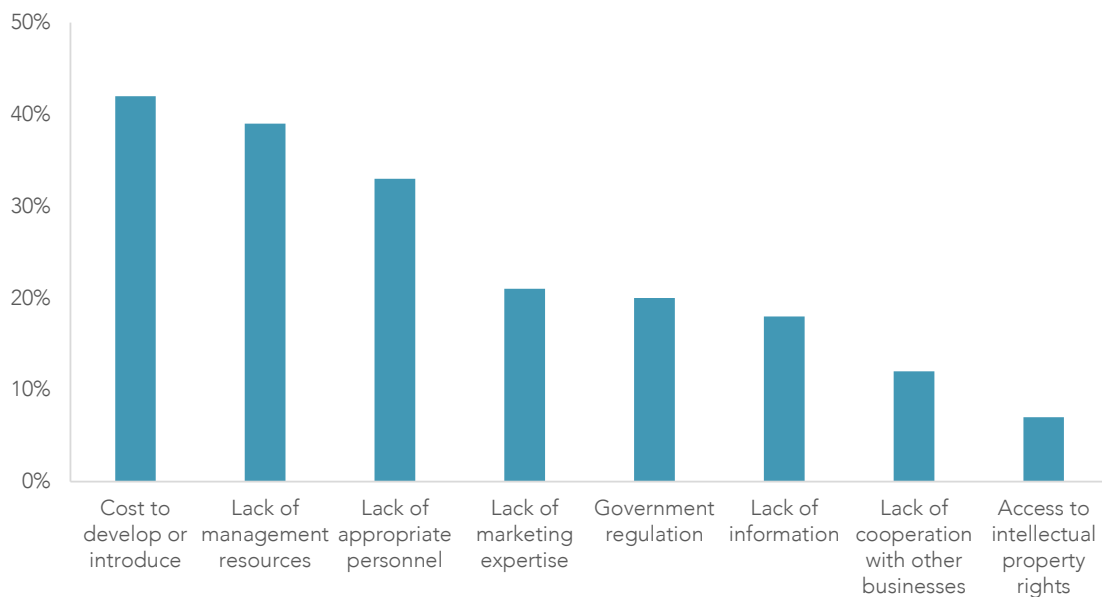
Management capability and practices are a significant determinant of firm productivity (Bloom, Brynjolfsson, et al., 2019; Bloom et al., 2017). Firms need the right management skills and culture to learn and adopt new ideas, technologies and processes from high-performing firms at the frontier. Adopting 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”.

Ordinary capabilities are necessary but not sufficient to generate productivity gains. 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). According to Teece, 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 9.1).

Figure 9.1 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 on the inquiry's issues paper (NZPC, 2020a). 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.

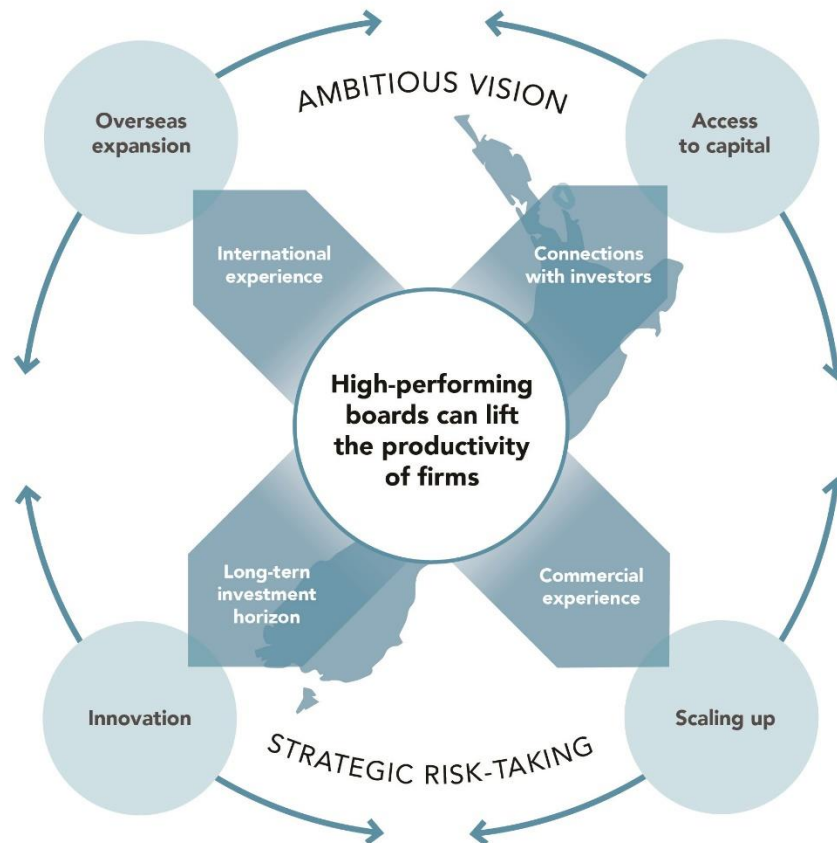
Directors with international commercial experience can help firms avoid common missteps when expanding into overseas markets, through helping them understand the risks, the required pre-work and the timeframes needed to be successful. For example, directors may be able to advise on target markets (such as consumer nuances, business culture, institutional arrangements), and appropriate business models and strategies to

pursue. Directors 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 9.2).

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 under-perform or are not well-matched to the company.

Figure 9.2 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 skilled people between firms. Building deep innovation ecosystems will help attract and retain large firms and top talent.

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, coaching and training for entrepreneurs and managers

Growing more large firms and linking into global talent are routes to grow the opportunities for upskilling through coaching and mentoring. There is also a role for government in helping to develop and fund initiatives for building firm-level management and leadership capabilities. Such initiatives should be co-funded, to ensure participating firms and entrepreneurs have “skin in the game” and are incentivised to learn and adopt new practices.

In their report for the Commission, Teece and Brown (2020) recommended government support for building both ordinary and dynamic management capabilities. They suggested the government establish:

- a pilot programme to help build dynamic management capabilities in self-selected frontier firms, in a targeted sector of the economy;
- a programme to build firm-level ordinary capabilities, involving a competitive fund to identify, acquire and diffuse best-practice ordinary capabilities and technologies;
- an international exchange and mentoring platform for managers in New Zealand frontier firms, with foreign multinational corporations; and
- a “long-run stewardship programme” for current and future directors, aimed at evolving corporate governance to support dynamic capabilities; and a pilot programme to experiment with procedural and structural changes to boards to foster greater focus on long-run strategy, innovation, investment and international opportunities.

A variety of government supports already exist. For example, 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. Firms can access co-funding for management coaching and training, as well as mentoring and other advice, through the government-funded Regional Business Partner Network (RBPN). Callaghan Innovation provides capability-building services through the RBPN and other initiatives. A range of other providers and networks receive part-funding from government, such as The Icehouse and Te Hono. Callaghan Innovation is developing a programme to build firms’ dynamic management capabilities, with the pilot due in 2021.

Given the variety of supports already available or under development, it makes sense to take stock of these before recommending additional programmes. Existing and pilot programmes should be evaluated for their effectiveness, so that the government can focus its resources into proven initiatives. Ineffective supports should be wound up, so that scarce resources can be directed towards filling gaps.

Support for building ordinary and dynamic management and leadership capabilities should be considered in the broader context of education and training (such as courses on entrepreneurship and management), on-the-job training, and migration policy. For example, three submitters said that tertiary education providers should offer more short courses and/or micro-credentials, to better suit mid-career learners (Anne French Consulting Ltd, sub. DR44; The Employers and Manufacturers Association, sub. DR55; and Venture Taranaki, sub. DR57).

A specific recommendation for helping to build Māori business capabilities is in Chapter 4 (recommendation 4.3).

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. Māori firms also collaborate with each other to help their development.

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. The leading New Zealand firm Mainfreight is a good illustration of all these features (Chapter 3). 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.

F9.4

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.

F9.5

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. Building deep innovation ecosystems will help attract, grow and retain large firms and top talent.

F9.6

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.

R9.2

A range of government-funded supports for building firm-level management and leadership skills are already in place. Existing and pilot programmes should be evaluated for their effectiveness before additional schemes are developed or rolled out.

The Government should identify opportunities for improving its supports for building firm-level ordinary and dynamic management capabilities. It should do this through a collaborative process involving industry, central and local government, iwi and Māori business interests, and private-sector providers.

F9.7

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.

9.3 Migration policy settings need to be reviewed

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.

But despite large inflows of immigrants over the last 10 years, skilled labour shortages continue. Difficulty finding skilled labour was a common theme in the Commission's engagement meetings, particularly in the software industry. This suggests an ongoing mismatch between the supply of labour and the needs of firms, that is not being met either by the domestic education and training system, or by skilled migration.

The primary sector relies heavily on seasonal migrant labour

A mismatch also exists at the lower-skilled end of labour supply. Some New Zealand industries, including in the primary sector, rely heavily on temporary migrant labour to meet their seasonal employment needs. The Commission looked at this in relation to the horticulture industry, as part of its industry case studies (Lewis et al., 2021).

The horticulture industry is highly seasonal, with the peak periods for picking and packing for some crops lasting only a few weeks each year. Growers struggle to find sufficient local labour to meet their seasonal employment needs. This is partly because the work is unattractive to many local workers, due to relatively low wages and piece rates in some roles, the strenuous and short-term/insecure nature of the work, and often the need to temporarily relocate. But it also reflects other difficulties with the pool of long-term unemployed. Industry stakeholders told the Commission that despite ongoing efforts to train and employ locals, they encounter problems with drug use and absenteeism.

Due to the mismatch in the supply and demand of domestic labour, the horticulture industry relies heavily on temporary migrant workers, including through the Recognised Seasonal Employer (RSE) scheme and the Working Holiday Scheme. Strong employer 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 total number of Working Holiday Visas has also increased dramatically, from just under 9 000 in 2000 to over 79 400 in 2019. New Zealand is an outlier when it comes to temporary work rights. It now has the highest number of temporary work permits issued on a per capita basis, in the OECD (Wilson & Fry, 2021).

Efforts to attract local workers have redoubled during the border closure prompted by Covid-19, with some horticulture firms offering improved pay and conditions (Andrew, 2020). 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 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. Higher wages could also spur greater investment in growing and harvesting technologies to reduce the strenuousness of the work (and hence make it more attractive for local workers), such as raised beds for growing ground crops. And as Nunns et al. (2020) point out, automation creates new types of jobs that are more skilled.

Peter Crawford submitted that sectors dependent on seasonal labour could be more strategic about how they meet their short-term labour needs (sub. DR34). In horticulture, this could involve greater regional coordination of workers across crops with different harvest times, to help create more stable and extended employment for locals. This could build on existing initiatives and platforms to help match workers to

horticulture jobs.²⁴ One horticulture firm told the Commission about local schemes to transport in willing workers from outlying regional towns. Schemes like this could be scaled up or used more systematically.

The productivity impacts of seasonal migrant workers in New Zealand are not well understood

The literature shows that provided migration policy is tailored to local conditions and kept under review, temporary immigration can provide net benefits to migrants and their host communities. However, a new report prepared for the Commission by Wilson and Fry (2021) found very limited economic analysis of the impacts of the substantial increases in temporary migration to New Zealand on local workers, automation, or productivity. Some studies of the RSE scheme provide limited empirical information, but evidence on the effects of the Working Holiday Scheme is scant.

A recent econometric study by McLeod and Maré found the overall impacts of temporary migration on local workers have been modest and positive, with some larger positive and negative effects in various subgroups including young people and beneficiaries. Technical challenges prevented this study from separately identifying the impacts of working holiday makers and RSE workers. The study did not examine the impacts on capital investment or productivity. The authors recommended further detailed analysis of the dynamics between migrant employment and the employment of New Zealanders, particularly considering the ongoing increases in migration (as their dataset extended only to 2015) (McLeod and Maré, 2018).

Wilson and Fry caution against applying results from overseas studies on permanent migration, to temporary migration in New Zealand today. In the absence of adequate New Zealand-specific data, questions around the effects of the RSE and Working Holiday Scheme on local employment and wages, and on investment in labour-saving technologies and productivity, remain unanswered.

Based on the available information, Wilson and Fry concluded that RSE workers are more productive than other temporary migrant workers and locals. However, while they may receive higher compensation than local workers, this wage differential may not fully reflect their higher productivity. Further, the visa conditions on RSE workers may serve to reduce the market power of RSE workers compared to locals. If this is the case, RSE employers would effectively be receiving a subsidy. This outcome may in turn have negative consequences for local potential employees, by limiting the wages employers are prepared to offer locals.

Wilson and Fry found that while output in the horticulture industry has increased, not enough data is available to tell whether temporary and seasonal migration is increasing overall productivity or is simply allowing more production. They advocate for more effective and ongoing review of the impacts of temporary migration in New Zealand, noting that such a review is likely to require bespoke data collection.

Employers say the combination of RSE worker productivity and the certainty of having a reliable workforce on hand at critical points like harvest-time is underpinning increased investment in plant and equipment, including automation, and creating permanent jobs for local workers (Bostock New Zealand, sub. DR67 and New Zealand Apples & Pears, sub. DR65). A case-study example is in Box 9.1. As Wilson and Fry note, this dynamic suggests some complementarity between RSE and local workers. To the extent that these new permanent jobs are taken up by people who were previously unemployed, this creates additional, social benefits.

²⁴ Such as PickNZ: www.picknz.co.nz/work-opportunities/work-planner; and Seasonal Staff: www.seasonalstaff.co.nz.

Box 9.1 The productivity benefits of scale and automation

Bostock New Zealand is a large horticulture firm based in Hawke's Bay. As well as being New Zealand's largest organic apple grower, it also produces squash, onions, wine, grain and organic chicken.

The firm illustrates many of the features of frontier horticulture firms. It has shown strong growth, with total revenue increasing from \$80m in 2010 to \$204m in 2020 (annual growth of 10% over ten years). Ninety per cent of its revenue comes from exports, well above the average export intensity of 38% for the horticulture industry as a whole.

Revenue growth has been supported by increases in both scale and productivity. For example, the area planted in apples has increased significantly, from 366 ha in 2011 to 563 ha in 2021. Greater scale can generate productivity benefits by spreading fixed costs over a greater volume of output.

The firm has also invested heavily in labour-saving automation, such as a machine to pack squash in bins and an electronic onion-packing tower. A \$500 000 investment in the automatic squash bin fillers increased the speed of packing and reduced the number of employees needed (see image). The business also made other efficiency improvements, including by improving produce quality and reducing the number of varieties grown. These initiatives combined raised labour productivity (measured by tonnes per hour worked) by 93% over two years.



The scope for automation is currently greater in the packhouses than in on-orchard activities such as picking. Technologies for orchard activities are still some years away. In the meantime, apple growers like Bostock New Zealand are investing in equipment such as hydraulic platforms that reduce the physical effort required to pick. For example, the platforms remove the need for pickers to carry heavy baskets up ladders, which brings the task within the capacity of more workers (including women) and may make the jobs more attractive to local workers.

John Bostock is Bostock New Zealand's owner. He says that the certainty of a reliable seasonal labour force, comprised mostly of RSE workers, has enabled increases in output, investment in mechanisation, and an increase in permanent positions. Total employment in the firm has grown at a similar rate to revenue, yet permanent roles have grown faster. As a proportion of the total employee headcount, permanent jobs have increased from 29% in 2014 to 34% in 2019 (this proportion is much higher during non-peak months, as most casual labour is employed during the harvest and packing season). John Bostock sees the creation of permanent, full-time positions as critical to the future of the horticulture industry.

Source: Pers. comm. John Bostock and Neil Chittock, Bostock New Zealand, 21/12/2020 and 29/1/2021. Image provided by Bostock New Zealand.

Increasing productivity-enhancing automation in the horticulture industry

Horticulture firms told the Commission that the short seasonal peak, combined with the relatively low cost of labour (compared to capital), make it challenging to achieve an acceptable rate of return on capital investment in labour-saving and productivity-enhancing technology. Some firms noted that the uptake of automation overseas is being driven by rising labour costs and employment standards, as well as more favourable depreciation rates on machinery and equipment (Lewis et al., 2021). In places such as the United Kingdom and the United States, labour shortages due to Covid-19-related border closures (and in the UK,

also Brexit) are accelerating interest and investment in robotics for harvesting crops (Evans, 2020; Hodge, 2020; Terazono, 2020). Box 9.2 provides a local example of how labour shortages in the 2000s spurred innovation in the wine industry.

Automation has some technical challenges. The tasks in the horticulture industry are many and varied. Some tasks, such as picking, are proving difficult to automate due to the biological environment, the nature of the picking action and the judgements required (making it hard to achieve the speed and results of human pickers). This means that commercial feasibility is still many years away for some technologies.

Box 9.2 Labour shortages spurred innovation in the wine industry

Automation is already widespread in the wine industry, with the larger firms operating at industrial scale. For example, most Marlborough sauvignon blanc is harvested by machine, then processed in bulk in stainless steel tanks by contract processors. However, pruning has proved a difficult aspect of the production process to automate.

Pruning grape vines (cane pruning) is labour intensive. The process involves selecting which vines to retain (typically four out of 20 vines attached to the trellis wires), cutting the unwanted vines and then stripping them out from the trellising. The task of selecting and cutting the vines is skilled, while removing the unwanted vines is strenuous physical work. Removing the vines is complicated by the fact that they are entangled in the trellis wires.

KLIMA is a company established in 2008 by two New Zealand viticulturists. The company has developed and commercialised a mechanised vineyard-pruning system. The system involves self-releasing clips that free the vines from their trellis posts and wires and a machine that cuts, strips and mulches the unwanted vines.

The “burning platform” for the innovation was a severe shortage of seasonal labour during the 2006 pruning season. This prompted viticulturists Marcus Wickham and Nigel Gerge to rapidly design, prototype and trial mechanised solutions.

The pair engaged intellectual property specialists EverEdge IP to help them secure patents. EverEdge challenged them to think beyond the New Zealand market, and helped them commercialise the products overseas. KLIMA entered a strategic partnership and licensing arrangement with the German vineyard machinery firm ERO Weinbau to manufacture and distribute the machines across Europe.



The KLIMA system prunes a row of vines in two minutes compared to two hours for a person. The company estimates that their system generates labour-cost savings of 30% to 50%, or around \$1 000 to \$1 500 per hectare. Wickham reports that demand for KLIMA products in New Zealand slowed for several years following the introduction of the RSE scheme, which relieved labour constraints and lowered the cost of manual pruning. He says that demand from the United States was initially low due to the availability of low-cost workers, but is now growing due to improvements in local wages and employment conditions.

The pruning machine received a Gold Medal Award at the SITEVI Exhibition in France and the Gold medal and overall prize for innovation at the SIMEI Exhibition in Italy.

Source: DEMM Engineering & Manufacturing Magazine (2012), Goode (2010), KLIMA (2020), Marcus Wickham, pers. comm. 11/8/2020. Image source: KLIMA.

Time to review New Zealand's migration policy

The Government's draft Research, Science and Innovation (RSI) Strategy aims to make New Zealand "a magnet for talent" (MBIE, 2019c).

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. This review would consider the optimal level and mix of permanent and temporary migrants to support innovation and productivity, in the context of a broader population strategy. It would assess the role and objectives of migration policy, together with New Zealand's education and training system, in meeting firms' demand for labour. Humanitarian immigration, such as refugees and asylum seekers, would be outside the scope of the review.

The review would consider how migration policies can best contribute to attracting and retaining the right skilled migrants to grow New Zealand's current and future frontier firms. This would include migrants with needed expert research and technical skills, as well as entrepreneurs, investors and experienced business leaders.

In relation to low-skilled and temporary migrant workers, the review should look to reduce inflows of these workers over time. The Government will need to work collaboratively with industries that currently rely on seasonal migrant labour, to develop a planned transition away from such reliance and determine the role of government in supporting that transition. This may include supporting 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.

Any review must be based on New Zealand's particular circumstances, now and into the future. While overseas experience is illuminating, New Zealand needs policies that fit its circumstances. Therefore, more evidence on the economic impacts of temporary migration in New Zealand is needed. The Government should commission empirical studies to assess the impacts of working holidaymakers, international students and RSE workers on local labour markets, automation and productivity.

F9.8

Despite large inflows of migrants to New Zealand over the last 10 years, skilled labour shortages continue. This suggests an ongoing mismatch between the supply of labour and the needs of firms, that is not being met either by the domestic education and training system, or by skilled migration.

F9.9

A mismatch exists at the lower-skilled end of labour supply. Some New Zealand industries, including in the primary sector, rely heavily on temporary migrant labour to meet their seasonal employment needs. New Zealand now has the highest number of temporary work permits issued in the OECD, per head of population.

F9.10

A new report has found very limited economic analysis has been done on the effects of the substantial increases in temporary migration to New Zealand on local workers, automation and productivity.

R9.3

The Government should commission a review of migration policy. The review should:

- consider the optimal level and mix of permanent and temporary migrants to support innovation and productivity, in the context of a broader population strategy; and
- assess the role and objectives of migration policy, together with New Zealand's education and training system, in meeting firms' demand for labour.

The review should consider how migration policies can best contribute to attracting and retaining the right skilled migrants to grow New Zealand's current and future frontier firms. This would include migrants with needed expert research and technical skills, as well as entrepreneurs, investors and experienced business leaders.

The review should also look at how to reduce inflows of low-skilled and temporary migrant workers over time. As part of this, the review should consider the aspirations of New Zealanders to attain higher skills and education, and jobs commensurate with their skills.

R9.4

The Government should work collaboratively with industries that currently rely on seasonal migrant labour, to develop a planned transition away from such reliance, and determine the role of government in supporting that transition. This may include:

- supporting industries to accelerate the development of automation and other labour-saving technologies;
- building the necessary skill base for higher-tech production practices; and
- helping to make jobs more attractive to local workers (eg, in horticulture, by coordinating work across multiple crop types to provide work for all or most of the year, with associated training).

R9.5

Any review of migration policy must be based on New Zealand's particular circumstances. More evidence on the economic impacts of temporary migration in New Zealand will be needed to support such a review. The Government should commission empirical studies to assess the impacts of working holidaymakers, international students, and workers in the Recognised Seasonal Employer scheme on local labour markets, automation and productivity.

10 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.
- A good system of regulatory stewardship focuses not only on monitoring and compliance with current regulations, but also on new or amended regulations needed to keep pace with technology and 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, horticulture and health technology (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 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 innovation in products, organisational forms and business models. Yet Fonterra's fortunes have fluctuated, and it has struggled to deliver on expectations that it would be a "national champion".
- Recent changes to DIRA have removed Fonterra's obligation to accept milk from its previous farmer suppliers. This removal risks harming competition and innovation by new dairy processors. At DIRA's next review, the Government should assess the removal and rescind it if the net effects are negative.
- 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 a consumer's permission), they can offer consumers new and better goods and services.
- Modern genetic modification (GM) technologies such as gene-editing offer potential new opportunities for boosting productivity, improving health outcomes, reducing biosecurity risks, and responding to climate-change risks and other environmental problems effectively and efficiently.
- The regulatory framework for GM tools was last reviewed in 2001 and does not reflect technological advances since that time. The Government should review the GM regulatory framework, to ensure it is fit for purpose. This review should include wide engagement with industry, iwi and Māori interests, and the general public.
- 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 not collaborating in the healthtech innovation ecosystem. The Government should improve the mandate and incentives for DHBs to collaborate. This will provide vital support for the healthtech sector and lead to better health outcomes.

10.1 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-productivity firms to high-productivity firms. But healthy competition requires the regulatory underpinning of strong competition policy and operation (Box 10.1).

Box 10.1 **Strong competition policy and operation are essential to productivity growth**

Competition affects all three forces that shape an economy's productivity growth: re-allocating 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 (re-allocation) 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. Zheng et al. (2021) find in line with other studies that resources in manufacturing industries tend to be allocated more efficiently than in service industries. Service industries are more often domestically focused, face less trade exposure and therefore less competitive pressure.

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; they 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 (NZPC, 2014b).

If New Zealand is to maximise the contribution of frontier firms, the Government will need to pay close attention to see 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. This focus is at the expense of good regulatory stewardship: keeping regulations up to date, removing unnecessary regulations, and designing and implementing new regulations when needed. These elements of regulatory stewardship, as well as good regulatory operational practice, are needed to encourage long-term value creation (APC & NZPC, 2019; Crampton & Ting-Edwards, 2017).

Regulatory stewards include Ministers and public servants in policy and regulatory agencies. Regulatory stewards must ideally exercise *dynamic capabilities* to sense when regulations need to change and then seize opportunities to change. This will 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 10.2).

Box 10.2 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 United States, 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.

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 19 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 (2019).

F10.1

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.

R10.1

The Government should prioritise keeping regulations up to date with technological and other changes, where not doing so would curb innovations that have potentially high payoffs in wellbeing. This action should apply especially in areas of focus for innovation.

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.

10.2 Improving competition and innovation 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 and regulation.

The Dairy Industry Restructuring Act 2001

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 provisions to manage the risks arising from Fonterra’s dominance. Some provisions have since been added or amended. The key provisions are below.

- **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 freedom to choose enabled farmers to respond to Fonterra’s performance by switching their milk supply from and to Fonterra. The freedom to switch exposed 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. With the introduction of TAF in 2012, the DIRA was amended 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 each 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 each 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 10.3).

Box 10.3 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 share price on the NZX and ASX grew rapidly until it became, in mid-2020, one of the most valuable companies listed on the NZX, with a market capitalisation of around \$13 billion. The company recorded strong revenue and profit growth up to and including the 2020 financial year (in which its profit increased by 30%). The company's successes have been mostly in Australia and New Zealand with liquid milk and infant formula; and in China with infant formula. The market also highly rated a2 Milk's growth prospects in China, the United States and the United Kingdom.

Owning no cows, no farms and no processing factories, the company's business model had similarities to the ride company Uber which owns no vehicles and the vacation company Airbnb which owns no property. Until recently, a2 Milk has been strictly an intellectual property (IP), marketing and distribution company, having entered into strategic supply agreements with dairy processors in both foreign and domestic markets.

The Covid-19 pandemic has disrupted a2 Milk's business model – especially its supply routes to the Chinese market. The company has cut its growth and profit forecasts and its share price has suffered a dramatic fall of over 50% since August 2020. Also, a2 Milk has recently bought a 75% stake in Southland milk processor – Mataura Valley Milk – so its assets are no longer the purely intangible ones of customer links, brand, IP and research.

Source: Barry and Pattullo (2020).

Fonterra – New Zealand's largest company

The Fonterra Dairy Cooperative is New Zealand's largest company by revenue, employment and hugely by exports. It earned over \$18 billion in export revenue in the year to June 2019, around 20% of New Zealand's total exports of goods and services (LIC & DairyNZ, 2019). It is the sixth largest dairy company in the world and the largest dairy exporter.

Yet at home, Fonterra attracts supporters and detractors in roughly equal measure. The Commission has heard both sides in its case study of the dairy industry as part of its Frontier Firms inquiry. Four issues that go to the heart of the analysis and themes in this report illustrate the divergent views about Fonterra.

Fonterra as a large and leading frontier firm

First, Fonterra itself argues that it has the attributes of a frontier firm and that these include significant benefits to New Zealand Inc., in addition to the income it generates for its many workers, capital owners and suppliers. In its submission (sub. DR75, pp. 2–3), Fonterra says that the benefits it provides include:

- training thousands of highly skilled workers and partnering with manufacturing unions;
- facilitating access to foreign markets for other New Zealand companies by building demand for New Zealand dairy in China for example, and building the New Zealand provenance story more generally;
- providing input and support in New Zealand trade negotiations and broader trade policy issues such as tariff quota administration and safeguards, and non-tariff barriers to New Zealand exports; and
- providing expert advisers who participate in shaping the global regulatory environment in food, and developing food standards in international organisations.

Detractors point to Fonterra’s record over 2016–19 of poor returns, its destruction of shareholder value, and reliance over a longer period on large-volume commodity sales. As a hoped-for national champion at the time it was set up, 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 (Barry & Pattullo, 2020).

Inquiry participants cited examples to the Commission of Fonterra behaving in an opposite way to a collaborator and team player willing to work with other dairy businesses, often regarding the emerging success of others as a threat to itself. Another common view is that Fonterra’s progress has been hampered by intrigues within and between its board and senior management, and by “farmer politics”.

Even Fonterra and its farmer-owners agree that it performed poorly and had bad results in the two to three years around 2016–19. Two major food-safety scandals, poor returns and partnerships going wrong in several of Fonterra’s large offshore investments in China, South America and Australia were some of the causes. With so little value added and, in some instances, significant value lost, Fonterra’s productivity was clearly low over this period. Yet, the giant cooperative is now enjoying better times under new leadership who cautiously predict that the future is bright with their new approach (see below).

The growth of the dairy industry and Fonterra’s open entry and exit obligation

Second, supporters and Fonterra itself argue that it has been severely handicapped by its obligation to take new milk supply from anyone who chooses to become a Fonterra farmer-shareholder. The obligation to invest in stainless steel and large dryers to process peak-season milk flows has been at the expense of investing in innovation and creating value rather than volume. Therefore the 2020 amendment of the DIRA that ends this obligation is overdue, welcome and vital to Fonterra’s future fortunes.

Detractors argue that Fonterra encouraged the rapid conversions of land to dairy and competed vigorously to access large chunks of the new milk supply for itself. It followed an explicit strategy of boosting its production and sales of milk powder internationally. Rather than being forced to expand its processing capacity, it chose to do so. An example that illustrates Fonterra’s expansion mindset is the dairy conversions in the Mackenzie District in the 2000s. Fonterra was not obliged to take this milk because it was outside its existing catchment, but it wanted it and the conversions went ahead. The opposite occurred in Wanaka where Fonterra choose not to take the milk and far fewer conversions took place.

Value versus volume

Third, whatever Fonterra’s past behaviour regarding volume, the company now accepts that further significant growth in dairy conversions and cow numbers will not happen and is undesirable because of

environmental limits and a reduction in social licence to operate (ie. the support and trust of their customers and the public). Fonterra therefore sees future growth coming increasingly from value rather than volume. But that does not mean becoming a southern hemisphere Nestlé – a world-leading conglomerate in “fast moving consumer goods” (FMCG).

Fonterra is shifting its portfolio towards greater innovation and higher value. Yet the seasonal peaks of milk under New Zealand’s grass-fed dairy system mean that significant, varying proportions of its production will still be milk powders and other volume products. Further, its value-added products are mainly aimed at wholesale customers (ie, business-to-business (B2B)) – food service products and specialised ingredients rather than FMCGs. Fonterra’s current range of value products include:

- a patented mozzarella-type cheese that Fonterra can manufacture in one day compared to the 3–4 months required in the traditional method and which is now estimated to be used in 50% of pizza toppings worldwide;
- specialised creams and other advanced ingredients for commercial cooking;
- a technique of milk fingerprinting that enables analysis of milk quality and the tracing of provenance; and
- milk protein concentrates aimed at the specialised nutritional needs of expectant mothers, infants, sports people and older people.

Fonterra states that it even innovates with its staples of whole milk and skim milk powders. Fonterra’s submission states that 45% of its raw milk went to value-added products in 2017–18, up from 42% in 2016–17. (sub. DR75, p. 10). These percentages likely include these improved powders.

On the negative side, Fonterra’s 2020 R&D spend of \$98 million is only half a per cent of its revenue. Critics argue Fonterra’s value-add products represent marginal improvements rather than radical breakthroughs and that payments to suppliers and shareholders have been unwisely generous, and at the cost of needed investment and keeping debt at prudent levels.

Fonterra is a milk cooperative whose farmer-owners have a dominant interest in the reliability of having their milk collected each day and being paid the maximum price for that milk. The challenge for Fonterra is this cooperative model’s unsuitability for attracting risk capital and the risk-taking needed for innovation.

According to Alex Duncan (a former senior corporate finance officer at Fonterra), Fonterra’s past problems arose largely from misguided efforts to push the cooperative model into complex and differentiated products for consumers (a “grass to glass” strategy) for which it is unsuited. Farmer-owners, he said, never bought this strategy. Given this ownership structure remains in place, Duncan recommended that Fonterra simplify itself by focusing on its core ingredients business and selling off the more downstream and consumer-facing assets. These assets could be bought by other New Zealand dairy businesses with greater appetites for innovation and risk, and with whom Fonterra could profitably partner (Duncan, 2019).

Care of the environment

Fourth, views are also polarised about Fonterra’s efforts to care for the environment both after and before the farmgate (Fonterra has powerful levers to influence the on-farm behaviour of its farmer suppliers).

Fonterra emphasises its environmental credentials: a commitment to sustainability; targets for lowering water use, solid waste and greenhouse-gas emissions from its factories; working with the Pastoral Greenhouse Gas Research Consortium; and on-farm initiatives with its farmer suppliers such as the Clean Streams Accord and a rollout of Farm Environment Plans.

Environmental critics aim their criticisms more at the whole dairy industry rather than Fonterra specifically. But Fonterra and its farmers do comprise the bulk of the industry. The familiar criticisms include overly intensive dairying putting pressure on soils and waterways beyond their capacity to absorb nitrates and other nutrients, a huge increase in fertiliser use, and repeated delays in bringing agriculture within any form of emissions pricing or other form of emissions regulation.

Fonterra's new leadership and its future

With a change in leadership around three years ago, Fonterra is showing encouraging signs of recovery. The new leadership has sold off many of the company's unprofitable assets and stabilised its finances (Woodford, 2020). They have reshaped Fonterra's strategy to a back-to-basics focus on maximising returns from the milk it sources in New Zealand and on marketing the quality of that milk. Fonterra accepts that future growth in milk supply will be modest at best and returns must come increasingly from innovation and adding value (Fonterra, sub. DR75).

Fonterra's new strategy is based on a triple bottom line of healthy people²⁵, a healthy environment and a healthy business.

Fonterra expressed, in a 2019 internal document it provided to the Commission, the shift in its strategy:

18 months ago we might have said we're a global dairy giant, here to make a difference in the lives of 2 billion peopleAt our heart, we're a cooperative doing amazing things with New Zealand milk to enhance people's lives and create value for customers and our farmer owners. It may not sound so radical, but this simple change of how we think of ourselves takes us to a really different place.

However, commentators and even Fonterra's new Chair (and ex-chair of Zespri), Peter McBride, point to the challenge of raising capital to execute the new strategy. McBride is promising a major review of capital structure that will include full consultation with stakeholders. Critical among these are Fonterra's farmer-owners who are fierce in their determination not to cede control to outside sources of finance, yet who have priorities, needs, capital constraints and risk appetites that incline them against investing significant risk capital in their company.

In creating more value from a given volume, McBride recognises the need for capital, the need to "respect capital" and "respect where value is created along the value chain and remunerating that part of the business" (Fox, 2020).

McBride is also keen to bring about culture change in the company, better communication with farmer suppliers including to make them more consumer, market and environmentally aware:

We are trying to lead change around sustainability and animal welfare and a whole lot of other stuff so we need to convey that message well. Bringing consumer and customer insights to our farmers is really important. I want to change things up a bit in that regard. (Fox, 2020)

While few would not wish McBride and CEO Miles Hurrell every success in their efforts to lift Fonterra's performance and become a fully frontier firm, only the future can reveal answers to three key questions about whether Fonterra can:

- make the transition from less reliance on volume to more on value, including innovation that is more radical;
- improve its positive contributions as an anchor firm to the dairy innovation ecosystem; and
- make substantial inroads into solving the problem of environmental sustainability for dairy, including the significant threats and opportunities posed by plant-based and synthetic proteins.

Strong recent price growth, culminating in the exceptional 21% rise in the global dairy trade auction price for whole milk powder in early March 2021, suggests a new period of dairy prosperity (NZ Herald, 2021). It will be important for the industry to find ways to use the high returns to tackle these three key questions. The alternative could be the familiar cycle of high returns being capitalised into higher land prices, and ongoing pressure for more conversions and more milk, at the cost of further environmental damage and pressure taken off the need to innovate.

²⁵ Fonterra sees its healthy people bottom line as having wide scope – referring not only to quality jobs, health and safety, and staff development but also to community programmes such as KickStart breakfasts, and the quality and nutritional value of Fonterra's products.

Successes from deregulation

The deregulation of dairy processing and exporting under DIRA 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 (OCD).
- The different companies have focused on and added value to the economy at different parts of the “value chain”. OCD, 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, The Tatua Co-operative Dairy Company, and the Māori-owned Miraka have developed strong B2B links, 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.

The 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-owners over many years.

Tatua’s experience is instructive. It has evolved a difficult-to-imitate niche of highly specialised nutraceutical and pharmaceutical ingredients that occupy quite specific positions in sophisticated value chains. The relationships required for these value chains take many years to build. 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 Vinamilk, the largest dairy company in Vietnam.

Challenges and concerns remain in dairy

As noted for Fonterra above, the whole 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 modest 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’s model at the lower end of the “value added” spectrum.
- Fonterra’s regulated pricing of farmgate milk based on a hypothetically efficient processor remains controversial. Overpricing is a risk, with undesirable consequences such as:
 - inflating the value of dairy land;
 - reducing Fonterra’s retained earnings when it could be invested in creating greater value from the farmgate onwards;
 - raising the price of raw milk – the essential input that other processors and would-be new entrants require to operate. Some of these processors argue that this is an unwarranted premium that they and new entrants must pay, and therefore depresses investment and innovation. Yet Fonterra argues that it is fairly rewarding its farmer suppliers and that its investor-owned processor competitors of course favour a lower milk price to reward shareholders (and noting that many of those shareholders are foreign-based rather than New Zealand-resident farmers) (sub. DR75, p. 9);
 - hiding the value of the milk by bundling it with a return on farmers’ capital invested in Fonterra. An analysis by Castalia for OCD indicated that, after adjusting the milk price for this bundling, OCD

suppliers (who are not required to hold shares in OCD) earned higher total economic returns on their milk than Fonterra suppliers in five of the seven years to 2019-20 (OCD, sub. DR71, p. 5).

- Dairy expansion has reached its environmental limits in terms of pressures on water quality, availability of water, biodiversity, natural landscapes and greenhouse gas emissions. It is likely that the industry has reached “peak cow” and the limits of its social licence, and must now grow value rather than volume.
- The dairy industry faces a serious threat from the rapid development of synthetic, factory-produced protein and plant-based milks that will be cost-competitive with the natural product and have a much lower emissions footprint.
- Average wages in the industry are modest. Farmers rely overly on capital gains and on boosting average yields (sometimes to the detriment of profit) 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 contributes to an unwillingness to invest in productivity-boosting, labour-saving automation.

Recent amendments to DIRA have overreached

In July 2020, the New Zealand Parliament amended the DIRA to reduce some of the regulatory requirements on Fonterra.

- From June 2023, Fonterra’s obligation to accept milk on its standard terms, including from farmers who previously supplied Fonterra and left – perhaps to supply another dairy processor – will end. If Fonterra does accept supply from such farmers, it may apply different terms compared to farmers who remained with Fonterra.
- From June 2021, the requirement for Fonterra to supply regulated milk to independent processors will become less onerous.

The first of these changes came late in the parliamentary select-committee stage of the amending Bill. As a matter of good process, the change failed to respect the important principle that changes in law affecting competition should be subject to full consultation and assessment of their impact on competition and market health.

The change risks curbing competition and discouraging innovation. It will enable Fonterra to use its still-dominant position to lock in its farmer suppliers and shareholders, deterring 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 misuse it.

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).

In its submission on MPI’s discussion document, the Commerce Commission recalled what it said in its 2015-16 review of competition in the dairy industry:

The DIRA limits Fonterra's market power and reduces barriers to entry and expansion for independent processors... We considered the open entry and exit provisions importantly safeguarded against Fonterra’s ability to hinder the prospects of its competitors in regard to dealing with farmers. It also offered protection to farmers against Fonterra behaving unfairly towards them, though we noted that as a co-operative, Fonterra had little incentive to deal poorly with its farmer suppliers. We supported the

retention of the open entry and exit provisions but noted that it might be worth exploring removing open entry for new dairy conversions. (Commerce Commission, 2019)

The Commerce Commission also found in its review that, while the obligation to accept supply imposed some costs on Fonterra, these were outweighed by the adverse consequences for the industry and New Zealand that might result if DIRA were repealed.

Synlait, one of Fonterra's competitors, expressed concern in more robust language in a note following its submission on the DIRA amendment Bill. OCD, another competitor, expressed similar concern in its submission to the inquiry.

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. (Synlait, pers. comm., 2020)

Repeal of open entry essentially permits Fonterra to boycott farmer-suppliers for perceived disloyalty. Farmers can be refused re-entry or have penalty-like conditions imposed if they seek to return to Fonterra. This greatly increases the perceived risk for farmers considering supplying another processor (for example, a new start-up). It locks in farmers with Fonterra and reduces incentives on Fonterra to improve its efficiency and returns for its farmer-shareholders. (OCD, sub. 71, p. 2)

Against these views, Fonterra argues that repeal of the obligation is vital to its ability to pivot away from volume towards value. It refers to the damage to its business from the combined effects of the obligation, new conversions, seasonal peak milk flows and farmer indebtedness.

These combined factors have imposed significant cumulative costs on Fonterra and our shareholding farmers. In significant cases it has meant that available capital has had to be invested in peak manufacturing capacity rather than value-add manufacturing production. It has meant our business needs to carry spare manufacturing capacity for farmers who could return to Fonterra. By being obligated to invest in large processing assets with a long capital life, DIRA has contributed to a legacy issue for Fonterra, in that we need to continue to efficiently process milk through this capacity to protect the value of those investments.

The regulatory distortion of creating a guaranteed buyer for milk, transfers risk away from the entities best placed to manage the risk of land-use change and new processing capacity—the new entrant processors and their suppliers—to Fonterra and our shareholding farmers. (sub. DR75, p. 4)

No disagreement exists between Fonterra, the Commission and the Commerce Commission, that Fonterra should no longer be obliged to accept milk from land newly converted to dairy. However, the Commission believes on balance that the obligation to take back existing suppliers is net beneficial for the industry and New Zealand. It accepts that the obligation should not be permanent – it should no longer exist when Fonterra is less dominant. But given its continuing challenges, the dairy sector needs more healthy competition and innovation, not less.

The 2020 amendments to DIRA provide for a review of the need for DIRA every four to six years. As noted, Fonterra's obligation to accept new supply does not end until June 2023. By the time of the next review, the removal of the obligation will have been in force for one to two years. The review will be an opportunity to assess the impact of the removal as well as further market developments and any changes in dairy's environmental footprint. The review should focus on these three aspects.

If the review finds that Fonterra continues to dominate the market share of farmgate milk and removal of the obligation is having negative impacts on competition and innovation that outweigh other benefits, then the obligation should be reimposed. Subsequent reviews should make similar assessments.

F10.2

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.

F10.3

The previous prevailing ethos in the dairy industry (albeit with exceptions) was one of expanding volume rather than innovating for value. This failed to recognise environmental limits. This ethos appears to be changing, which is welcome.

The ending of Fonterra's obligation to take milk from new dairy conversions is consistent with this change and is a desirable amendment to the Dairy Industry Restructuring Act 2001.

F10.4

Strong recent growth in dairy prices, including the exceptional 21% rise in the global dairy auction price for whole milk powder in early March 2021, suggest a new period of dairy prosperity. It will be important for the industry to find ways to use the high returns to solve the challenges of making dairy environmentally sustainable, competing with plant-based and synthetic proteins and improving the dairy innovation ecosystem.

F10.5

One of the July 2020 amendments to the Dairy Industry Restructuring Act 2001 removed the right of farmer-suppliers of Fonterra to leave the cooperative and return on similar terms. This amendment came late in the legislative process and did not follow the principle of subjecting changes affecting competition to full consultation and assessment.

The amendment will increase Fonterra's power to deter its farmer suppliers from leaving. Such power risks causing detrimental effects on competition, new entry and innovation in dairy processing. However, these three elements are needed more than ever given the environmental limits to further expansion of dairy volumes.

R10.2

The next review of the Dairy Industry Restructuring Act 2001 in 2024 or 2025 should include an assessment of the effects on Fonterra and the wider dairy sector of the removal of Fonterra's obligation to accept the re-entry of its farmer supplier-shareholders who have left the cooperative to supply another processor and then wish to return.

If the review finds the net effects of removing the obligation are negative, then the Government should reimpose it. Subsequent reviews should make similar assessments as needed and depending on Fonterra's future market share of farmgate milk.

10.3 Reforming data rights to unlock innovation and benefit consumers

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 reinforces this conclusion (Lewis et al., 2021).

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 individuals, businesses and other entities 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 can give rise to new products and services, allowing consumers (among other benefits) to compare products, seamlessly switch product providers, and transact with greater convenience, security and efficiency.

Under current regulatory settings, barriers exist to consumers gaining access to their data from data holders such as banks, health providers, power utilities and telecommunications companies.

- Some firms hold their consumer data tightly because they do not want to create openings for their competitors.
- Third-party providers, such as financial technology (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, the United Kingdom, Europe, Japan, Singapore and India have sought to overcome these barriers by creating and regulating *consumer data rights* (CDRs). In creating rights for people to access, change 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. This extension enabled what is known as "open banking" (Box 10.4).

Submitting on the Commission's draft report, Jim Donovan argued for the Government to be bold by supporting and investing in a comprehensive national data and identity infrastructure. He recommended the development of "a comprehensive open model for citizen-centric identity and data, which would apply to future government systems developments, and encourage industry development of applications, platforms, and services to support it" (sub. 41, pp. 5–6).

Box 10.4 **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 United Kingdom introduced open banking regulations in 2018, and Australia implemented a similar system in mid-2020 as part of a wider national consumer data right to give consumers greater access to, and control over, their data.

One beneficiary of opening banking in the United Kingdom has been the New Zealand-founded ethical consumption platform CoGo (short for “Connecting Good”). CoGo is an app-based service that allows 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 United Kingdom in 2018.

CoGo has used open banking to offer new services to its UK members. Those members who connect their bank to the CoGo app receive information on how much of their spending is with firms accredited for taking action on members’ consumption priorities. A recent innovation is a real-time carbon tracker based on the members’ spending histories. CoGo now offers this service in New Zealand, but had to negotiate with banks separately to gain access to members’ banking data.

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.

Source: CoGo (2021); Australian Competition & Consumer Commission (2021).

Progress on a consumer data right in New Zealand has been slow

Relative to many other developed countries, progress on a CDR in New Zealand has been slow.

The banking industry and Payments NZ have led most work to date on open banking in New Zealand (Minister of Commerce and Consumer Affairs (Hon Kris Faafoi), 2019). The Commerce and Consumer Affairs Minister is considering the introduction of 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 become tired of waiting and intend moving to Australia. Other benefits of establishing consumer data rights in New Zealand include these three.

- Establishing a consumer data right offers an opportunity for New Zealand to harmonise with Australia, in turn enlarging the market of firms who use CDRs to provide innovative services that consumers and other firms value. Harmonising CDRs would advance the New Zealand-Australia Single Economic Market agenda (APC & NZPC, 2019). International interoperability is also an increasingly possible opportunity (Australian Government, 2020).
- CDRs are typically accompanied by improved privacy and data protection. Individuals and businesses have greater control over the information held about them. They can make better use of their data and protect it from third parties whom they wish should not have it.
- 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 creates opportunities for alternative payment systems.

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, 2020d). Informed by submissions on the discussion document, MBIE is advising the Government on the desirability of, and options for, regulatory reform to establish a CDR in New Zealand.

In the discussion document, MBIE investigated four approaches to reform.

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 under its regime.
3. **An economy-wide consumer data right.** This could be like the economy-wide General Data Protection Right (GDPR) approach in the European Union. 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. Individuals can also transfer their data to a trusted party.
4. **A sector-specific approach.** The primary legislation would apply to a specific sector. The United Kingdom’s open banking regime is an example of this approach.

MBIE suggested five criteria for choosing among the approaches, and assessed each approach against the criteria. MBIE chose the sectoral-designation approach (Box 10.5).

The Commission agrees with MBIE’s criteria and its choice of the sectoral-designation approach as the best option against these criteria. The Commission 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 and perhaps the wider finance sector should be one of the early designated sectors.²⁶ The Government should involve the Financial Markets Authority, the Reserve Bank of New Zealand and the Commerce Commission, as well as the private sector, in developing the regime.

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 and the group as a whole. MBIE’s discussion document identified that establishing a CDR may interact with Māori data sovereignty and needs to be treated in line with the spirit and obligations of the Treaty of Waitangi (MBIE, 2020d, p. 22).

F10.6

Establishing a consumer data right would enable individuals, businesses and other entities to access their data from a variety of data holders and use it directly or transfer it at their discretion to trusted third parties. Such regulatory reform could:

- open opportunities for innovative digital businesses to devise new products and services that can lift productivity and enhance wellbeing; and
- improve data owners’ choice, control and security including to protect their data from third parties whom they wish should not have it.

²⁶ The European Commission is currently developing an Open Finance Framework.

Box 10.5 Criteria for choosing the best form of a Consumer Data Right

MBIE suggested in its discussion document the following five 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	A sector-designation approach appears the most likely to meet the criteria and address the identified problems. While imposing significant implementation costs, this option is likely to lead to improved consumer welfare and economic benefits.
An economy-wide approach	An economy-wide approach may meet the criteria of reach and trust, but is unlikely to meet the remaining criteria. We consider that this approach would be effective at strengthening existing privacy rights, yet its limitations make it less likely to achieve 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 the approach might lead to individual open sectors, the potential benefits of a CDR will be diminished due to the lack of interoperable open sectors.

F10.7

Consumer data rights that enable new services such as open banking are based on the concept of individual rights to personal data. Yet policy debate is ongoing about collective data rights and “indigenous data sovereignty”. This refers to the rights of indigenous groups to govern and control data about their members and the group as a whole.

Establishing a CDR may interact with Māori data sovereignty and needs to be treated in line with the spirit and obligations of the Treaty of Waitangi.

R10.3

The Government should introduce a consumer data right consistent with Australia’s sectoral-designation regime. Banking or the wider finance sector should be one of the early designated sectors, to facilitate the development of efficient and effective open banking and open finance in New Zealand.

10.4 Reducing constraints to innovation in the primary sector

The current regulation of GM does not reflect technological advances

Genetic modification (GM) research is an important pathway to innovation, including in New Zealand's primary industries. It offers new opportunities for boosting productivity, solving biosecurity risks, and responding to climate change risks and other environmental problems effectively and efficiently.

Gene-editing technologies can be used to improve 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. These technologies can also speed up conventional plant-breeding processes, allowing innovations such as new cultivars to be developed more quickly (Royal Society Te Apārangi, 2019b). Improved disease resistance in crops can in turn reduce the need for chemical herbicides and pesticides. In addition, superior qualities of products derived using GM tools could, in future, generate price premiums in major markets (subject to consumer acceptance).

The products derived from gene editing span a range of "degrees of separation" from human consumption. Examples are applications in forestry (products not consumed); ryegrass (consumed by animals, which people then consume); and fruit varieties from gene-edited parents (null segregants²⁷) 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).

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. Similar concerns have been raised with the Commission in previous inquiries.

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). New Zealanders for Health Research (sub. DR40) said that New Zealand's GM regulations are also a handbrake on health research.

Time for a full regulatory review

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 or petri dish). 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 not-GM regulations). 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. These techniques can also

²⁷ Null segregants are organisms that used GM as an intermediate step in development, but the final organism contains no foreign or intentionally altered DNA.

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. The precision of gene editing means these changes can be indistinguishable from naturally occurring organisms, and indistinguishable from changes made by techniques that are exempt from regulation.

In 2018, the Ministry for the Environment (MfE) advised that the regulatory settings were quickly becoming outdated and hard to enforce. It referred to a 2014 court decision that adopted a strict definition of the not-GM regulations. MfE said that this interpretation has meant that organisms created using new technologies such as gene editing are more highly regulated than those created using exempt techniques or naturally occurring organisms, regardless of the level of risk they present.

Organisms developed using new and more precise technologies receive the same level of scrutiny as earlier GM techniques that are not listed in the Not-GM regulations... This may result in organisms being regulated at a level not proportionate to the risk they pose and New Zealand missing out on the benefits they could provide (such as medical treatments, crops, trees or forage with beneficial properties). Anecdotal evidence suggests the high level of regulation is discouraging potential applicants from submitting an application to the Environmental Protection Authority (EPA) for field trials in containment or a release of a GMO as the perception is they are unlikely to be successful or it will take too much time, effort and financial backing. (Ministry for the Environment, 2018, pp. 2–3)

MfE also pointed to a potential widening of definitional differences between HSNO and the Food Standards Code. 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).

Regulatory approaches in other countries are also evolving in light of technological advances. In some jurisdictions such as the United States and Australia,²⁸ 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). Canada is regulating on a products or traits-based approach, rather than a process-based approach (Government of Canada, 2016). In New Zealand, the EPA has made a statutory decision that organisms modified with RNAi are not GMOs (Environmental Protection Authority, 2018).

It is good practice to regularly review regulatory regimes, to ensure they remain fit for purpose, accommodate new technologies and do not stifle innovation. The Commission recommends that the Government conducts a full review of the GM regulatory framework. The New Zealand Climate Change Commission made a similar recommendation in its recent draft advice. It recommended evaluating the role of emerging technologies for reducing biogenic agricultural emissions, such as genetic engineering, and reviewing and updating processes and regulatory regimes to ensure that new emissions-reducing technologies and practices can be rapidly deployed (He Pou a Rangi Climate Change Commission, 2021, p. 119).

The review should consider the emerging regulatory approaches in other jurisdictions, particularly New Zealand’s key product destination and competitor markets, and the trade and regulatory enforcement

²⁸ Regulatory amendments introduced in Australia in October 2019 allow for gene editing without an introduced template to guide genome repair. The amendments also allow for organisms modified by introduced RNA to not be considered GMOs. Such introduced RNA blocks gene expression (RNAi) that does not give rise to any change in the genome sequence (Office of the Gene Technology Regulator, 2020).

impacts from different treatment of GM technologies in different markets (such as New Zealand's obligations under the Cartagena Protocol on Biosafety²⁹).

In addition to re-assessing 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 standalone regulator for GM. The review of New Zealand's regulatory regime should consider whether separate legislation and/or a standalone regulator would be a more effective approach.

The review will need to engage with iwi and Māori interests. It should also coordinate with the whole-of-government work that is considering the recommendations of the Wai 262 report (in particular the recommendations around GM legislation).³⁰

Regulatory review requires an informed national conversation about GM

In his final television interview as the Government's Chief Science Advisor, Sir Peter Gluckman said that

[t]he science is as settled as it will be... [I]t 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)

And in 2018, MfE 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)

GM is a controversial and emotive issue and segments of the population in New Zealand and internationally remain resistant to GM. New Zealand Apples & Pears submitted that

little has been done by way of public education or awareness; if there is to be a fully informed discussion about GMO, this engagement needs to take place, as the concept of GMO is not well understood.

The apple industry has relied on natural breeding and genetics to develop its world leading varieties. Indeed, Hawkes Bay declared itself GMO free, providing a unique selling proposition for locally produced products. We remain interested in the outcomes of this discussion. (New Zealand Apples & Pears, sub. DR65, p. 7)

The Sustainability Council of New Zealand submitted that

[f]ood GMOs are not being adopted for use in the outdoors principally because of producer concerns that consumer attitudes to GM food remain resolutely negative. Thus, what productivity gains the use of GM technology offers can be more than wiped out by market resistance to products containing GMOs – expressed through barriers to accessing supermarket shelves. (Sustainability Council of New Zealand, sub. DR64, p. 2)

The Council expressed concern about the "fundamental issue of market resistance and the damage that the technology can do – including spill-over effects on private and national brands" (sub. DR64, p. 2).

A national conversation will therefore be challenging, but is important. It will need to engage with the range of industry interests and Māori interests, and assess public attitudes to new genetic technologies and their application. It will also need to consider the potential impacts on New Zealand firms that wish to retain GM-free status, and on New Zealand's reputation and brand more generally. Public engagement will need to be supported by information resources about modern GM tools.

²⁹ An international agreement on the trans-boundary movement of living modified organisms.

³⁰ The Wai 262 claim was a contemporary Waitangi Tribunal claim lodged in 1991. The Tribunal's report, *Ko Aotearoa Tēnei: A report into claims concerning New Zealand law and policy affecting Māori culture and identity*, is known as the "Wai 262 report".

F10.8

New Zealand's approach to regulating genetic modification techniques under the Hazardous Substances and New Organisms Act 1996 was last reviewed in 2001 and does not reflect technological advances since that time.

R10.4

The Government should undertake a full review of the regulation of genetic modification (GM), to ensure it is fit for purpose and supports domestic innovation. The review should:

- consider the emerging regulatory approaches in other jurisdictions, particularly New Zealand's key product destination and competitor markets;
- consider the trade and regulatory enforcement impacts from different treatment of GM technologies in different markets;
- assess consumer attitudes in New Zealand and internationally;
- consider the potential impacts on New Zealand firms that wish to retain GM-free status, and on New Zealand's reputation and brand more generally;
- recognise Māori views on GM and the rights and interests of iwi in taonga species (indigenous flora and fauna);
- coordinate with the whole-of-government work that is considering the recommendations of the Wai 262 report, in particular those relating to GM legislation;
- 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;
- consider the merits of separate legislation and/or a standalone regulator for genetic technologies; and
- undertake wide public engagement, including with Māori and industry, and backed by information resources to support public understanding of modern GM technologies.

Constraints in the post-entry quarantine system are 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. The backlog in MPI's development of risk analyses and associated IHSs is also significant.

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 the PEQ system provides 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.

F10.9

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.

R10.5

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.

10.5 Integrating District Health Boards more effectively into the healthtech innovation ecosystem

Health technology is a vibrant and fast-growing sector

Healthtech is a vibrant and fast-growing sector in New Zealand. The industry includes three main subsectors: medical devices; digital health and IT products; and diagnostics and therapeutics. New Zealand Trade and Enterprise reported that the sector generated \$1.9 billion in revenue in 2019. 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. (Lewis et al., 2021)

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 revenue in the early stages of development. These steps are important for healthtech businesses to achieve success in the 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.
- Partnership in successful innovations can become a source of revenue for DHBs.

While some fragmentation and duplication exist, most parts of the healthtech innovation ecosystem appear to be well organised and collaborative. Close links exist between healthtech firms, universities and other research institutes, health providers, and government agencies. The MedTech Centre of Research Excellence (MedTech CoRE) has played an important role in encouraging collaboration and nurturing an active innovation ecosystem; yet it has recently been defunded. 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 [Auckland Tourism, Events and Economic Development³¹] 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 the incentive and mandate to participate in innovation. For example, s.28 of the Public Health and Disability Act (2000) requires DHBs to obtain the consent of the Minister before undertaking joint ventures with healthtech firms. 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 effective framework exists for DHBs to collaborate with commercial entities that are striving to innovate.
- DHBs lack targeted funding for innovation. In general, DHBs do not have innovation funds or discretionary funding to support innovation. While innovation can improve patient outcomes it often comes at additional cost for DHBs.
- DHBs' procurement processes are risk averse. According to participants in the Commission's case study, DHBs can incorporate incremental innovation within current processes but not disruptive innovation. Procurement systems and processes favour large and established players and lowest-cost options.
- The DHBs are siloed. Each DHB (and even the departments within them) 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 firms that succeed must rely on key individuals, clinical champions and personal networks to support clinical trials. The counter experience of ARANZ Medical illustrates this (Box 10.6).

³¹ ATEED merged with Regional Facilities Auckland (RFA) on 1 December 2020 to become Auckland Unlimited.

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 supported innovation consistently over long periods 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.

Second, 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.

Box 10.6 **ARANZ Medical**

ARANZ Medical Ltd. is a healthcare informatics company focused on innovative medical imaging and data-capture devices, and analysis software. Its primary focus is wound care.

The standard medical model is to have regular check-ups in person with doctors, often in specialised clinics, monitoring the progress of wound healing. Information gathering is time consuming and can be inaccurate. Sometimes patients must travel a long way for these check-ups. ARANZ Medical looks to disrupt this model by allowing patients to be seen in the home or to visit local centres to have a high-definition photo taken of the wound. Its software can accurately measure and track the progress of wounds, allowing escalation of patients with potential problems to their doctor.

This new approach has the potential to improve outcomes and save considerable costs, both in staff time and patient inconvenience. Particularly with diabetes on the rise, poorly managed wounds can quickly escalate into amputations.

ARANZ had serious problems getting this innovation trialled and rolled out in New Zealand. Its new way of operating was simply too disruptive to the existing model of delivery in DHBs. New processes would need to be created, IT system changes implemented, and clinicians trained. Another big problem was that ARANZ could not find information on how much wound care costs in New Zealand, so it was difficult to build a business case around how much money could be saved.

ARANZ faced the problem that the one-off costs of disruption were clear to DHBs, but the benefits were uncertain given it was an unproven technology. As a result, DHBs were unwilling to take the risk and ARANZ had to go overseas to trial and market its product. It found much greater willingness in the United States to trial and roll out its innovation, and its biggest customer is now the United States Department of Veterans Affairs. ARANZ is the provider of their "tele-wound" solution.

Now that the approach is running successfully overseas, the New Zealand health system is slowly starting to accept it. The business case is easier to make for DHBs as the model is better developed, proven and more cost-effective overall. The risk is that in the meantime New Zealand could have lost this promising and innovative company. Luckily ARANZ has continued to base its product development in Christchurch.

This case study also points to the broader opportunities to digitise health information in New Zealand. With an appropriate health digital platform, it would be much easier for a telehealth system like ARANZ Medical to plug and play into the health system, feeding information to clinicians and patients alike.

Source: Interview with ARANZ Medical.

Early local support of healthtech companies is important for them to achieve export success

Because the New Zealand market is small, most healthtech companies generate only a small part of their revenues domestically (Lewis et al., 2021). 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 local 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.

As noted, DHB’s 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 and some drew a contrast with overseas jurisdictions. For example, New Zealanders for Health Research submitted:

NZHR adds that many of its stakeholders draw contrasts with the UK where health research is an essential, normal and funded component of clinical practice. As the UK’s NHS based health system arguably has more in common with the New Zealand health system... if the New Zealand system were to look something like the UK system that in NZHR’s view would be a good start. (sub. DR40, p. 7)

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 Research Strategy has attempted to provide a coherent strategy on innovation. However, inquiry participants felt that implementation has been slow, poorly coordinated and lacking in resource to ensure DHBs engage with healthtech 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 intends 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 review 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.

- DHBs should be fewer in number and larger, and required to act cohesively under Health NZ leadership.
- A strong emphasis on, and accountability for, achieving population health outcomes should exist.
- Better and wider use of health data including standards, interoperability, and patient control of their own health data (including their ability to share it) should receive strong emphasis.

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.

F10.10

District Health Boards (DHBs) are hugely important in New Zealand's health system, yet they 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 incentive and mandate to participate in innovation;
- lack of targeted innovation funding for DHBs; and
- rigidities in DHBs' procurement processes.

Another negative influence has been the tendency of DHBs to operate in silos, without an effective strategy from the centre on innovation and learning.

R10.6

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 efficiency, effectiveness and accessibility of New Zealand's health and disability system.

11 Making it happen

Key points

- New Zealand’s frontier firms have key roles to play to turn around the country’s lacklustre productivity performance. New Zealand can learn from other small advanced economies to grow frontier firms by surrounding them with world-class innovation ecosystems.
- As a small economy, New Zealand needs to focus on a limited number of areas to achieve critical mass and sustained world-class performance. Focus requires getting alignment across government silos and executing new ways of operating.
- Among the 30 recommendations in this report, three actions and some new institutions are priorities to make the approach happen.
 - A collaborative process is needed to select the areas of focus. This process should be overseen by an Innovation Council made up of key stakeholders (from industry, government including senior members of the Government, Māori, researchers, and educators).
 - Each focus area will need a devolved and independent governing body to manage project selection, funding and delivery.
 - The Government will need to allocate substantial long-term funding to each focus area.
- The process to select the areas of focus must be clear, collaborative and transparent to ensure all partners are involved in the decisions, to foster ownership and to minimise the risk of lobbying.
- The Innovation Council’s role will be ongoing. It will oversee the resourcing, monitoring and evaluation of projects in each focus area.
- Implementing focused innovation policy is difficult and carries some risks. Success requires design features and actions to mitigate these risks.
- The Commission’s recommendations for change are entirely consistent with supporting sustainable and inclusive economic growth and recovery from the Covid-19 pandemic. Indeed, innovation-led productivity improvements are key to delivering inclusive prosperity, improved wellbeing and making the transition to a low-emissions economy.

11.1 Growing world-class innovation ecosystems

In terms of productivity, New Zealand’s frontier firms are far behind their counterparts in other small advanced economies (SAEs). 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 successful SAEs, and it is timely to learn from these other countries.

In particular, New Zealand’s innovation policy has not paid enough attention to innovation ecosystems. These ecosystems are made up of entities, their capabilities, and the networks between them. Firms are critical to the ecosystem, including larger “anchor” firms, small and medium enterprises, and entrepreneurs. The ecosystem includes workers with the right skills, international links, research bodies, education and training providers, mentors and investors with deep knowledge and understanding of the industry, and enabling infrastructure and regulations. New Zealand’s innovation ecosystems are not currently working well for New Zealand’s existing and potential frontier firms.

Small economies only have the capacity to get to critical mass and support sustained world-class innovation ecosystems in a limited number of areas. Most other SAEs use some version of focused innovation policy, adapted to their circumstances. As a complement to broad-based innovation policy (which potentially benefits all firms), government should deliberately focus its resources on strengthening innovation ecosystems in a small number of high-potential areas rather than thinly spreading those resources.

The selected focus areas should be ones in which New Zealand already has a measure of existing or emerging competitive advantage in global markets, and the ability to gain critical mass. An example of an area of existing strength is the primary sector (both on-farm/orchard/forest and processing) and examples of emerging strengths are certain “weightless” activities (eg, health technology, creative, and digital goods and services).

The goal is growing world-leading innovation ecosystems that enable New Zealand’s frontier firms to operate at the global frontier. To achieve this, those ecosystems must be capable of attracting and retaining the best talent and investment from around the world.

11.2 Bringing coherence and alignment to a cluttered landscape

To build world-class innovation ecosystems, a government needs to clarify and align objectives and priorities across different policy silos. A whole-of-system approach is needed, but past interventions in New Zealand have often been ad hoc and piecemeal. Policies and their implementation must be aligned and applied consistently and coherently to achieve desired outcomes. The risk of non-alignment is that different objectives in different policy areas could pull unhelpfully against each other.

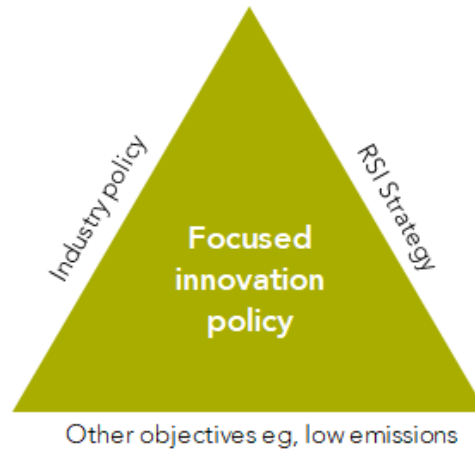
Delivering a focused innovation policy will require a mindset change across government, and a different way of working. True focus will require agencies to work together and devolve some responsibilities and funding from their respective roles. Government officials will need to shift past behaviours, which may in turn require capacity building so they develop the necessary skills. Building world-class innovation ecosystems will also require the private sector having the capacity, capability and willingness to collaborate.

Two main processes are already under way in this space in New Zealand: the draft Research, Science and Innovation (RSI) strategy; and the Industry Strategy (made up largely of the Industry Transformation Plans (ITPs)). Officials run both processes, which are not well aligned.

The set of initiatives aimed directly at innovation and economic development need to run with the grain of broader social and environmental objectives. The transition to a low-emissions economy is one example of a long-term priority that should be considered in the selection and objectives of focus areas. Coherence with broader objectives will enable greater effort and resource and improve the longevity of areas of focus. As part of this approach, government will need to carefully prioritise its many broader objectives. Some current priorities may need to be downgraded. In other words, if everything is a priority then nothing is a priority.

Areas of focus could be industries, technology platforms or “mission” objectives. Mission-oriented policies address societal challenges such as those arising from climate change, technological disruption and social inequalities. The work of Mazzucato sets out how missions “must be a combination of bold, measurable and targeted, ambitious but realistic, able to encourage multiple interactions across sectors, involving multiple bottom-up solutions” (Wilkes, 2020).

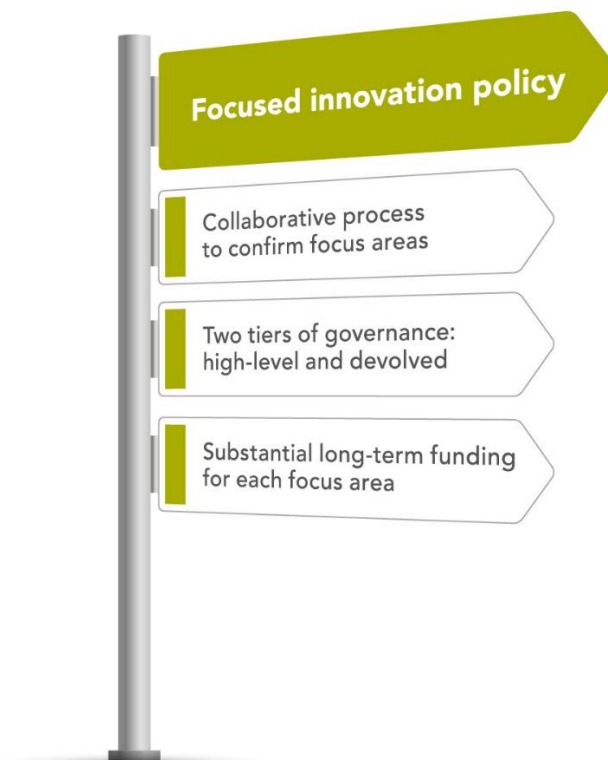
Figure 11.1 Aligning objectives and priorities across policy silos



11.3 Priority actions and some new institutions

This report has 30 recommendations. This section sets out three priorities for immediate action by the Government. These priorities include setting up some new institutions that will be needed. The suggestions presented here are one way to implement the Commission's main recommendations, based on the lessons from overseas experience.

Figure 11.2 Three priorities for immediate Government action



Set up an innovation council to run a collaborative process to confirm focus areas

The Government should set up a high-level strategy body (eg, an Innovation Council) with key stakeholders as members (from industry (firms and workers), government, Māori, researchers and educators). Government representatives should include senior government roles, such as the Prime Minister, so that resources can be unlocked across government. This high-level body would set the strategic objectives and criteria to use when selecting focus areas. The criteria would include contribution to future productivity growth and where collaboration with government could add most value. Clear criteria are essential to ensure that decisions are not ad hoc, or the result of lobbying or political calculations.

The risks of policy failure are greatest when it is left in the hands of people keenest to pick technological winners, anoint favoured companies, pull up maps of the country and direct resources around. Political motivations often contradict commercial imperatives... There is nothing as quick or decisive as a market to weed out the worst ideas.... Any policy maker that embarks on an industrial strategy without clear awareness of these disadvantages will run the risk of a clumsy failure. (Wilkes, 2020)

The process should use the “high potential” ITPs as a starting point. The high-level body would invite proposals for focus areas from consortia of research institutions, firms and industry groups. The consortia would propose strategic areas of innovation that meet the specified objectives and criteria. Industry groups would be expected to commit to co-funding as part of their proposals. Proposals must be for new approaches that will enhance the relevant innovation ecosystem, not pitches in support of existing businesses undertaking existing activities.

The Council would then draw on independent expertise (eg, expert panels and officials) to assess the proposals and provide feedback. Once the proposals are fully developed, the Council would make recommendations to the Government about their preferred focus areas.

With the focus areas chosen and set up, the Innovation Council would have a continuing role to *oversee*:

- the resourcing, monitoring and evaluation of each focus area. The monitoring and evaluation would assess how well the plans and projects in each focus area are meeting their objectives;
- the finalisation of the RSI strategy including an emphasis on building stronger links between industry and researchers; and
- periodic, independent reviews of the entire innovation system.

Set up devolved, transparent governance for each focus area

Once a focus area is confirmed, an independent not-for-profit governance body would be established for that area. As well as other stakeholders, government officials would normally be members of these bodies. The bodies would confirm a long-term strategy for each of the focus areas. Based on the strategy, they would also select, design and implement projects/initiatives within the budgets devolved to them. Funding for the projects would come from both government and industry, and spending would be subject to the normal financial probity requirements for government expenditure.

The devolved governance bodies would be responsible for monitoring their projects and commissioning robust, independent and transparent evaluation of them – to inform adjustments to their design and delivery (including stopping projects that are clearly failing). Arrangements and funding for monitoring and evaluation should be built into projects from the outset.

In summary, two tiers of governance would operate: a high-level strategy body and then an implementation body for each focus area. These new institutions must provide a collaborative, cohesive approach to leadership and governance. The experiences of Māori enterprises, with longer time horizons and multiple objectives, will provide invaluable expertise in these efforts.

A need may also exist for a working group of “innovation related” Ministers to agree on and action priorities coming from the work of the Innovation Council.

Commit substantial long-term funding for the focus areas

To match the efforts of other SAEs, the Government will need to commit significant sums of money over a long period (eg, 10 years) to the focus areas. The Innovation Council would make recommendations to government about how to allocate funding across focus areas. Resources would not necessarily be equal across focus areas; the resource allocated should match the potential of that innovation ecosystem. Government funding is likely to come from a variety of pots – including from the RSI strategy pot – depending on the focus area.

11.4 Risks and mitigation

Successfully implementing focused innovation policy is difficult. Such a policy can bring rewards, but also carries risks. Achieving success will require mitigation of these risks. The key risks, and ways to mitigate them, are set out in Table 11.1

Table 11.1 Risks of focused innovation policy and their mitigation

Risks	Consequences	Mitigation
Failing to make choices	Spreading effort and funding too widely and continuation of “sub therapeutic doses” – sub-scale investments that achieve little.	Make objectives and focus areas specific with well-defined “edges” and substantial funding.
Industry capture / funding business as usual	Funding is captured by business interests and used to fund activities that they would do anyway. This will simply pump up profits for incumbents instead of supporting genuinely new and innovative activities and “shifting the dial” on productivity.	Require some private investment in policy processes and projects. Funding decisions must be based on clear and transparent criteria (including additionality – a focus on new activities).
Lack of policy commitment and funding duration and stability	Innovation is complex, risky and non-linear, so impatience and a short-term focus could lead to premature closure, wasting stakeholders’ time and resources, and generating distrust in government engagement processes. Premature closure would also fail to achieve the desired outcomes.	Give firms and researchers enough certainty and consistency of funding and policy (over long enough time horizons) to support investment in innovation. The Commission recommends funding horizons of around 10 years. Securing cross-party support for such a strategy would be helpful.
Lack of necessary public sector capability	Implementation is ineffective.	Consciously build capability and skills and apply them over a long enough time to create effective networks.
Being overly risk averse	Fear of failure creates an overly cautious approach, stifling innovation and failing to deliver the desired productivity gains.	Create the right institutions and processes (eg, the Innovation Council, devolved governance and expert assessment) to support an experimental and adaptive approach.
Being overly optimistic and ad hoc	Ad hoc political decisions lead to inappropriate projects, for example picking “superstar” technologies.	Ensure good institutional design with effective selection and evaluation processes to weed out poor ideas and shut down unsuccessful projects.

Source: Wilkes (2020).

11.5 Supporting inclusive and sustainable growth and recovery

New Zealand’s primary sector is facing some significant challenges such as the need to reduce its greenhouse gas emissions, and the competitive threat from plant-based proteins. Firms in the weightless sector face intense international competition. The severe public-health and economic shock from the Covid-19 pandemic has reinforced the importance of facing up to present and future challenges.

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 collaborating and doing business over distance. This can help grow the scale and performance of New Zealand’s frontier firms.

Innovation-led productivity improvements are key to delivering inclusive prosperity and improved wellbeing, and are vital to lowering the cost of the transition to a low-emissions economy. In short, higher productivity will provide New Zealand with more choices. To work successfully with stakeholders to develop focused

innovation policy will require the Government to clarify its priorities and how focused innovation policy can help meet those priorities. The Commission's recommendations for change are entirely consistent with supporting sustainable and inclusive economic growth and recovery from the Covid-19 pandemic. Government has a key role in supporting industries and workers to prepare for new technologies and the potential benefits from adopting them.

Sir Paul Callaghan's vision was to "make New Zealand a place where talent wants to live". Despite offering an enviable environment and quality of life and having led the world in its response to the Covid-19 pandemic, New Zealand still struggles to achieve this vision. This report shows that achieving the vision will not be easy, but that it is possible. The country could create several world-class innovation ecosystems that attract and retain top talent, pull in investors, and build and nurture high-performing frontier firms and high-quality jobs. Other successful SAEs that have focused their innovation efforts on areas of existing or emerging strength demonstrate that these outcomes are possible.

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 led to 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 both contribute to and reflect 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 held down 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 its small 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

High-performing small advanced economies typically have several 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 workers with the right skills, investments in enabling infrastructure and regulations, and mentors and investors with deep knowledge and understanding of the particular industry. New Zealand generally lacks such firms.

F2.7

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.

F2.8

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 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.

Chapter 3 – Frontier firms: analysis and comparisons

Findings

F3.1

On average, New Zealand's frontier firms have labour productivity levels well below the frontier defined by the most successful frontier firms in the small advanced economies of Belgium, Denmark, Finland, the Netherlands, and Sweden. New Zealand's levels are over 50% below these firms.

F3.2

Over 2003 to 2016, New Zealand frontier firms grew 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 in order to close the gap with the small-advanced-economy frontier.

F3.3

A study for this inquiry found the productivity gap between frontier and non-frontier firms in New Zealand did not change significantly from 2003 to 2016. The gap is smaller and more stable than in several small advanced European economies (whose gaps generally increased 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 benefited 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 of 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. However, the European countries allocated a higher proportion of capital to their frontier firms. This was also the case in comparing New Zealand and European firms on their labour productivity performance. This finding is consistent with European firms being more capital-intensive than their New Zealand counterparts.

European countries also allocated a higher proportion of labour to their frontier firms (measured in terms of labour productivity). This reflects the fact that European countries tend to have more large, capital-intensive and productive firms that employ many people.

Chapter 4 – Insights from Māori firms

Findings

F4.1

The Māori economy comprises a range of organisational forms, structured under various legal frameworks. There is no single or agreed definition of a Māori business or "Māori firm". 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 products (goods or services), and whether the business has a kaupapa Māori focus or has adopted Māori 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 (excluding Māori authorities) found that they operate similarly to non-Māori firms. This research showed that 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 combine and leverage these factors to gain success over their competitors.

F4.5

Māori firms need to serve multiple objectives (“multiple bottom lines”). This 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 showing that self-reported rates of innovation and R&D are higher for Māori firms compared to all New Zealand firms.

F4.6

Māori 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

Mātauranga Māori and Māori brand distinctiveness are significant assets that require adequate legal protections and processes. The Wai 262 report made recommendations for changes to legislation, policies and process relating to mātauranga Māori and intellectual property. The Government’s progress to directly address these recommendations has been slow.

F4.8

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.

F4.9

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 optimising the Māori business ecosystem, to better promote productivity, innovation and growth in the Māori economy.

F4.10

The Ministry for Business, Innovation and Employment has commenced preliminary work to identify the range of support currently provided to Māori economic development, including Māori enterprises. Once completed, this work will help provide a foundation for further work across government, including the Māori Economic Resilience Strategy.

F4.11

Government procurement processes offer potential for stimulating Māori business growth. The new 5% target for the number of public service contracts awarded to Māori businesses is a good start. But to achieve its objectives, it will need supplementing with capability-building support for suppliers and procurement process improvement by procuring agencies.

F4.12

Māori land-based businesses are constrained by the land tenure and compliance requirements of Te Ture Whenua Māori Act 1993. It is a challenge to balance land retention and protection with effective governance and management to raise productivity and returns for Māori landowners. To address these matters, the Government is currently considering further reform of the legislation. The Government could also consider continued improvement of services to Māori businesses.

F4.13

Māori businesses and entrepreneurs face challenges accessing capital. The Reserve Bank is leading work to explore the access-to-capital landscape for Māori. This will take into account work currently being led by the Ministry for Business, Innovation and Employment and The Treasury on access to capital for small to medium enterprises.

F4.14

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.

F4.15

Stats NZ is leading work to develop a consistent measurement framework for Māori businesses and improve its data products on Māori businesses. This is important groundwork for future research and analysis into the performance of Māori firms.

F4.16

A small but growing talent pool of Māori have 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.

Initiatives to build capability for Māori businesses to participate in public procurement processes are one way of helping grow the pipeline of Māori business talent.

Recommendations

R4.1

The Government, led by Te Puni Kōkiri, should take an all-of-government approach to address the recommendations of the Wai 262 report, and prioritise and accelerate action to protect mātauranga Māori and intellectual property.

R4.2

Government should provide support and resourcing for a Hui Taumata (national Māori business summit) of iwi and Māori business stakeholder organisations. 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;
- formulate actions to improve the Māori business ecosystem; and
- develop ideas for how government and Māori business networks can better work together.

The Government should invite the Iwi Chairs Forum, the Federation of Māori Authorities, the Māori Economic Development Advisory Board, and other key iwi and Māori business stakeholder organisations to establish a clear kaupapa/purpose, format, location and date for the Hui Taumata.

Te Puni Kōkiri would lead government support for the Hui Taumata, working closely with the Ministry for Business, Innovation and Employment, the Treasury, the Ministry for Primary Industries, New Zealand Trade and Enterprise, and Callaghan Innovation.

R4.3

The Government, led by Te Puni Kōkiri, should provide culturally appropriate supports to build the capability of Māori businesses to participate in government procurement processes. Supports should include help to meet prequalification standards, participate in tendering processes and establish joint ventures/consortia. Any additional supports for Māori business must be easy to navigate, and not exacerbate the current confusing clutter of programmes.

R4.4

The Government should undertake further work to explore how the Māori–Crown relationship can be better utilised and enhanced, to unlock the potential of actual and potential Māori frontier firms, and help meet the Crown’s Treaty obligations.

R4.5

The Government, led by Te Puni Kōkiri, should explore and consider practical steps it could take to reform Te Ture Whenua Māori Act 1993, alongside improved coordination of government services and support to Māori landowners for land development purposes. The overarching goal should be to rebalance the legislation to allow for more land utilisation and development, while recognising the importance of retaining Māori land in the hands of its owners and their whānau and hapū. The approach to change needs to be more ambitious than before, and properly informed by all reviews carried out in the last decade.

R4.6

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 on the Government’s Māori Economic Resilience Strategy.

Chapter 5 – Exporting and innovation

Findings

F5.1

Developed countries must innovate to create and keep a competitive advantage. Small advanced economies (SAEs), including New Zealand, must expand into export markets to achieve economies of scale. Exporting specialised, distinctive, high-value products 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

Foreign direct investment (FDI) that is innovative and oriented to exporting can provide spillover benefits to a local economy. Historically, New Zealand has struggled to attract this kind of FDI. High-quality FDI is attracted to locations by several factors, particularly the strength of local innovation ecosystems.

F5.4

New Zealand Trade and Enterprise (NZTE) has a suite of reasonable performance measures in place which should be retained. Yet it is difficult to use them to accurately demonstrate NZTE’s added value. It would be possible to estimate its value added 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 foreign direct investment (FDI) that is innovative, oriented to exporting, likely to stay long term and a source of spillover benefits. It should integrate FDI attraction with a focused innovation policy. The measures that can be used to upgrade an innovation ecosystem can also be part of a negotiated package to attract high-quality FDI. Such a programme requires careful monitoring, evaluation and adaptation to New Zealand circumstances to ensure it produces net benefits.

R5.2

New Zealand Trade and Enterprise (NZTE) should regularly commission independent evaluations of their services. These evaluations should use a variety of approaches and methods to assess the effectiveness of their services, and to inform improvements and choices about the future mix, design and delivery of services.

To facilitate quantitative evaluation of impact, businesses receiving NZTE support should be identified in the Longitudinal Business Database (including the type of support they receive) to allow for more robust, long-term assessment of NZTE's performance.

Chapter 6 – Innovation ecosystems and firms

Findings

F6.1

Innovation has spillover benefits. These provide the rationale for broad government support for innovation through policies like R&D tax credits, research grants and intellectual property regulation; 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).

F6.2

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.

F6.3

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 and services that influence innovation by firms.

F6.4

Recent Government changes to procurement policy are a step in the right direction. However, both sides will need to build innovation-specific capacity to ensure they lead to increased innovation:

- within the public sector procurement profession to balance the competing interests of innovation with traditional procurement goals; and
- within local firms to understand how to access opportunities when they arise and meet delivery expectations.

F6.5

The rapid growth of intangible capital means that innovation ecosystems are increasingly vital. This adds to the reasons for government to support innovation ecosystems. Government can support innovation ecosystems indirectly, through for instance broader education and social policies, or directly, with policies that strengthen specific parts of an innovation ecosystem.

F6.6

New Zealand's innovation performance is mixed. On some measures the country is average; on others it is notably weaker than comparator small advanced economies. The areas of weakness include:

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

The areas of weakness suggest that building successful innovation ecosystems should be a strong focus for government.

F6.7

Some firms applying for the new Research and Development Tax Incentive (RDTI) are having trouble establishing the eligibility of their R&D activities. Complaints focus on the requirements to demonstrate scientific and technological uncertainty, the tests for novelty (eg, demonstrating it on a "worldwide basis") and the costs of doing so.

Also, the switch from grants to the RDTI may be leaving gaps for some types of firms and R&D projects.

These problems may be transitional and are acknowledged by the relevant government agencies, who are working on solutions that can be readily implemented in the next tax year. Solutions could involve adjusting statutory criteria, changing guidelines issued by Inland Revenue, or changing how officials interpret these provisions.

F6.8

Compared to other small advanced economies, links between public research institutions and businesses in New Zealand are generally weak and emphasise “science push” rather than “industry pull”. This reflects system-design, 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, this subset is focused on land-based industries and geothermal technologies.
- Given weaknesses in core funding, and substantial reliance on contract income or contestable funding, CRIs likely do not invest enough 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 emphasis on forging collaborative innovation efforts between public research institutions and businesses, except in the land-based and geothermal industries.

F6.9

New Zealand firms that seek government assistance for innovation and exporting have a bewildering choice of programmes and points of contact. This can make it difficult for:

- firms to access the assistance they desire; and
- government agencies to apply assistance in a way that best achieves the Government’s objectives.

Recommendations

R6.1

The Government should adequately resource and support public sector procurement professionals and local firms to build innovation specific capacities. This will help both parties make the most of mutually beneficial opportunities to support innovation, and to achieve wider benefits from public sector procurement budgets.

R6.2

By the end of 2021, Inland Revenue, the Ministry for Business, Innovation and Employment, and Callaghan Innovation should carry out a stocktake of the operation of the Research and Development Tax Incentive (RDTI) from its start to the end of the 2020–21 tax year. The stocktake should:

- assess the causes of difficulties that some firms have found in establishing the eligibility of their R&D activities for the RDTI;
- assess whether the RDTI is on track to meet its policy objectives;
- identify and implement amendments to statutory eligibility criteria, guidelines and administrative procedures that will best resolve identified problems; and
- consider supplementing the RDTI with the use of grants to fill eligibility gaps, to help the RDTI better meet its policy intentions.

R6.3

In implementing its research, science and innovation (RSI) strategy, the Government should allocate a significant part of its RSI budget to invest in supporting linkages within innovation ecosystems by:

- building business-oriented research capabilities in public research institutions (Crown Research Institutes and universities);
- incentivising more and better links between businesses and public research institutions (Crown Research Institutes and universities); and
- strengthening international connections.

R6.4

The Government should review the suite of programmes designed 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.

This review should consider ways to improve the connectivity between Māori businesses and the government supports for innovation and exporting.

Chapter 7 – Focused innovation policy

Findings

F7.1

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, marshal the resources needed for success, and provide durable strategic direction across successive governments;
- governance of specific initiatives that gives participants “skin in the game”, and which oversees 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 focus on new activities (rather than support for business as usual) combined with a willingness to take an experimental “portfolio” approach, accepting that not all initiatives will succeed;
- transparency about what the key judgement calls are on where to focus effort;
- transparency about the nature, extent and target of government assistance;
- transparent monitoring and evaluation of initiatives, adjusting the mix over time; and
- a consistent but adaptive approach to strategic direction that allows sufficient time for innovative initiatives to bear fruit.

F7.2

Small advanced economies (SAEs) develop by finding new areas of specialised production that give firms a competitive advantage in international markets. Firms do so by building on existing capabilities in their innovation ecosystems that make successful and impactful innovation more likely. With scope for only a limited number of specialisations in a small economy, governments of SAEs can assist by bringing public resources to bear in areas of promise. They use these resources to support programmes of research and innovation, with associated investments in skills, the national science system, and building links between firms and researchers.

F7.3

The areas of the economy that governments select for focus often do not correspond to industries defined by standard classifications. For instance, they may 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).

F7.4

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 a country's environmental and social objectives.

F7.5

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.

F7.6

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.

F7.7

While the Government's Industry Strategy is framed ambitiously and has elements of a successful approach, interacting weaknesses exist:

- few public resources are explicitly associated with the strategy, and the strategy is only weakly aligned with policy arenas controlling substantial resources;
- the choice of areas for focus seems to have arisen through interactions between officials, government ministers and bilateral engagements with selected industry representatives, rather than through a visible wider multi-stakeholder process;
- administration of the programme is largely in the hands of officials, when emerging international practice favours devolved multi-stakeholder governance of strategy and specific initiatives in the chosen focus areas; and
- a strong commitment to monitoring, review and evaluation of the strategy and its component parts is lacking.

F7.8

Much of the government funding channelled through Callaghan Innovation and New Zealand Trade and Enterprise (NZTE) to support innovation and exporting by firms is targeted at individual firms. A significant proportion of Callaghan's assistance is targeted at firms in areas of the economy, or which use technologies, that the Government has chosen for focused innovation effort. Callaghan also devotes some resources to supporting initiatives that strengthen the innovation ecosystems in which its customer firms operate. Yet scope exists to apply more of NZTE's and Callaghan Innovation's resources to the Government's chosen areas of focus

Recommendations

R7.1

As part of its industry strategy, the Government has identified areas with "high potential" in which to develop industry transformation plans. As a complement to broad innovation policy, the Government take these areas as a starting point and should partner with stakeholders to:

- confirm the choice of a small number of areas of the economy to focus innovation effort, for the purposes of raising firm productivity and export success (while ensuring other wellbeing objectives are met); and
- support these focus areas with a substantial and enduring commitment of public resources, conditional on the private sector at least matching these resources.

Other small advanced economies provide examples of the required level and duration of public funding – in the order of \$20 to \$40 million each year for each broad area of focus, for periods of five to ten years.

R7.2

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 areas.

Overall governance and oversight of the focused innovation areas should include senior representation from Government, Māori, industry (firms and workers), researchers and educators. This governing body should be responsible for setting strategic directions, recommending areas of focus and overseeing the strategy as it proceeds.

Governance in each chosen area of focus should be devolved to independent multi-stakeholder bodies. Each devolved body will make decisions on resourcing, implementation, monitoring and evaluation of initiatives within its area of focus.

R7.3

The Government should partner with other stakeholders to develop and implement a strategy to build the skills and capabilities within the public sector and more widely to successfully implement its focused innovation policies. The strategy should draw on experience already available in New Zealand and internationally in the devolved governance and operation of multi-stakeholder economic development programmes.

R7.4

The Government should:

- review its funding channelled through Callaghan Innovation and New Zealand Trade and Enterprise, including funding targeted at individual firms to support innovation and exporting; and
- design and implement policies and mechanisms to give greater weight to strengthening the innovation ecosystems in areas of focused innovation policy.

Chapter 8 – Strategic direction in innovation policy

Findings

F8.1

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, from within New Zealand and from overseas;
- improving connections among researchers and innovators, including business;
- 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, improving coordination across the network of research providers, and increasing the quality of 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.

The draft RSI strategy lacks a clear fit with the Government's industry strategy and the relatively small allocation of resources to the industry strategy risks undermining the industry strategy's effectiveness.

Recommendations

R8.1

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 RSI strategy (and a significant quantum of associated funding) should be clearly aligned with the Government's industry strategy.

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.

R8.2

The Government should engage with other stakeholders (researchers, educators, industry (firms and workers) and Māori) to develop a transparent implementation plan for its research, science and innovation (RSI) 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 RSI strategy will be resourced and over what timeline;
- how a significant quantum of resource under the RSI strategy will be aligned with the Government's industry strategy;
- proposed changes to policies and practices (including funding criteria) that will better achieve the objectives of the RSI strategy;
- which agencies will take the lead on the actions; and
- arrangements to monitor and evaluate initiatives and the overall success of the RSI strategy.

R8.3

The Government should commission a comprehensive independent review of New Zealand's innovation policies. The review should consider:

- 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 draw on expertise in mātauranga Māori and on te ao Māori.

Chapter 9 – Talent and leadership

Findings

F9.1

Scope exists for a more systematic approach to:

- building the pipeline of postgraduate talent needed to support innovation; and
- increasing retention of postgraduates in New Zealand by developing career pathways.

F9.2

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.

F9.3

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.

F9.4

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.

F9.5

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. Building deep innovation ecosystems will help attract, grow and retain large firms and top talent.

F9.6

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.

F9.7

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.

F9.8

Despite large inflows of immigrants to New Zealand over the last 10 years, skilled labour shortages continue. This suggests an ongoing mismatch between the supply of labour and the needs of firms, that is not being met either by the domestic education and training system, or by skilled migration.

F9.9

A mismatch exists at the lower-skilled end of labour supply. Some New Zealand industries, including in the primary sector, rely heavily on temporary migrant labour to meet their seasonal employment needs. New Zealand now has the highest number of temporary work permits issued in the OECD, per head of population.

F9.10

A new report has found very limited economic analysis has been done on the effects of the substantial increases in temporary migration to New Zealand on local workers, automation and productivity.

Recommendations

R9.1

Collaboration between research institutions and industry for the purpose of developing skills should be improved and scaled up as part of a focused innovation policy process.

R9.2

A range of government-funded supports for building firm-level management and leadership skills are already in place. Existing and pilot programmes should be evaluated for their effectiveness before additional schemes are developed or rolled out.

The Government should identify opportunities for improving its supports for building firm-level ordinary and dynamic management capabilities. It should do this through a collaborative process involving industry, central and local government, iwi and Māori business interests, and private-sector providers.

R9.3

The Government should commission a review of migration policy. The review should:

- consider the optimal level and mix of permanent and temporary migrants to support innovation and productivity, in the context of a broader population strategy; and
- assess the role and objectives of migration policy, together with New Zealand's education and training system, in meeting firms' demand for labour.

The review should consider how migration policies can best contribute to attracting and retaining the right skilled migrants to grow New Zealand's current and future frontier firms. This would include migrants with needed expert research and technical skills, as well as entrepreneurs, investors and experienced business leaders.

The review should also look at how to reduce inflows of low-skilled and temporary migrant workers over time. As part of this, the review should consider the aspirations of New Zealanders to attain higher skills and education, and jobs commensurate with their skills.

R9.4

The Government should work collaboratively with industries that currently rely on seasonal migrant labour, to develop a planned transition away from such reliance, and determine the role of government in supporting that transition. This may include:

- supporting industries to accelerate the development of automation and other labour-saving technologies;
- building the necessary skill base for higher-tech production practices; and
- helping to make jobs more attractive to local workers (eg, in horticulture, by coordinating work across multiple crop types to provide work for all or most of the year, with associated training).

R9.5

Any review of migration policy must be based on New Zealand's particular circumstances. More evidence on the economic impacts of temporary migration in New Zealand will be needed to support such a review. The Government should commission empirical studies to assess the impacts of working holidaymakers, international students, and workers in the Recognised Seasonal Employer scheme on local labour markets, automation and productivity.

Chapter 10 – Innovation-enabling regulation

Findings

F10.1

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.

F10.2

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.

F10.3

The previous prevailing ethos in the dairy industry (albeit with exceptions) was one of expanding volume rather than innovating for value. This failed to recognise environmental limits. This ethos appears to be changing, which is welcome.

The ending of Fonterra's obligation to take milk from new dairy conversions is consistent with this change and is a desirable amendment to the Dairy Industry Restructuring Act 2001.

F10.4

Strong recent growth in dairy prices, including the exceptional 21% rise in the global dairy auction price for whole milk powder in early March 2021, suggest a new period of dairy prosperity. It will be important for the industry to find ways to use the high returns to solve the challenges of making dairy environmentally sustainable, competing with plant-based and synthetic proteins and improving the dairy innovation ecosystem.

F10.5

One of the July 2020 amendments to the Dairy Industry Restructuring Act 2001 removed the right of farmer-suppliers of Fonterra to leave the cooperative and return on similar terms. This amendment came late in the legislative process and did not follow the principle of subjecting changes affecting competition to full consultation and assessment.

The amendment will increase Fonterra's power to deter its farmer suppliers from leaving. Such power risks causing detrimental effects on competition, new entry and innovation in dairy processing. However, these three elements are needed more than ever given the environmental limits to further expansion of dairy volumes.

F10.6

Establishing a consumer data right would enable individuals, businesses and other entities to access their data from a variety of data holders and use it directly or transfer it at their discretion to trusted third parties. Such regulatory reform could:

- open opportunities for innovative digital businesses to devise new products and services that can lift productivity and enhance wellbeing; and
- improve data owners' choice, control and security including to protect their data from third parties whom they wish should not have it.

F10.7

Consumer data rights that enable new services such as open banking are based on the concept of individual rights to personal data. Yet policy debate is ongoing about collective data rights and “indigenous data sovereignty”. This refers to the rights of indigenous groups to govern and control data about their members and the group as a whole.

Establishing a CDR may interact with Māori data sovereignty and needs to be treated in line with the spirit and obligations of the Treaty of Waitangi.

F10.8

New Zealand’s approach to regulating genetic modification techniques under the Hazardous Substances and New Organisms Act 1996 was last reviewed in 2001 and does not reflect technological advances since that time.

F10.9

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.

F10.10

District Health Boards (DHBs) are hugely important in New Zealand’s health system, yet they 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 incentive and mandate to participate in innovation;
- lack of targeted innovation funding for DHBs; and
- rigidities in DHBs’ procurement processes.

Another negative influence has been the tendency of DHBs to operate in silos, without an effective strategy from the centre on innovation and learning.

Recommendations

R10.1

The Government should prioritise keeping regulations up to date with technological and other changes, where not doing so would curb innovations that have potentially high payoffs in wellbeing. This action should apply especially in areas of focus for innovation.

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.

R10.2

The next review of the Dairy Industry Restructuring Act 2001 in 2024 or 2025 should include an assessment of the effects on Fonterra and the wider dairy sector of the removal of Fonterra’s obligation to accept the re-entry of its farmer supplier-shareholders who have left the cooperative to supply another processor and then wish to return.

If the review finds the net effects of removing the obligation are negative, then the Government should reimpose it. Subsequent reviews should make similar assessments as needed and depending on Fonterra’s future market share of farmgate milk.

R10.3

The Government should introduce a consumer data right consistent with Australia's sectoral-designation regime. Banking or the wider finance sector should be one of the early designated sectors, to facilitate the development of efficient and effective open banking and open finance in New Zealand.

R10.4

The Government should undertake a full review of the regulation of genetic modification (GM), to ensure it is fit for purpose and supports domestic innovation. The review should:

- consider the emerging regulatory approaches in other jurisdictions, particularly New Zealand's key product destination and competitor markets;
- consider the trade and regulatory enforcement impacts from different treatment of GM technologies in different markets;
- assess consumer attitudes in New Zealand and internationally;
- consider the potential impacts on New Zealand firms that wish to retain GM-free status, and on New Zealand's reputation and brand more generally;
- recognise Māori views on GM and the rights and interests of iwi in taonga species (indigenous flora and fauna);
- coordinate with the whole-of-government work that is considering the recommendations of the Wai 262 report, in particular those relating to GM legislation;
- 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;
- consider the merits of separate legislation and/or a standalone regulator for genetic technologies; and
- undertake wide public engagement, including with Māori and industry, and backed by information resources to support public understanding of modern GM technologies.

R10.5

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.

R10.6

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 efficiency, effectiveness and accessibility of New Zealand's health and disability system.

Appendix A Public consultation

Submissions

INDIVIDUAL OR ORGANISATION	SUBMISSION NUMBER ³²
Anne French Consulting Ltd	DR44
Arnold & Woodhall Ltd	DR61
Auckland Unlimited	32, DR77
Barbara Allen, Margreet Boersma, Nic Naismith and Anne Staal	DR66
Ben Wylie-van Eerd	DR43
Bostock New Zealand	DR67
Business Leaders' Health & Safety Forum	30
BusinessNZ/ExportNZ	DR52
Callaghan Innovation	DR74
Canterbury Knowledge Commons	DR68
Chartered Accountants Australia and New Zealand	31, DR53
Chris Boxall	4
Cluster Navigators	20
Consortium for Medical Device Technologies (CDMT)	DR69
Cooperative Business New Zealand	DR73
Doug Galwey	12, DR63
Dr Kerry McDonald	DR42
Dr Stuart R Corson	DR54
Economic Development New Zealand	DR72
Essence Networks Ltd	DR47
ExportNZ	29
Fonterra	DR75
Graham Vaughan-Jones	DR80
HYDRA Software Ltd	10, DR62
Ian Lockie	17
Ifor Ffowcs-Williams, Doug Galwey and David Wilson	DR63
Jack Foster	DR56
Jim Donovan	DR41
John Lovelock, VTOL Aviation Ltd	DR39
John Turner	2
Jonathan Mason	7
Kerry Neal	DR78
Kevin Sampson	1, DR36
Kevin Yiwei Huang	5
Kirsty Reynolds	DR70
Kirsty Reynolds and Anton Douglas	25
Kiwi Innovation Network Limited	DR38
Manufacturing Alliance	33
Mark Fuller	26
Medical Technical Association of New Zealand	DR59

³² Submissions on the inquiry's [issues paper](#) are given a plain number in order of receipt. Submissions on the inquiry's [draft report](#) are numbered with a DR prefix.

Mick Clitherow	DR79
Mike Styles	6
Ministry of Business, Innovation and Employment	8
New Zealand Air Line Pilots' Association	27
New Zealand Apples & Pears	DR65
New Zealanders for Health Research	DR40
Not published	3
NZ International Business Forum	28
NZ Product Accelerator	DR60
NZ Trade & Enterprise	DR50
NZX	22
Open Country Dairy Limited	DR71
Peter Crawford	DR34
Productivity People Ltd	21
Professor Tava Olsen	18
Roger Ford	DR58
Rosebank Business Association	15
Simon Smelt	DR37
Stephane Mathieu	DR35
Stephen G. MacDonell	11
Sustainability Council of New Zealand	DR64
Te Au Rangahau	DR81
Te Puni Kōkiri	DR76
Tertiary Education Commission	09, DR45
The Employers and Manufacturers Association (EMA)	DR55
The Icehouse	14, DR48
The MacDiarmid Institute for Advanced Materials and Nanotechnology	24
The University of Auckland	16, DR46
Tony Caughey	19
Venture Taranaki	DR57
WeCreate	23, DR49
Xero	13
Zespri	DR51

Engagement meetings

Abrie Swanepoel, Australian Department of Industry, Science, Energy and Resources

Andy Hamilton

Anne French

Apata Group Ltd

Aranz Medical

Auckland Bioengineering Institute

Auckland UniServices

Auckland University of Technology

Bank of New Zealand

Berkeley Research Group

Biofarm

Biosecurity New Zealand

Bostock 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

Cooperative Business New Zealand

Coriolis

Dairy Companies Association of New Zealand

DairyNZ

Dan Andrews

Datacom

David Tanner

David Skilling

EastPack

Eight360

Eric Crampton

Export Credit Office, The Treasury

Fonterra

FoodBowl

FoodHQ

FoodSouth

Frank Siedlok, University of Auckland

Georgian Partners

Greenstone TV

IBM

Ifor Ffowcs-Williams and Tony Caughey

Inland Revenue

Institute of Directors

Jim Donovan

John Turner

Kea

Keith Woodford, Lincoln University

Kerry McDonald

Kiwi Landing Pad

KiwiNet

KLIMA
KMP Partnership
Marcel van den Assum
Mark Paine
Maxim Institute
Michael Reddell
Ministry for Pacific Peoples
Ministry for Primary Industries
Ministry for the Environment
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 Apples & Pears
New Zealand Game Developers Board
New Zealand Growth Capital Partners
New Zealand Health IT
New Zealand Kiwifruit Growers Association
New Zealand Product Accelerator
New Zealand Trade and Enterprise
New Zealand Winegrowers
Next Era Global
NZX
Orion Health
Pāmu Farms of New Zealand
Paul Conway
Peter McBride
Pharmac
Phil Veal
Plant & Food Research
PlantTech
Polis Consulting Group
Recorded Music NZ
Reserve Bank of New Zealand
Richard Bentley
Richard Dellabarca
Riddet Institute
Rocket Lab
Roger Ford
Roger Procter
Rowan Simpson
Ruth Richardson
Science for Technological Innovation National Science Challenge
Serge van Dam
Simplicity (NZ) Ltd
Stats NZ
Straker Translations
Sustainability Council of New Zealand
Taribon
Te Au Rangahau, Massey University
Technology and Innovations New Zealand
Technology Investment Network
Te Puni Kōkiri

TDB Advisory
 The FoodBowl
 The Icehouse
 The MacDiarmid Institute for Advanced Materials and Nanotechnology
 The Treasury
 Tony Crawford
 Trans-Tasman Business Circle
 Upstart Press
 Waikato-Tainui
 Waitematā District Health Board
 WeCreate
 WellSouth
 Whaimutu Dewes
 Whāriki Māori Business Network
 Xero
 Zespri

Presentations, roundtables and workshops

The Commission hosted the following:

David Skilling webinar	Lessons on frontier firms from small advanced economies	June 2020
Productivity Commission webinar for Ministry of Business, Innovation and Employment	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 webinar	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
Workshop attended by Ministry of Business, Innovation and Employment; NZ Trade & Enterprise; The Treasury and Callaghan Innovation	How a more focused innovation policy might work in practice, particularly how government agencies can contribute to building innovation ecosystems	February 2021

The Commission presented at the following:

4 Day Week Global & Fintech webinar	Productivity in New Zealand post Covid-19	May 2020
Massey University – Strategic management and international leadership course	How can we help Kiwi firms reach for the productivity frontier?	July 2020
Motu webinar	Global productivity: trends, drivers, and policies	September 2020
<i>Take on Board Breakfast</i> event – interview and webinar with Helga Svendsen	Research on board composition and decision making	November 2020
Institute of Directors webinar	How can we lift the performance of boards? Insights from <i>New Zealand boards and frontier firms</i>	November 2020
MaDE 2020 conference	New Zealand firms: Reaching for the frontier. Draft inquiry report	December 2020
ExportNZ webinar	How can New Zealand build more world class exporting firms?	December 2020
Treasury Guest Lecture	Unlocking New Zealand’s productivity potential: The key role of frontier firms	December 2020

Auckland Unlimited webinar	Sharing key findings of the NZPC draft Frontier Firms report	January 2021
Victoria University of Wellington Institute of Governance and Policy Studies – Macroeconomics discussion group	Upgrading the innovation ecosystem is the key to success – sharing key findings of the NZPC draft Frontier Firms report	February 2021

The Commission participated in the following:

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 virtual panel	Scaling up technology firms – capital planning and the listing process	July 2020
NZTech webinar	The Digital Technology Industry Transformation Plan	August 2020
Technology Investment Network member roundtable	Tackling the talent challenge	September 2020
NZIER internal session - Julie Fry and Peter Wilson	Migration and New Zealand's frontier firms (Report commissioned by Productivity Commission)	October 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	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-ups		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
IR	R&D loss tax credit	Enables loss-making start-up companies to receive cash of up to 28% (or \$560 000) of the net cost of their eligible R&D activity. The tax credit is effectively an interest-free loan to be repaid from future taxable income.		X	X		
MBIE, CI and IR	R&D Tax Incentive (RDTI)	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	

Agency	Programme	Function	Starting (& operating) a business	Idea exploration	Product development	Commercialisation and growth	Internationalisation
NZTE	myNZTE	NZTE's online platform to provide current and potential NZTE customers with business tools, learning modules and information on markets, global trends, regulations and so on			X	X	X
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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