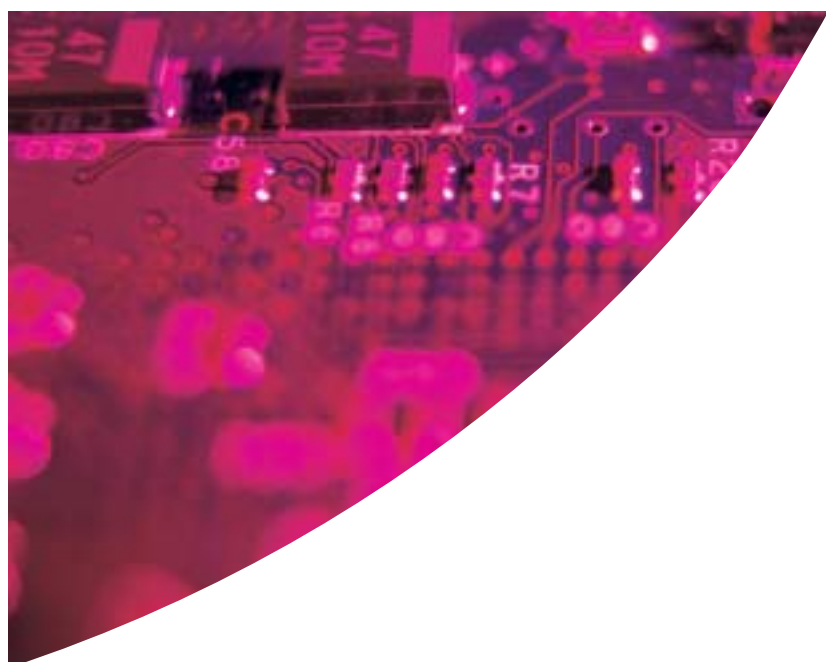


*Growth and Innovation Framework
Benchmark Indicators Report 2003*



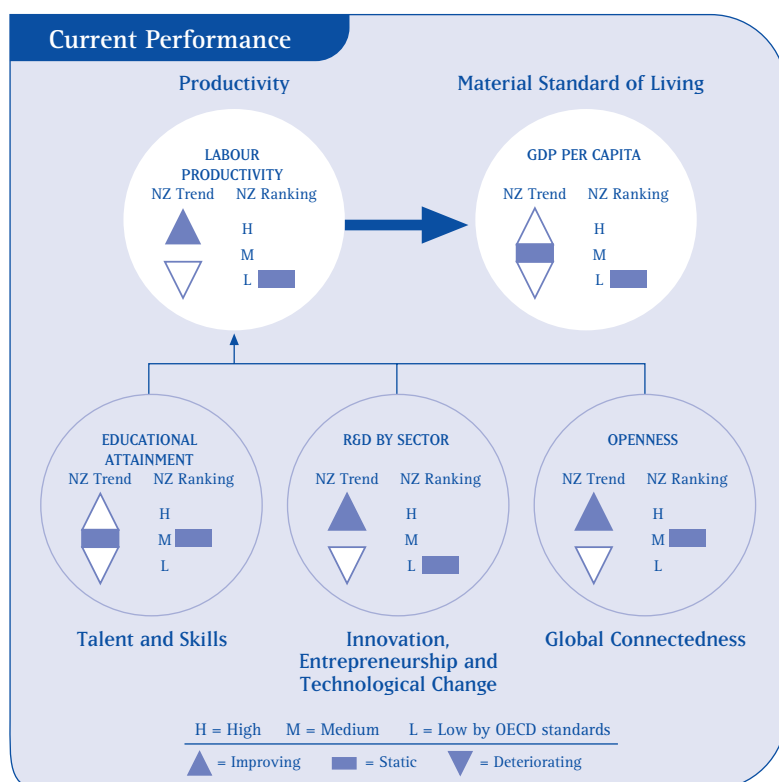
Executive Summary

The government's overarching goal is to improve New Zealanders' living standards in a sustainable way. This is clear from its vision, in which New Zealand becomes:

- a land where diversity is valued and reflected in our national identity
- a great place to live, learn, work and do business
- a birthplace of world-changing people and ideas
- a place where people invest in the future.¹

This is a vision of sustainably improving living standards based on innovation, investment in skills, capital and research and development, with strong returns and business success.

As part of its work to achieve this vision, the government is preparing a broad suite of indicators covering social, environmental, cultural and economic outcomes. These indicators aim to measure progress towards the government's wider goals and provide a view of New Zealanders' well-being. The growth and innovation indicators discussed in this report are part of this broader picture.



The chart illustrates the current direction of changes in some 'headline' indicators and New Zealand's ranking among member countries of the Organisation for Economic Co-operation and Development (OECD).

Although well-being is more than just income levels, income is an important component of living standards. New Zealanders' material standard of living is lower than many other OECD countries, although the decline in our relative incomes appears to have stabilised.

¹ *Growing an Innovative New Zealand*, New Zealand Government (2002), Executive Summary, pg. 6 refers

Similarly, in recent years there have been improvements in productivity growth, particularly in labour productivity. However, productivity levels and productivity growth are still low by OECD standards.

There are signs of improvements in New Zealand's innovation, entrepreneurship and technology, and openness to trade, with New Zealand businesses as innovative as their European counterparts, if not more so. However, levels of research and development (R&D) are low by international standards, particularly for the private sector.

New Zealand also needs to improve its export performance (relative to GDP) to match that of similar OECD countries. Given the relatively high quality-of-life ranking of New Zealand cities in international surveys and a flow of skilled migrants, such improvements should serve to increase New Zealand's connections with the rest of the world.

Investment flows give some indication of future confidence in economic performance. While the current stock of foreign direct investment (FDI) in New Zealand is comparatively high, from the late 1990s to 2001 new investment declined at a time when global FDI increased significantly, and has continued to decline as global FDI has fallen dramatically. New Zealand also has average levels of capital investment, but investment in plant, machinery and equipment (as opposed to land and other physical assets) is relatively low compared with other OECD countries.

Finally, the quantity and quality of skills and the match of these with labour market requirements are critical for improvements in productivity and sustainable economic growth. The proportion of the population with a post-secondary school qualification, while improving, is below average in international terms. There are encouraging signs for ongoing improvements in the skills of the workforce. New Zealand ranks top in continuing education and training for adults in the OECD's International Literacy Survey, and most employers appear to be investing in external or in-house/on-the-job training.

Foreword

This report provides a baseline set of growth and innovation indicators for the New Zealand economy. These indicators paint a picture of the economic environment that results from actions taken by businesses, sectors, regions and central and local government.

The indicators go beyond measuring changes in income. As the report outlines, there are also indicators of innovation, the supply of skilled and talented people, the nature and extent of global connections, and the focal sectors – biotechnology, information and communications technologies (ICT) and the creative industries.

The indicators provide no particular surprises. They reinforce the need to improve New Zealand's per capita income growth and productivity already outlined in *Growing an Innovative New Zealand*, the government's growth and innovation framework, and other recent commentaries on the New Zealand economy.

The improvement in New Zealand's performance in research and development (R&D) by sector and in openness outlined in the report are a sign that things are moving in the right direction. But this starting point is low to average compared with the performance of other OECD countries. Government policy has a role in addressing this situation and its growth and innovation framework sets the direction for ongoing policy development across the public sector.

The framework also stresses partnership with businesses, unions, and local government. Communication is needed in developing that partnership. The indicators are intended to help communicate and continue a dialogue about the key elements of the growth and innovation framework that contribute to the overall sustainable economic development objective.

The results of that dialogue and other responses to this initial growth and innovation indicator report will help to refine the indicators. A refined set of indicators will form the basis of an update report within the next few years, when new data are available and changes in the indicators can be assessed.



GEOFF DANGERFIELD
Chief Executive

1

A Vision of Increasing Living Standards for New Zealanders

The government is working to improve the living standards of all New Zealanders in a way that is sustainable. This is expressed in a broadly based vision of New Zealand in which New Zealanders:

- celebrate those who *succeed* in all walks of life and encourage those who fail to try again
- are full of *optimism and confidence* about ourselves, our country, our culture, our place in the world, and our ability to succeed
- gain strength from our nation's foundations in the Treaty of Waitangi and work in harmony to achieve our separate and collective goals
- are excellent at *responding to global opportunities and creating competitive advantage*
- are rich in *well-founded and well-run companies and enterprises characterised by a common sense of purpose and achievement. These are global in outlook, competitive and growing in value*
- *derive considerable value from our natural resource advantages:* climate, human capital, infrastructure and a sense of community
- *cherish our natural environment*, are committed to protecting it for future generations, and are eager to share our achievements in that respect with others
- know our individual successes contribute to stronger families and communities and that all of us have fair access to education, housing, health care, and fulfilling employment.²

² This vision for New Zealand has been expressed in *Growing an Innovative New Zealand*, the 2002 Speech from the Throne and the Prime Minister's address to the opening of Parliament in 2003.

PRINCIPLES FOR SUSTAINABLE DEVELOPMENT

Sustainable development is at the heart of this vision. The government has adopted ten sustainable development principles. These principles are intended to ensure that all of the government's decisions take account of its economic, social, environmental and cultural goals, including decisions on policies that contribute to sustainable economic growth.

This will be achieved by:

- considering the long-term implications of decisions
- seeking innovative solutions that are mutually reinforcing, rather than accepting that gain in one area will necessarily be achieved at the expense of another area
- using the best information available to support decision-making
- addressing risks and uncertainty when making choices and taking a precautionary approach when making decisions that may cause serious or irreversible damage
- working in partnership with local government and other sectors and encouraging transparent and participatory processes
- considering the implications of decisions from a global as well as a New Zealand perspective
- decoupling economic growth from pressures on the environment
- respecting environmental limits, protecting ecosystems and promoting the integrated management of land, water and living resources
- working in partnership with appropriate Māori authorities to empower Māori in development decisions that affect them
- respecting human rights, the rule of law and cultural diversity.

GROWING AN INNOVATIVE NEW ZEALAND

In adopting these principles, the government has identified its most important task as building the conditions for long-term sustainable economic growth. Sustainable economic growth is the means to achieve higher living standards and the government's vision, rather than an end in itself. And it can also support progress towards social, environmental and cultural goals.

The government's sustainable economic growth objectives are set out in its growth and innovation framework, *Growing an Innovative New Zealand*³. This document outlines the contribution that the government believes economic growth can make on New Zealanders' overall well-being. It also outlines the government's view of how the public and private sectors can contribute to achieving higher rates of sustainable economic growth. The framework is based on active policies and the public and private sectors working together to achieve stronger sustainable economic growth.

The government has identified innovation and the accumulation of knowledge as the key to higher sustainable economic growth. It believes the main drivers of innovation and the broad action areas needed to enhance innovation in New Zealand to be:

- *Strengthening the innovation framework*. Innovation in its broadest sense is about improving performance by doing something differently. Successful innovation requires the exploitation of new ideas. This can result in new technologies, new products, services and processes, changes in business models and taking full advantage of new markets. Innovation also provides opportunities to discover new solutions to sustainability issues and allows us to improve efficiency in the use of inputs into the production process.⁴

³ A copy of the *Growing an Innovative New Zealand* is available at www.beehive.govt.nz/innovate/innovative.pdf

⁴ See *The Growth and Innovation Framework, Environment and Sustainability: Linking Frameworks and Indicators*, a report for the Ministry of Economic Development, Dr Ralph Chapman (2002) at www.med.govt.nz.

- *Developing talent and skills.* A well-educated and adaptable workforce is an essential ingredient of a productive and competitive economy. New Zealand will attain such a workforce only through developing, attracting and retaining people with exceptional skills and talent and an increasing innovative capacity.
- *Increasing global connectedness.* Economic integration with the rest of the world to expand New Zealand's potential market is critical. This integration delivers more than just increasing transactions. It also increases New Zealand's access to skilled people, ideas and knowledge.⁵

In addition to this focus on the economy-wide drivers, the government is also focusing some of its efforts on three sectors, information and communication technology (ICT), biotechnology and creative industries, which are perceived to have high growth potential and can contribute to stronger growth in other sectors of the economy. Existing effort in other important sectors of the economy (e.g. agriculture, forestry and tourism) has also continued through dedicated agencies (e.g. the Ministry of Agriculture and Forestry, the Ministry of Tourism and Tourism New Zealand).

INFORMATION NEEDED FOR DECISION-MAKING

The sustainable development principles point to the need for integrated decision-making. A comprehensive approach must, however, be reconciled with the fact that the government and the private sector have to make timely decisions. But making these requires the best possible information about:

- the overall environment within which decision-makers operate (e.g. changes in New Zealanders' living standards and the overall quality of the natural and built environment)
- specific issues such as investment by the public and private sectors, building of new transport infrastructure, and delivery approaches for income and other support.

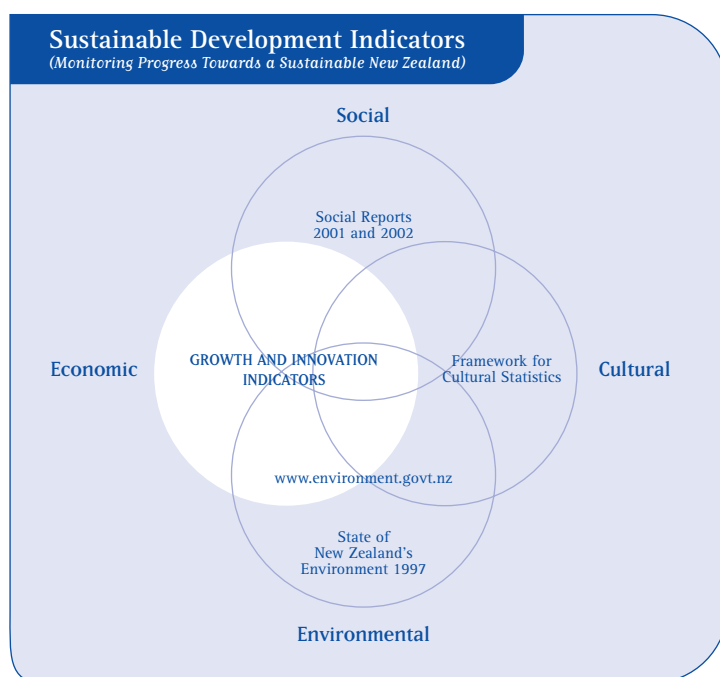
The indicators examined in this baseline report will, over time, provide information about progress towards achieving economic growth. They will provide an opportunity to review the assumptions on which the growth and innovation framework is based and highlight possible areas for change in the framework over time.

⁵ Drawn from *Growing an Innovative New Zealand*, New Zealand Government (2002).

The Growth and Innovation Indicator Approach

The government is in the early stages of developing a comprehensive set of indicators for sustainable development to provide improved information for decision-making.

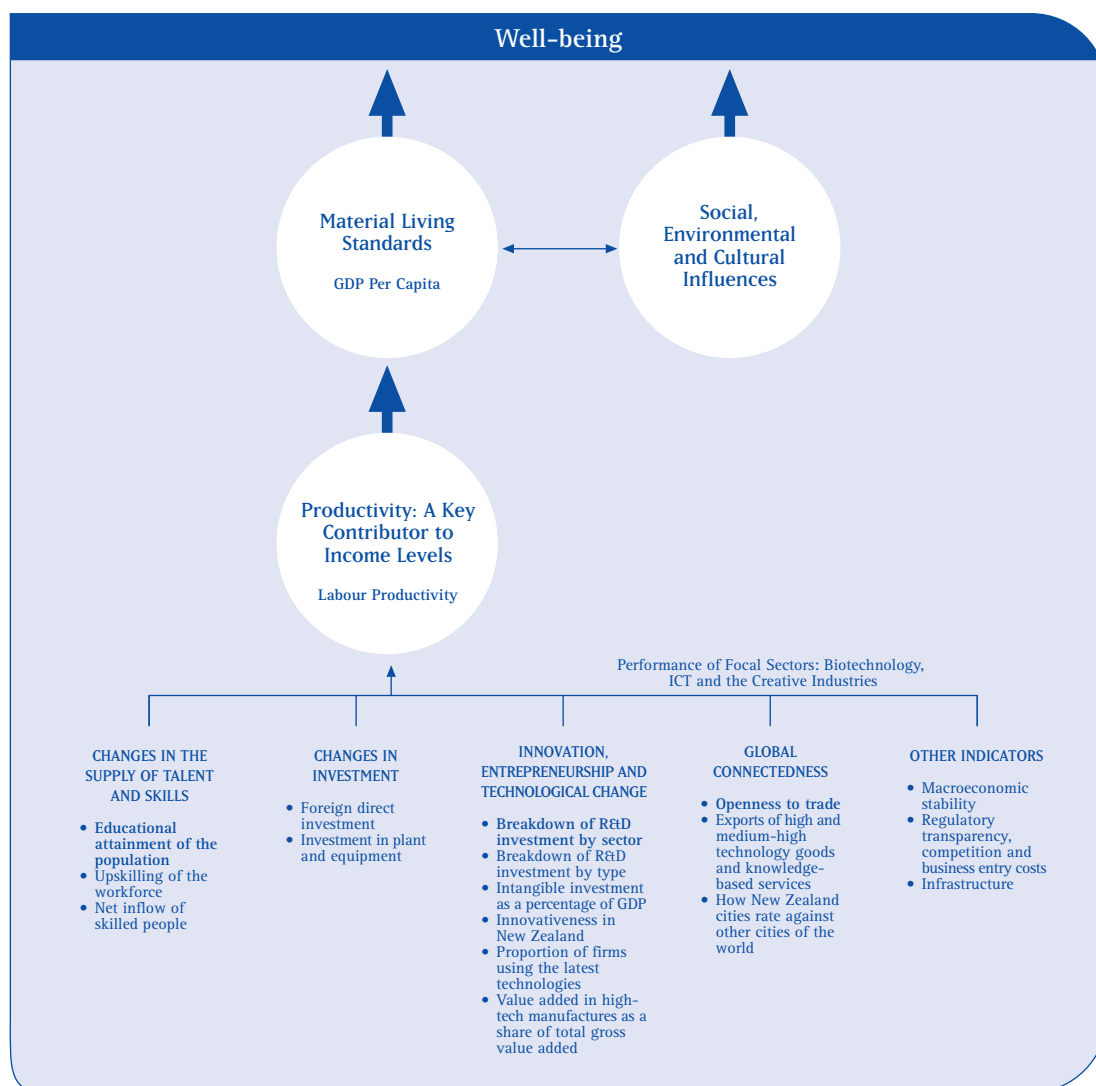
More detailed indicators are in various stages of preparation for each aspect of sustainable development. Following the publication of comprehensive social reports in 2001 and 2002, an initial set of social indicators was published in July 2003 (see <http://socialreport.msd.govt.nz>). The Ministry for the Environment has launched an environmental indicators website, following on from the publication of *The State of New Zealand's Environment* in 1997. A framework for cultural statistics has also been developed. The growth and innovation indicators complete this picture.



THE GROWTH AND INNOVATION INDICATORS

The government has identified an initial set of 17 growth and innovation indicators, which are intended to provide information on New Zealand's progress towards achieving a high value-added economy through higher levels of innovation and productivity.

The choice of indicators reflects the framework's assumptions on the drivers of improved growth and innovation. Labour quality and quantity, investment, technological change (through innovation and entrepreneurship) and other, less tangible, factors all contribute to economic performance.



The growth and innovation indicators focus on:

- **Material standards of living: Gross Domestic Product (GDP) per capita⁶** has been used as the principal indicator. In addition, the report discusses Gross National Income (GNI) per capita. Income is likely to have the largest impact on material standards of living although environmental, social and cultural outcomes also have an impact.
- **Direct contributors to the level of national income (GDP and GNI):** Productivity is a direct contributor to economic growth and higher living standards. Productivity is simply an arithmetic measure of the rate at which outputs (i.e. goods and services) are produced from given amounts of inputs (skills, land, raw materials, machinery, management and so on). An improvement in productivity is synonymous with ‘adding value’ by improving the efficiency with which inputs are transformed into outputs and getting more value for those outputs. Productivity growth cannot be directly observed and measured. Rather, it is calculated as a residual – that is, it is assumed to be the amount of output growth that remains after allowance is made for the contribution of input growth. Total or multi-factor productivity provides the best measure of productivity, because it allows for growth in more than one input (i.e. capital and labour). However, reliability and availability reasons led to selecting labour productivity as the productivity indicator. **Labour productivity** is a partial productivity measure. It nevertheless provides useful information about our productivity performance.

6 The indicators highlighted in bold are ‘headline’ indicators from which an overall assessment of New Zealand’s progress is made in Chapter 3.

- *Changes in the supply of talent and skills:* Labour is a critical input for the production of goods and services. When effectively matched to labour demand, improvements in labour skills can have a significant impact on productivity. The indicators selected are:
 - educational attainment of the population
 - upskilling of the workforce
 - net inflow of skilled people, this also influences New Zealand's global connectedness.
- *Changes in investment:* Investment funds the purchase of physical capital whether from domestic or offshore sources. The investment indicators selected are:
 - foreign direct investment (FDI), which also influences New Zealand's global connectedness
 - investment in plant and equipment.
- *Innovation, entrepreneurship and technological change:* Productivity growth requires increases in value from the sale of goods and services and/or lower production costs. This requires generating and applying new ideas/technology in ways that meet demand for goods and services, most notably in new niche markets. The indicators selected reflect this. They are:
 - breakdown of R&D investment by sector and by type
 - intangible investment as a percentage of GDP
 - innovativeness of New Zealand firms
 - proportion of firms using the latest technology in value-added high-tech manufactures
 - value-added in high-tech manufactures as a share of total gross value-added.
- *Global connectedness:* Success in global markets relies on strong relationships and trust. This is the essence of global connectedness. Through such connectedness, New Zealanders can develop awareness of new customer niches, potential product and services innovations, and changes in production processes. The indicators selected are:
 - openness to trade
 - exports of high and medium-high technology goods
 - ranking of New Zealand cities internationally.
- *Other indicators:⁷* Indicators on the economic foundations are generally available, for example through economic and fiscal updates. The discussion in this report focuses on:
 - macroeconomic stability
 - regulatory transparency, competition and business entry costs
 - infrastructure.
- *Performance of the focal sectors:* There are also indicators for each sector on which the government is currently focused: biotechnology, ICT and the creative industries.

SELECTION OF THE INDICATORS AND FUTURE DEVELOPMENT

This initial set of indicators will provide a baseline against which further progress can be assessed. They are also intended to:

- provide a link between:
 - higher-level indicators of material standards of living and productivity
 - lower-level goals, where policy changes have a more direct impact
- provide a means to focus efforts by departments and delivery agencies and support alignment and co-ordination between them
- help guide further public and private sector discussion on the need for growth and innovation policies and the policy direction that the government is following. In the process, the indicators will be further developed and refined.

⁷ These indicators were not among those agreed by Cabinet. However, discussion of New Zealand's performance in these areas has been included to provide a more comprehensive view of New Zealand's overall performance.

In selecting the indicators, Cabinet considered:

- *The number of indicators:* A large number of indicators provides a comprehensive picture of growth and innovation, but may also make it difficult to see the overall situation clearly. By contrast, too few indicators will not adequately capture the complexity of the economy.
- *The availability of data:* To minimise compliance costs within government and ensure the reliability of the information, the indicators reflect information currently collected and reported by departments and delivery agencies.
- *The existence of time series data:* Using information that has been collected and will continue to be collected on the same basis over time will ensure that trends can be seen in the medium- to long-term.
- *The need to focus on outcomes:* The indicators are intended to be sufficiently high level to capture the outcome of actions by both the public and private sectors.
- *The ability to effectively communicate progress towards the government's growth and innovation objectives:* The indicators need to be easily communicated to business and the community generally.
- *The extent to which international comparability was possible:* Each economy has unique characteristics. However, the government's economic objective of raising per capita income is specified as relating to other OECD countries. This requires, as far as possible, international comparability for each of the indicators.

We intend to develop and refine the indicators as understanding of the factors influencing growth and innovation deepens and as new data sets are developed.

SOME QUALIFICATIONS ABOUT THE INDICATORS

The indicators provide a useful picture of the state of growth and innovation in New Zealand. However, as with all statistics and their interpretation, several qualifications are required.

A comprehensive approach is needed

The indicators need to be looked at as a whole. As a set, they provide a comprehensive picture of the factors influencing growth and innovation in New Zealand. When viewed together and over time, they will provide valuable information about trends, New Zealand's future direction and how different parts of the innovation system relate to each other. Individual indicators can, at best, provide only an indication that change is occurring in a particular area.

Visible change takes time

It will be a number of years before the indicators will allow conclusions to be drawn on whether New Zealand's economic performance has unambiguously improved. It will be at least five to eight years before underlying trends in the indicators can be isolated from cyclical and temporary influences. It is also likely that many of the efforts of government and businesses to improve New Zealand's economic performance will deliver results only after a significant time lag. For example, it may be some time before the economy shows the benefits of raising New Zealanders' skill levels in certain areas or encouraging more entrepreneurial behaviour. Similarly, it will take time to realise the rewards from R&D.

Attributing changes in indicators to policies is difficult

The indicators intentionally measure high-level outcomes. In pulling together this information, we recognise that we cannot establish with certainty the specific cause of a change in outcome. We hope, however, that, over time, these indicators will enable both businesses and the government to achieve a greater understanding of how individual actions impact on New Zealand's growth and innovation performance.

Measurement difficulties

There are significant measurement issues associated with many of the indicators used in this report. Much of the data used is drawn from surveys, all of which have a margin of error and may be interpreted in different ways by different respondents. We have footnoted or commented on all of the data sources and some caveats around perceived problems with the data.

Comparing New Zealand's performance to that of other OECD countries is important. Where possible, the methodology adopted uses internationally comparable data.⁸ This has meant that the data may not, in some cases, provide an accurate picture of New Zealand's performance because the methodology used does not reflect the unique characteristics of the New Zealand economy. In these cases, we propose for future reports to investigate methodologies that better reflect New Zealand's unique circumstances.

In addition, international comparisons must be treated with caution, as different countries' data will reflect the unique characteristics of each country. No country matches New Zealand in terms of size, geography and natural resource endowments, which means we need to take such factors into account in any cross-country comparison.

Next steps

Implementing the framework extends beyond developing the indicators. These simply form a stable basis for ongoing monitoring and reporting on implementation, as begun in the *Growth and Innovation Progress Report 2003* that accompanies this report. This draws on weekly reporting on growth and innovation policy development and implementation to the Minister for Economic Development and other Ministers, as well as material produced by other government departments and delivery agencies.

However, as implementation continues there will be an increasing emphasis on evaluation of the framework. The indicators form part of this evaluation effort.

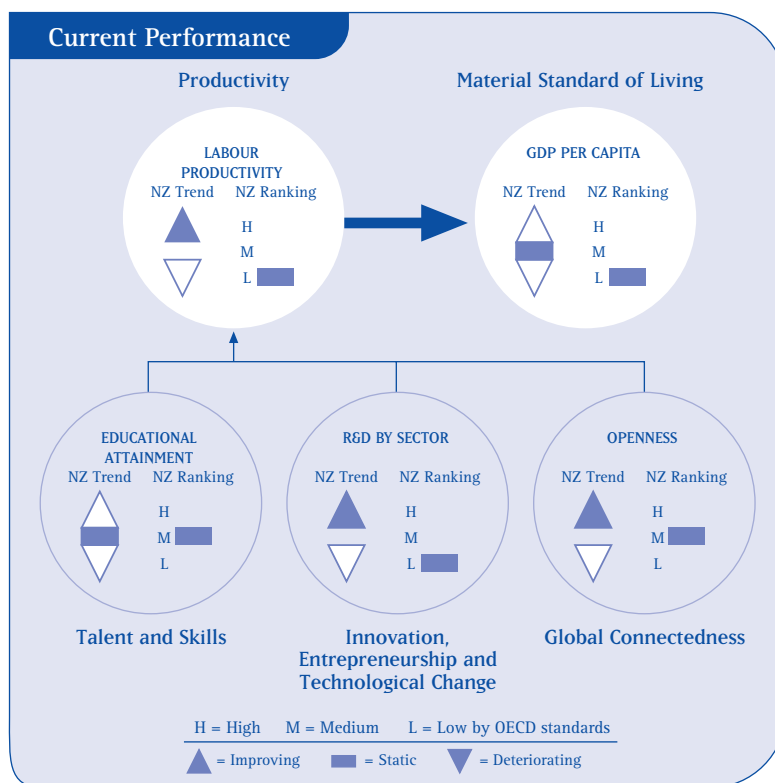
⁸ Instances where this was not possible are outlined in footnotes.

3

Growth and Innovation Indicators: Broad Findings

This chapter gives an overview of New Zealand's current growth and innovation performance. It highlights the potential inconsistencies between:

- the high-level indicators of growth and innovation performance (e.g. GDP per capita and labour productivity) where New Zealand ranks at the lower end of the OECD
- some of the lower-level indicators (e.g. openness to trade, firms' innovativeness, stocks of foreign direct investment). New Zealand is doing better on a range of key growth and innovation indicators than relative per capita income, productivity levels and economic growth might suggest. This may not be sufficient to improve productivity and growth performance.



MATERIAL STANDARD OF LIVING

While the New Zealand economy grew throughout the 1970s and 1980s, other OECD countries grew more rapidly, on average. This means that New Zealand's ranking in terms of per capita income trended downwards for much of the 1970s and 1980s, resulting in a drop in ranking on real GDP per capita from ninth in the OECD in 1970 to 21st in 2001 (of 30 member countries). The performance of the economy improved in the 1990s and we now appear to have halted New Zealand's fall down the OECD rankings.

PRODUCTIVITY: A KEY CONTRIBUTOR TO INCOME LEVELS

To achieve higher levels of real per capita income, it is critical that New Zealand raises productivity, including labour productivity. Over the past decade, New Zealand's labour productivity performance has been near the bottom of the OECD. New Zealand has also performed poorly in terms of labour productivity growth, despite improvement in the rate of productivity growth. The majority of OECD countries over the period 1998–2002 experienced labour productivity growth of around two to three percent compared with 1.5 percent in New Zealand. There was also a marked divergence in economic performance. New Zealand was not in the top group over the 1990s in measures of economic performance.

Further increases in New Zealand's productivity growth will require an enhanced supply of skills and talent (matched to labour demand), improvements in investment, strengthened innovation, entrepreneurship and technological change, and increased global connectedness. Stable macroeconomic policy settings, regulatory transparency and competition, and the availability of infrastructure provide the necessary foundations for growth and innovation.

SUPPLY OF SKILLS AND TALENT

A well-educated, skilled and adaptable workforce is crucial if New Zealand is to sustain higher rates of economic growth through innovation. The skills necessary to support innovation and productivity improvements include:

- *Foundation skills.* These skills, including basic literacy and numeracy, enable people to participate in the labour market and provide a basis from which to build other skills.
- *Technical skills,* particularly in science and engineering, but also in the trades.
- *Business management capability.* This is needed to spot opportunities, use new technology and effectively manage rapidly growing businesses.

Educational attainment in New Zealand is average when compared to a selection of 18 higher-income OECD countries. The level of attainment is improving but the overall numbers of those with post-secondary qualifications is static. There is also a long 'tail' of poor educational achievement, and the difference between the top and bottom ends of educational achievement is one of the largest in the world.

Although on-the-job training by employers is high, we continue to face skill shortages in most sectors of the economy, particularly technical skills. These shortages are impacting the expansion of firms.

New Zealand has a low rate of unemployment. But Māori and Pacific peoples' unemployment rate is higher than for other New Zealanders. This represents an increasing opportunity cost to the economy and poses potential risks for social cohesion. Labour force participation rates for women, while average for the OECD, could also be higher.

Addressing performance in each of these areas has the potential to improve the skills available to employers and, therefore, contribute to higher levels of innovation and labour productivity.

Migration is also important for maintaining the supply of skills as well as contributing to global connectedness. While, over the past two decades, there have been fluctuations in New Zealand's net migration, there appears to have been a 'brain exchange' between New Zealand and other countries, rather than a 'brain drain' from New Zealand. There is also a high level of inflows and outflows of migrants. This potentially increases global connectedness, although with settlement and other costs.

CHANGES IN INVESTMENT

Investment is driven by the ability to generate returns on capital. Making such returns in New Zealand requires developing market opportunities – mostly offshore. This requires access to appropriate finance, a pool of appropriately skilled labour, innovative ideas and entrepreneurial drive.

Confidence in economic prospects is likely to be shown through:

- *Offshore interest in investing in New Zealand, principally through foreign direct investment (FDI).* New Zealand has a high level of international investment (stock of FDI as a percentage of GDP). However, more recently New Zealand has attracted only moderate amounts of FDI when compared to similar countries. It is also evident that New Zealand's current stock of FDI is focused more in the non-tradeables sector (e.g. finance, electricity and telecommunications) than in sectors with a greater emphasis on exports. This may have made New Zealand more cost competitive (one part of productivity), but may not have provided the impetus for identifying and taking new offshore market opportunities.
- *Levels of domestic investment, particularly in plant, machinery and equipment.* Investment in plant, machinery and equipment (PME) has been increasing over the past decade. The ratio of capital per worker and researcher is also higher than that of a selection of OECD countries. This probably reflects New Zealand's small size, where production runs are smaller than would be the case overseas for plant and equipment of similar capacity. However, given New Zealand's relatively poor productivity and income levels, this higher ratio may also indicate that appropriate skills are not available to take full advantage of the investment by ensuring that the plant, machinery and equipment are tailored for New Zealand-specific conditions.

INNOVATION, ENTREPRENEURSHIP AND TECHNOLOGICAL CHANGE

Innovation is complex. Successful innovation depends on having people who can come up with new ideas and have the entrepreneurial drive to develop, manage and market them. The innovation system covers all aspects of formulating an idea for a new or improved product or process from initial concept through to taking it to markets. This includes the research and development (R&D) process, the commercialisation process, entrepreneurial effort and obtaining capital.

Innovation combined with entrepreneurship drives technological change. Technological change has two principal impacts that drive increases in productivity:

- the development of new products that create new markets
- the ability to use new processes and capital (e.g. tools and machinery) that can lower costs.

The public and private sectors need to make the most of the current investment in innovation which should result in businesses being increasingly more able to explore and develop new ideas and knowledge. In particular:

- *Government funding and basic research dominate R&D by sector and type:* New Zealand's investment in R&D is lower than the OECD average. Private sector investment is particularly low. As a result, basic research appears to predominate. However, New Zealand is a net importer of technology, and businesses (including farmers) need to be able to successfully apply this technology, often combined with local R&D, to have a material impact on productivity.
- *New Zealand's investment in knowledge (intangible investment) is increasing:* This should, over time, contribute to increased innovation, and enhance our ability to make the most effective use of new capital and processes and to respond to niche market opportunities. Currently, however, intangible investment levels remain lower than in many OECD countries.
- *New Zealand firms are relatively innovative and a majority are using up-to-date technology:* New Zealand firms appear to be quite innovative and are investing in technology that is new for New Zealand. Small firm size, however, may contribute to a lack of connections with the research community to make the most of innovative ideas in New Zealand. A lack of global connectedness may also reduce firms' awareness of the demand for innovative products and services. Current returns on investment in innovation and new technology may be significantly below their potential.
- *The contribution of high technology to New Zealand's total value-added is increasing:* However, international comparison is difficult because major areas of New Zealand's economy, for example agriculture and the food, beverage and tobacco industry, are significantly more technology intensive than in other OECD countries.

GLOBAL CONNECTEDNESS

International relationships and connections are a key driver of innovation and growth for New Zealand. New Zealand is relatively well connected internationally. However, when compared to other small countries, there is room to do better. The key indicators of this are:

- *New Zealand's openness to international trade:* New Zealand's exports as a percentage of GDP are average for the OECD, but lower than comparable small countries, particularly those that have had sustained periods of above-average economic growth.
- *The export of high and medium-high technology goods and knowledge-based services:* New Zealand has also not been particularly strong in the export of high and medium-high technology goods and knowledge-based services, as defined by the OECD. This measure of performance is strongly influenced by New Zealand's economic structure, where agriculture tends to be more technology driven than typical OECD countries.
- *The ranking of New Zealand's cities internationally:* Cities in New Zealand rank very well in international quality-of-life surveys. This ranking has improved in the last 12 months, making New Zealand an increasingly attractive place to live, as well as to visit, even if there is a significant difference in income levels. Such a ranking provides the potential to attract and retain skilled people and investment from offshore.

As noted above, migration trends also have a significant impact on global connectedness. By international standards, New Zealand has high gross and net migration flows. For example, currently one in five New Zealanders was born overseas.

OTHER INDICATORS

The foundations of the New Zealand economy and economic policy create the necessary conditions for New Zealand's economic transformation. While not the subject of this report, they are a significant part of its context.

Sound monetary and fiscal management are necessary to maintain business confidence, encourage private sector investment and ensure resources are used to generate the best returns over time. Pro-competition regulations and low trade barriers are also necessary. Because they encourage competition they drive innovation and lower costs. This leads to higher productivity.

Recent efforts to strengthen the foundations of the New Zealand economy provide a generally sound economic base from which to work towards higher growth rates. These include:

- *Stable monetary and fiscal frameworks:* New Zealand has had eight years of uninterrupted government surpluses, matched within the OCECD only by Finland. The government has consistently maintained a tight fiscal policy and adopted a consistent monetary policy approach, with resulting low inflation.
- *Average government size:* Size of government comparisons need to ensure that all levels of government are taken into account, rather than focusing only on central government. Up-to-date comparable fiscal information for general government suggests that New Zealand has a relatively small government sector. There are also doubts about the significance of the size of government for growth.⁹ The impact on growth of the structure of the tax system and of government expenditure may be the issues that require further investigation.
- *Low regulatory and administrative burdens:* Regulatory barriers and compliance costs in New Zealand are similar to those faced by businesses in Australia and the United States, and lower than in most OECD countries.¹⁰ Progress is being made in reducing the regulatory burden on businesses (e.g. the government is making amendments to the Resource Management Act, implementing the recommendations of the business compliance cost panel, and making ongoing efforts to improve regulatory and business compliance cost statements). It may be, however, that further effort to reduce compliance costs is required, taking into account the costs and benefits of regulations.
- *Infrastructure:* Infrastructure in New Zealand is generally good, but requires ongoing investment to support and keep pace with economic growth and changes in technology. For example, the OECD suggests that, in telecommunications, New Zealand has good (privately supplied) low-speed internet access, but limited high-speed internet access and only limited e-commerce activity. Project Probe aims to increase New Zealand's broadband capacity and a range of e-commerce initiatives has been put in place. Roothing is a further important infrastructure item (at least in some geographic areas). Business groups in New Zealand raise rooding maintenance and congestion as a potential hindrance to business expansion, primarily in the Auckland region and in some rural areas.¹¹ Government is also focusing on electricity to ensure that the challenges of New Zealand's geography and energy sector are effectively managed.

9 For a fuller discussion and analysis see *Economic Growth and the Size and Structure of Government*, Unpublished MED Working Paper, Arthur Grimes (2003), pg. 22.

10 *New Zealand and the OECD*, Presentation by Donald Johnson, OECD Secretary-General (OECD, 2002)

11 See *Potential Impediments to Growth: New Zealand and International Evidence on Firm Dynamics*, MED Internal Working Paper, Fabling and Grimes (2002).

4

Material Standards of Living

- Income is a major, although not the only, determinant of standards of living.
- GDP per capita is an internationally comparable measure of living standards used by the OECD. The assessment in this chapter also looks at Gross National Income (income earned by New Zealanders in New Zealand and internationally).
- Both measure all goods and services produced in the economy, including production with positive as well as negative characteristics (e.g. waste management, disasters etc.). They do not, however, capture all production in the economy (e.g. unpaid or voluntary work).
- Using these measures, New Zealand's relative income per capita is 21st in the OECD. It has stabilised at this level after a decline over several decades. Sustained and significant growth is required to achieve average income per person similar to that of Australia.
- Productivity improvements, discussed in Chapter 5, will be a critical contributor to improving New Zealanders' incomes relative to the OECD.

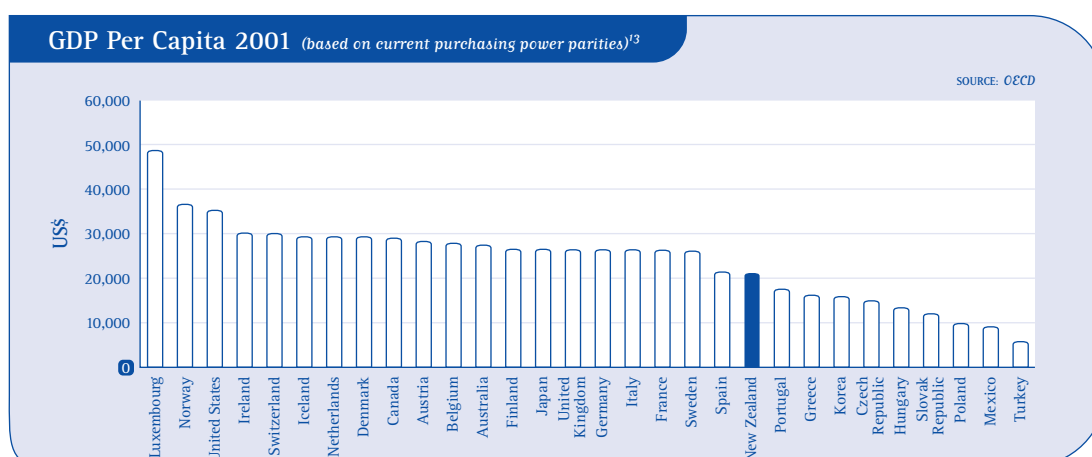
REAL GDP PER CAPITA 21st in the OECD

WHY IS IT SIGNIFICANT?

Well-being is measured by more than just income levels. For that reason, the government's set of Sustainable Development Indicators is more broadly based.¹²

However, income is still an important component of living standards. Gross domestic product (GDP) per capita is one indicator of New Zealand's income. It measures the gross value of all goods and services produced in New Zealand. It is generally accepted as an internationally comparable indicator of material living standards.

HOW DOES NEW ZEALAND PERFORM?

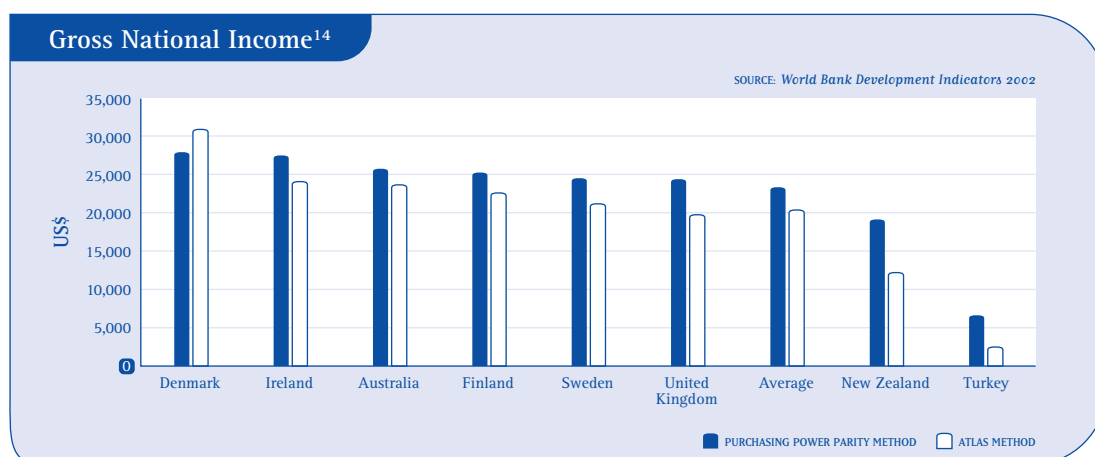


New Zealand's real GDP per capita was just under the OECD average in 1970, but had declined to around 85 percent of the average in 2001. New Zealand is now 21st in the OECD in per capita income terms. Although the New Zealand economy grew, other developed countries grew more rapidly. New Zealand's per capita income has stabilised at around 85 percent of the OECD average, with the growth in the 1990s appearing to halt the relative decline of the previous two decades.

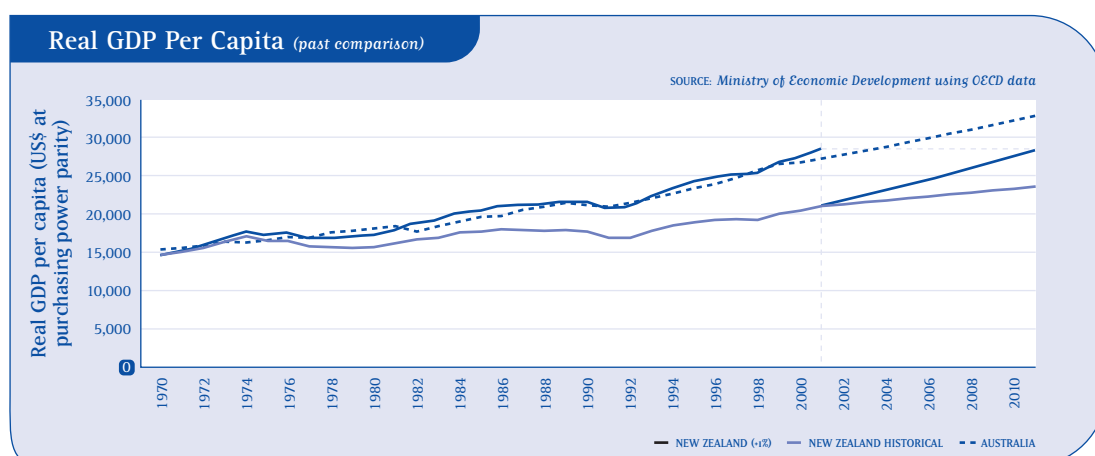
GDP per capita only measures income produced in New Zealand. Another indicator of income, Gross National Income (GNI), measures the production of goods and services by New Zealanders in New Zealand and overseas. GNI is not used as frequently in international comparisons, but provides a better measure of the government's overarching sustainable economic development goals than GDP per capita. However, using GNI currently makes little difference to New Zealand's ranking in the OECD. We also stand around 21st in the OECD on this measure.

¹² See *Monitoring Progress Towards a Sustainable New Zealand*, Statistics New Zealand (August 2002) <http://www.stats.govt.nz/domino/external/web/nzstories.nsf/htmldocs/Sustainable+Development:+Overview>

¹³ GDP adjusted to take account of differences in price levels between countries.



The chart below compares New Zealand's GDP per capita growth since 1970 to Australia. At that time the two countries' per capita incomes were almost equal, but by 2001 Australia's was 30 percent greater than New Zealand's. As shown in the chart, if New Zealand had had one percentage point per annum higher growth from 1970, New Zealand's per capita income would now exceed Australia's. However, the economy's relatively poor historical performance means that, even if we were to achieve four percent annual growth for the next decade, we would still only reach where Australia is today.



Based on Treasury's expectations for growth of around 2.8 percent to 3.0 percent¹⁵ and the Department of Statistics projections of population growth of 1.2 percent per annum, the outlook is for annual per capita income growth averaging around 1.8 percent over the medium term. The OECD looks likely to achieve a similar outcome.¹⁶

WHAT DOES THIS MEAN FOR NEW ZEALAND?

New Zealand appears to have halted its decline in relative income. As noted in *Growing an Innovative New Zealand*, moving up the OECD rankings will require a sustained, non-inflationary increase in New Zealand's growth rate to above that of the OECD average for a number of years. The key to achieving this is raising New Zealand's productivity, which does not compare well with that of other OECD countries, as discussed in more detail in Chapter 5.

¹⁴ The Atlas method reduced the impact of exchange rate fluctuations in the cross-country comparison of GNI.

¹⁵ *December Economic & Fiscal Update 2002* <http://www.treasury.govt.nz/forecasts/defu/2002/>

¹⁶ Based on the average OECD growth rate since the mid-1980s and population growth since 1992.

5 Key Contributors to Income Levels

- Productivity is a key contributor to income levels.
- Using more capital and bringing more people into the labour force, for example through immigration, can help to increase total production in the economy. But this may do little to increase average incomes for individual New Zealanders.
- The increases in productivity needed to increase average incomes require a combination of:
 - the entrepreneurial drive to identify and take advantage of new market opportunities for innovative products and services. This requires ongoing efforts to understand international and domestic markets, the capability to come up with and develop innovative ideas, and the capability to effectively manage firm growth and meet customer needs.
 - increasing the amount produced from investment and labour. This, too, requires an appropriately skilled labour force.
- The preferred way to measure changes in these areas is to measure the joint productivity of investment and labour. This is called total or multifactor productivity.
- However, in the absence of an official series for multifactor productivity, the indicator used measures labour productivity (output per hour worked). This measure is more internationally comparable and suffers less from measurement errors than currently available multifactor productivity data.
- As with GDP per capita, New Zealand's labour productivity is poor compared with other OECD countries. This is consistent with New Zealand's overall economic performance and is reflected in most of the broader measures of productivity.

LABOUR PRODUCTIVITY¹⁷

New Zealand has low rates of labour productivity growth

WHY IS IT SIGNIFICANT?

Productivity is a way of looking at how efficiently production inputs are used in an economy. The economics literature suggests that productivity is a major contributor to long-run economic growth and improved living standards.

Labour productivity measures an economy's outputs in relation to its labour inputs. The relationship between economic growth (GDP per capita), labour productivity and labour utilisation is illustrated by the following equation.

$$\frac{\text{GDP}}{\text{Person}} = \frac{\text{GDP}}{\text{Hours worked}} \times \frac{\text{Hours worked}}{\text{Employees}} \times \frac{\text{Employees}}{\text{Persons}}$$

Or, in other words, GDP per capita = labour productivity x labour utilisation.

Growth in labour productivity is, therefore, crucial to the government's goal of achieving higher economic growth and, ultimately, higher living standards.

We have used labour productivity as the main indicator of productivity. We would have preferred a broader measure of productivity, total factor productivity (TFP). However, a reliable measure of TFP for New Zealand is not available.

HOW DOES NEW ZEALAND PERFORM?

New Zealand's economic growth over the past decade has been largely due to a significant increase in labour utilisation (contributing over 75 percent of real output growth), with a smaller contribution from labour productivity growth.¹⁸ New Zealand now has comparatively high rates of labour utilisation.¹⁹ While there may be some scope for further increases, this is likely to be limited, and ongoing economic growth is increasingly dependent on labour productivity growth.

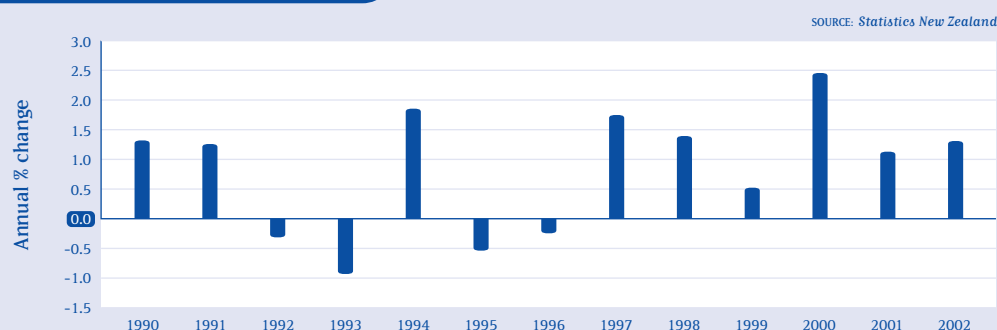


¹⁷ Substantial data and measurement issues arise in estimating New Zealand's productivity growth. Care should be exercised in the interpretation of these charts.

¹⁸ *Productivity: Note in Advance of the Large Business Leadership – Government Forum*, Treasury Report T2002/1294 (2002) refers.

¹⁹ OECD, *The Sources of Economic Growth in OECD Countries* (2003) pg. 34.

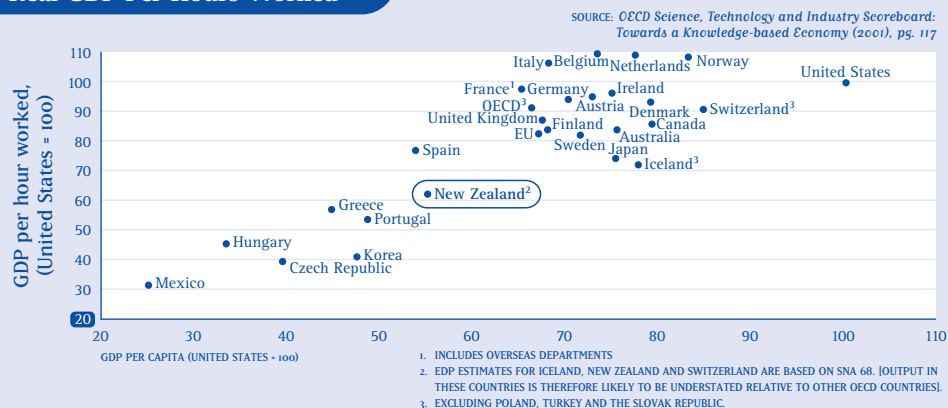
Labour Productivity Growth



The charts above show New Zealand's labour productivity since 1990. Productivity growth picked up from the mid-1990s, to average 1.5 percent over the 1998–2002 period. However, New Zealand's growth rates are below those of the majority of OECD countries, which have averaged between two and three percent.²⁰

The chart below illustrates the strong correlation between labour productivity and living standards (in terms of GDP per capita). It suggests that, in order to raise living standards, New Zealand must increase its labour productivity. This requires investigating the factors that contribute to labour productivity growth, such as capital deepening, investment in knowledge, and innovation.

Real GDP Per Hours Worked



The mix of industries in an economy has a bearing on both the level and growth of labour productivity. Labour productivity in the agricultural sector has been relatively good, with growth rates comparable to other developed countries in the 1960s and 1970s, and well above the OECD average since 1979.²¹ In contrast, the manufacturing sector's performance has been comparatively poor, although from 1979 to 1987 the difference between the New Zealand and OECD average was small. The service sector's productivity growth was behind the OECD for all periods except 1983–1988. That said, international comparisons for this sector are less reliable than for other sectors, due to substantial differences in the definition of services and measurement of service outputs.²²

20 OECD Science, Technology and Industry Scoreboard – Towards a Knowledge-based Economy, OECD (2001), pg. 121.

21 See also, *Recent Productivity Trends in New Zealand Primary Sectors: Agriculture Sector and Forestry and Logging Sector*, Johnson and Forbes (2000) MAF technical paper No: 2000/20.

22 See *Productivity and Quality in New Zealand Firms: Effects of Deregulation*, Campbell, Bollard and Savage (1989), NZIER Research Monograph 46

WHAT DOES THIS MEAN FOR NEW ZEALAND?

In common with most other OECD countries, an ageing population and international competition for skilled migrants mean that New Zealand's rate of economic growth will become increasingly constrained by the supply of labour.²³ Lifting New Zealand's already high labour utilisation rates is not likely to be sufficient to offset the decline in the relative size of the working-age population. Continued growth in living standards will come from labour productivity growth.

There is no magic bullet for improving productivity. Rather, research suggests that productivity growth is underpinned by a wide range of factors including technological change, accumulation of human and physical capital, firm organisation, openness, institutions, resource allocation and plant/firm turnover within industries. These factors will differ across firms. A method that improves labour productivity in one business or industry may not yield the same benefits elsewhere. Therefore, investment in improving productivity is largely a firm-level decision. Businesses will invest in improving productivity through innovation, capital investment or upskilling employees if they believe that benefits will outweigh the incremental cost of this investment.

Some economists expect significant increases in labour productivity to result from investment in new technologies, such as ICT. Work by the Australian Productivity Commission suggests that such increases have been obtained through the effective *use* of ICT, even without an ICT production industry. It appears that, while ICT and other new technologies have the potential to boost productivity, this is yet to happen in New Zealand.

²³ See also discussion in the *Sustainable Development Programme of Action* (2003) and forthcoming study of population trends in New Zealand.

6

Changes in the Supply of Talent and Skills

- Labour is a critical input into the production of goods and services. Effective use of new machinery, the implementation of new processes and the spotting of market opportunities can't happen without the appropriate skills acquired formally through educational institutions and on-the-job learning.
- Matching of skills to labour market needs is also important. To address current skill shortages, in the face of continuing unemployment, particular emphasis is needed on matching with demand the skills of those outside the labour force, and upskilling those in the labour force to meet both current and anticipated demand.
- The indicators suggest that skill levels are improving:
 - The proportion of the population with school qualifications is steadily increasing, but the proportion with post-school qualifications is not changing significantly. The averages also hide marked differences for some segments of the population, particularly Māori and Pacific peoples where attainment is below average.
 - New Zealand has high levels of continuing education and workplace training. This country ranks top in continuing education and training for adults in the International Literacy Survey.
- Migration, over time, appears to have little impact on the availability of skilled people. The data on the net inflows of skilled people confirm a 'brain exchange'.

EDUCATIONAL ATTAINMENT OF THE POPULATION

New Zealand has average levels of educational attainment compared with high-performing OECD countries

WHY IS IT SIGNIFICANT?

Transforming New Zealand into a high value-added economy requires an increasingly educated, skilled and adaptable workforce. This is essential for New Zealand to lift its productivity and growth to levels more consistent with New Zealand's international counterparts.

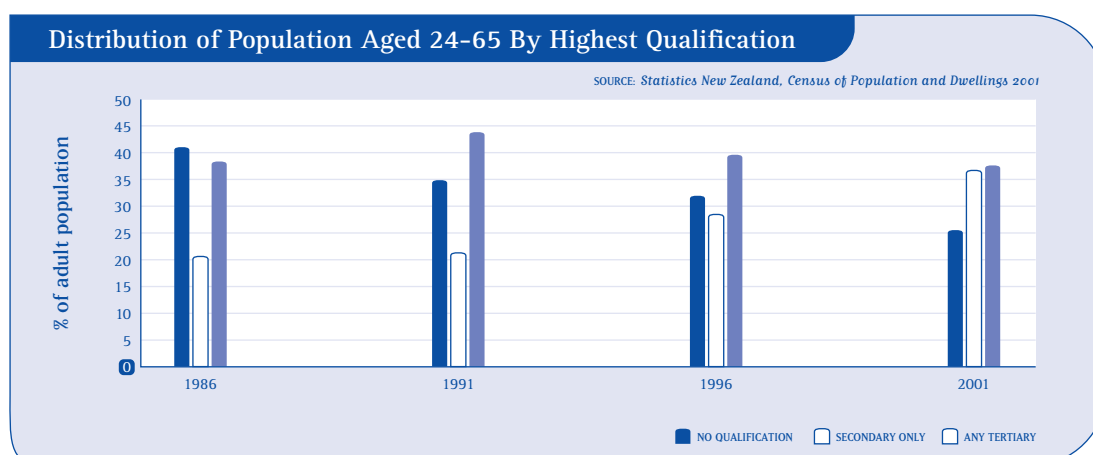
This does not necessarily imply that New Zealand needs more university graduates, but that the workforce needs to possess the necessary skills and training to do what firms require. This means raising the proportion of the workforce with basic education (particularly literacy and numeracy), as well as the proportion with technical and management skills. A better match of supply and demand in skills and training will also have an impact.

The development of more generic attributes, such as communication, analytical, problem-solving and cognitive skills, is also growing in importance. These skills, which are more transferable across roles in the workforce, will help New Zealand adapt to an increasingly fluid market for labour.

Levels of educational attainment can be used as a proxy for the skill level of the workforce. That said, they do not provide information about the type, area or quality of the skills.

HOW DOES NEW ZEALAND PERFORM?

Between 1986 and 2001, the proportion of adults (those aged 25–64 years) with no qualification fell from 41 percent to 26 percent. The proportion with only secondary qualifications rose from around 20 percent to over 36 percent, and with a university degree increased from seven percent to over 14 percent. However, the proportion of adults with any kind of tertiary qualification (university plus 'other' tertiary qualification) remained around 38 percent. This suggests that the level of basic/generic training of the workforce is rising, but that the proportion that goes on to higher education is remaining static. Nevertheless, the distribution within the tertiary category suggests some graduation up through the tertiary category, from more vocational qualifications towards university degrees.



International comparisons of qualification levels are difficult. Education and qualification systems differ across countries, as do definitions and categorisation of tertiary and non-tertiary or post-secondary.²⁴ Data sources also vary. For example, in the table below, the New Zealand data comes from the *Household Labour Force Survey* rather than the Census.

For the countries listed below, the proportion of the adult population with secondary qualifications is 42 percent, with tertiary 28 percent. With 40 percent and 29 percent respectively, New Zealand's profile is about average.



WHAT DOES THIS MEAN FOR NEW ZEALAND?

We cannot draw too much from the international comparisons. The comparison is with 18 higher-income OECD countries only and there are difficulties in comparing qualifications between countries.

There are also potential difficulties with using highest educational qualification as an indicator. The indicator captures only the highest qualification rather than the number of qualifications or the depth of the education received.

With those caveats, trends within New Zealand show that an increasing proportion of the adult population is completing secondary-level qualifications, and that participation in post-secondary education is also continuing to rise (although this does not appear to result in an increased proportion of people with post-secondary qualifications).

²⁴ The post-secondary, non-tertiary category was excluded from comparison, for reasons of comparability.

This means that the overall skill level in the population, as measured through highest qualification, is rising. This improvement is most marked in those leaving secondary school with a qualification.

The corollary is that labour force participation rates for younger age groups have fallen, as young people spend more time in the education system.

However, the indicator data also point to continuing low skill levels for the 20 percent of the population who have no formal qualifications. In many cases, this means poor functional literacy and numeracy. Those in this category, therefore, face lower incomes, more risk of unemployment and reduced chances of improving their prospects.

Removing disparities in the educational performance between Māori and other students could result in an improvement in New Zealand's economic performance, particularly as demographic projections show that Māori will increase to 20 percent of the population by 2051. At that stage, young Māori will be a more significant proportion of the workforce.²⁵

UPSKILLING OF THE WORKFORCE

New Zealand has high levels of continuing education and workplace training

WHY IS IT SIGNIFICANT?

Evidence suggests that labour productivity, service quality and the rate of innovation are all improved by training. Training enhances a firm's ability (through its employees' actions) to cope in an environment characterised by fast-paced change and intense competition.²⁶

However, the benefits of training can be obtained only if there is a strong link between businesses' skill requirements and the responsiveness of the labour market to those requirements. Skill shortages and continuing unemployment suggest that this match may not be occurring.

For those in the workforce, upskilling includes:

- improving functional literacy and numeracy
- formal training through polytechnics and universities, as well as apprenticeships
- on-the-job and other less formal training.

HOW DOES NEW ZEALAND PERFORM?

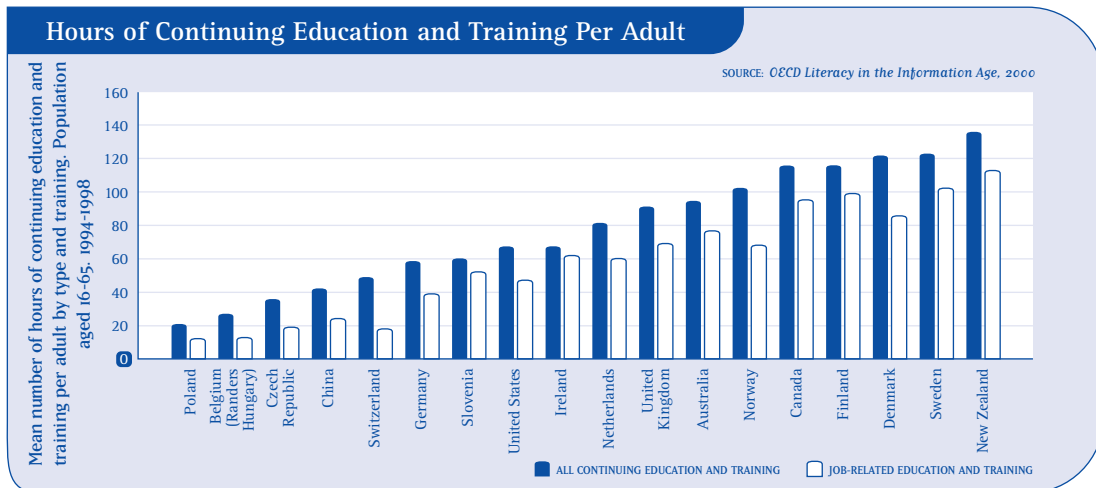
Education participation rates for 15–19 year olds in New Zealand are below the OECD average (72 percent versus 77 percent). However, there is evidence of relatively good education participation by older age groups here. 21.4 percent of New Zealanders aged between 20 and 29 participated in formal education in 2000, the same as the OECD average. In the 30–39 years and 40+ groups, the New Zealand participation rate is nearly double and triple the OECD average (at nine percent and 3.1 percent respectively).²⁷ These rates are, however, significantly lower than Australian participation rates across all age categories.

²⁵ See *Progress Towards Closing Social and Economic Gaps between Māori and Non-Māori*, Te Puni Kōkiri (May 2000) and *Māori Economic Development*, NZIER/Te Puni Kōkiri (February 2003).

²⁶ See *Productivity and Competitiveness Indicators: Update 2002*, UK Department of Trade and Industry (2002), pg. 22.

²⁷ *Education at a Glance*, OECD (2002).

As shown in the chart below, New Zealand is at the top in continuing education and training for adults (16–65 years of age) in the International Adult Literacy Survey.²⁸ In this study, the average number of hours for New Zealand per person of all continuing education and training was approximately 135. Job-related education and training was approximately 113 hours per person.



Encouraging people to complete formal qualifications is one way of lifting the level of human capital, but skills can also be upgraded through workplace training and job rotation.

The *Firm Foundations* study provides insights into the levels of on-the-job training being conducted by New Zealand firms.

In 2001, 84 percent of firms (with six or more full-time equivalent employees (FTEs)) had put at least some of their employees through in-house training, and 72 percent had put at least some of their employees through external training programmes.



Less formal training mechanisms, such as job rotations and exchanges are used less often by New Zealand businesses, with 46 percent of firms surveyed offering this form of training to their employees.

There is also a link between the firms that invest in training and firm performance (i.e. returns on investment). *Firm Foundations* reports that the firms that achieved good operational outcomes all invested in some employee education and training. This compares to 83 percent of all firms surveyed (with six or more FTEs), and 49 percent of firms with poor operational outcomes.

²⁸ The data was collected from selected country comparisons 1994–1998.

WHAT DOES THIS MEAN FOR NEW ZEALAND?

International evidence suggests that the unemployment rate could fall further. For example, the US employment rate fell below four percent in 2000. In New Zealand, there are still groups of the population with high unemployment (most notably those without qualifications). Further training can result in both lower unemployment, and also more intensive use of those already in the workforce (i.e. an increase in labour productivity).

NET INFLOW OF SKILLED PEOPLE

The data appears to confirm the “brain exchange”

WHY IS IT SIGNIFICANT?

International migration is important to growth and innovation. It is an important channel through which companies can access skills and talent, especially in knowledge-based sectors. This is particularly important for New Zealand, which has one of the highest proportions in the OECD of overseas-born people in its working age population. In 2001, one in five of New Zealand’s working age population was born overseas, with a proportion of one in three in Auckland. This compared to one in four in Australia, one in five in Canada, one in 10 in the US and one in 20 in the UK.

Closer economic ties between countries have resulted in rapidly growing flows of goods, services, capital, information, and short and long-term migration. As a result, the market for skilled people is increasingly global rather than national. Ageing populations in the OECD, with associated concerns about smaller cohorts entering the labour market in coming decades, are resulting in more open migration policies. This suggests that the trend towards greater international migration will accelerate in coming decades. The result is an increasing turnover of people (churn), which may assist in the formation of the networks and exchanges of ideas that underpin innovation but could have significant impacts on regional economies and on social cohesion.

New Zealand residents with skills and talent in demand in the global economy can now access opportunities in other countries that were previously unavailable to them. These include earning higher incomes, more opportunities to use their skills and talent, and living in cities with a more vibrant cultural life (see also Chapter 9: Global Connectedness for a discussion of New Zealand cities’ international ranking).

Attracting, retaining and regaining skills and talent in New Zealand will include offering a favourable mix of factors both economic (job opportunities, income, career development) and lifestyle (physical environment, housing, social services, education, security, range of goods and services).

HOW DOES NEW ZEALAND PERFORM?

Permanent and long-term (PLT) skilled migration trends are one measure of New Zealand's success in attracting, retaining and regaining highly skilled people – both New Zealanders and overseas-born migrants.

PLT migration measures migration lasting more than one year. However, it may be of limited usefulness in today's fluid international labour market because:

- it does not reflect the economy's ability to utilise the skills of expatriates and others through high levels of global connectedness
- temporary and short-term work-related migration can make a useful contribution
- PLT migration statistics measure migrant intentions. Many migrants change their plans ('category jump'). As a result, planned long-term absences from, or stays in, New Zealand may end up being much shorter than intended, and shorter absences and stays may become long-term.

The level of inward PLT migration to New Zealand has fluctuated markedly over the last 20 years. The source of this fluctuation is overseas-born arrivals, with the numbers of returning New Zealanders remaining relatively stable over this period. In addition, immigrant source countries have changed. The UK has historically been the major source of inward migrants, but arrivals data for recent years show a significant increase in the number of migrants from non-traditional source countries, particularly India and the People's Republic of China.

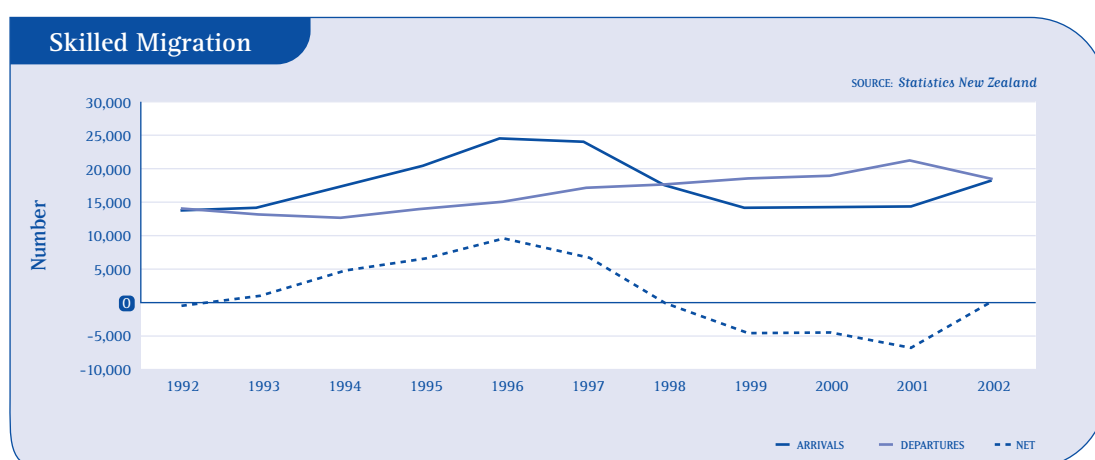
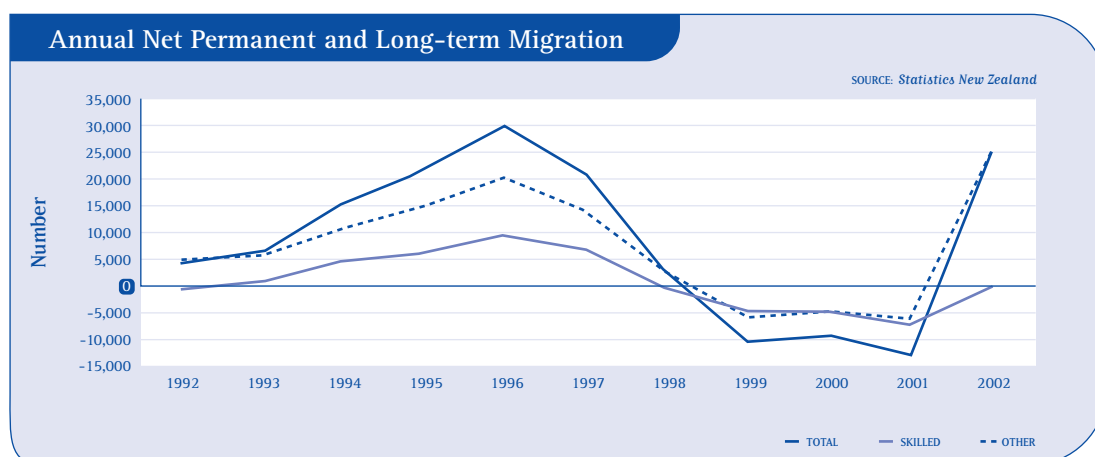
The number of PLT departures has also fluctuated over the last few decades. Departing New Zealanders account for the bulk of PLT departures. The biggest group are young adults, often skilled, who often return later in life, bringing with them work experience, knowledge and advanced qualifications. However, a growing number of older working people are leaving. This may reflect dissatisfaction with the scale and nature of employment opportunities within New Zealand (a result of the small size of the economy), the focus on primary industries, and economic conditions in New Zealand compared to Australia.

The charts below show annual net PLT migration by occupation. We have grouped professionals, associate professionals and trades workers into the 'skilled' category. The first chart shows that skilled migrants account for a small proportion of total migrants. This is partly because principal migrants – those whose skills are assessed under immigration policy – account for fewer than half of the around 12,000 migrants currently approved under the Skills Category, with the rest being family members. It may also be a result of problems with categorisation and completion of arrival cards. Over half of all arrivals fall into the 'not applicable/not stated' category, which, from 1997, included those not actively engaged in work, including students. A large proportion of cards is also deemed 'unidentifiable or illegible'.

The charts below suggest that, over time, the migration of skilled workers roughly nets out and lends support to the notion of a 'brain exchange' rather than a 'brain drain'.²⁹ It does not, however, provide information on the particular types of skills migrants have or their relevance to New Zealand, or migrants' employment outcomes.³⁰

29 See *Brain Drain or Brain Exchange?* Choy and Glass, Treasury Working Paper 01/22, (2001)

30 The employment rate gap between recent migrants (those living in New Zealand for one to five years) and the native-born is about 17 percentage points.



There is growing recognition of the importance of international recruitment, and of the international market for skilled workers. However, comparable data for international comparisons is elusive. There is no generally recognised definition of highly skilled, partly due to problems regarding recognition in one country of qualifications from another. As noted above, skilled migrants often migrate on a temporary basis, for well-defined periods, and are thus excluded in analysis of PLT migration. Furthermore, different countries are likely to have different skill requirements (skill demand and policy focus), in terms of both industries and occupations.

WHAT DOES THIS MEAN FOR NEW ZEALAND?

Migration directly affects the economy in two key ways: migrants bring skills, talents, diversity and new ideas, and high levels of net migration affect household demand for goods and services and can boost domestic demand. Immigrants can also increase the supply of labour. New Zealand's working-age population grew by two percent over the year to December 2002. Over half of this increase was due to net migration gains, with 30,500 working-age migrants entering the country.

Immigrants coming to New Zealand (both foreign nationals and returning Kiwis) frequently provide benefits to the economy that cannot be gleaned from data; for example, qualitatively different tacit knowledge from broader job experience, or connections and contacts abroad.

However, the process of adjusting to New Zealand society means that foreign nationals may take some years to become fully productive. Limited English language skills have been identified as a

key barrier to successful settlement. Recent changes to immigration policy to strengthen English language requirements are designed to address this and target migration at those who can adjust and become productive most rapidly.

The growing number of students coming to New Zealand to study and those entering on a temporary work permit are an untapped source of potential skilled migrants. These people come in as short-term migrants, but may decide to stay or re-enter as permanent migrants.

Immigration policy is only one of a number of influences on net migration. The attractiveness of New Zealand as a destination for overseas-born skilled migrants is also important. With a large number of countries seeking skilled migrants, New Zealand's attractiveness is influenced by how potential migrants perceive New Zealand's position in relation to other countries regarding:

- economic and social conditions
- wages
- lifestyle and security
- tightness of immigration policies.

Changes in Investment

- Investment is driven primarily by the ability to generate returns on capital. Such returns arise from market opportunities. For New Zealand firms, significant market opportunities are mostly offshore due to the relatively small size of the domestic market. Making the most of market opportunities requires access to appropriate finance, a pool of appropriately skilled labour, innovative ideas and entrepreneurial drive.
- Confidence in New Zealand's economic prospects is likely to be shown through:
 - offshore interest in investing in New Zealand, principally through foreign direct investment (FDI)
 - domestic investment, particularly in plant, machinery and equipment.
- The high stock of FDI in New Zealand is similar to that of other small, open economies. Despite global increases in FDI from the late 1990s to 2001, flows of FDI into New Zealand declined and have since continued to decline in tandem with a dramatic fall in global FDI. While the decline in the quantity of FDI inflows is not in itself a concern, FDI is often regarded as high-quality investment because of its potential to generate significant spillover benefits (e.g. through its contribution to the dissemination of new technologies). Realising these spillover benefits requires a concerted effort by government to attract new FDI that can bring broader economic benefits to New Zealand.
- Investment in plant, machinery and equipment (PME) is also a sign of business confidence in the economy. It is, therefore, a leading indicator of future economic performance. Investment in PME has been increasing over the past decade. There is also a high ratio of capital per worker and researcher in New Zealand compared to a selection of OECD countries. This probably reflects New Zealand's small size, where production runs are lower in relation to the capacity of plant and equipment than in larger countries and overseas markets are needed to realise full benefits of the investment. However, given New Zealand's relatively poor productivity and income levels, this high ratio may also point to the appropriate skills not being available to take full advantage of the investment under New Zealand conditions.

FOREIGN DIRECT INVESTMENT

New Zealand has a high stock of inward foreign direct investment, but has recently attracted less foreign direct investment than many of its OECD peers

HOW DOES NEW ZEALAND PERFORM?

Foreign direct investment (FDI) measures the value of cross-border capital transactions, both debt and equity, between enterprises in a direct investment relationship (i.e. where an investor owns 10 percent or more of the equity) in an enterprise.

FDI can benefit the economy by adding to the stock of economic assets and by putting domestic factors of production (e.g. land and labour) to better use. More importantly, international experience has shown that FDI has the potential to generate valuable spillover benefits. For example, FDI can contribute to the dissemination of advanced technological and managerial practices within the economy, or improve New Zealand firms' access to export markets. FDI is also more stable than other types of foreign capital (e.g. portfolio investment and lending to financial institutions), exhibiting greater stability in the face of economic or financial shocks.

The following discussion details trends in both the stock of FDI and the flow of FDI into New Zealand over the past decade. International comparisons are also made.

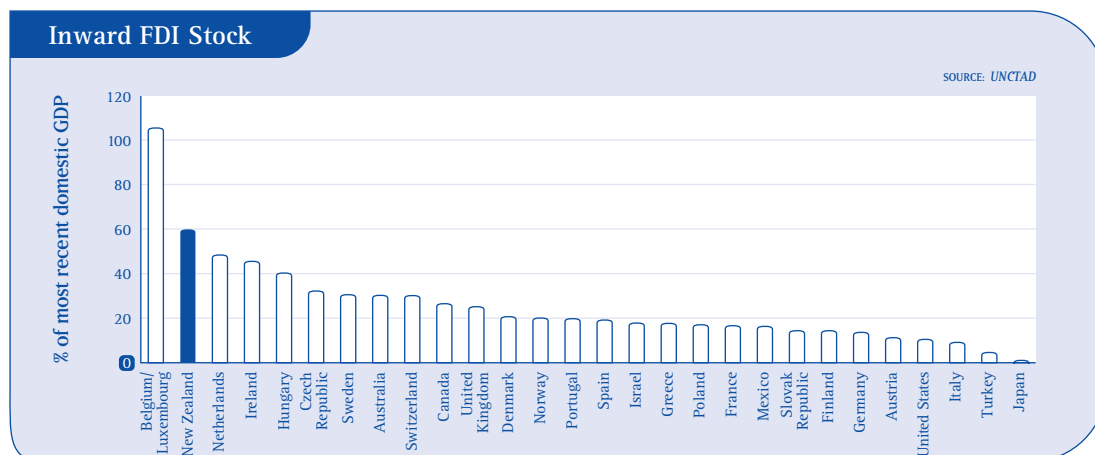
The stock of inward FDI

The stock of inward FDI in New Zealand grew steadily between 1993 and 1998, before levelling off and, more recently, reducing to around NZ\$50 billion as at 31 March 2002.³¹



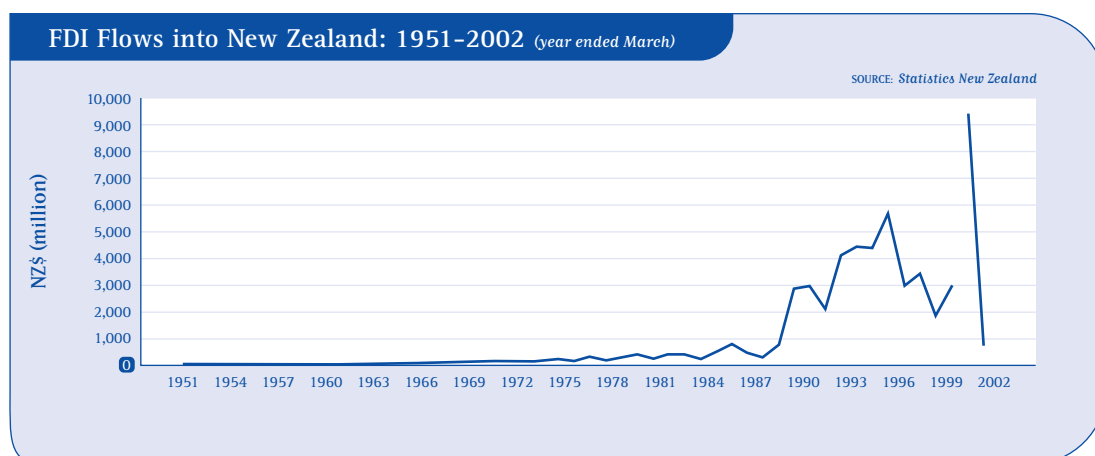
³¹ The extent of foreign investment participation in any given economy is arguably best measured by the inward FDI stock. Another measure is UNCTAD's transnationality index of host economies. The index takes account of the above measure, as well as recent FDI trends, and foreign affiliates' shares of total employment and value added per employee. New Zealand still ranks in the top four OECD countries on this measure.

The following chart shows that New Zealand has a relatively high degree of FDI compared with most OECD countries. But it is important to note that a high stock of FDI is the norm for small open economies. Small open economies tend to rely more heavily on external sources of investment to compensate for a lack of domestic sources of finance (for example, where there is a low level of domestic savings).



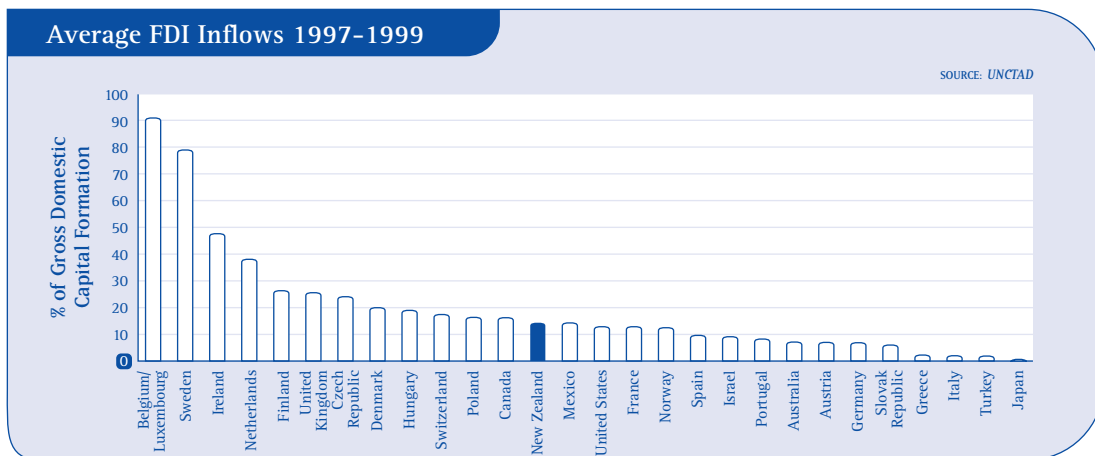
FDI flows into New Zealand

An examination of FDI flows provides us with a more dynamic picture. FDI inflows peaked with the large-scale privatisation sales of the late 1980s and early 1990s. But from the mid-1990s onwards, inward flows have trended downward despite a measure of volatility (the 'blip' in 2001 is partly explained by changes to methodology and data collection, which means that the figures for 2001 onwards are not directly comparable with those for earlier periods).³²



It is useful to set this experience against the international picture. Comparing recent performance only, the chart below shows that New Zealand has attracted only moderate amounts of FDI relative to many of its OECD peers, albeit from a high base. The downturn in FDI flows into New Zealand in the late 1990s happened at a time when global FDI inflows were increasing significantly. More recently, global FDI inflows have fallen dramatically and New Zealand has not been immune to this downturn.

³² The large net inflow of FDI into New Zealand in the year ended March 2001 was also explained by the break-up and sale of a single large corporation.



WHAT DOES THIS MEAN FOR NEW ZEALAND?

A declining inflow of FDI into New Zealand is not simply an issue of the availability of finance – equity or debt. Potentially it means that the productivity-related benefits from FDI are not being realised.

As noted at the beginning of this chapter, international evidence suggests that inward FDI can bring with it valuable spillover benefits. However, research suggests that these benefits do not accrue automatically. Rather, evidence suggests that spillovers are most likely to occur where:

- the technological and managerial capabilities of the foreign firm are advanced but not so far advanced that they are not relevant for domestic industry
- local firms have the capability and motivation to develop forwards and backwards linkages with the foreign firm
- there exists a healthy and competitive domestic industry, especially where the investment is domestic market oriented
- the investment is export-oriented, especially in small economies since offshore markets generally offer greater scope for expansion than domestic markets
- the investment is skilled labour intensive, and involves recruitment and training of domestic employees
- the foreign affiliate opens up new markets for New Zealand firms.

It is noted that the above data does not provide us with any insights into the quality of the stock of FDI in New Zealand, and this should be an issue for further research.

Nevertheless, FDI has an important role to play in raising New Zealand's use of new technology, improving New Zealanders' skills, and promoting economic growth generally. New Zealand needs to continue to focus on attracting investment that has a good chance of generating these spillover benefits. This in turn will require careful management (e.g. government support for high-quality FDI and not solely a focus on the quantity of new investment).

INVESTMENT IN PLANT AND EQUIPMENT

New Zealand has relatively low levels of investment in plant, equipment and machinery as a proportion of total investment in physical capital

WHY IS IT SIGNIFICANT?

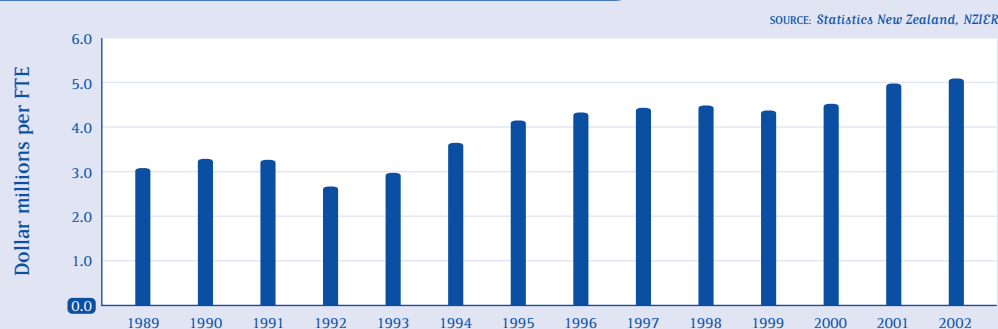
Investment in more efficient physical capital can increase the productivity of the workforce. Total investment in capital (or gross fixed-capital formation) includes plant, machinery and equipment (PME), buildings, land improvements, infrastructure (such as roading) and transport equipment. The ratio of physical capital per worker illustrates the extent to which worker productivity is supported by investment in tools and machinery. As investment is a flow, and employment is a stock of resources, it is useful to also compare employment with the stock of capital.

HOW DOES NEW ZEALAND PERFORM?

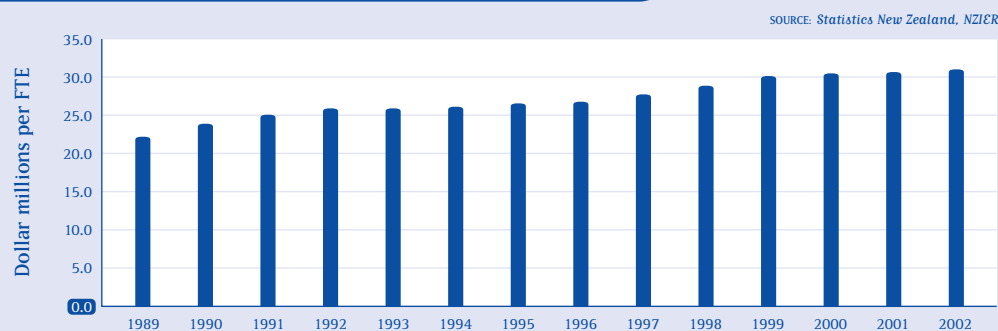
PME has been isolated from other capital investment. This type of capital is probably most substitutable for labour and most influential on labour productivity.

The charts below show that the ratio of PME to labour (measured as full-time equivalent employees (FTEs)) has been increasing over the last decade or so. This is indicative of 'capital deepening', and is likely to be a factor driving the recent growth in labour productivity.

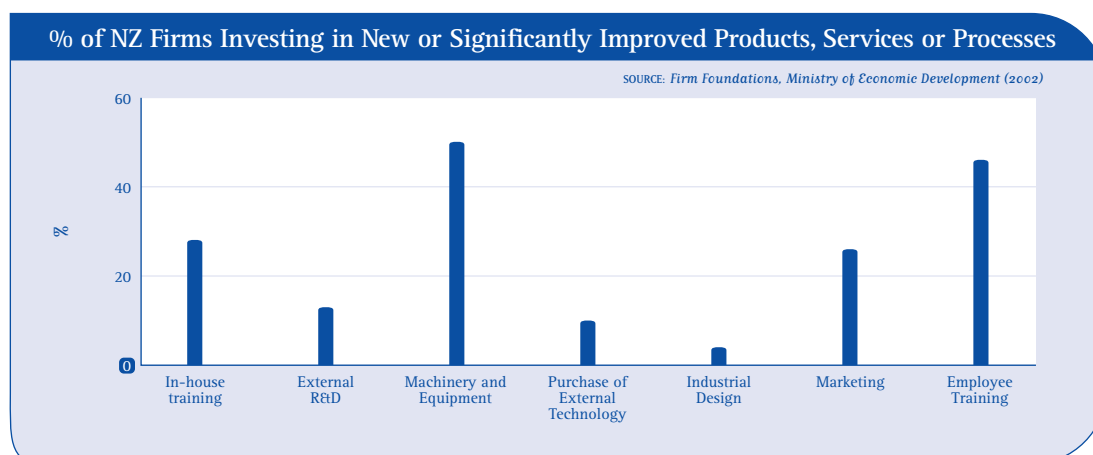
Ratio of PME Investment to FTEs (constant 1995/96 prices)



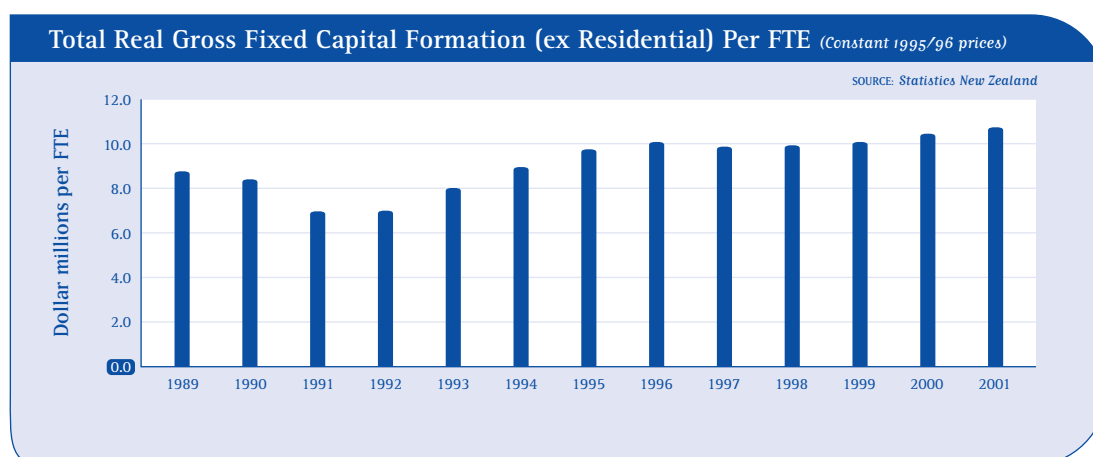
Ratio of PME Capital Stock to FTEs (constant 1995/96 prices)



In 2002, the *Firm Foundations* study of New Zealand firms with six or more FTEs revealed that 50 percent had invested in machinery and equipment in the previous 12 months. The study recorded only that investment specifically required for the introduction of new or significantly improved products, services or processes. This was the area where the highest proportion of firms chose to invest.

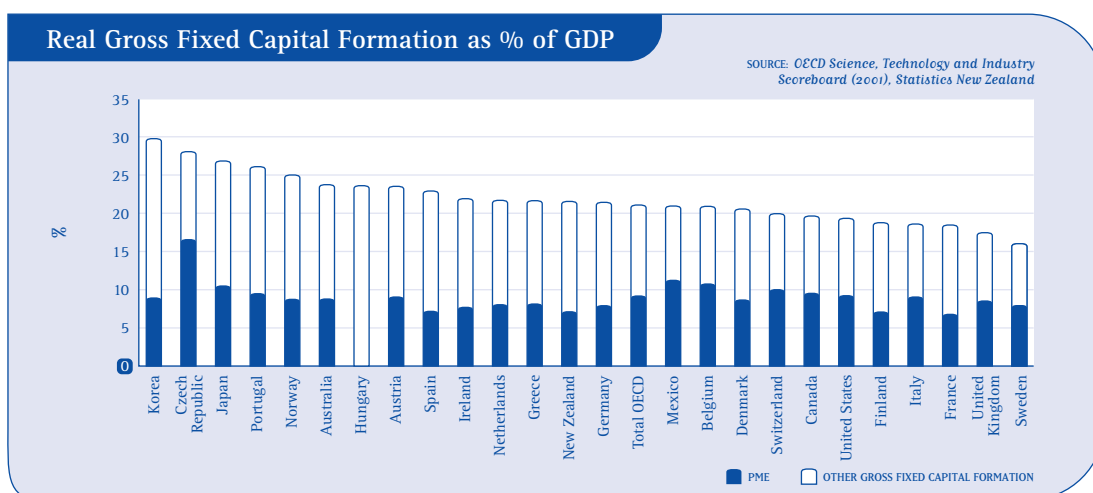


The ratio of total capital investment (other than residential buildings) to FTEs exhibits a similar trend to investment in PME, generally increasing over the last decade.



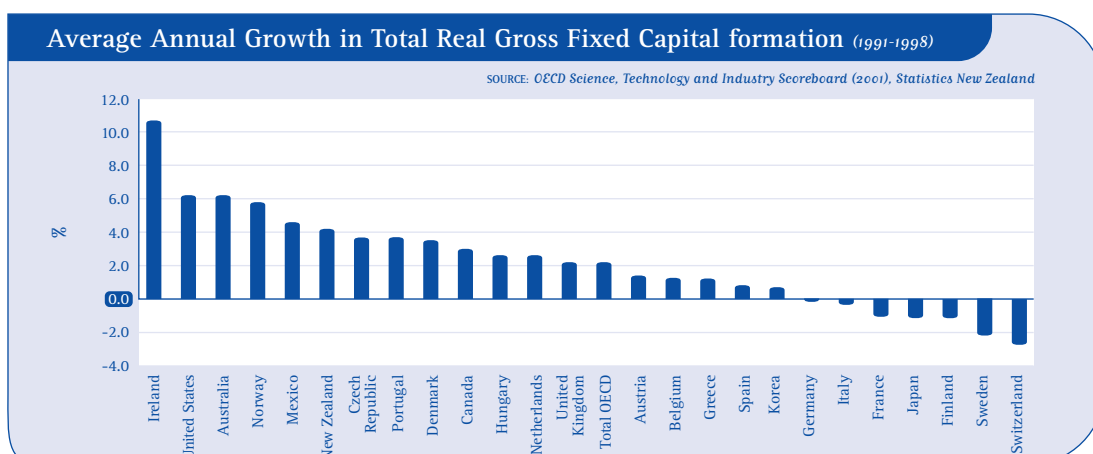
Similar international data are difficult to obtain. International comparisons commonly measure investment in PME as a proportion of GDP. The OECD comparison presented below is in real (i.e. constant dollar) terms. The average ratio across OECD countries for PME investment was nine percent in 1998. By this measure, New Zealand is below average, with seven percent.

The OECD average for total investment as a proportion of GDP was 21 percent in 1998. The ratio for New Zealand, excluding residential investment, was 15.9 percent, and 21.5 percent for total investment. New Zealand therefore has a lower investment in PME as a proportion of total investment than other OECD countries.



Note: OECD data in 1995 US dollars using purchasing power parities. New Zealand data is in constant 1995/96 prices.

The chart below shows average annual growth in total investment from 1991 to 1998. New Zealand's growth rate was 4.2 percent, well above the OECD average of 2.2 percent.



Note: OECD data in 1995 US dollars using purchasing power parities. New Zealand data in constant 1995/96 prices.

WHAT DOES THIS MEAN FOR NEW ZEALAND?

Investment in plant and machinery is a leading indicator. It is expected that increases in levels of investment will contribute to productivity growth. However, this productivity growth depends on:

- the investment being in productivity-enhancing PME. This relies on PME investment being used to produce goods that permit attractive opportunities for New Zealand products to be developed and satisfied, particularly internationally, and to lower production costs
- having appropriately skilled people to realise the full value of the investment.

This is particularly relevant for New Zealand, where the composition of inputs is different from some of the leading growth performers in the OECD.

Investment in plant, machinery and equipment is driven by returns

The growth in PME investment over the 1990s probably reflects increasing growth opportunities. Improving per capita income growth marks this period, preceded by decline.

The continued strong economic performance over the past few years means we can expect to see this growth continue. The economy's relative level of investment in PME may therefore improve. However, given New Zealand's economic structure and tax arrangements, we are likely to see other investments, for example in land, continue to be higher than other OECD countries.

New Zealand has a high capital to labour ratio internationally

New Zealand has a high capital to labour ratio. A recent comparison of factor endowments (e.g. capital, researchers – skilled labour – and unskilled labour) for Finland, the United States, Australia, Canada and New Zealand found that New Zealand has the highest capital per unit of labour and capital per researcher of the five countries.³³ This probably reflects New Zealand's small population in relation to the capital investment needed to produce many of the goods delivered by New Zealand businesses.

Limited impact on relative productivity

Given their limited impact on productivity levels, New Zealand's high capital per unit of labour and capital per researcher may suggest that New Zealand has not had the appropriate skills to exploit the benefits of our investment in physical capital. The small scale of New Zealand businesses is also likely to be a factor.

³³ See *Getting onto the Map in the Global Economy: The Case of Finland*, Bjorksten and Meriluoto (2002) in J. Poot (ed.), *On the Edge of the Global Economy* (2002).

8 Innovation, Entrepreneurship and Technological Change

- Innovation combined with entrepreneurship drives technological change. Technological change has two principal impacts that drive increases in productivity:
 - new products to enable niches in new markets to be identified and satisfied
 - the ability to adopt new processes and capital (e.g. tools and machinery) that can lower costs.
- The indicators suggest that:
 - *Government funding and basic research dominate R&D by sector and type:* New Zealand's levels of investment in R&D are lower than the OECD average. Investment by the private sector is particularly low. As a result, basic research appears to predominate. However, New Zealand is a net importer of technology and firms (including farmers) need to be able to successfully apply this technology, often combined with local R&D, to have a material impact on productivity.
 - *New Zealand's investment in knowledge (intangible investment) is increasing.* This should, over time, contribute to higher levels of innovation, and the ability to make the most effective use of new capital and processes and to respond effectively to niche-market demand. Currently, however, intangible investment levels remain lower than many OECD countries.
 - *New Zealand firms are relatively innovative and a majority are using up-to-date technology:* New Zealand firms appear to be quite innovative and are investing in technology that is new for New Zealand. However, small firm size may contribute to a lack of the connections with the research community that can make the most of innovative ideas in New Zealand and offshore. A lack of global connectedness may also reduce firms' awareness of the demand for innovative products and services. Current returns on investment in innovation and new technology may be below their potential as a result.
- *The contribution of high technology to New Zealand's total value added is increasing:* However, international comparison is difficult because major areas of New Zealand's economy, for example agriculture and the food, beverage and tobacco industry, are significantly more technology intensive than in other OECD countries.

R&D INVESTMENT BY SECTOR PERFORMING THE R&D

New Zealand's total R&D investment is low and the Government is the main funder of R&D

WHY IS IT SIGNIFICANT?

Technological progress from research and development (R&D) is seen as a key driver of long-term economic growth through increasing competitiveness and productivity.³⁴ In addition to driving economic growth, technological progress can improve the quality of people's lives and the environment.

Investment in R&D is crucial to transforming New Zealand into a highly skilled, high value-added economy. This investment is a useful measure of activities that support knowledge creation in an economy, but it is only a proxy for the benefits produced from it.

In an innovative economy, all sectors would be expected to undertake at least some R&D. However, even in such an economy small firms might undertake little or no R&D, given their size and the costs involved.

Governments generally invest in R&D that has public benefits and would not otherwise be undertaken. There is also a role for government in ensuring that at least some of the basic research undertaken or funded by government is, ultimately, transferred to the private sector to help generate new products and services. UK evidence suggests that government R&D leads to higher levels of business R&D.³⁵

However, innovation also requires private sector R&D effort and entrepreneurial drive:

- to seek out new market opportunities and/or new production processes that use new ideas and knowledge
- to ensure that firms have the skills and capability to take on new ideas and knowledge
- to provide some direction for future basic research.

Research in the UK and other OECD countries has shown that the spillover benefits of private sector R&D are greater than those of public sector R&D.³⁶

HOW DOES NEW ZEALAND PERFORM?

The most common (although not necessarily definitive) method of measuring R&D activity is total expenditure on R&D.

New Zealand's investment in R&D has been steadily increasing over the past decade. This is from a low level relative to the rest of the OECD. As a percentage of GDP, New Zealand still spends less on R&D than most other OECD countries. A contributor to this may be the tax treatment of R&D. Other OECD countries provide greater incentives for private sector R&D through the tax system. This may result in higher reported levels of R&D in those countries.

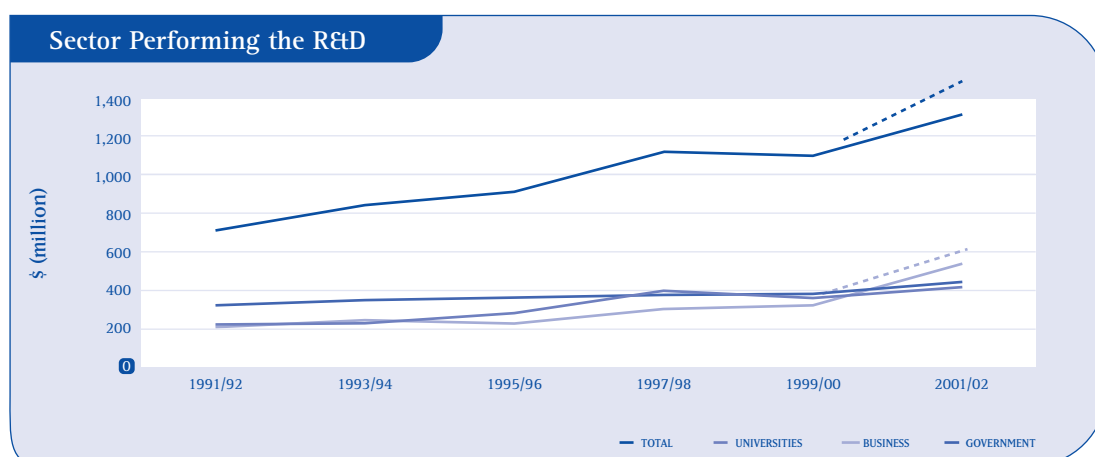
34 See *Productivity and Competitiveness Indicators: Update 2002*, UK Department of Trade and Industry (2002), pg. 16 and 17.

35 See *UK Competitiveness Indicators: Second Edition*, UK Department of Trade and Industry (2001), pg. 49.

36 See *UK Competitiveness Indicators: Second Edition* (2001), pg. 48.



The government is the main funder of R&D in New Zealand, followed by businesses and others.³⁷ Crown Research Institutes and universities perform most of New Zealand's R&D. It should be noted that the 2001/02 R&D Survey used new methodology to identify enterprises undertaking R&D. The solid lines in the accompanying charts are based on the old methodology. The results for 2001/02 based on the new methodology are indicated by the broken lines on the charts. The 2001/02 data indicates that, under either measure, there was a substantial increase in private R&D expenditure from 1999/00 to 2001/02.



Both the public³⁸ and private sectors in New Zealand invest less in R&D than the OECD average. This is most pronounced in the private sector. New Zealand businesses contribute 34 percent of the total R&D effort. This is lower than almost all other OECD countries and one-third of the OECD average (as a percentage of GDP),³⁹ possibly as a result of the predominance of relatively small businesses and the structure of the economy.

Across the OECD, a 'typical' private R&D firm is a large manufacturer. However, in New Zealand most private sector R&D is done by smaller firms⁴⁰ and within short timeframes. New Zealand has few manufacturers in industries that require high levels of R&D, such as major defence industries, aeronautics and pharmacology. It should be noted, however, that a higher proportion of New Zealand R&D is undertaken by the service sector than in the rest of the OECD.⁴¹

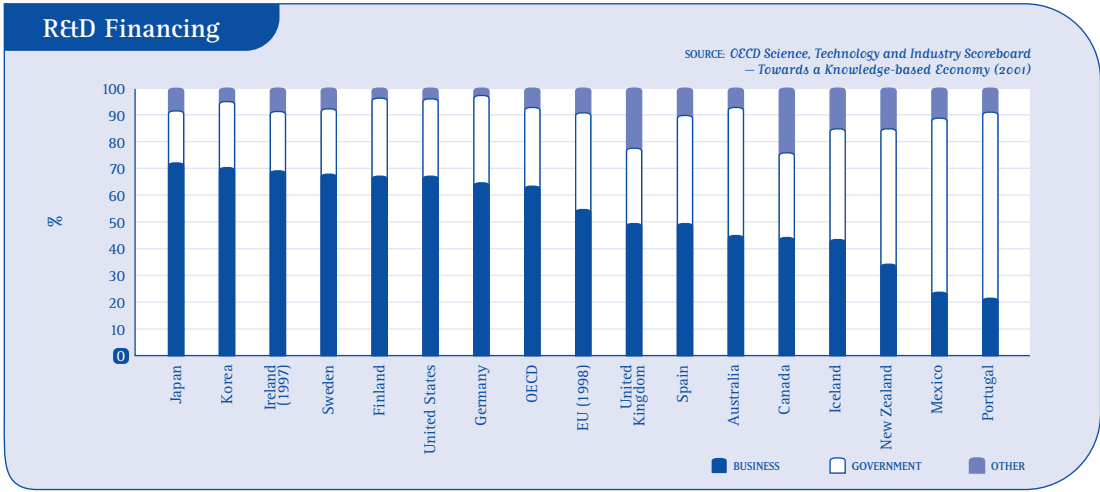
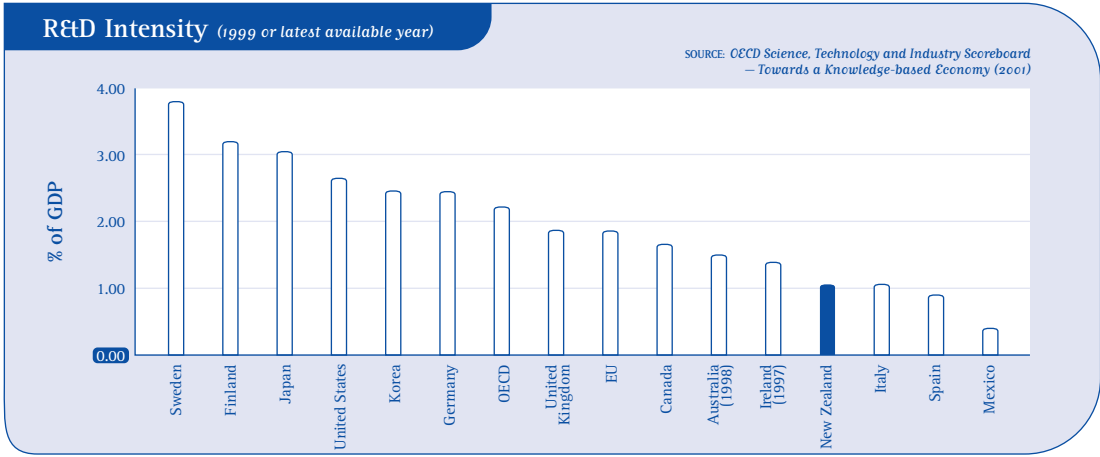
37 Others include private non-business and overseas funders.

38 Government expenditure on R&D is about 14 percent below the OECD average.

39 In 1999/2000, the ratio of business R&D to GDP in New Zealand was 0.32 percent compared with the average ratio for OECD countries of 1.05 percent. (Source: Ministry of Research, Science and Technology).

40 Firms employing fewer than 500 people.

41 *New Zealand Research and Development Statistics 1999/2000*, The Ministry of Research, Science and Technology, pg. 13.



WHAT DOES THIS MEAN FOR NEW ZEALAND?

It is difficult to determine the appropriate balance of public and private sector R&D. However, it is likely, given the structure of the New Zealand economy, that the balance for New Zealand will be different from other OECD countries.

Cultivating the habit of businesses doing research

New Zealand businesses do not appear to have cultivated the ‘habit’ of doing research. This suggests that there may be room for higher levels of R&D by the private sector and the latest data indicate that the private sector may be improving its performance. It is the private sector, rather than the public sector, that will drive the demand for new ideas and technologies that will find market niches or carve out new markets. As New Zealand is a net importer of technology, the private sector also needs the capability to spot and develop ideas from overseas, build on them and translate them into marketable opportunities.

Commercialising R&D

The government is the main investor in R&D and it is imperative that it obtains the best value from its investment. Realising the full benefits of its R&D investment and using it to achieve a high value-added economy requires commercialisation of R&D. The Science and Innovation Advisory Committee found that public sector R&D institutions, where a large amount of

New Zealand's R&D is carried out, appear to have difficulty with part of the process.⁴² They require better connections with businesses and entrepreneurs to support increased commercialisation of R&D.

Major changes in the R&D undertaken by the private sector require significant changes in the economy

Any significant changes to the balance of R&D between the public and private sectors is likely to arise as a result of a transformation of the structure of the economy, both in terms of firm size and the industries in which firms operate.

New Zealand as a technology importer

Because New Zealand is a net importer of technology, the private sector also needs appropriate R&D capability to spot and develop ideas from overseas, build on them and translate them into marketable opportunities.

BREAKDOWN OF R&D INVESTMENT BY TYPE OF RESEARCH

WHY IS IT SIGNIFICANT?

Boundaries between types of R&D are becoming increasingly blurred. However, for the purposes of categorising R&D, the OECD uses the following definitions:

- *Basic research*: Experimental or theoretical work undertaken to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application in view.
- *Applied research*: More directed research, conducted with an application in mind.
- *Experimental development*: Systematic work that draws on existing knowledge gained from basic and applied research and practical experience. This work may be directed to producing new materials, products and services, to installing new processes, systems and services, to improving substantially those already produced or installed or to translating new knowledge in social sciences into operational programmes.

The development and implementation of a new technology (products or processes) involves a series of scientific, technological, organisational, financial and commercial activities. As different types of R&D are needed at different phases of the development and production process, it is important to have an appropriate balance across the research types.

Basic research is increasingly seen as a key long-term driver of innovation.⁴³ However, the economic benefits of that research cannot be realised unless it is applied or commercialised. In addition to basic research that need not be undertaken in New Zealand, this requires other types of R&D and skills. To realise the value of New Zealand's R&D, key players involved in each part of the research and development process need to be well connected.

⁴² *Turning Great Ideas into Great Venture: An Innovation Framework for New Zealand*, Science and Innovation Advisory Committee, (2001), pg. 30.

⁴³ The OECD notes that public sector research understandably has a more complex relationship with growth [than private sector R&D] as it is less focused on commercial applications but is nevertheless often the generator of important basic knowledge and often works in tandem with commercial enterprise. Indeed, much of R&D policy now focuses on improving the link between the public and private sector research. See *The Policy Agenda for Growth: An Overview of the Sources of Economic Growth in OECD Countries*, OECD (2003).

HOW DOES NEW ZEALAND PERFORM?

Official data on New Zealand's expenditure by type of R&D are not currently available. The following information is based on existing studies and OECD statistics.

Government focus is principally on basic research

The government is the main funder of R&D in New Zealand and there is a significant focus on basic research. Governments are generally the largest investors in basic research, as the private sector is rarely able to capture its full value. Accordingly, countries in which the government is the main funder of R&D tend to have higher levels of basic research expenditure as a proportion of their total R&D expenditure.⁴⁴ This is the case in New Zealand.

In a recent report for the Knowledge Wave Trust, McKinsey and Company noted that, for OECD countries, total basic research averages 40 percent of total government R&D budgets. In New Zealand, the Foundation for Research, Science and Technology (FRST) (which has a total research budget of around \$500 million per year) estimates that approximately 50 percent of its contracts are directed towards basic, 32 percent towards applied and 18 percent to developmental research (experimental and product). The Health Research Council estimates that 86 percent of its \$115 million budget goes towards applied research.

Care is needed in interpreting these estimates⁴⁵. However, it appears likely that, in terms of government funded R&D, New Zealand has a reasonable spread across the different research activities, although, as expected, this is weighted towards basic research.

Over the late 1990s, OECD countries have tended to spend more on basic research.⁴⁶ However, the OECD has also found that governments increasingly want to be able to demonstrate that public investment in R&D is used efficiently and is generating returns. Across the OECD, there is a growing emphasis on research for business performance and an expectation that the public sector can contribute to this objective.⁴⁷ In New Zealand public funding for R&D is increasingly contingent on a private sector contribution.

Private sector has a more applied R&D focus

Private sector R&D is usually skewed toward applied research and experimental development. This tends to have shorter timeframes, more immediate returns and less risk than basic research. The low levels of private sector investment in basic research across the OECD⁴⁸ are likely to be more pronounced in New Zealand because of the large number of small firms. Given this, the private sector has an important role in commercialising the research of government institutions and universities.

44 *OECD Science, Technology and Industry Scoreboard: Towards a Knowledge-based Economy* (2001), OECD, pg. 38.

45 It is important to note that these figures are the subject of some debate. McKinsey, for example, based on programme descriptions, concluded that only 14 percent of the New Zealand Government R&D funding went to basic R&D.

46 *OECD Science, Technology and Industry Scoreboard: Towards a Knowledge-based Economy* (2001), OECD, pg. 38.

47 *OECD Science, Technology and Industry Outlook* (2002), OECD, chapter 5.

48 See *OECD Science, Technology and Industry Scoreboard: Towards a Knowledge-based Economy* (2001), OECD, pg. 38 and *OECD Science, Technology and Industry Outlook* (2002), OECD, chapter 5.

WHAT DOES THIS MEAN FOR NEW ZEALAND?

The Science and Innovation Advisory Committee indicated that it considers that New Zealand is having difficulty commercialising research.⁴⁹ This implies that New Zealand needs to focus increasingly on the applied or developmental end of the spectrum and the commercialisation-oriented processes beyond (such as pre-production testing, marketing and distribution activities).

This is a complex issue, however, as basic research is a key driver of long-term innovation and makes other contributions to the country, particularly in areas in which New Zealand is unique (such as research relating to health, biodiversity and Māori communities). Conducting basic research also tends to make New Zealand a more attractive destination for the scientists needed to drive innovation at this level.

Basic and applied research can also be responsible for the big research developments that can generate significant commercial gains. Commercialising as much as possible of this research in New Zealand will ensure New Zealand reaps the full benefits of its discoveries. This requires:

- early end-user engagement in the research process and a greater level of partnership between public research providers and private sector developers
- the existence of a venture capital market that can fund the development phases of at least some of New Zealand's inventions (while recognising that the commercialisation of some inventions will always go offshore).

New Zealand's distribution of R&D by type also needs to take account of the fact that New Zealand is a net importer of technology. Much of New Zealand's R&D is therefore likely to build on international developments or look for solutions either to New Zealand-specific issues or issues New Zealanders have particular expertise in.

MEASUREMENT ISSUES

A data series for this indicator will be available for the next Growth and Innovation Indicators report from the R&D expenditure survey to be carried by Statistics New Zealand.

There are considerable definitional difficulties in determining the types of research being undertaken. Funding providers and researchers often use different definitions of basic, applied and experimental development (and sometimes different terms) and there is no clear distinction at the interface between the different types of research or the cut-off point between experimental development and the related activities required during the realisation of an innovation. To compound the issues, sometimes it is only when the research has been underway for a period that it becomes clear what type of research it is.

⁴⁹ *Turning Great Ideas into Great Venture: An Innovation Framework for New Zealand*, Science and Innovation Advisory Committee, (2001)

INTANGIBLE INVESTMENT AS A PERCENTAGE OF GDP

New Zealand's investment in knowledge is below that of many other OECD countries

WHY IS IT SIGNIFICANT?

Knowledge is a key driver of innovation. Investment in knowledge, along with investment in more efficient physical capital, is a factor in sustained productivity growth. Intangible investment as a percentage of GDP is a rough measure of a nation's investment in knowledge.⁵⁰ This indicator captures some aspects of inputs into innovation. However, it does not measure the outcomes of investment in knowledge.

The last decade has seen OECD countries move towards an increased level of investment in knowledge (as a percentage of GDP) and a declining investment in physical capital (as a percentage of GDP). This is seen as evidence of the move towards a knowledge-based economy.⁵¹

HOW DOES NEW ZEALAND PERFORM?

Intangible investment is measured by a nation's total expenditure on R&D, higher education (from both the public and private sectors) and software.

Although New Zealand's investment in knowledge as a percentage of GDP is below that of many other OECD countries, it did increase over the 1997–1999 period.

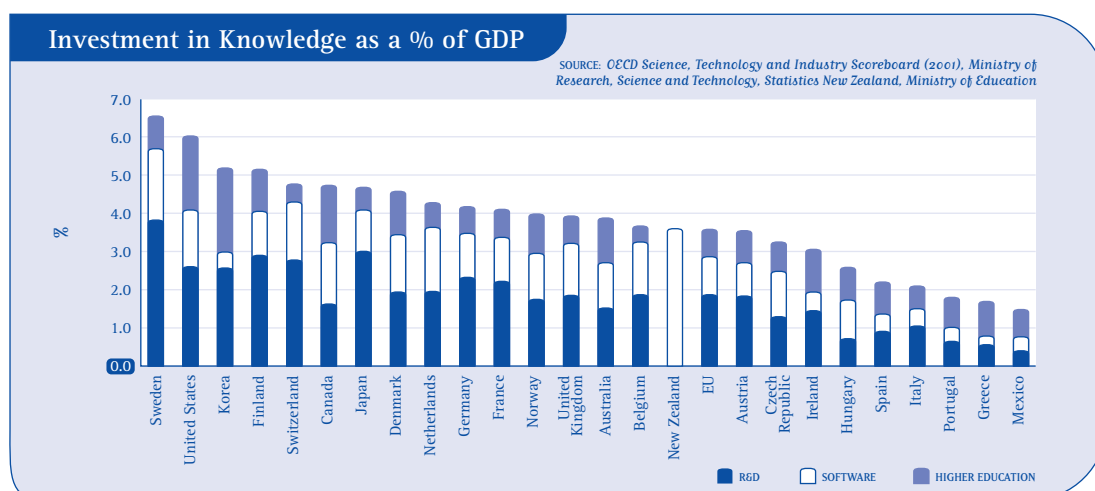
Total investment in knowledge in New Zealand increased from 3.1 percent of GDP in 1997 to around 3.4 percent of GDP in 1999, compared to the OECD average of 4.7 percent. However, care must be taken in analysing this data. There are differences in data availability and type between countries, while the split of New Zealand data used by the OECD has not been obtainable.

The top ranking OECD countries by this measure are Sweden, the United States and Korea. New Zealand is:

- at about the same level as Belgium, Austria and the EU average
- slightly below the UK and Australia, but above Ireland.

⁵⁰ Investment in knowledge is a difficult measure and this indicator provides a rough indication only. This measure excludes knowledge embedded in physical capital.

⁵¹ *OECD Science, Technology and Industry Scoreboard: Towards a Knowledge-based Economy*, OECD, (2001), pg. 14.



Note: OECD data are for 1998, New Zealand data are for 1999 and have not been broken down because of poor comparability with other OECD data. New Zealand's R&D figures (from MoRST) exclude expenditure on computer and related activities, and university fees and contracts. Software figures (from Statistics New Zealand) relate to total use in the New Zealand economy, and include exports but exclude households. Including households raises the figure from 0.6 percent to 0.7 percent. Education figures (from the Ministry of Education) relate to expenditure by public sector providers only (but do include expenditure on tuition fees by domestic and international students). The Ministry has not recorded or estimated private-sector expenditure on tertiary education, although the level of expenditure on private-sector providers is thought to be a relatively small component of total expenditure.

WHAT DOES THIS MEAN FOR NEW ZEALAND?

The correlation between a country's investment in knowledge and its ranking in terms of GDP per capita is not clear-cut.

Investment in R&D is a complex process. There can be a long lead-time before any returns are captured. Any successes may subsequently fail to be successfully commercialised. It can take even longer for any resulting benefits to flow through the economy. This means that R&D is high risk. It can involve high levels of investment with a low probability of high returns.

Therefore, there may be stronger incentives on New Zealand firms to take up and adapt to new innovations and technology than to invest in R&D themselves. Similarly, investment in education may take time to be reflected in increased productivity and is not necessarily indicative of investment in skills necessary to make the most of new ideas and technology.

INNOVATIVENESS IN NEW ZEALAND

New Zealand has a high proportion of innovative firms

WHY IS IT SIGNIFICANT?

Innovation is a key factor in sustaining economic growth, and in developing a more flexible New Zealand economy capable of competing successfully on the international stage.

Innovation is the dynamic process of creation, which involves the search for, experimentation with, and development and adoption of, new and better products, services, processes and organisational mechanisms. Innovation is driven not only by the breadth and depth of skill in R&D, engineering and market research, but also by an atmosphere which fosters, recognises and rewards innovation.

Levels of innovation may reflect levels of competition. Innovation (in terms of both products and processes) allows businesses to better compete on a number of fronts, including price, quality of goods and services and the development of new or adapted goods and services.

Innovative firms also tend to have better organisational and management practices leading to increased productivity levels. In addition, innovative firms tend to be more profitable and export more.⁵²

HOW DOES NEW ZEALAND PERFORM?

Innovativeness in New Zealand is measured by the proportion of firms with new products (goods or services) or processes introduced in the last three years. This indicator provides a rough measure of the extent to which new knowledge is being commercialised through the introduction of new products and services, new production processes and service delivery mechanisms.⁵³

Firm Foundations found that a large number (68 percent) of New Zealand firms introduced an innovation (relating to either a product or a process) in the three years ended June 2001. Levels of innovation appear to increase with business size. Eighty percent of large firms (those with 50 or more full-time employees) introduced an innovation, compared with 66 percent of small firms (those with six to 19.5 full-time employees).

Firm Foundations indicated that approximately 50 percent of firms consider their innovations to have originated from within the firm. The result is slightly higher for process innovations (as opposed to product innovations), and larger firms are slightly more likely to introduce their own innovations than smaller firms are.

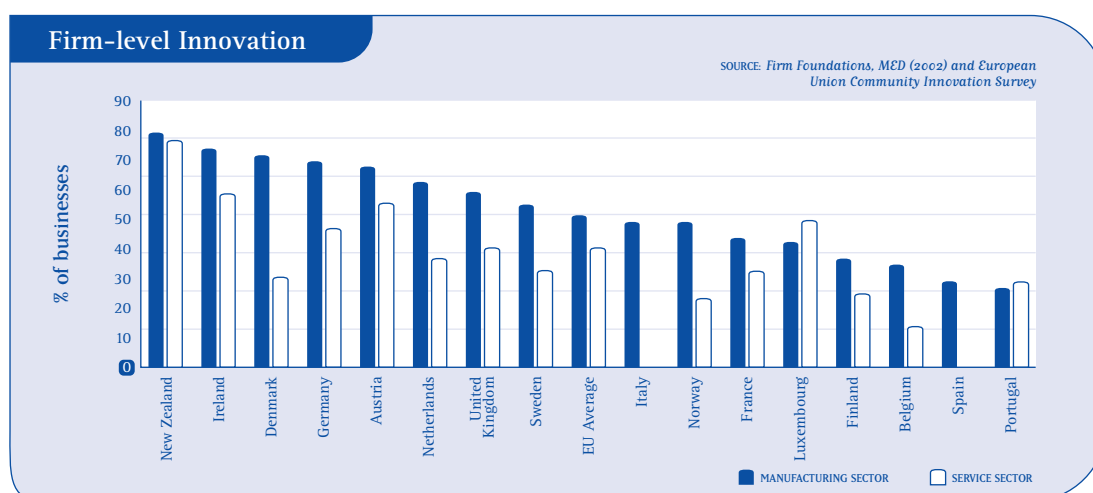
Firm Foundations did not, however, distinguish between products or processes that were new to a firm and those new to the market generally. It is therefore difficult to know the extent to which New Zealand firms are developing novel products or processes. As New Zealand is a net importer of technology, it is likely that a key source of innovation for New Zealand firms is adapting or adding value to technologies and processes developed elsewhere.

⁵² *Innovation in New Zealand*, Ministry of Research, Science and Technology and Statistics New Zealand, (2001).

⁵³ There are a number of measurement issues associated with this indicator. It is fairly new and consistent measures across countries have yet to be developed. The data may not be comparable across countries.

The manufacturing sector had the highest rate of innovation, with 79 percent of manufacturing firms introducing a new product or process. Sixty-seven percent⁵⁴ of service sector and 56 percent of primary sector firms introduced an innovation.

Manufacturing is also the leading innovative sector in European Union (EU) countries. The charts below compare rates of innovation of the New Zealand manufacturing and service sectors and their European counterparts.⁵⁵ This comparison suggests that New Zealand businesses are at least as, if not more, innovative than their EU counterparts.



Note: The definition of innovation used relates to the introduction by a firm of a product/service or process that is new to the *firm*.

WHAT DOES THIS MEAN FOR NEW ZEALAND?

New Zealanders have traditionally thought of themselves as innovative. Businesses here have displayed a propensity to find innovative solutions to some of the problems they face, such as overcoming geographical barriers in distributing their products.⁵⁶

Firm Foundations has confirmed that New Zealand firms willingly adopt and develop new ideas and methods to enhance their products, production and management processes. However, New Zealand's apparently high levels of firm-level innovation do not appear to have resulted in higher firm profitability or productivity levels. This may reflect levels of openness and FDI. Improvements in these areas might provide increased opportunities to better exploit New Zealand firms' innovativeness. The results of the *Firm Foundations* study also suggest there may be room for more entrepreneurship to better connect innovators with markets and allow New Zealand firms to realise the full value of their innovations.

⁵⁴ 76 percent when adjusted to be comparable with the EU Community Innovation Survey.

⁵⁵ Based on the EU's Community Innovation Survey and *Firm Foundations*, which asked firms for information about their innovation activities. The reference periods for these two surveys are different. The New Zealand survey measures innovation during the three years 1998–2001, while the EU survey covers the three years 1994–1996 (except for Portugal and Norway where the survey covered the years 1995–1997).

⁵⁶ *Firm Level Manufacturing Export Study*, by Infometrics for Ministry of Economic Development, Treasury and Trade New Zealand, 2002).

PROPORTION OF FIRMS USING THE LATEST TECHNOLOGIES

A number of New Zealand firms invest in the latest technology

WHY IS IT SIGNIFICANT?

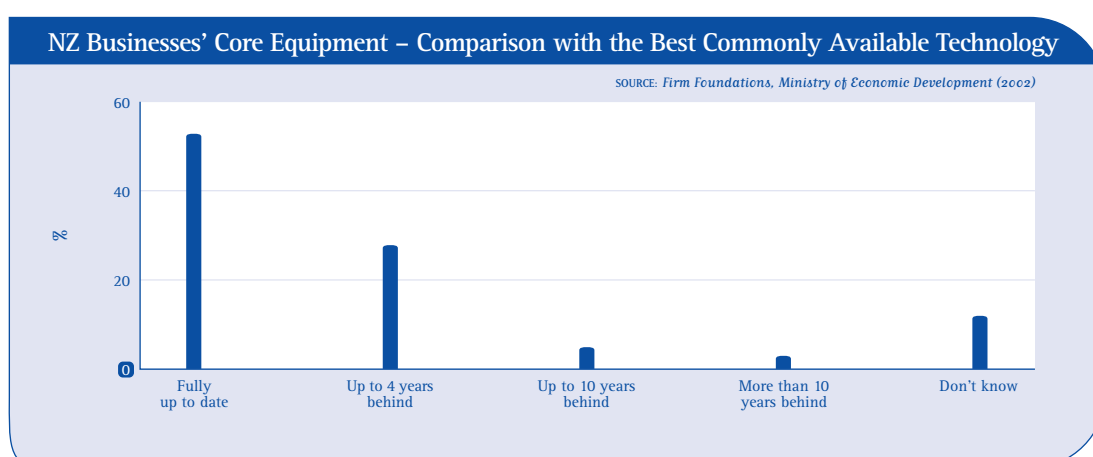
New Zealand firms are increasingly operating in a globalised and intensely competitive environment. Demand is increasing for more customised goods and services, higher quality, faster delivery and more environmentally friendly products. To keep up with this rising demand, firms must raise their productivity through investment in improving staff capabilities and employing new technologies.

Increases in productivity are closely related to innovative performance and contribute to growth. The uptake of new technologies, along with the commercialisation of innovation, plays a pivotal role in enhancement of firm productivity and contributes to higher technological capabilities and better-skilled employees.

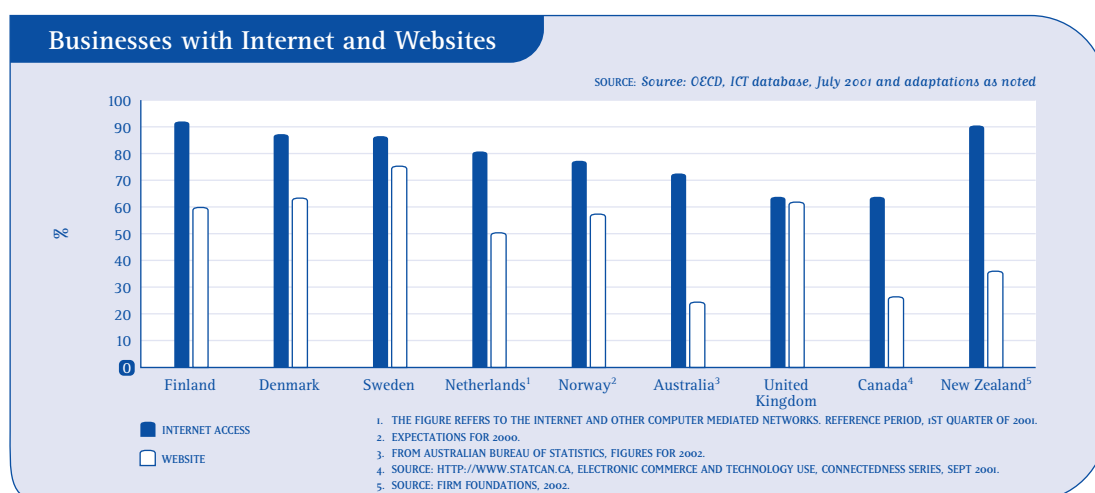
HOW DOES NEW ZEALAND PERFORM?

Previous business practice studies found that many New Zealand firms did not have proactive approaches to technology. The *Firm Foundations* (2002) study suggests that this trend has been partially reversed by a number of New Zealand businesses. Fifty-three percent of New Zealand businesses (with six or more FTEs) consider their core equipment to be fully up to date. Eighty percent employ equipment that they consider to be no more than four years behind the most up to date.

The study shows a positive correlation (though not causation) between better operational outcomes and more up-to-date equipment. Eighty-three percent of high performing firms had core equipment that was fully up to date and 98 percent had core equipment that was no more than four years behind the most up to date.



The use of information technologies is generally viewed as an important component of business practices and is a proxy for the uptake of new technologies, even though its application can differ markedly across firms and industries. A relatively high proportion of New Zealand households has access to a computer and this usage rate is also reflected in New Zealand's business population. Eighty-nine percent of firms (with six or more FTEs) have some proportion of their employees regularly using PCs, 89 percent of firms have employees that regularly (at least once a week) access the Internet, and 36 percent of firms have a website.



New Zealand compares well on internet access with all the countries surveyed, being second to Finland by just two percentage points. New Zealand lags behind other OECD countries on the measure of companies with a web presence, but is still ahead of Australia and Canada.⁵⁷

WHAT DOES THIS MEAN FOR NEW ZEALAND?

Well-performing New Zealand firms are moving towards the frontier for goods production. Firms are replacing existing technology with that available internationally. This implies that many firms are watching international developments.

In addition, some of the work on productivity growth suggests that New Zealand should, over time, start to see productivity improvements through the relatively high usage of ICT by firms and individuals.

However, in both cases, technology is being used that has generally been designed for other economies. There is some evidence that, for these technologies to be fully effective, firms and others need to be able to adapt them to local conditions.⁵⁸ This requires links to those with appropriate skills, including researchers in universities, Crown Research Institutes or private research establishments. In addition, staff may need to be retrained to make the most of the new technology. This is more difficult if levels of existing skills are low and processes have been learned by rote.

Overall, the performance against this indicator is encouraging. But this will only translate into higher productivity if other factors are also present. Only then is the investment being made in new technology worthwhile.

⁵⁷ International comparisons can only be indicative at best as data across countries has not been collected on the same basis. In particular, some of the surveys, including Firm Foundations, excluded smaller firms (which are less likely to have computer access) and firms in particular sectors (for example, Denmark and Finland excluded finance and insurance sectors, generally one of the most intensive users). The data points also do not all reflect the same point in time.

⁵⁸ See *Economic Development as Self-Discovery*, Hausman, H. and Rodrik, D. (2002)

VALUE ADDED IN HIGH-TECH MANUFACTURES AS A SHARE OF TOTAL GROSS VALUE ADDED

New Zealand has very low levels of high-tech manufactures

WHY IS IT SIGNIFICANT?

High-tech, knowledge intensive firms have the potential to develop new, high value-added products and services, which are likely to more readily find market niches and be less price sensitive than low-tech products.

While all industries generate and/or exploit new technology and knowledge, some are more technology or knowledge intensive than others. It is possible to assess the importance of technology and knowledge by monitoring growth in the production of high-tech goods in an economy. High-tech R&D manufactures as a percentage of total sales can provide some measure of the transformation of the economy from low-tech to high-tech with greater levels of value-added production over time.

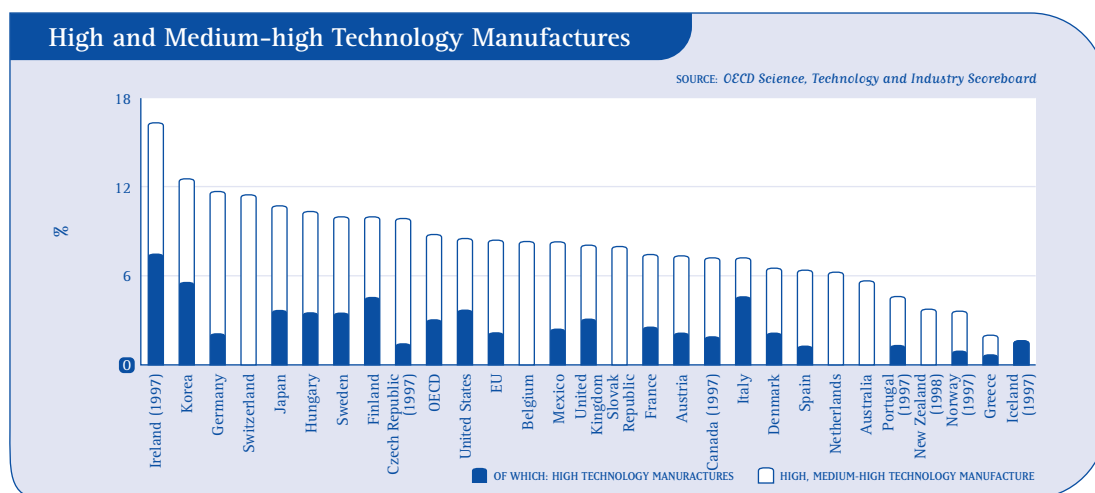
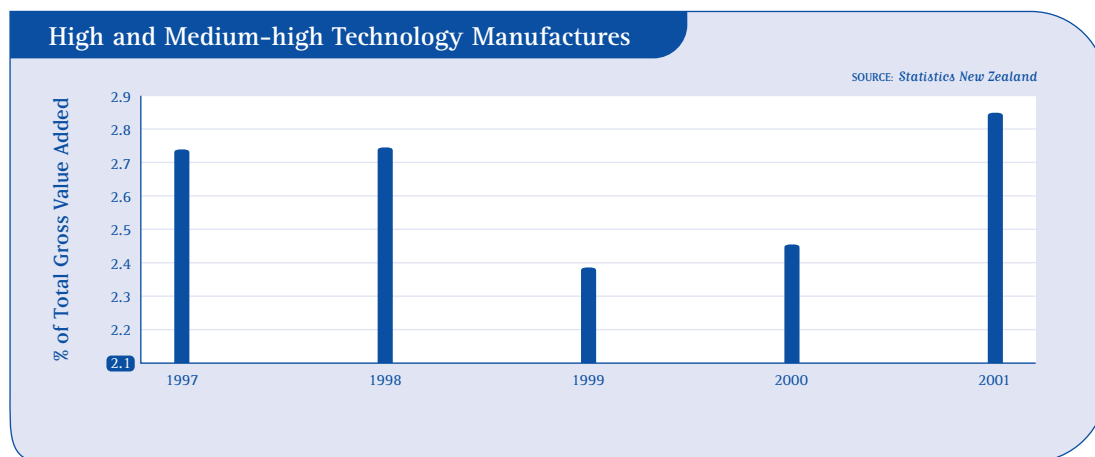
The structure of the New Zealand economy and the OECD classification system may limit the usefulness of this indicator. The OECD classifies manufacturing industries into high-tech, medium-high tech, medium-low tech and low-tech by ranking industries according to their average over 1991 to 1997 of *aggregate* OECD R&D intensities (gross domestic expenditure on R&D as a percentage of GDP). Those industries whose average OECD R&D intensities are higher receive a higher technology classification.

As of 2001, those industries classified as high-tech included: aircraft and spacecraft; pharmaceuticals; office, accounting and computing machinery; radio, television and communications equipment; and medical, precision and optical instruments. Industries classified as medium-high tech included: electrical machinery and apparatus; motor vehicles, trailers and semi-trailers; chemicals excluding pharmaceuticals; railroad equipment and transport equipment; and machinery and equipment.

The OECD classification was based on 13 OECD countries. Consequently, the classification has been derived from data provided by countries whose industry technology intensity scores will differ from New Zealand. For example, New Zealand R&D intensity (for private organisations) for the Food, Beverage and Tobacco industry is approximately 30 percent higher than the equivalent OECD intensity (1.5 percent of value added compared to 1.1 percent of value added for the 1999/2000 reference period). The OECD therefore classifies the Food, Beverages and Tobacco industry as a low-tech industry, whereas it may be higher for New Zealand.

HOW DOES NEW ZEALAND PERFORM?

The chart below shows New Zealand's high and medium-high tech manufactures (using the OECD technology classifications) as a proportion of total gross value added. It shows that, in 1997, such manufactures accounted for 2.7 percent of value added. By 2001, this had increased to 2.9 percent.



By contrast, in the OECD high and medium-high tech manufacturing comprised approximately nine percent of total OECD value added. Notably, high and medium-high tech manufacturing has been a driving force behind recent economic growth in Ireland, where it now represents more than 16 percent of total value added.

WHAT DOES THIS MEAN FOR NEW ZEALAND?

It is not surprising that New Zealand performs poorly in this indicator relative to other OECD economies. Much of this has to do with the structure of the New Zealand economy. New Zealand's low R&D intensity in high-tech manufacturing can, in part, be explained by New Zealand's high proportion of small and medium-sized enterprises by international standards. As at 2001, 97.3 percent of enterprises in New Zealand employed 19 or fewer staff.

In addition, agriculture accounts for 7.5 percent of value added in the New Zealand economy, compared to less than three percent for other OECD economies. This reflects New Zealand's uniqueness in the OECD. New Zealand agriculture has relatively high levels of R&D and uses medium and high technology inputs more than other countries. This results in high productivity levels in this sector.

New Zealand's R&D intensity is typically much lower in the OECD classification of high and medium-high tech industries. Exceptions are radio, TV and communication equipment, which represented 18.4 percent of value added in 1999/2000, compared to an OECD average of 17.2. Further, many of the high-tech industries such as spacecraft and pharmaceuticals either do not exist or are considered to be fledgling industries in the New Zealand economy. Analysis of trade data for New Zealand using the OECD classification must, therefore, take into account that it does not capture the distinct characteristics of the New Zealand economy. If it were to do so, then New Zealand may compare more favourably to other countries.

9 Global Connectedness

- Global connectedness is about the international relationships that New Zealanders and New Zealand firms establish. Through these relationships, understanding and trust of New Zealand and New Zealanders are created. As importantly, New Zealanders are exposed to new ideas, new markets, different cultures and ways of doing things.
- These connections and their benefits are difficult to measure. However, the available evidence suggests that, while New Zealand is quite well connected internationally, there may be some way to go to match similar small, but high-growth, OECD countries, particularly in relation to exports.
- There are, however, some useful proxies that have been used in this report. These are:
 - *New Zealand's openness to international trade*: New Zealand's exports as a percentage of GDP are average in the OECD, but lower than comparable small countries, particularly those that have had sustained periods of above-average economic growth
 - *the export of high and medium-high technology goods and knowledge-based services*: New Zealand has also not been particularly strong in the export of high and medium-high technology goods. This reflects New Zealand's economic structure, where agriculture tends to be more technology-driven than typical OECD countries
 - *the ranking of New Zealand's cities internationally*: Cities in New Zealand rank very well internationally and that ranking has improved in the last 12 months. This makes New Zealand an attractive place to live, and to visit, even if there is a significant difference in income levels. It provides the potential to attract and retain skilled people and investment from offshore.

OPENNESS TO TRADE

New Zealand has average levels of openness

WHY IS IT SIGNIFICANT?

An open and globally connected economy is necessary for New Zealand to achieve and sustain high growth rates. Openness and global connectedness give New Zealand access to capital, markets, skilled labour, networks, technology, competitively priced goods and services, other cultures and fresh perspectives. Evidence from other small economies indicates that internationalisation is necessary (although possibly not sufficient) for economic success.

High levels of openness can also spur productivity improvements. Opening up New Zealand markets to competitive pressures from offshore:

- encourages better resource allocation
- promotes innovation
- gives New Zealand opportunities to benefit from specialisation and economies of scale through exporting in the areas in which New Zealand has a comparative advantage.

It also exposes New Zealand firms to new technology, ideas and management practices.

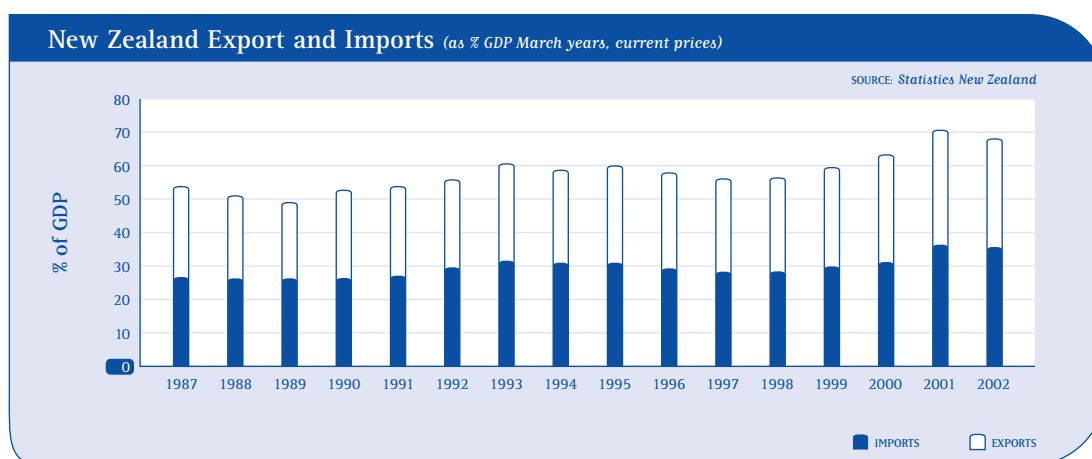
HOW DOES NEW ZEALAND PERFORM?

An economy's openness can be measured in several ways, including:

- ratios of international trade (total imports plus total exports) to GDP
- levels of tariffs and non-tariff barriers
- ratios of foreign direct investment to GDP⁵⁹
- levels of international connectedness between New Zealand and international businesses.

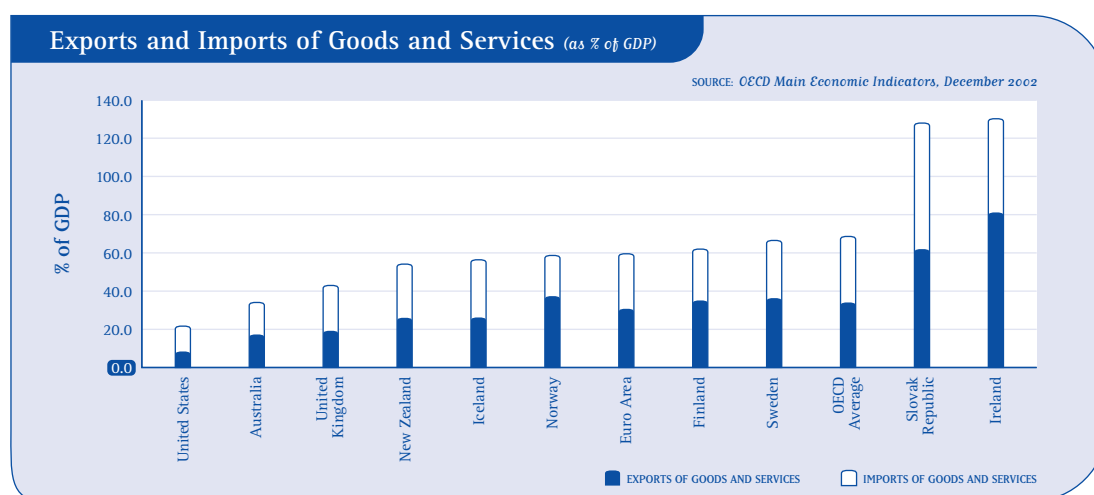
Irrespective of the measure used, New Zealand is generally considered to have an open economy. New Zealand has unilaterally reduced tariffs and removed barriers to inward flows of investment, and has been aggressive in pushing for multilateral trade liberalisation.

However, the combined total of New Zealand's imports and exports as a percentage of GDP is approximately 70 percent, only slightly higher than the OECD average of 66.5 percent.



⁵⁹ FDI is discussed in chapter 7: Changes in Investment.

Measurement issues complicate comparison with other countries. The data for the chart below are from the OECD's Main Economic Indicators. These exclude trade in services and some goods and the cost of insurance and freight.⁶⁰ As a result, New Zealand's performance appears weaker than suggested by the national accounts data in the chart above, which include this cost. New Zealand's ratio of exports to GDP in the OECD comparison is around 26 percent, below the OECD average of around 33 percent. It is also below that for other small countries, such as Finland (35 percent) and Ireland (80 percent).



However, these EU countries, as members of a large common market, face significantly lower barriers to trade than New Zealand. New Zealand faces not only geographic barriers, but also barriers of culture and other countries' trade policies.

High transport costs associated with geographic isolation can reduce levels of international trade by eroding a country's competitive advantage. The 2002 *Firm Level Manufacturing Export Study*, however, found that New Zealand's location was a relatively minor issue in terms of overall company growth and that many companies have developed strategies to overcome the barriers of distance.⁶¹

WHAT DOES THIS MEAN FOR NEW ZEALAND?

During the 1980s, most OECD countries reduced or removed border protection measures, such as import tariffs and quotas. New Zealand reduced or removed almost all import barriers, although some remain for clothing, footwear and textiles.

While many import barriers were lowered across the OECD, barriers to trade in agriculture remain pervasive in most OECD countries. Given that this is an area in which New Zealand has an established comparative advantage, New Zealand has continued to pursue multilateral trade liberalisation that reduces tariffs and subsidies on agriculture.

Although the infrastructure of openness is now well in place, including high levels of access to and use of the internet,⁶² New Zealand's performance in forging global connections is mixed. Available evidence indicates that New Zealand's researchers are well connected

⁶⁰ Goods excluded from this data include monetary gold, direct transit trade, temporary imports and exports, transactions in second-hand ships and aircraft, stores and bunkers for ships and aircraft, goods treated as part of trade in services and goods for repair.

⁶¹ *Firm Level Manufacturing Export Study*, (Infometrics for Ministry of Economic Development, Treasury and Trade New Zealand, 2002).

⁶² See, for example, *The Knowledge Economy*, Information Technology Advisory Group, August 1999.

internationally,⁶³ but New Zealand's businesses also need to take advantage of ways to increase the flows of technology, ideas and tacit knowledge across New Zealand's borders.

EXPORTS OF HIGH AND MEDIUM-HIGH TECHNOLOGY GOODS AND KNOWLEDGE-BASED SERVICES

New Zealand has low levels of exports of high and medium-high tech goods and services

WHY IS IT SIGNIFICANT?

The future competitiveness of firms will be dependent on quality and knowledge, rather than cost alone. Knowledge-based activities have become increasingly sought after, and have led to positive benefits for firm productivity. Producers of high and medium-high tech goods have the potential to build market niches, enabling the goods to 'leap over' tariff and price barriers. However, this may require a critical mass of firms and well-developed domestic and international markets.

This indicator uses the OECD definition of knowledge-based industries (i.e. knowledge-intensive services, high-tech manufacturing, and medium-high tech manufacturing⁶⁴) as a proxy for the level of knowledge-intensive outputs across countries. Therefore, trade specialisation in knowledge-based industries can be measured by the share of exports of high and medium-high tech goods in total goods exported and the share of exports of knowledge-intensive services in total services exported. Analysis of trade specialisation in high and medium-high tech sectors and knowledge-based services allows New Zealand commercialisation of these goods and services internationally to be determined.

HOW DOES NEW ZEALAND PERFORM?

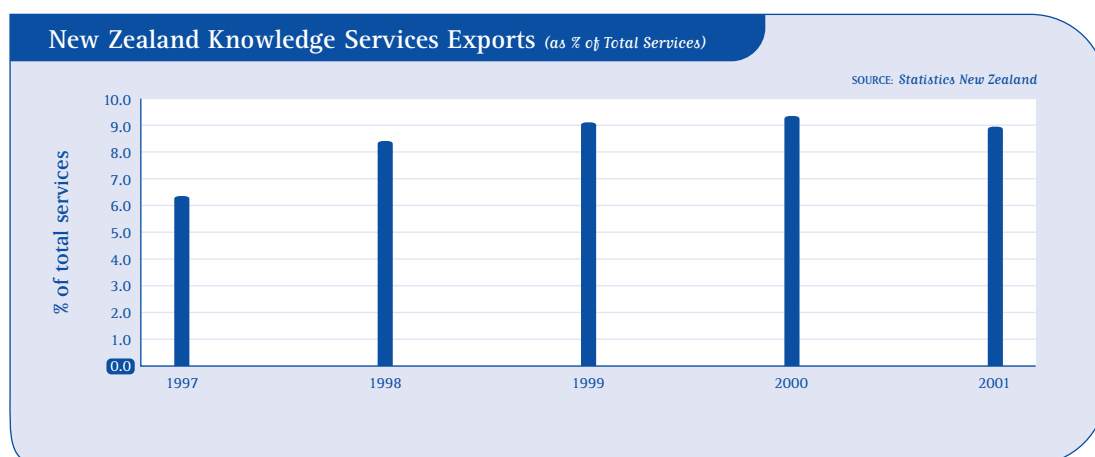
In terms of the share of exports of knowledge-based services,⁶⁵ New Zealand has experienced an upward trend recently, with approximately 8.9 percent of the economy's exports accounted for by knowledge-based services in 2001, compared with about 6.4 percent in 1997. However, New Zealand's performance in this indicator remains well below that of the seven major OECD economies (UK, Canada, France, Japan, Germany, the United States and Italy). The UK is the leader here, with over 50 percent of its exports in the services sector classified as knowledge-intensive in 1998, followed by Japan, Canada and Germany at around 45 percent.⁶⁶

63 See *A Bibliometric Profile of the New Zealand Science System*, Working Paper, Ministry of Research, Science and Technology (1995).

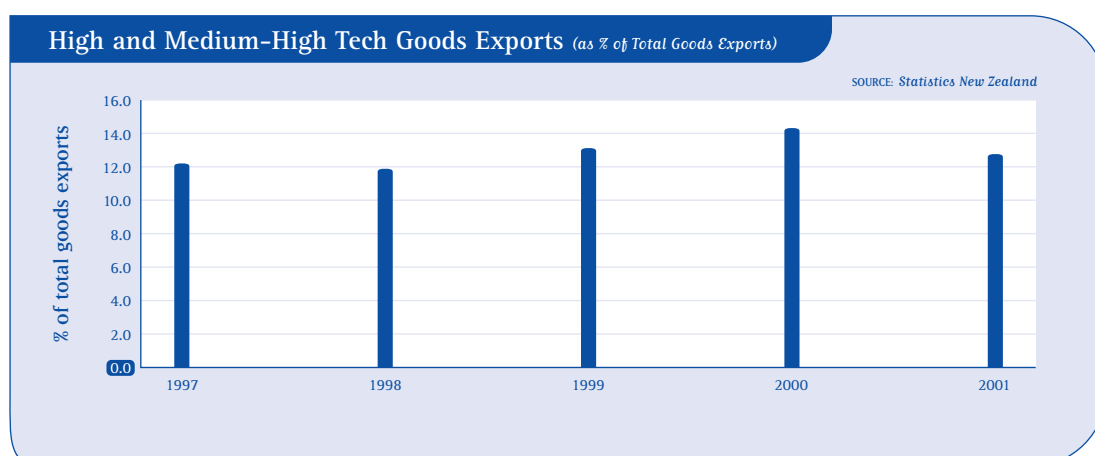
64 For further information on this classification see *OECD Science, Technology and Industry Scoreboard (2001)*, Annex 1. This does not include agriculture – likely to be a medium to high-tech industry in New Zealand, but not in typical OECD countries.

65 Note that New Zealand includes real estate in its definition of knowledge-based services whereas the OECD does not.

66 *UK Competitiveness Indicators: Second Edition (2001)*, pg. 77.

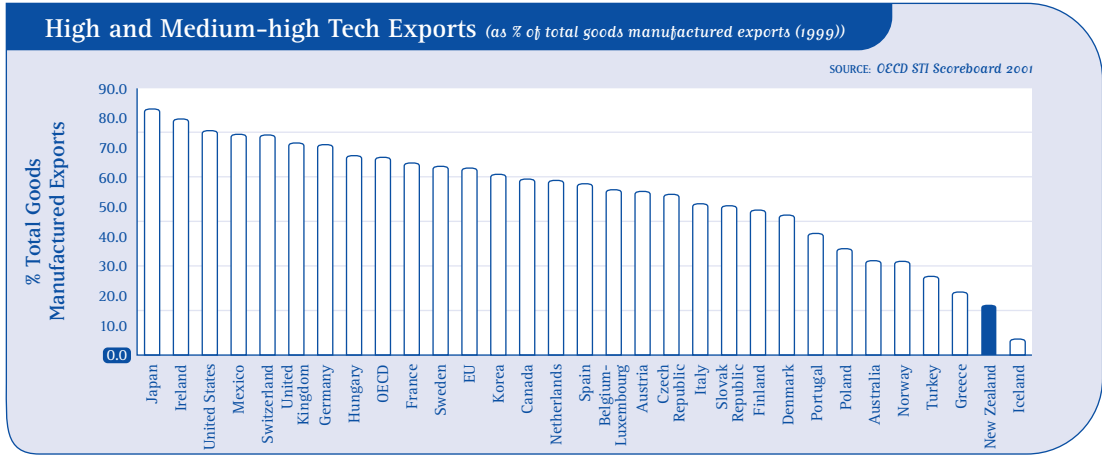


For the share of exports of high and medium-high tech goods in total goods exported, New Zealand's performance has been consistent across the period 1997-2002. In 2001 high and medium-high tech goods represented approximately 12 percent of total goods exports. New Zealand's performance can be compared to the United Kingdom, the United States and France, which have experienced an upward trend in the share of exports of high and medium-high tech goods in total goods exported, reaching between 15 – 20 percent in 1999.⁶⁷



The chart on the next page provides an international comparison of high and medium-high tech manufacturing exports as a percentage of total manufacturing exports for 1999. The average across OECD countries is 53.5 percent. The OECD figures show New Zealand at 16.8 percent, one of the lowest of all countries.

⁶⁷ UK Competitiveness Indicators: Second Edition (2001), pg. 77.



WHAT DOES THIS MEAN FOR NEW ZEALAND?

There is some evidence that New Zealand firms may have difficulty internationalising given their small size and small domestic market, leading to firms having to export more quickly than is usual in other countries.⁶⁸ This may contribute to New Zealand’s poor performance in exports of high and medium-high tech goods, exports of knowledge-based services and exports of manufactures.

However, a more immediate explanation for New Zealand’s poor performance relates to New Zealand’s current lack of comparative advantage in these areas (see the discussion of value added in high-tech manufactures as a share of gross value added). This indicates that the current OECD classification system also underestimates New Zealand’s performance in this area.

HOW NEW ZEALAND’S CITIES RATE AGAINST OTHER CITIES OF THE WORLD
 Auckland and Wellington rank well and are improving their ranking in international surveys

WHY IS IT SIGNIFICANT?

A high quality of life rating for New Zealand cities is an important factor in attracting the skills, talent and capital required for increasing innovation, the development of key industries (such as ICT, biotech and creative industries) and, subsequently, economic growth.

The availability and quality of labour are important determinants of the extent to which innovative practices are undertaken. The fact that labour is a vital component in the growth and innovation equation is very relevant for New Zealand. Compared to many other countries, for example those in the EU, New Zealand’s access to labour markets is limited by geography. New Zealand has to make up for this with cities that offer attractive employment opportunities accompanied by other factors such as environmental cleanliness, health and safety and infrastructure. These all shape the prospective employees’ and investors’ perceptions of New Zealand and its cities.

⁶⁸ See *World Famous in New Zealand – How New Zealand’s Leading Firms Became World Class Competitors*, Colin Campbell-Hunt (2001).

HOW DOES NEW ZEALAND PERFORM?

As the largest population and commercial centre, Auckland's international quality of life directly reflects on New Zealand's overall ranking. The latest Mercer Human Resource Consulting Quality of Life Survey (released in March 2003) ranks Auckland as fifth (equal with Sydney). This is an improvement from sixth place in last year's Mercer survey.⁶⁹ Wellington ranks 15th in the same survey (up from 22nd in the 2002 survey).

With this survey covering 215 cities, having the fifth and 15th ranked cities in the world in terms of quality of life is a major selling point for New Zealand.

New Zealand cities also rank favourably compared to other international cities on a number of international competitiveness measures.

Personal safety

Both Auckland and Wellington ranked 25th equal in terms of personal safety – the same ranking as Perth, but ahead of cities such as Sydney, Melbourne and Glasgow.

Environmental standards

In a Mercer 2002 survey on environmental standards and cleanliness of the world's cities, Wellington ranked seventh and Auckland ninth. The World Conservation Union Well-being Index 2000, which looks specifically at how well countries are adopting the goal of sustainability, ranks New Zealand 14th in the world, ahead of Australia (18th) and the United States (27th).

Infrastructure

Auckland ranks well in terms of lifestyle options, but does not rank well in terms of infrastructure and transport networks (traffic congestion and a smaller number of international airlines connecting with Auckland) compared to other cities.

Richard Florida's⁷⁰ work on 'creative capital' also suggests that it is more than just being offered a well-paid job that attracts creative and innovative people to cities.

The 'creative class' is seen as the key part of any labour market. This is because their skills, attitudes and characteristics are essential for putting innovation into practice. These people are attracted to locate in a particular city for a number of reasons other than remuneration. These include:

- the presence of thick labour markets (where they have a number of employment options available)
- openness and tolerant attitudes
- visible diversity (variety of art/music venues, outdoor recreation, unique social meeting places and architecture).

Creative and innovative people may encourage economic growth through their international networks, as well as by driving innovation.

Wellington has taken steps to attract creative people through its 'Creative Capital' campaign. Auckland (and other New Zealand cities) may be able to do more in terms of promoting themselves to this creative core of the labour market, given that Auckland already ranks highly in terms of some of the 'quality of life' factors sought by the creative class.

69 Mercer's study is based on evaluations for 39 key quality of life determinants under the following categories – political and social environment, economic environment, socio-cultural environment, medical and health considerations, schools and education, public services and transportation, recreation, consumer goods, housing and natural environment.

70 See *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community, and Everyday Life*, Richard Florida (2002).

WHAT DOES THIS MEAN FOR NEW ZEALAND?

While New Zealand cities, particularly Auckland, rank well, higher ranked cities highlight several implications for New Zealand from the current rankings.

London was ranked the best city in the world to locate a business by the *European Cities Monitor 2002*. It has a number of factors contributing to its number one spot including:

- the availability of qualified staff
- transport links
- easy access to markets, customers and clients
- a favourable climate for doing business, created by the government

New Zealand cities will never be able to compete with London, particularly in terms of access to markets.

The London factors do suggest, however, that Auckland in particular may need to improve the quality of its transport and telecommunications infrastructure and make optimum use of information and communications technology (ICT) to make access to customers and clients as easy as possible.

The labour market in New Zealand cities is also distinctive, particularly in relation to participation rates and ethnic diversity. For example, Auckland has higher than average labour force participation and fairly low unemployment (five percent at September 2002).

Auckland's labour force, in line with the entire New Zealand labour force, is getting older and more ethnically diverse. However, the Māori and Pacific peoples component of Auckland's labour force will increase in size and become relatively younger by comparison with the Pakeha component. Auckland's Māori/Pacific labour force largely work in semi-skilled occupations and generally have lower levels of education than Auckland's Pakeha population. The predicted increased dependency on this segment of the labour market suggests that better skilled and educated Māori and Pacific peoples will be needed if the city is to achieve its innovation and growth aims.

The government's recently released Sustainable Development Programme of Action has made sustainable cities a priority. The Programme of Action recognises that, as 85 percent of New Zealanders live in towns and cities, they are a strong base for economic growth. One of the desired outcomes from the Programme of Action is 'cities as centres of innovation and economic growth'. The programme of action to achieve that outcome includes a number of steps that could improve Auckland's ranking in comparison with other cities including:

- central government working with local authorities to improve legislative and statutory controls on planning, development and service delivery (giving priority to Auckland and focussing particularly on transport infrastructure and services)
- improved settlement outcomes for migrants
- cultural development in cities, including cultural industries and employment.

Performance of the Focal Sectors: Biotechnology, ICT and the Creative Industries

- In addition to its existing efforts in major sectors such as agriculture, forestry, fishing and tourism, through the growth and innovation framework government is focusing its efforts and engagement with the private sector in three sectors:
 - Biotechnology
 - information and communications technology (ICT)
 - the creative industries.
- Several themes are apparent from the sector-related indicators:
 - *The sectors have impacts across the economy*, not just in their specific areas. This, in part, explains the difficulty of obtaining data for these sectors. There are strong parallels with the tourism sector, for which a 'satellite' account has been established within the national accounts.
 - *Export growth* has been very strong in ICT and the creative industries. The export performance of biotechnology is more difficult to assess.
 - *The estimated size of the sectors varies* between biotech (contributing less than one percent of GDP currently) through the creative industries (around three percent of GDP) to ICT which is estimated to be 4.3 percent of GDP.
- This picture is not complete. Further work is required to ensure the availability of data to measure progress and the impact of these sectors on the economy as a whole.

BIOTECHNOLOGY

WHY IS IT SIGNIFICANT?

The term biotechnology broadly refers to a range of technologies that involve processing biological materials or processing material by biological processes. A distinction is made between 'traditional' biotechnology processes such as fermentation used in the preparation of beer and bread and 'modern' biotechnology, such as the development of vaccines or bio-informatics (the electronic management of biological data such as gene sequencing).

Biotechnology has the potential both to be a large industry in its own right (such as through pharmaceutical developments) and to improve productivity and add value to products in other sectors of the economy, particularly agriculture, forestry, horticulture and other food and beverage production.

HOW DOES NEW ZEALAND PERFORM?

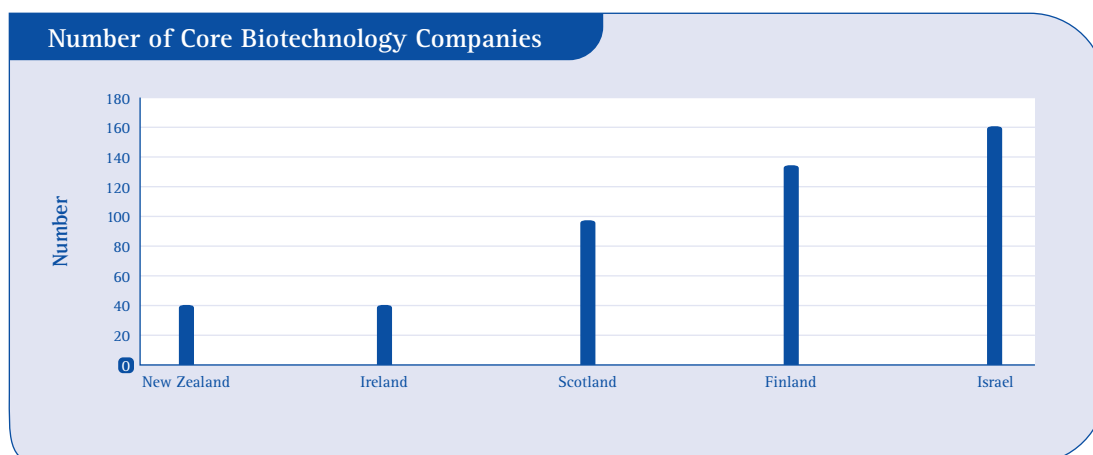
Statistics on biotechnology have not been routinely collected in New Zealand. This is largely because biotechnology has been seen as a process applying across a range of sectors, rather than an industry. Nevertheless a (Modern) Biotechnology Survey was conducted by Statistics New Zealand for 1998/99 as a benchmarking survey. The statistics used in this section are drawn from that survey and from the work of the Biotechnology Taskforce.

Based on the 1998/99 Biotechnology Survey:

- 180 enterprises were involved in modern biotechnology in 1998/99
- the industry generated income of \$475 million
- 2,700 people were employed in the industry
- 67 percent of biotechnology employees held a graduate or post-graduate degree
- 56 patents were granted to biotechnology enterprises in 1998/99.

Based on a separate survey undertaken by Biotenz, the Biotechnology Taskforce estimates that there were \$250 million worth of biotechnology exports in 2000.

The Biotechnology Taskforce also identified 40 'core' biotechnology companies and 350 companies in the biotechnology 'community' (i.e. including legal advisers and patent attorneys). This number is reasonably low when compared to other countries of a similar size, as demonstrated in the following chart.



New Zealand's comparatively low numbers of biotechnology companies is consistent with low levels of R&D, particularly private sector R&D.

WHAT DOES THIS MEAN FOR NEW ZEALAND?

In order for biotechnology to facilitate growth in other sectors of the economy, the biotechnology industry itself needs to grow. Biotechnology presents exciting opportunities to New Zealand to build on and add value to areas in which it already has an established comparative advantage. The Biotechnology Taskforce has been considering opportunities for and impediments to growing the biotechnology sector and has set objectives for its growth. These are identified in the Taskforce's recently released report.⁷¹

INFORMATION AND COMMUNICATIONS TECHNOLOGY

WHY IS IT SIGNIFICANT?

New information and communications technologies have had an immense impact on the economies of all countries over the last quarter century. They have led to efficiencies in existing business practices and the creation of entirely new areas of business. In addition to changing the way most business is done, the information and communications technology (ICT) sector has grown into a substantial sector in its own right. Therefore, the ICT sector can contribute to economic growth directly, and provide opportunities for efficiencies and opportunities in other parts of the economy. Indeed, some analyses of productivity suggest that ICT use has been a key productivity driver in the United States and Australia.⁷²

The use of the term ICT is relatively new, with the ICT sector being an agglomeration of the communications sector (dominated in New Zealand by telecommunications providers such as Telecom and TelstraClear) and the information technology (IT) sector (which ranges from small software development firms to massive multinational hardware and software producers).

HOW DOES NEW ZEALAND PERFORM?

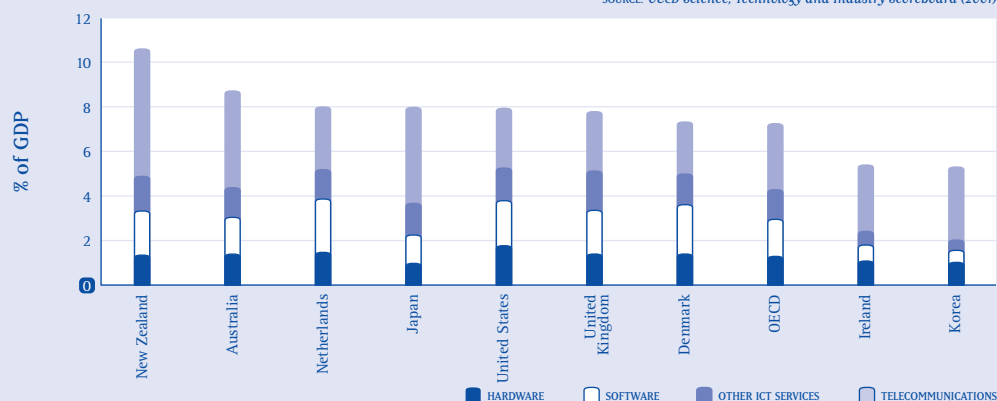
OECD figures suggest New Zealand ICT use is very high, while exports of ICT products are low but growing steadily. The following table shows ICT intensity in selected countries (including the OECD average). The data uses ICT expenditures as a percentage of GDP divided into different areas of expenditure. New Zealand has the highest figure in the OECD at 10.6 percent of GDP, with figures high in all areas, particularly telecommunications.

⁷¹ The Taskforce reports can be obtained from www.industry.govt.nz

⁷² See *Information Technology and Australia's Productivity Surge*, Productivity Commission Staff Research Paper, Parham, D., Roberts, P. and Sun, H. (2001).

ICT Expenditures (as a Percentage of GDP (1999))

SOURCE: OECD Science, Technology and Industry Scoreboard (2001)



The following OECD tables show that, in contrast to New Zealand's high use of ICT, New Zealand's exports of ICT are low on both an absolute and comparative basis. Exports of ICT equipment do show a high level of growth, but from a low starting point.⁷³

■ EXPORTS OF ICT EQUIPMENT, 1990–2000 (\$US MILLION)⁷⁴

	1990	1995	2000	Annual Average % Growth
Australia	605	1624	1389	8.7
Ireland	5,115	11,095	24,833	17.1
New Zealand	28	92	122	15.5
Norway	540	759	833	4.4

■ EXPORTS OF ICT SERVICES, 2000 (\$US MILLION)⁷⁵

	Communication Services	Computer and Information Services	Total ICT Services Exports
Australia	819	421	1240
Ireland	328	5,479	5,807
Japan	821	1,569	2,390
Korea	387	11	398
Netherlands	1,426	1,152	2,578
New Zealand	181	79	260
United Kingdom	2,505	3,684	6,189
United States	4,090	4,900	8,990

⁷³ Readers should note that these statistics are gathered differently and are not directly comparable with the export statistics produced by Statistics New Zealand and outlined in the chart that follows the tables.

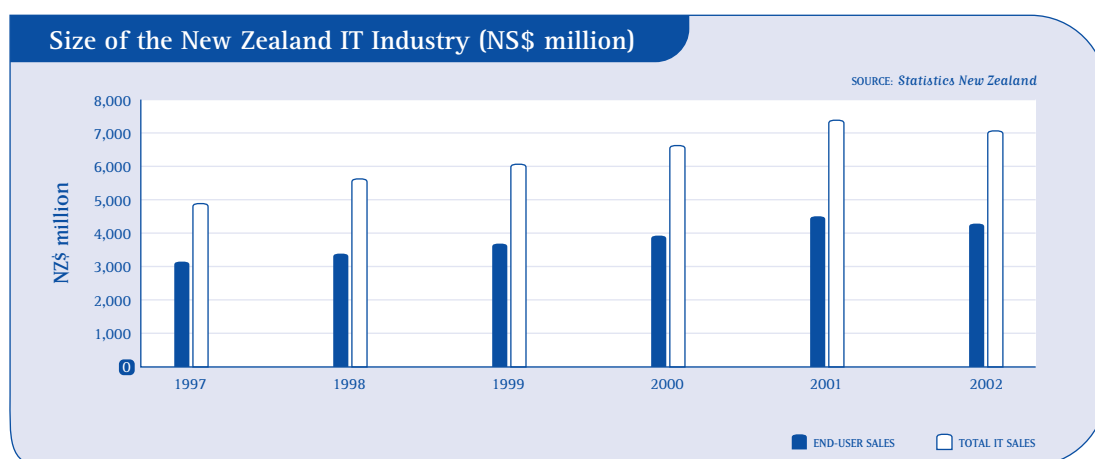
⁷⁴ From *OECD Information Technology Outlook: ICTs and the Information Economy*, OECD (2002)

⁷⁵ From *OECD Information Technology Outlook: ICTs and the Information Economy*, OECD (2002)

The figures currently available (which relate primarily to the IT sector rather than the ICT sector and include communications hardware but not communication services) show that the New Zealand ICT sector makes up approximately 4.3 percent of GDP. In the last few years the sector has grown steadily at a rate in excess of the economy as a whole. Export income from the ICT sector in 2002 was almost NZ\$1 billion. The following chart shows exports of ICT hardware, software and services (excluding communications services) according to Statistics New Zealand's annual *Information Technology Report*.



The following chart shows the size of the New Zealand IT industry (in millions of dollars, excluding telecommunications) since 1997. The 'Total IT Sales' figures, which include an unknown amount of double counting of retail and wholesale sales, showed growth of between three percent and 15 percent between 1997 and 2001. In 2002 there was a fall of four percent. The figures for 'End-User Sales', which exclude export sales and other categories to avoid double counting, showed growth of between four percent and nine percent between 1997 and 2001. In 2002 there was a fall of five percent.



WHAT DOES THIS MEAN FOR NEW ZEALAND?

The ICT sector has the characteristic of being able to grow at a very high rate. This is clear from the experience of high ICT sector growth in countries such as Ireland and India. It is a sector that is built largely on intellectual property, particularly on the software side. This means that many ICT businesses can be located anywhere there is a supply of appropriately trained staff. As a result, ensuring that the market of appropriately trained staff is responsive enough to meet the demand of the ICT sector is likely to be the most important prerequisite for future growth.

CREATIVE INDUSTRIES

WHY ARE THEY SIGNIFICANT?

The core creative industries sector has been defined as 10 industries including advertising, software and computing services, publishing, television and radio, film and video, architecture, design, designer fashion, music and performing arts and visual arts.

Like ICT and biotechnology, some industries within the creative industries sector have the potential to add value to a range of other industries. For example, the design industry can add value to manufacturing industries, such as whiteware and furniture, helping producers find market niches and making their products more competitive internationally. Many of the creative industries, such as film and fashion, also have the potential for significant export growth in their own right.

The creative industries are also important for branding New Zealand. They have the potential to present New Zealand as an innovative and vibrant country, helping to attract investment, open up new market opportunities, and attract and retain talented people.

HOW DOES NEW ZEALAND PERFORM?

Industry Growth and Contribution to GDP

The creative industries sector grew faster than the economy as a whole between 1997 and 2001. The creative industries are estimated to have contributed around 3.1 percent to New Zealand's total GDP in the year ended 31 March 2001, compared with 2.6 percent in the year ended March 1997 (see the table below).

The contribution to GDP compares with Australia (3.3 percent) and the United Kingdom (five percent).⁷⁶

Export Growth

Creative industry exports grew rapidly (435 percent) between 1997 and 2001. This compares with total export growth in the services sector of 16 percent.

Productivity

Productivity (GDP per employee (FTE)) is low compared with the national average but highly variable across the sector.⁷⁷ For example, in 2000/01 GDP/FTE for creative industries overall was \$71,821 but varied from \$31,300 for music and performing arts to \$100,000 for advertising. The national average across all sectors for 2000/01 was \$81,227.

Value Added within the Sector

The largest sectors in the creative industries in 2000/01 by value-added contribution were software and computer services (47 percent), publishing (15 percent), TV and radio (11.5 percent), film and video (seven percent) and architecture (six percent).

⁷⁶ There are considerable differences in the way creative industries are measured internationally. Care must be taken when making cross-country comparisons, particularly with the United Kingdom.

⁷⁷ GDP per hour worked (used in the labour productivity section) is the preferred method of measuring labour productivity. However GDP per FTE is an acceptable alternative when hourly information isn't available.

■ ECONOMIC CONTRIBUTION OF CREATIVE INDUSTRIES

31 March	1996/97	1997/98	1998/99	1999/00	2000/01
GDP/FTE (\$) ⁷⁸	64,374	67,065	72,364	71,412	71,821
Share of total GDP (%) ⁷⁹	2.6	2.8	3.1	3.2	3.1
Exports (\$m) ⁸⁰	195	288	507	654	850

WHAT DOES THIS MEAN FOR NEW ZEALAND?

While there is some, albeit limited, information on the creative industries sector, we have no information on the uptake of creative industries by other industries or the value that they add to the products of other industries.

The opportunities for growing two of the creative industries, design and screen production, and their contribution to other sectors of the economy, have been considered by two industry taskforces.⁸¹

⁷⁸ Refers to GDP per full time equivalents in employment. Source: *Creative Industries in New Zealand, Economic Contribution*, Report to Industry New Zealand, March 2002, NZIER. It is important to note the caveats around the accuracy of this data because of the poor statistical database on which the information is based. Data collected has been based on ANZSIC codes.

⁷⁹ Source: *Creative Industries in New Zealand, Economic Contribution*, Report to Industry New Zealand, March 2002, NZIER. Note caveats around the accuracy of this data because of the poor statistical database on which the information is based. Data collected has been based on ANZSIC codes.

⁸⁰ Sources: Statistics New Zealand: *Quarterly Exports of Services Survey*. Includes computer and information; royalties and licence fees; advertising, market research and public opinion polling; architectural engineering and other technical services; and personal, cultural and recreational.

⁸¹ The Taskforces' reports are available at www.industry.govt.nz.

