Research and development in New Zealand: 2016
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Purpose and background

Purpose
Research and development in New Zealand: 2016 presents an overview of key sections of interest within research and development (R&D) carried out in New Zealand. R&D plays a critical role in innovation. It is essentially an investment in technology and future capabilities that results in new products, processes, and services.

Information in this report is based on data from the R&D Survey with a focus on 2014 and 2016 data. This survey is conducted by Stats NZ and funded by the Ministry of Business, Innovation and Employment (MBIE).

This report focuses on the 29 percent increase in business expenditure on research and development (BERD) from 2014 to 2016. BERD was $1,602 million in 2016, up $356 million from $1,246 million in 2014. This is the largest value increase in BERD observed in the R&D survey time series.

The 2016 R&D Survey collected information on employment and expenditure by private sector enterprises, government departments, government-owned trading entities, and universities that undertake R&D.

See Research and Development Survey: 2016 for the first release of data from the 2016 survey.

Background
R&D is important for economic growth and sustaining a dynamic economy.

R&D is creative work that:
- is carried out systematically with the goal of increasing knowledge
- is original
- has investigation as its primary objective.

Statistics from the survey, which is run every two years, measure New Zealand’s R&D activity. These statistics also provide a basis for benchmarking this performance against other countries.

Businesses may undertake R&D in-house or fund other businesses to undertake R&D. Similarly, an industry sector may undertake or fund R&D that benefits and occurs in another sector. For example, the government can provide R&D grants to the business sector.

The recently revised Frascati Manual 2015 serves as a key guide for the R&D survey.

Reference period and frequency
The most-recent survey relates to the 2015/16 financial year. Those with balance dates falling between 1 October and 31 December supplied financial data for the year ending 2015. Businesses with balance dates falling between 1 January and 30 September supplied data for the year ending 2016.

This report (and release) has been published every two years since 2002.
Data quality
Stats NZ have collaborated with MBIE and Callaghan Innovation (CI) on the focus of this report, to investigate breakdowns of the 2016 BERD figure.

The survey is designed to produce estimates at the one and two digit ANZSIC level, for example manufacturing as a total, with food manufacturing as a subtotal. Any lower level breakdowns of these estimates (eg source of funds broken down by business size) will have higher sampling error and should be treated with care.

Sampling error
The sampling error of the total BERD figure for 2016 ($1,602 million) was 5.1 percent at the 95 percent confidence level. This estimate is within plus or minus 5.1 percent ($82 million) of the $1,602 million, with 95 percent confidence.

Response rates
The target response rate for the 2016 R&D survey was 85 percent, with an achieved response rate of 77 percent. The target was not met due to the November 2016 earthquake. The response rate for the 2014 R&D survey was 87 percent.

For further information on the 2016 response rate, please see Research and Development Survey 2016: Data Collection Methodology.

Sampling rates
The overall sampling rate for the 2016 R&D survey was 93 percent, with 3,969 units sampled from a population of 4,268 units. The sampling rate for the business sector for 2016 was also 93 percent.

For further information on the sampling method of the R&D survey, please see Appendix 1: Population definition and sampling method of the R&D survey.

Rounding
Business counts are randomly rounded to a base of three. This means that if the estimated number of businesses in a category is 50, the published number will be either 48 or 51 businesses, as those numbers are divisible by three. This rounding ensures that individual businesses are not identifiable from published data.

Due to random rounding to base three, business counts that are published as between zero and six inclusive should be treated with caution. For example, a count of one business will be published as either zero or three businesses.
Summary

Largest increase in business expenditure on research and development driven by 500 and over RME count businesses

The $356 million increase in business expenditure on research and development (BERD) from 2014 to 2016 is the largest value increase in the R&D survey time series. This increase was driven by businesses with a rolling mean employee (RME) count of 500 and over, who contributed 50 percent of the $356 million increase.

There were 45 businesses with an RME of 500 and over who contributed to BERD in 2016, 30 of which were existing contributors. This means that they contributed to BERD in both 2014 and 2016. This group of businesses increased their BERD contribution by 121 percent from 2014 to 2016.

Existing contributors with RME of 500 and over account for 24 percent of 2016 BERD

Existing contributors to BERD are businesses that contributed to the BERD figure in both 2014 and 2016. Businesses that were existing contributors with an RME count of 500 and over accounted for 24 percent ($384 million) of the 2016 BERD figure. This was an increase of $210 million from 2014. This group accounted for only 14 percent of the 2014 BERD figure.

Manufacturing continues to be the main purpose of R&D for businesses in 2016

The main purpose of R&D was manufacturing, making up 30 percent of BERD in 2016 compared with 28 percent in 2014. The manufacturing sector was the main contributor of R&D for the purpose of manufacturing in both years, spending $407 million on manufacturing R&D in 2016 compared with $265 million in 2014.

Overseas source of R&D funds mainly from organisation in same group

In 2016, $168 million of R&D funds came from overseas, compared with $144 million in 2014 – a 17 percent increase. Seventy percent of the $168 million from overseas ($117 million) was from organisations within the same group as the business receiving the funds. This includes organisations like parent companies or subsidiaries.

Businesses with an RME count of 10 to 49 had the highest number of businesses receiving funds from all overseas sources.
Increase in BERD

In 2016, businesses spent a total of $1,602 million on R&D, up $356 million (29 percent) from $1,246 million in 2014. We looked at the factors behind this increase, including:

- the size of the business performing R&D
- whether or not the business reported R&D in the 2014 R&D survey
- the purpose of R&D
- the source of a business’s R&D funds.

Business size

The largest increase in BERD came from businesses with an RME value of 500 and over ($178 million increase from 2014 to 2016). This accounted for 50 percent of the $356 million increase in BERD from 2014 to 2016.

While BERD has increased $356 million from 2014 to 2016, the number of businesses contributing to that figure have decreased by 102 businesses. This decrease is driven by businesses that have an RME count of less than 10.

A businesses size is determined by its RME count. RME is a 12-month rolling average of the monthly employment count figure. The employment count of a business is obtained from taxation data.

Examples of businesses with an RME count of zero are holding companies, property owning companies, self-employed people with no employed staff, people in professional and management services, or trusts.
Figure 1

Business expenditure on research and development
By rolling mean employee count, 2006–16

<table>
<thead>
<tr>
<th>Year</th>
<th>500+</th>
<th>250 to 499</th>
<th>50 to 249</th>
<th>10 to 49</th>
<th>1 to 9</th>
<th>Zero</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>2012</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>2014</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Due to rounding, figures may not add to stated totals. Figures exclude GST.

Existing BERD contributors vs new entrants and leavers

Existing contributors to BERD are businesses that contributed to the BERD figure in both 2014 and 2016. New entrants are businesses who did not contribute to BERD in 2014 but did contribute in 2016. Leavers are businesses that contributed in 2014 but did not contribute in 2016.

To be defined as contributing to BERD, the business must have reported greater than zero expenditure on R&D. Businesses that were surveyed in both 2014 and 2016 but only reported R&D expenditure in one of these years are leavers or new entrants, depending on the year.

Expenditure reported by existing contributors increased in all RME groups of 10 and above. The 500 and over group more than doubled its BERD from 2014 to 2016, increasing from $174 million to $384 million.

In 2014, existing contributors accounted for 50 percent of the number of businesses contributing to BERD and 77 percent of the total BERD figure. These percentages remained similar in 2016, at 56 percent and 79 percent respectively. This suggests that there is a core group of key contributors that sustain their R&D activity over at least the two-year period.
Purpose of R&D

In the R&D survey, respondents are asked about the purpose of their R&D. The purpose is the area that will ultimately benefit from the results of R&D carried out by this business, and is linked closely with the Socioeconomic Objective Classification. We looked at the purpose of R&D by business sector and RME count. The business sector refers to the sector that carried out the R&D. See Appendix 3: Business sector breakdowns for definitions of the different business sectors.

Manufacturing was still the main purpose of R&D for businesses in 2016, making up 30 percent of BERD in 2016 compared with 28 percent in 2014. The manufacturing sector was the main contributor of R&D for the purpose of manufacturing in both years, spending $407 million on manufacturing R&D in 2016 compared with $265 million in 2014.

Businesses with an RME count of 250 and above increased their R&D expenditure for the purpose of manufacturing to $304 million in 2016, from $148 million in 2014, a 105 percent increase.

Businesses with an RME count of less than 250 decreased their R&D expenditure for the purpose of manufacturing by 15 percent, spending $174 million in 2016 compared with $205 million in 2014.

Businesses reported $112 million in R&D expenditure for the purpose of commercial services and tourism in 2016, compared with $35 million in 2014. The commercial services and tourism category accounts for 7 percent of the total 2016 BERD figure but had the largest percentage increase (220 percent) of all the purpose categories.
Source of funds

In the R&D survey, businesses are asked where they receive their R&D funds from. The possible categories are from New Zealand businesses (either from their own business or another New Zealand business), New Zealand government, overseas, tertiary, or other sources.

In 2016, businesses with a RME count of 50 to 249 received the largest amount of overseas funding – $103 million out of the total $168 million. In the 2016 R&D survey, the source of overseas funds was split out into separate questions for the first time. This shows $71 million (69 percent) of this $103 million is from overseas organisations in the same group as the receiving business. This includes parent companies, fellow enterprises, subsidiaries, or branches.

Table 1

<table>
<thead>
<tr>
<th>RME count</th>
<th>Organisation in the same group (2)</th>
<th>Overseas government and other</th>
<th>Total overseas funds $(million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>1</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>1–9</td>
<td>11</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>10–49</td>
<td>29</td>
<td>13</td>
<td>42</td>
</tr>
<tr>
<td>50–249</td>
<td>71</td>
<td>32</td>
<td>103</td>
</tr>
<tr>
<td>250–499</td>
<td>C</td>
<td>0</td>
<td>C</td>
</tr>
<tr>
<td>500+</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Total</td>
<td>117</td>
<td>51</td>
<td>168</td>
</tr>
</tbody>
</table>

1. Figures exclude GST.
2. Includes ultimate parent companies, immediate parent, fellow enterprise, subsidiary, or branch.
C confidential

Source: Stats NZ

Businesses in the 10 to 49 RME count group had the largest number of businesses receiving funds from overseas, accounting for 42 of the total 111 businesses.
Appendix 1: Population definition and sampling method of the R&D survey

Businesses are part of the R&D population if they meet any of the following criteria:

- have applied for a grant from the Ministry of Business, Innovation, and Employment
- are on the Intellectual Property Office of New Zealand list
- ticked ‘yes’ to R&D activity in the previous year’s Business Operations Survey
- have been in the past two years of the R&D survey
- have indicated that they are involved in R&D when answering the Business Register Update Survey.

If a business falls under the following ANZSIC codes, they are automatically excluded from the R&D population due to negligible R&D activity:

- G – Retail trade
- H – Accommodation and food services
- I – Transport, postal and warehousing
- P – Education and training (with the exception of universities).

Businesses that have the ANZSIC code M6910 (Scientific research) are reclassified according to their field of research. This is so that R&D activity is reported in the area that benefits from the activity. An example of this would be if an M6910 business was conducting dairy farming research, they would be reclassified under the agriculture ANZSIC code for the R&D survey.

When the R&D population list has been established, the population is stratified by industry (determined by ANZSIC code) and size. This ensures that the R&D survey has sufficient coverage to produce quality estimates.

Once stratified, the sample is randomly selected from the population list. The R&D survey has a relatively high sampling rate, with the 2016 overall sampling rate being 93 percent.
Appendix 2: Tables of total New Zealand businesses

The following tables use data from business demography statistics. Business demography statistics give an annual snapshot (as at February) of the structure and characteristics of New Zealand businesses.

Up to 2015, the business demography series was based on Stats NZ’s Longitudinal Business Frame (LBF). From 2016, the business demography series is based on Stats NZ’s Business Register (BR).

Business demography statistics are limited to economically significant individual, private-sector and public-sector enterprises that are engaged in the production of goods and services in New Zealand. These enterprises are maintained on the Stats NZ Business Register, which generally includes all employing units and those enterprises with GST turnover greater than $30,000 per year.

Appendix 2, table 1

<table>
<thead>
<tr>
<th>Total New Zealand businesses</th>
<th>By rolling mean employee count</th>
<th>2010–16</th>
</tr>
</thead>
<tbody>
<tr>
<td>RME count</td>
<td>Count of businesses</td>
<td></td>
</tr>
<tr>
<td>Zero</td>
<td>321,993</td>
<td>322,008</td>
</tr>
<tr>
<td>1–9</td>
<td>125,337</td>
<td>124,230</td>
</tr>
<tr>
<td>10–49</td>
<td>23,196</td>
<td>23,322</td>
</tr>
<tr>
<td>50–249</td>
<td>3,603</td>
<td>3,690</td>
</tr>
<tr>
<td>250–499</td>
<td>372</td>
<td>336</td>
</tr>
<tr>
<td>500+</td>
<td>330</td>
<td>336</td>
</tr>
<tr>
<td>Total</td>
<td>474,828</td>
<td>473,919</td>
</tr>
</tbody>
</table>

Note: Due to rounding, figures may not add to stated totals.
Source: Stats NZ

Appendix 2, table 2

<table>
<thead>
<tr>
<th>Total New Zealand businesses</th>
<th>By business sector</th>
<th>2010–16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector</td>
<td>Count of businesses</td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>73,221</td>
<td>71,355</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>21,396</td>
<td>20,751</td>
</tr>
<tr>
<td>Services</td>
<td>380,214</td>
<td>381,819</td>
</tr>
<tr>
<td>Total</td>
<td>474,828</td>
<td>473,919</td>
</tr>
</tbody>
</table>

Note: Due to rounding, figures may not add to stated totals.
Source: Stats NZ
Appendix 3: Business sector breakdowns

The three business sectors referred to in this report are primary, manufacturing, and services. Each of these sectors are defined by what industries are included in them. We apply the industry breakdowns using the Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC06).

The ANZSIC codes in the primary sector are:
- A – Agriculture, forestry and fishing
- B – Mining

The ANZSIC code in the manufacturing sector is:
- C – Manufacturing

The ANZSIC codes in the services sector are:
- D – Electricity, gas, water, and waste services
- E – Construction
- F – Wholesale trade
- G – Retail trade
- H – Accommodation and food services
- I – Transport, postal and warehousing
- J – Information media and telecommunications
- K – Financial and insurance services
- L – Rental, hiring and real estate services
- M – Professional, scientific and technical services
- N – Administrative and support services
- O – Public administration and safety
- P – Education and training
- Q – Health care and social assistance
- R – Arts and recreation services
- S – Other services

Retail trade; accommodation and food services; transport, postal and warehousing; and education and training are excluded from the R&D survey population, but are included in Appendix 2: Tables of total New Zealand businesses.