



Research and Development Survey

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Research and Development Survey

Abstract

The Research and Development Survey is run by Stats NZ jointly with the Ministry of Business, Innovation and Employment (MBIE). This survey measures the level of research and development activity, employment and expenditure for the business, government and higher education (university) sectors in New Zealand. It is a biennial survey, posted in August to approximately 3500 respondents. The survey has been run since 1989, with a number of changes in methodology over that time.

Purpose

The Research and Development Survey was designed to collect data as defined by the Frascati Manual (2002). The definition had been reviewed in 2016 by using the latest version of the Frascati Manual (2015). Research and development comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge. Any activity classified as research and development is characterised by originality. Investigation is a primary objective. Research differs from studies, in that studies involve collecting, processing and analysing data but are usually not characterised by novelty and innovation. The purpose of this survey is to collect data which will be used to produce summarised statistics of research and development activities for release to government, business and other users in the community. The statistics will be used in the development of science policy areas. This survey is partly sponsored by the Ministry of Business, Innovation and Employment (MBIE).

Research and Development Survey Series

Methodology

General information

Survey background

The Research and Development Survey (R&D Survey) was jointly developed by Stats NZ and the Ministry of Business, Innovation, and Employment (MBIE).

The R&D Survey measures the level of R&D activity, employment, and expenditure by businesses, government departments, government-owned trading entities, and higher education (universities). The R&D Survey is conducted every two years by Stats NZ.

Data collection

The R&D Survey is a postal survey consisting of four questionnaires: a business questionnaire, a government questionnaire, a CRI questionnaire, and a higher education (universities) questionnaire. These questionnaires are specifically designed to capture data on R&D from these different organisation types.

Information collected included:

- the number of personnel within an enterprise working on R&D
- current and capital expenditure on R&D
- expenditure by type of R&D
- source of funds for R&D carried out
- the area of application of the R&D.

We requested information for the last financial year within the 12 months ending 30 September.

Target population

The target population is all economically significant enterprises we have pre-identified as performing or funding R&D activities in New Zealand.

A range of information sources are available that allow us to identify R&D performers. These, combined with the last few iterations of this survey, have allowed us to build a consistent picture of the types of firms carrying out R&D in New Zealand. These changes were first made to the survey in 2012 and have allowed us to more intensively survey these businesses and create a better picture of individual R&D performers and their characteristics.

Enterprises (business, government, and CRI) are included in the R&D Survey population if they:

- are economically significant and active on the Stats NZ Business Register
- are not classified to ANZSIC06 codes 'G', 'H', 'I', or 'P'
- are a university
- fulfil one or more of the following indicators of R&D activity:
- enterprises indicating they undertook R&D in the Annual Frame Update Survey

- enterprises applying for funding from the Ministry of Business, Innovation and Employment (and its predecessor agencies)
 - enterprises applying for patents in the last two years
 - enterprises recording R&D activity in the last BOS or the previous two R&D surveys (only from full coverage strata)
- Excluding ANZSIC division codes 'H' (accommodation and food services), 'G' (retail trade), and 'I' (transport, postal and warehousing) is due to the previous equivalents of these industries showing little or no contribution to the total reported expenditure on R&D in the 2002 survey. We considered such contributions too small to justify their inclusion in the survey population so the equivalent industries have been excluded since the R&D Survey: 2004. ANZSIC division 'P' (education and training) is excluded, with the exception of universities, who perform the vast majority of R&D in this industry.

We also sent the higher education (universities) questionnaire in August. Data was collected for the year ended 31 December. The higher education (universities) questionnaire was designed to allow universities to use financial information that is generally produced for annual reporting purposes. This means that a number of data items for universities' R&D were produced using modelled information. Universities New Zealand – Te Pūkai Tara assisted us to determine these modelling specifications. Information collected included university discretionary income, internal and external research funding, academic staff salaries, university operating expenditure by faculty, and R&D personnel data.

Measurement errors

The R&D Survey results are subject to measurement errors. Customers need to consider these when analysing the results from the survey.

Measurement errors include mistakes by respondents when completing the questionnaire, variation in respondents' interpretation of the questions asked, and errors made during data processing. In addition, the survey applies imputation methodologies to cope with non-respondents and item non-response (see Imputation methodology for more detail). These methods are not without error.

We adopt procedures to minimise these types of errors, but they may still occur and are not quantifiable.

Given the nature of the data collected, there are limitations on the level of accuracy that can be expected from the R&D Survey. Many respondents do not keep a separate account of their R&D expenditure, or they may include R&D with other scientific and technological services, such as consulting.

Analysis of results

We compare the R&D Survey results with annual reports and other indicators we publish. Where the survey results differ substantially, more detailed study of the data is made.

Imputation methodology

This section outlines the imputation methodology we use in the R&D Survey (business, government, and CRIs). No unit non-response was required for the R&D higher education (universities) survey, as a 100 percent response rate was achieved.

Unit non-response

Unit (or complete) non-response occurs where units in the population do not return the questionnaire, or an invalid questionnaire is received. We use a weight adjustment method to rate up the responding firms to compensate for the non-responding firms within the same estimation cell. The data from responding firms are multiplied by the inverse of the response rate for the estimation cell.

We remove any enterprises that cease operation during the survey period from the weight calculations.

Item non-response

Item (or partial) non-response is where units return the questionnaire but fail to provide data for selected aggregates.

We apply item non-response imputation to breakdowns where a total can be sourced from another question and personnel questions where data is not provided. The item non-response imputation method then uses the mean proportion of all responding linked units (excluding outliers) within the item non-response estimation cell, and we apply these proportions to the sourced total. For personnel questions the totals are imputed using a similar method.

Published sector and industry breakdowns

The published sector and industry breakdowns provided in this release are created using recommendations from the OECD's Frascati Manual 2002 to allow for greater international comparability.

This manual recommends that state-owned enterprises (Business Type 1996 classification) be classified to the business sector. In addition, the Frascati Manual 2002 recommends that the industrial classification code for significant research organisations be changed to the industry they predominantly serve. We apply the industry breakdowns using the Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC06).

Business sector

Includes central and local government-owned trading enterprises and all other enterprises with the following New Zealand Institutional Sector (NZISC)1996 codes.

Government sector (excluding universities)

The government sector excludes the eight universities, and central and local government trading enterprises, and includes all enterprises with the NZISC96 codes included in the table below.

- Central and local government trading enterprises are including in business sector.
- All District Health Boards were included in R&D 2016 survey population.

Higher education (universities)

The higher education (universities) sector includes the eight New Zealand universities that are members of Universities New Zealand – Te Pūkai Tara. These are classified to NZISC96 code 3111 (central government excluding funded social security), with an ANZSIC06 code of P810200 (higher education).

Included within the higher education sector are universities' commercial arms. Before 2010, they were represented in the business sector.

Published industries

The published industries within the business sector are based on ANZSIC06 classification, apart from the reclassification of significant scientific research organisations (M691) to the industry they predominately serve and the inclusion of local and state-owned trading enterprises. Published industries are listed below, followed by their ANZSIC06 codes.

Business sector

- Primary industries – A and B
- Food product manufacturing – C11
- Beverage and tobacco manufacturing – C12
- Textile, clothing, footwear, and leather manufacturing – C13
- Petroleum, coal, chemical, and associated product manufacturing – C17, C18, and C19
- Non-metallic mineral product manufacturing – C20
- Metal product manufacturing – C21 and C22
- Machinery and equipment manufacturing – C23 and C24
- Other manufacturing – C14, C15, C16, and C25
- Wholesale trade – F
- Scientific research and technical services – M691 and M692 (excluding M6924)
- Computer services – M70
- Other services – D to S excluding (F, M691, M6921, M6922, M6923, M6925, M70)

Government sector

- Scientific research – M691
- Other government research – All ANZSIC codes except M691

Higher education (universities) sector

Total universities, including their commercial arms.

Data presentation

In 2016, we started presenting data in Infoshare. These tables show data available back to 2008, to allow easier time-series comparison.

Sampling Procedure

The R&D Survey uses a stratified sample in its sample design. We developed strata based on industries defined by their sector (ie business, government, or higher education (universities)) and ANZSIC06.

Substrata were then developed using RME and annual GST from the Statistics NZ Business Frame. These are both captured from tax data.

We made some of these substrata full coverage, meaning we selected all enterprises in the substratum for the survey. Within the full coverage substrata, we identified 'keys' for intensive attention in the data collection phase. Keys are enterprises that made significant R&D expenditure in 2014.

Frequency

5 Two-yearly

Main users of the data

Government departments, industry bodies, researchers, OECD.

Usage and limitations of the data

The purpose of this survey is to collect data which will be used to produce summarised statistics of research and development activities for release to Government, business and other users in the community. The statistics will be used in the development of science policy in areas such as the setting of research priorities, Government research funding levels, science education and innovation encouragement schemes.

R&D data is also used to provide input into the OECD Main Science and Technology Indicator publication.

Related Materials

Other

- [Research and Development](#)

Variables

Published industry

Name	Description	Range
Food product manufacturing	ANZSIC codes of C11	
Beverage and tobacco manufacturing	ANZSIC code C12	
Textile, clothing, footwear, and leather manufacturing	ANZSIC code C13	
Petroleum, coal, chemical, and associated product manufacturing	ANZSIC codes of C17, C18, C19	
Non-metallic mineral product manufacturing	ANZSIC code C20	
Metal product manufacturing	ANZSIC codes of C21, C22	
Machinery and equipment manufacturing	ANZSIC codes of C23, C24	
Other manufacturing	ANZSIC codes of C14, C15, C16, C25	
Wholesale trade	ANZSIC code F	
Scientific research and technical services	ANZSIC codes of M691 and M692 (excluding M6924)	
Computer services	ANZSIC code M70	
Other services	ANZSIC codes of D to S excluding (F, M691, M6921, M6922, M6923, M6925, M70)	

Concepts

Research and Development Survey

Name	Description
All sectors	<p>All sectors includes basic research, applied research, and experimental development. We compile statistics for all three types research types for the business, government, and higher education sectors.</p>
ANZSIC06	<p>ANZSIC06 Australian and New Zealand Standard Industrial Classification 2006. The classification developed by Statistics NZ and the Australian Bureau of Statistics to reflect the structure of Australian and New Zealand industries. The 200 version updates the revision made in 1993 and 1996.</p>
Applied research	<p>Applied research investigation undertaken to acquire new knowledge. It is directed primarily towards a specific practical aim or objective.</p>
Basic research	<p>Basic research carried out to advance knowledge, without seeking long-term economic or social benefits or making any effort to apply the results to sectors responsible for their application.</p>
Bioscience	<p>Bioscience the development and application of knowledge of the way plants, animals, and humans function for the development of products and services.</p> <p>Bioscience activities may occur in the following areas:</p> <ul style="list-style-type: none"> - agriculture feedstock and chemicals - aquaculture, horticulture, and forestry - human and animal therapeutics and diagnostics (including clinical trial providers) - medical devices and equipment - research testing and medical laboratories - microbes - biotechnology.
Biotechnology	<p>Biotechnology the application of science and technology to living organisms as well as parts, products, and models thereof, to alter living or non-living materials for the production of knowledge, goods, and services. The following list of techniques was published by the OECD in 2004 as an interpretative guide as to what biotechnology includes:</p> <ul style="list-style-type: none"> - DNA – the coding: genomics, pharmaco-genetics, gene probes, DNA sequencing/synthesis/amplification, genetic engineering - proteins and molecules – the functional blocks: protein/peptide sequencing/synthesis, lipid/protein glyco-engineering, proteomics, hormones, and growth factors, cell receptors/signalling/pheromones - cell and tissue culture, and engineering: cell/tissue culture, tissue engineering, hybridisation, cellular fusion, vaccine/immune stimulants, embryo manipulation - process biotechnologies: bioreactors, fermentation, bioprocessing, bioleaching, bio-pulping, bio-bleaching, biodesulphurisation, bioremediation, and biofiltration - DNA and RNA vectors: gene therapy, viral vectors - other: bioinformatics, nanobiotechnologies, other.

Crown research institutes (CRIs)	<p>Crown research institutes (CRIs) government-owned agencies that ensure New Zealand maintains capability in strategic areas of science that are of long-term importance to New Zealand. Each CRI focused on a productive sector of the economy, a group of natural resources, or a particular public-good task, enabling each CRI to have a clearly defined purpose and customer base. CRIs are publicly and privately funded. Established in 1992, their main purpose is to undertake research for the benefit of New Zealand. The law requires CRIs to:</p> <ul style="list-style-type: none"> - undertake research for the benefit of New Zealand - purpose excellence - comply with ethical standards - promote and facilitate the application of results of research and technological developments - exhibit a sense of social responsibility - maintain their financial viability.
Current expenditure	<p>Current expenditure for purpose of R&D, this is expenditure on labour costs and other current costs (including costs for external R&D personnel); services and items (including equipment) used and consumed within one year; and annual fees or rents for the use of fixed asset. Current expenditure is classified into two components – wages and salaries and other current expenditure.</p>
Enterprise	<p>Enterprise a legal business entity operating in New Zealand.</p>
Experimental development	<p>Experimental development systematic work, drawing on knowledge gained from research and practical experience, that is directed at producing new materials, products, and devices; installing new processes, systems, and services; or improving substantially those already produced or installed.</p> <p>The wording of these definitions is the result of cognitive testing of the definitions provided in chapter 4 of the OECD's Frascati Manual 2002 and the 1991 Glossary of Terms for Scientific and Technological Activities in New Zealand.</p>
Frascati Manual	<p>Frascati Manual OECD manual outlining the standard practices for the conduct and interpretation of surveys of research and experimental development. The manual is used widely by member countries of the OECD and by other countries around the world.</p>
Gross domestic product (GDP)	<p>Gross domestic product (GDP) the market value of all final goods and services produced within a country in a given period of time. It is also the sum of value added at every stage of production of all final goods and services produced within a country in a given period of time. Given that GDP data is provisional for a two-year period from the first release, the figures included in this report are provisional. Once we obtain updated figure, we revise the GDP data and derived data based on GDP. The revisions of this nature (as a result of changes external to the R&D dataset) are therefore not expressed in the report with a revision code R alongside. The same logic is also used in expressing GDP and other data from the OECD's Main Science and Technology Indicators (2012/2) report.</p>
Higher education (university) sector	<p>Higher education (university) sector types of R&D expenditure were provided for four types of research: pure-basic research, targeted-basic research, applied research, and experimental development. These types of research are based on the Frascati Manual 2002 definitions.</p>
Other current expenditure	<p>Other current expenditure includes expenditure on consumables, overheads (including rent and travel), wages and salaries for staff indirectly supporting R&D (e.g. central finance or cleaning services), on-site consultants or contract staff, and operating leases. Depreciation is not included.</p>

Research and development (R&D)	<p>Research and development (R&D) the definition of R&D used in this survey is consistent with the recommendations contained in the OECD's Frascati Manual 2002. R&D performed by enterprises are generally investigative work that is of actual or potential use in the development of new or enhanced materials, products, devices, processes, or services. R&D directed towards duplicating work already developed by others is only included if the knowledge or technology required for the development is not available to the enterprise.</p>
Researchers	<p>Researchers professionals engaged in the conception, creation, and management of new knowledge, products, processes, methods, and systems.</p>
Rolling mean employment (RME):	<p>Rolling mean employment (RME): defines the number of employees of an enterprise. This is a 12-month rolling average of the monthly employment count figure. The employment count is obtained from taxation data.</p>
Statistics New Zealand Business Frame	<p>Statistics New Zealand Business Frame a register of all businesses operating in New Zealand.</p>
Targeted basic research	<p>Targeted basic research produces a broad base of new knowledge likely to underpin solutions to current or future applications.</p>
Technicians	<p>Technicians people performing technical tasks in support of R&D activity, normally under the direction and supervision of a researcher. The tasks include preparing experiments and charts and graphs, and taking records.</p>
Wages and salaries	<p>Wages and salaries expenditure on wages and salaries for personnel performing R&D (including staff directly supporting R&D). Includes overtime, ACC, fringe benefits, redundancy, severance payments, and other related costs.</p>