MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

**NOT GOVERNMENT POLICY – NOT FOR DISTRIBUTION**

# SCIENCE SYSTEM ADVISORY GROUP

| | | | |
|---|---|---|---|
| **PAPER NUMBER** | SSAG-MBIE-002 | **DATE** | 5/04/2024 |
| **TITLE** | Business R&D in New Zealand | | |
| **RESPONSIBLE MANAGER** | Landon McMillan | | |
| **AUTHOR/S** | Nic Scott | | |
| **PURPOSE** | To provide an introduction to business R&D in New Zealand, including expenditure, sources of funding, business R&D workforce and the outputs of business R&D, including international comparisons where available. | | |

## Introduction

In this paper we provide a description of, and data on, the inputs and outputs of business sector R&D activity and the degree of co-operation between public and private entities engaged in R&D across the Small Advanced Economy initiative countries (plus Australia). In all cases we have either presented time-series data to show trends over time, or the most recent available data for each country (typically 2019-2021), to show the current situation.

We will be providing further information (including data and analytics) on business R&D, and in particular government supports for business R&D, technology transfer and innovation in subsequent papers.

## Summary

- New Zealand has relatively low business expenditure on R&D (BERD). This has improved in recent years, in both an absolute and relative sense.
- New Zealand follows most of the broader trends seen for comparison countries.
- New Zealand exhibits weak connectivity between the public R&D and private sectors, but has unusually high business funding of GOVERD, likely reflecting the commercial focus of CRIs.

## Inputs to Business R&D

### BERD as a proportion of GDP

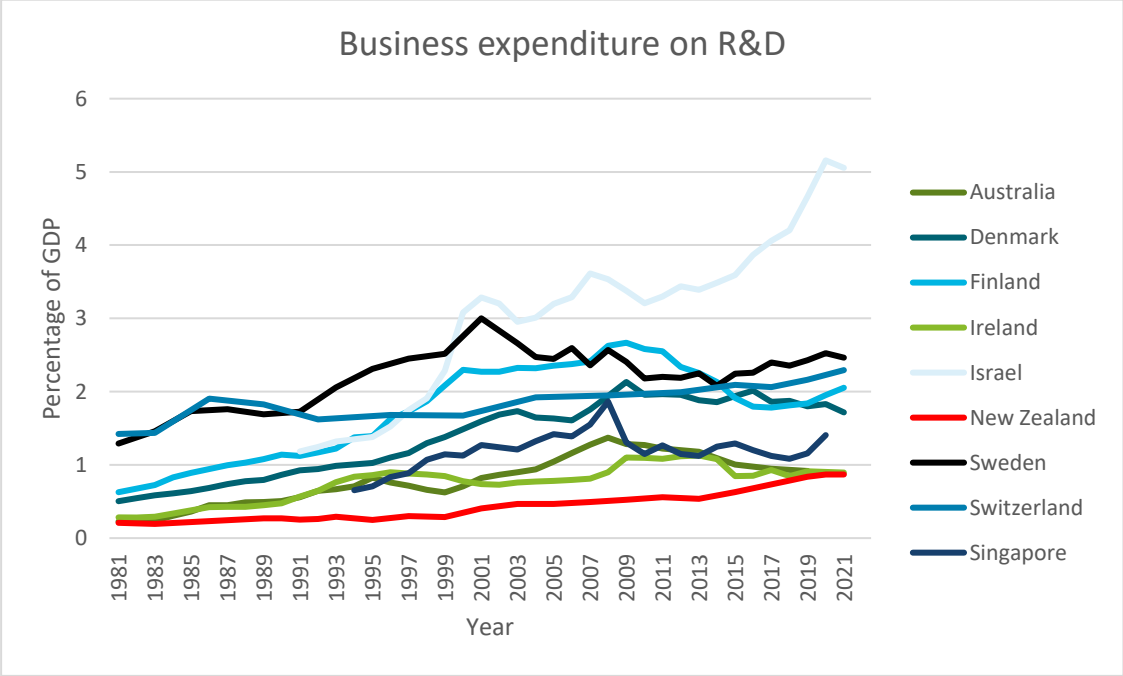


*Figure 1 Business expenditure on R&D as a percentage of GDP over time for New Zealand and comparator countries. Source OECD | Main Science and Technology Indicators*

Business Expenditure on R&D as a proportion of GDP for New Zealand is at the lower end of the comparison sample. It has been trending up, both in an absolute sense and relative to other countries, over the last decade, however recent data (possibly impacted by Covid-19) indicates this trend is now flattening out.

## BERD as a proportion of GERD

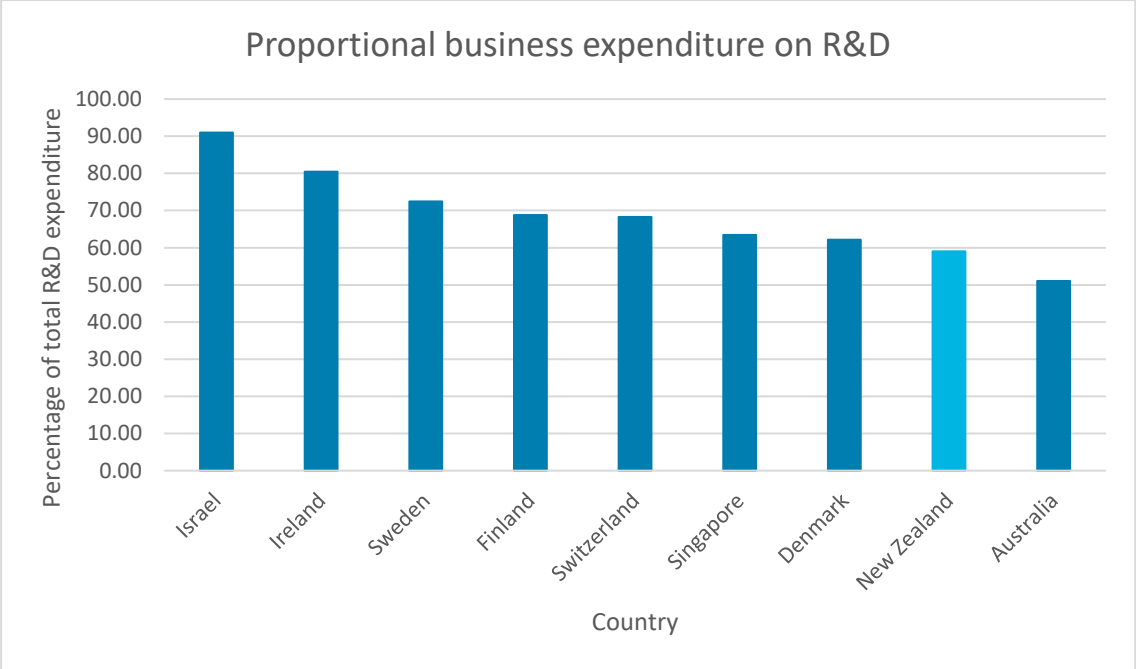


*Figure 2 Proportion of total R&D expenditure coming from businesses for New Zealand and comparator countries (most recent year available). Source OECD | Main Science and Technology Indicators*

New Zealand businesses contribute a low (but not statistically outlying) proportion of total R&D expenditure compared to other countries. This proportion has increased significantly over the last decade, reflecting the overall increase in business expenditure compared to flat government and higher education expenditure.

## Source of BERD

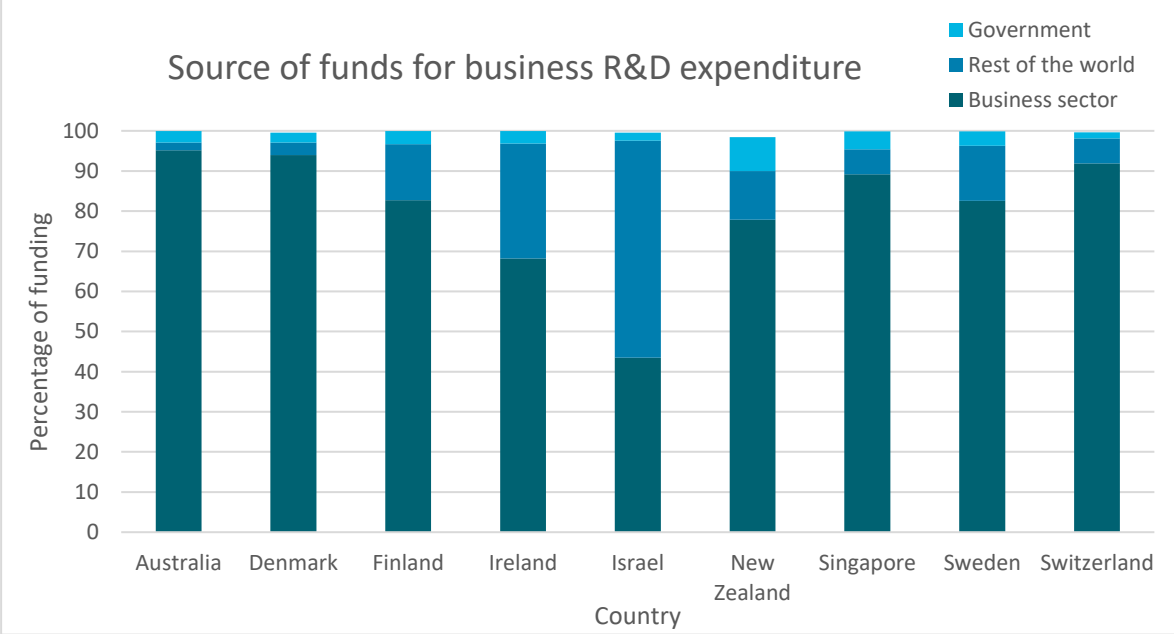


*Figure 3 Source of funding for R&D activity occurring in businesses for New Zealand and comparator countries (most recent year available). 'Rest of world' indicates R&D that took place in a business in the respective country but was funded by an entity in another country. Source OECD | Main Science and Technology Indicators*

The main source of funding for business R&D expenditure across the comparison sample is the domestic business sector, with the notable exception of Israel (and to a lesser extent Ireland), where foreign investment is a significant contributor. The proportion of foreign funding for New Zealand BERD is fairly typical, however an unusually large proportion of BERD is funded by government in New Zealand, compared to other small advanced economies. Note that this measure does not include indirect funding of business R&D through R&D tax measures.

### BERD by type of research

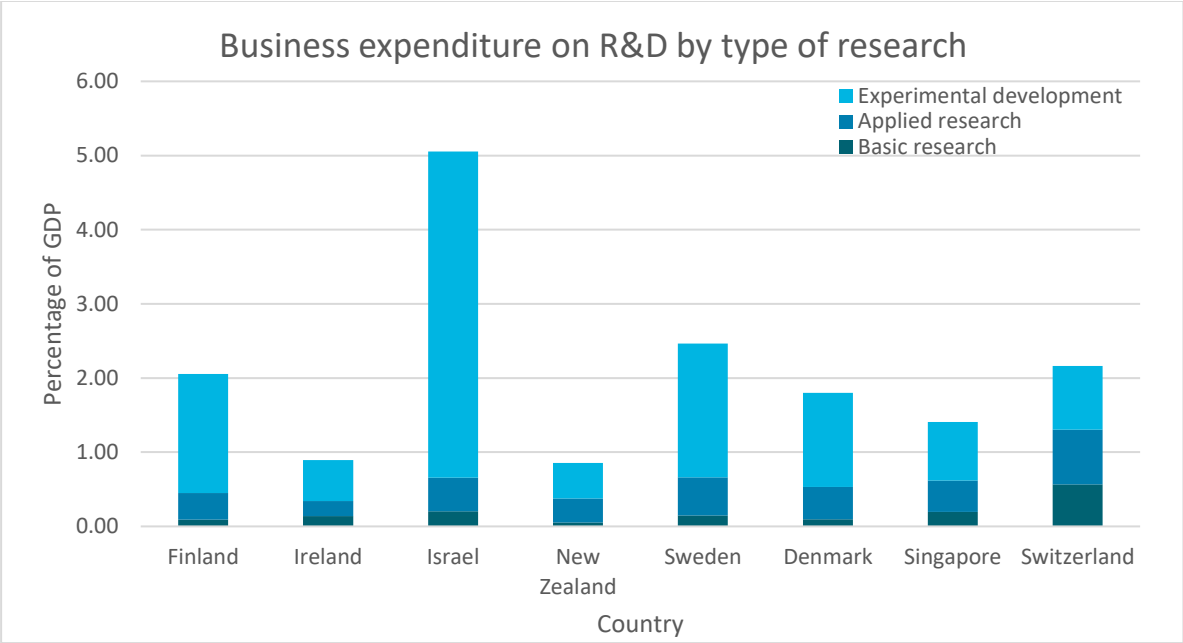


*Figure 4 Business expenditure on R&D by type of research (basic, applied, experimental development) for New Zealand and comparator countries. Source OECD | Main Science and Technology Indicators*

While New Zealand BERD is low overall, the balance of basic, applied and experimental development is broadly consistent with that in the comparison countries. Swiss (and to a lesser extent Irish) firms engage in an unusually high proportion of basic research. Israeli firms engage in far more experimental development than others, whereas New Zealand firms spend somewhat less (both absolutely and in relative terms) on this aspect of R&D.

## Government support for business R&D

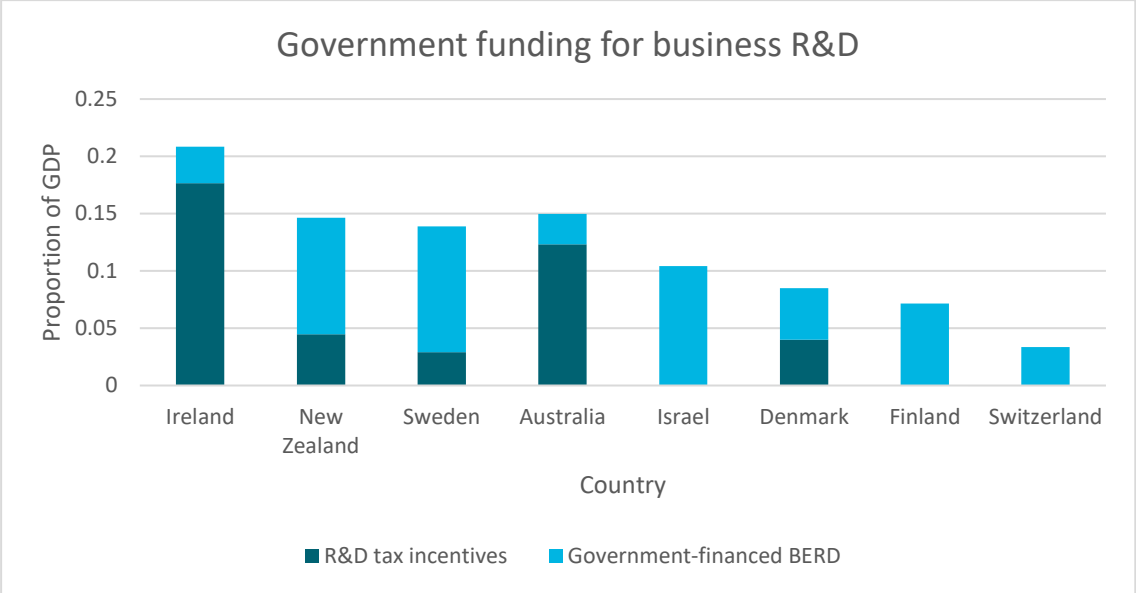


*Figure 5 Form of government support (either a tax incentive, or direct support including grants) for business R&D in New Zealand and comparator countries (most recent year available). Source OECD | R&D Tax Incentives database*

The New Zealand Government supports business R&D through a variety of measures, including the R&D Tax Incentive, direct grants and subsiding private-public research partnerships. The level of New Zealand government funding for business R&D is consistent with other small advanced economies as a proportion of GDP, but, as noted above, is large relative to total business expenditure.

## Business R&D workforce

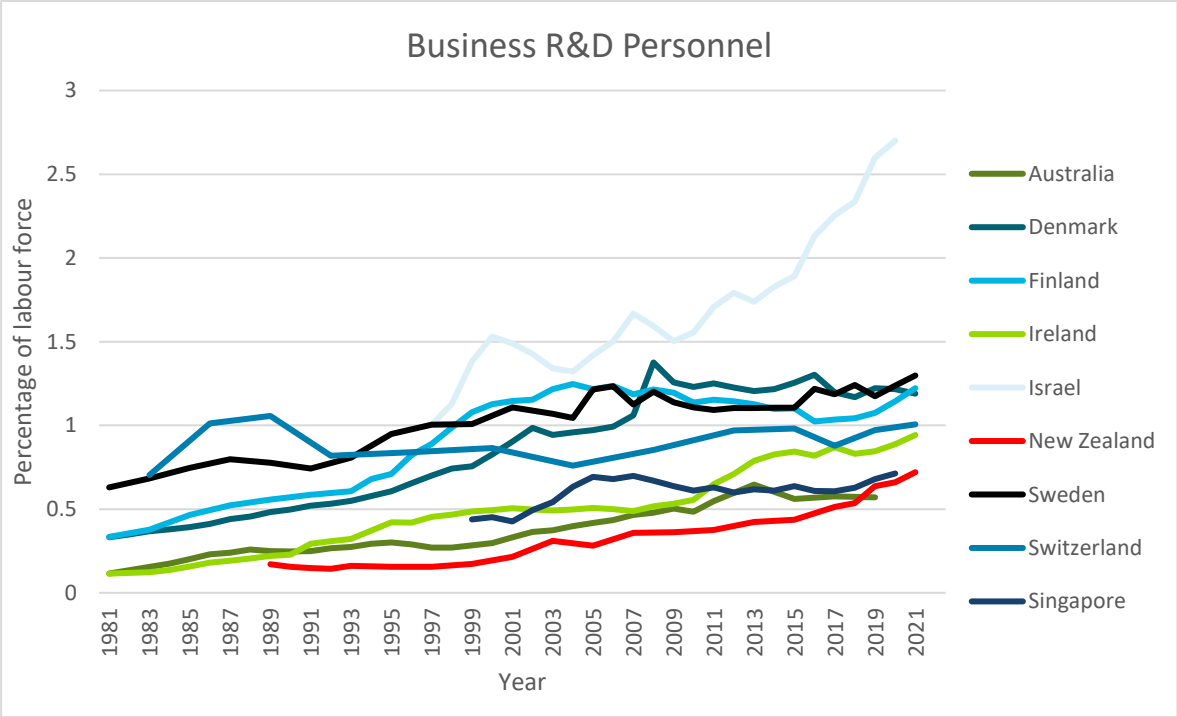


*Figure 6 R&D personnel working in businesses over time for New Zealand and comparator countries. We use the same broad Frascati manual (2015) definition of R&D personnel described in SSAG-MBIE-001. OECD | Main Science and Technology Indicators*

The proportion of the labour force employed in business R&D unsurprisingly reflects overall business R&D expenditure, with Israel the clear stand-out. The increase in New Zealand business R&D personnel is consistent with the increase in BERD over the last decade. For countries that have seen BERD decline during this period, the decline in business R&D personnel is less pronounced, perhaps suggesting firms try to hold onto their talent while cutting costs elsewhere.

### Firms engaging in R&D

Across the world, business R&D expenditure tends to be concentrated in large firms, and New Zealand is no different in this respect. However, New Zealand has few large firms and many more SMEs relative to the firm structure in other OECD countries, which leads to business R&D being even more concentrated in a relatively small number of firms that comparator countries. While some of this can be attributed to New Zealand's overall small size, the degree of concentration is larger than in other small advanced economies with available data.

Only three New Zealand firms are listed in the EU's Global Industrial R&D Investment Scoreboard of the top 2,500 R&D performing firms. These are: Xero (rank 773), Fonterra (1253) and Fisher & Paykel Healthcare (rank 1503). On a per-capita basis, New Zealand has 1/6$^{th}$ the number of high R&D-expenditure firms as other small advanced economies.

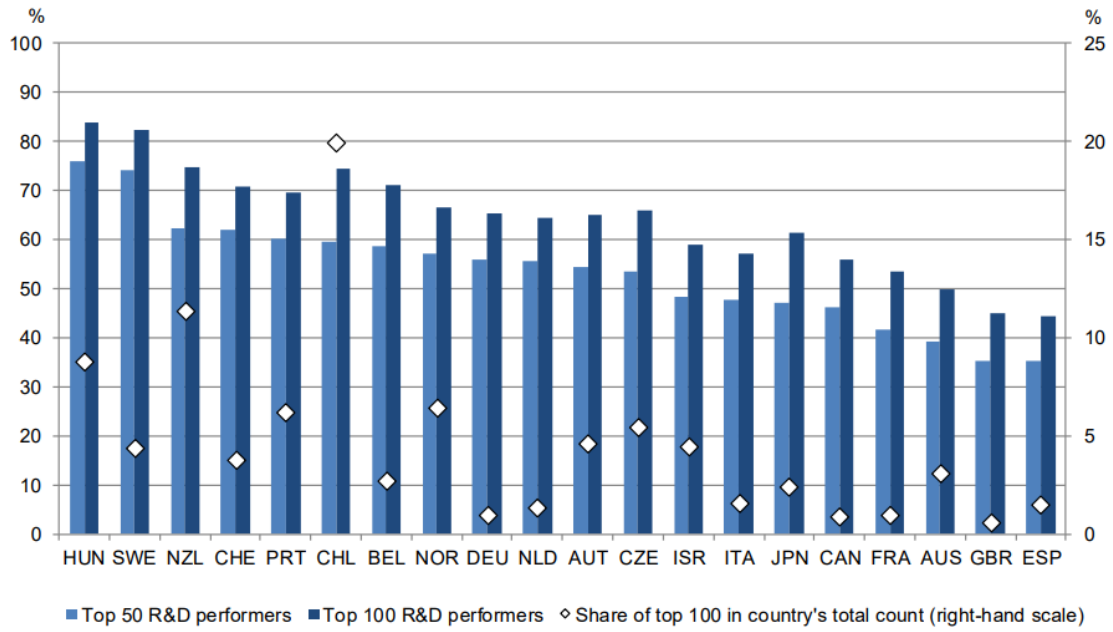


*Figure 7 Concentration of business expenditure on R&D in New Zealand and available OECD countries. (Left axis) Proportion of business expenditure on R&D from the top 50 or top 100 R&D performing firms. (Right axis) Share of total innovating firms accounted for by the top 100 R&D performing firms. Source OECD | microBERD project*

## Outputs of business R&D

There are few good direct measures of the outputs of business R&D. We present a mix of data that quantifies business innovation more broadly (VC investment, start-ups) or combine public and private R&D outputs but that are more widely used in the private sector (patenting).

### Proportion of businesses that report innovation

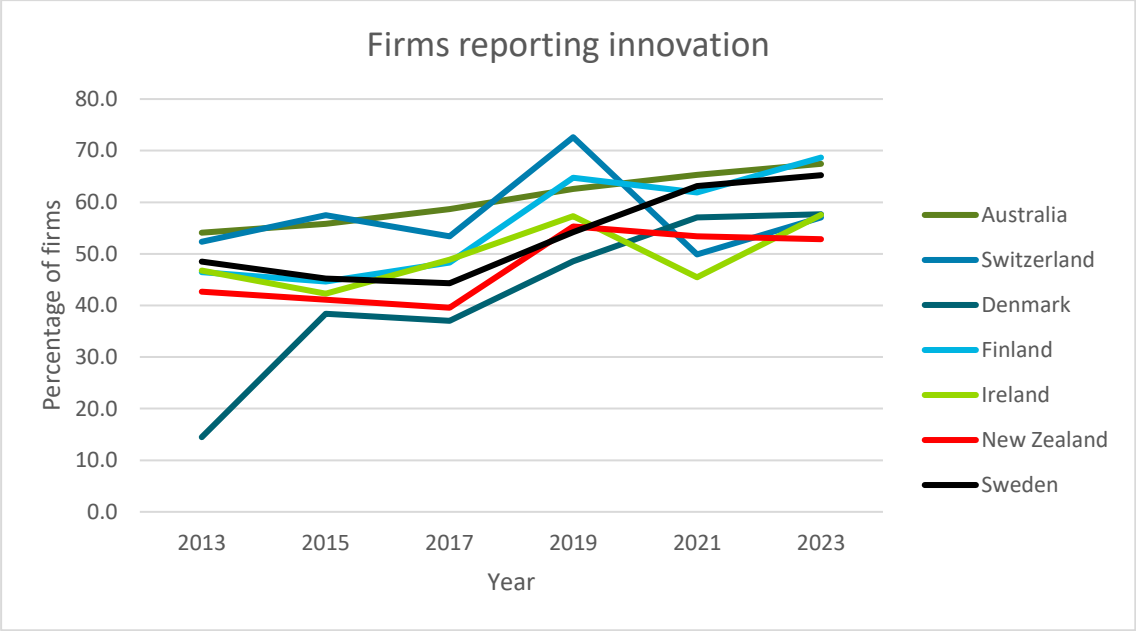


*Figure 8 Number of firms reporting innovation over time for New Zealand and comparator countries. Source OECD | Business Innovation Statistics and Indicators*

Around 50 per cent of firms across the comparison countries report engaging in product or process innovation (we exclude organisational or marketing innovations as these are less closely related to R&D activities). As with other measures, New Zealand follows the overall trends but lies at the lower end of the range of the comparison countries. As this is self-reported innovation it is unclear how strong an indicator of R&D outcomes this measure is.

### Venture Capital investment

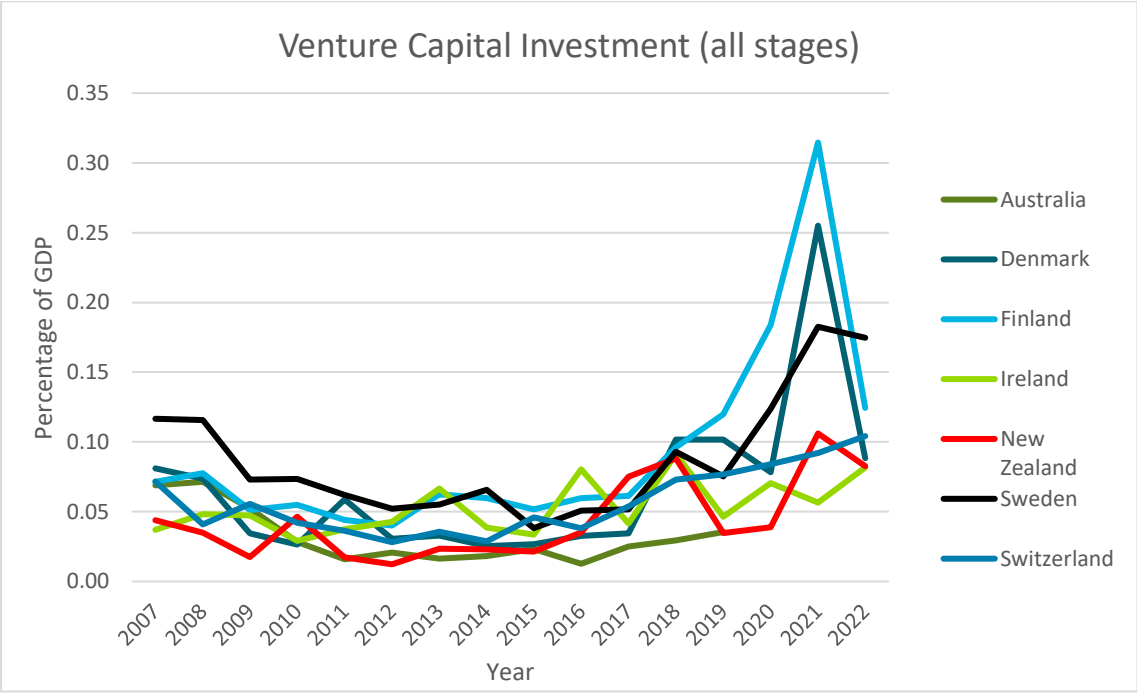


*Figure 9 Total Venture Capital investments in all industries for New Zealand and comparator countries. Source OECD | Enterprise Statistics*

Venture Capital investment in New Zealand lies at the lower end of the comparison sample, while broadly following the same trends. Israel has extremely high levels of VC investment, reaching 1-2% of GDP, but has been excluded from the above chart so the trends amongst other countries are move visible. The 2017/2018 bump in New Zealand VC investment is almost entirely attributable to investment in RocketLab in those years. The increase in 2021/2022 is due to significant increases in global liquidity arising from economic responses to the pandemic supported by the introduction of the NZ Superfund funded, New Zealand Growth Capital Partners Elevate venture capital fund of funds.

**Patenting**

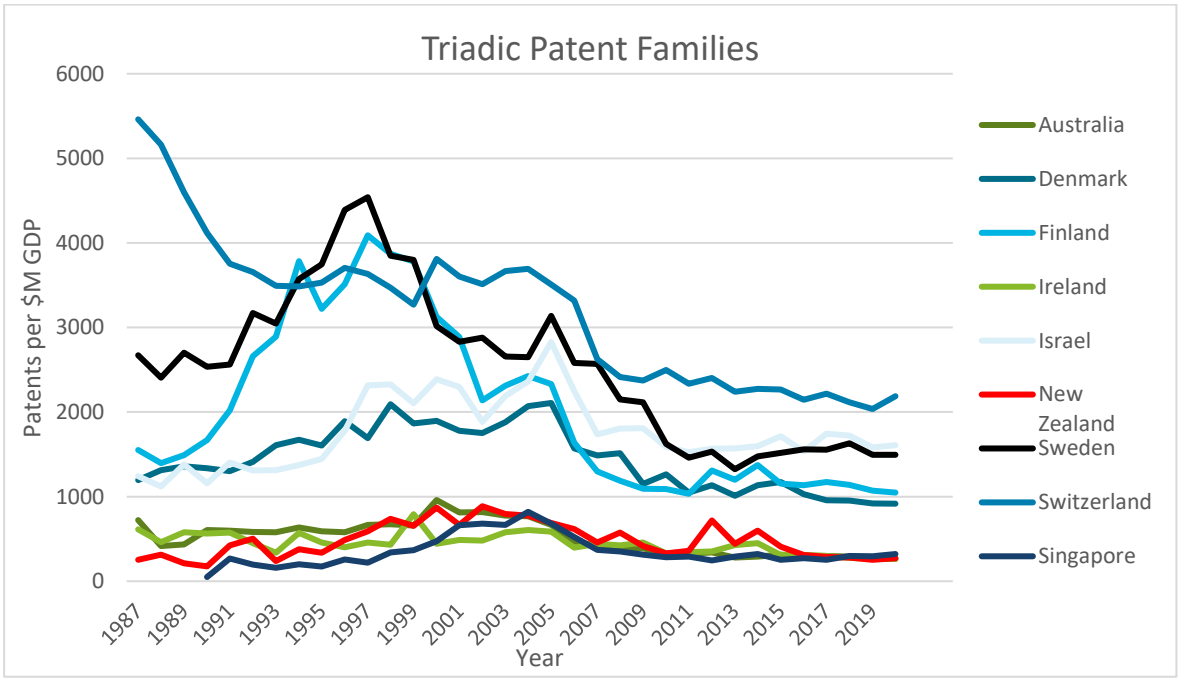


*Figure 10 Total triadic patent families (including from both public and private organisations) for New Zealand and comparator countries. Source OECD | Main Science and Technology Indicators*

The above data includes patents filed by businesses, universities and public research institutes so does not solely reflect the outcomes of business R&D, however, as the majority of patents are filed by businesses, they can be considered a reasonable proxy for business R&D activity.

New Zealand's patent rate (relative to GDP) has been largely stable for an extended period of time, and consistent with those of Singapore, Australia and Ireland. Countries with higher BERD than New Zealand have commensurately higher patenting rates.

## Collaboration between public and private R&D

### Business funding for HERD and GOVERD

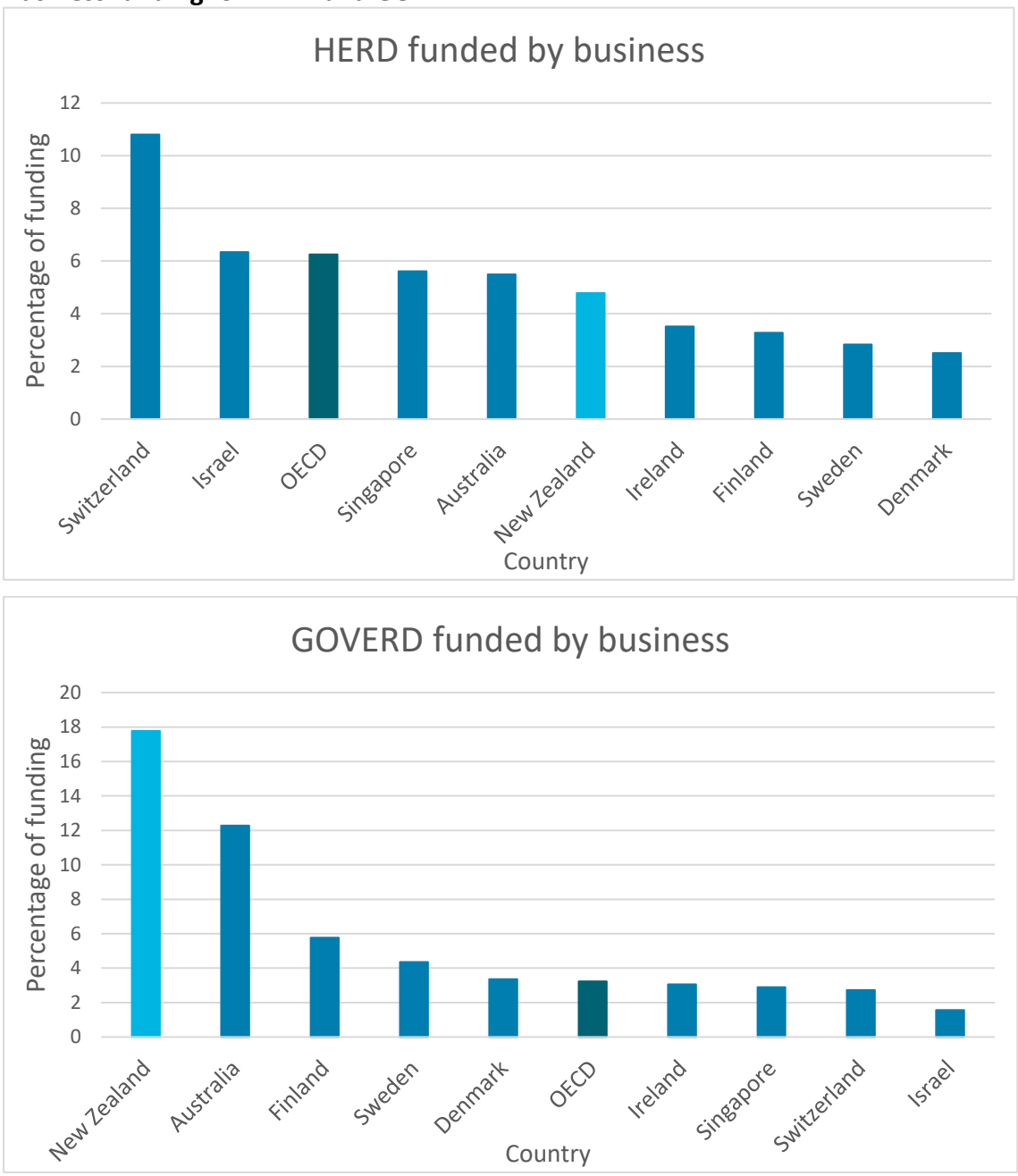


*Figure 11 (Upper panel) Higher education R&D activity funded by the business sector in New Zealand and comparator countries (most recent year available). (Lower panel) As above, but for government sector R&D activity funded by the business sector. Source OECD | Main Science and Technology Indicators*

New Zealand businesses fund an unusually high proportion of R&D conducted by the government sector. This likely reflects the strong industry-facing nature of some of the CRIs. The proportion of higher education R&D funded by New Zealand businesses is fairly typical for the comparison sample.

### Co-authorship with industry

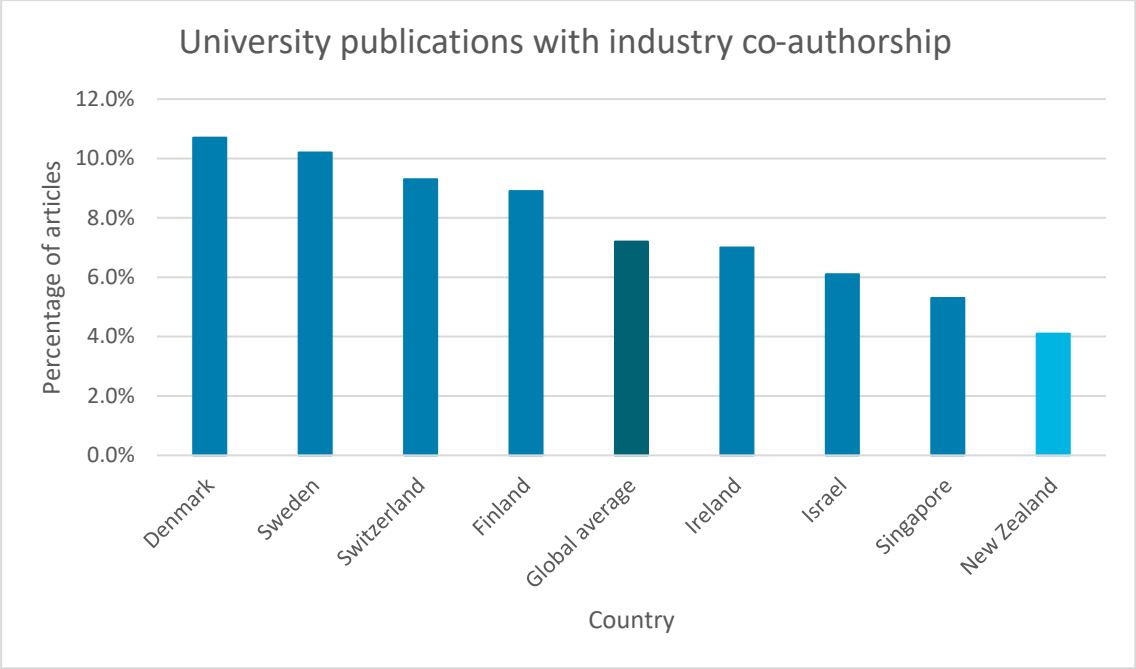


*Figure 12 Proportion of university publications that include an industry co-author (2018-2020). Source CWTS | Leiden University Rankings (Open version)*

New Zealand universities co-author publications with industry at a much lower rate than other countries in the comparison sample, and well below the global average.[1]

### Business-reported co-operation

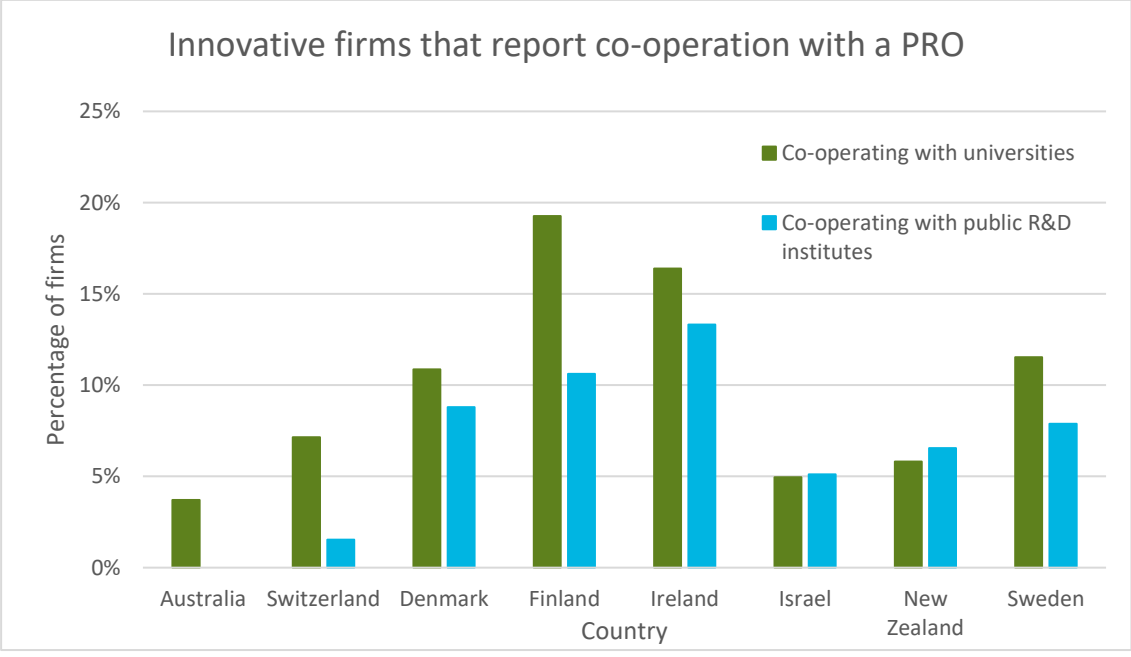


*Figure 13 Innovative firms reporting co-operation with a university or other public research organisation in New Zealand and comparator countries (most recent year available). Source OECD | Business Innovation Statistics and Indicators*

[1] Based on the CWTS Leiden Ranking dataset of over 1400 major universities, which includes all New Zealand universities except Lincoln University. Public research organisations like CRIs are not included.

In surveys of innovative businesses, New Zealand businesses report lower levels of co-operation with universities and public research institutes than in many other countries. The rate of co-operation is particularly low for universities. While large enterprises report higher rates of co-operation across the board, SMEs and large enterprises in New Zealand all have relatively low rates of co-operation, therefore this trend is not driven by the size makeup of New Zealand firms.