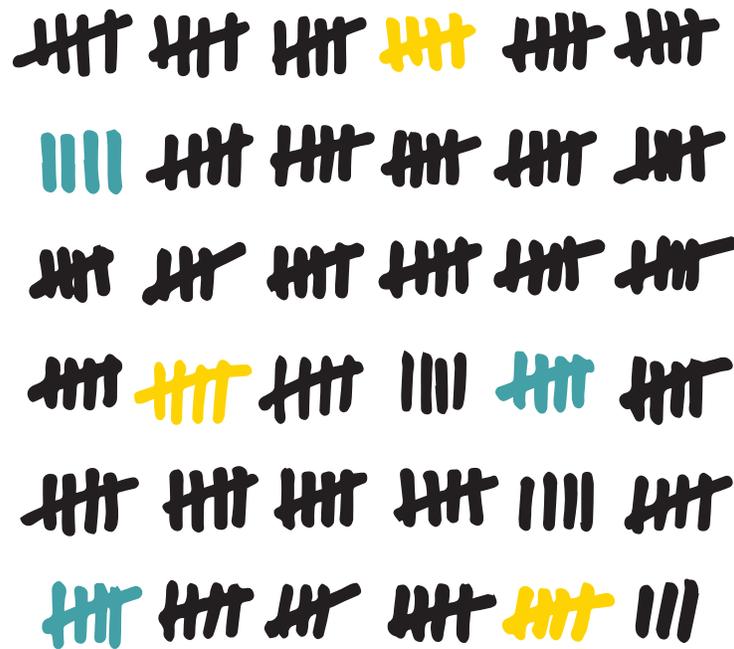


Losing Count

Canada Has Been Underreporting Business Expenditures on Research and Development



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The Myth of Canadian Industry's Poor R&D Performance

It appears that Canada's BERD may have been significantly underreported over an extended period of time.

Numerous reports on Canada's innovation economy have noted Canada's poor record of private sector spending on research and development (R&D) relative to other Organization for Economic Cooperation and Development (OECD) countries. While we are among the middle of the pack on public R&D spending, we rank near the bottom in business expenditures on research and development (BERD).

However, these statistics may all be incorrect. Because of the way that the data has been collected, it appears that Canada's BERD may have been significantly underreported over an extended period of time.

Until very recently, annual spending on R&D by Canadian businesses has been reported only for work that meets the definition of Scientific Research and Experimental Development (SR&ED) in the Income Tax Act. The definition of R&D used by most OECD countries is substantially different; it uses the current Frascati model that includes R&D in the humanities and the social sciences, and product development based on existing knowledge.

Because of these differences in definitions, Canada may have been underreporting its expenditures on R&D since 1997. It is difficult to estimate the level of underreporting spread out over nearly two decades, but we tried to gauge the extent of the problem by looking at salaries spent on R&D. We tabulated the differences between the total salaries spent on personnel involved in R&D activities and the amount allowed to be claimed for SRED purposes for a sample of ten companies. Although measuring total R&D salaries will overreport the amount that would be allowed under the Frascati definition, it is indicative of the problem that the differences in definitions have created. Our conclusion is that the R&D for our sample of companies may be underreported by up to 73%.

Are Business Expenditures on Research and Development Declining?

Numerous reports on Canada's innovation economy have pointed out not only that Canada's BERD expenditures are lower than the OECD average but also that they appear to be declining over time.

In recent years, the administration of the SR&ED program has become more structured, and expectations have been set for private sector R&D work to include formal experimental procedures and complete evidence records. According to program users, it is more difficult to get SR&ED credits approved now than in the past.

This may mean that not all R&D that was reported by companies in past years is captured with the tightening of the SR&ED program. Hence, if SR&ED is the number used by Statistics Canada for R&D reporting nationally, then R&D expenditures would have declined as the program was tightened.

Policy Implications

But if we are using an incomplete definition of R&D that leads to erroneous conclusions, then have we been developing flawed R&D policies and expenditure programs?

And if our R&D spending has been higher than reported, why aren't we doing better?

Unfortunately, without a substantial amount of work, it is unlikely that we will ever know how much business has actually been spending on R&D. Thus we may have lost critical time that could have been productively used to develop a more targeted innovation policy. We can only hope that recent changes to data collection by Statistics Canada will enable us to rectify these problems.

R&D Expenditures in Canada

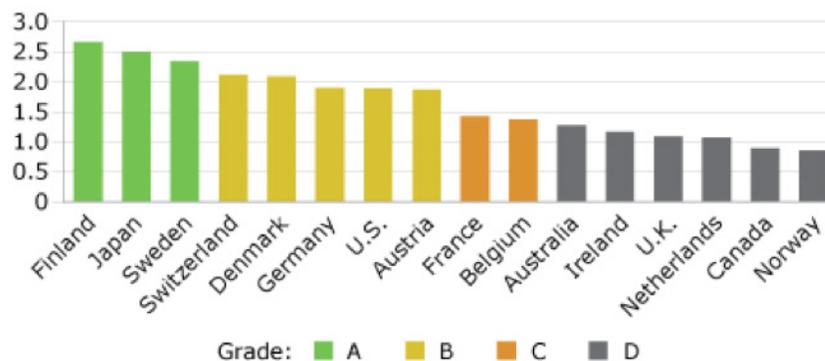
Numerous reports have noted Canada's lack of spending on research and development (R&D). While we find ourselves in the middle of the pack in terms of public R&D spending, we rank near the bottom on business expenditures on research and development (BERD).

From The Conference Board of Canada:

"Despite a decade or so of innovation agendas and prosperity reports, Canada remains near the bottom of its peer group on innovation, ranking 15th among the 16 peer countries."

"Canada is a weak performer on BERD. It gets a "D" grade and ranks 15th out of 16 peer nations. Moreover, Canada has been a "D" performer since the 1980s. Although Canadian businesses projected R&D spending of \$15.6 billion in 2011, as a group they spend much less than international peers (when BERD is measured as a percentage of GDP). BERD spending in the U.S., for example, is twice as high as in Canada. And Canadian businesses spend only a third (as a percentage of GDP) of what businesses in Finland spend on R&D. In fact, not only does Canada lag its competitors on BERD, it also falls below the OECD average."

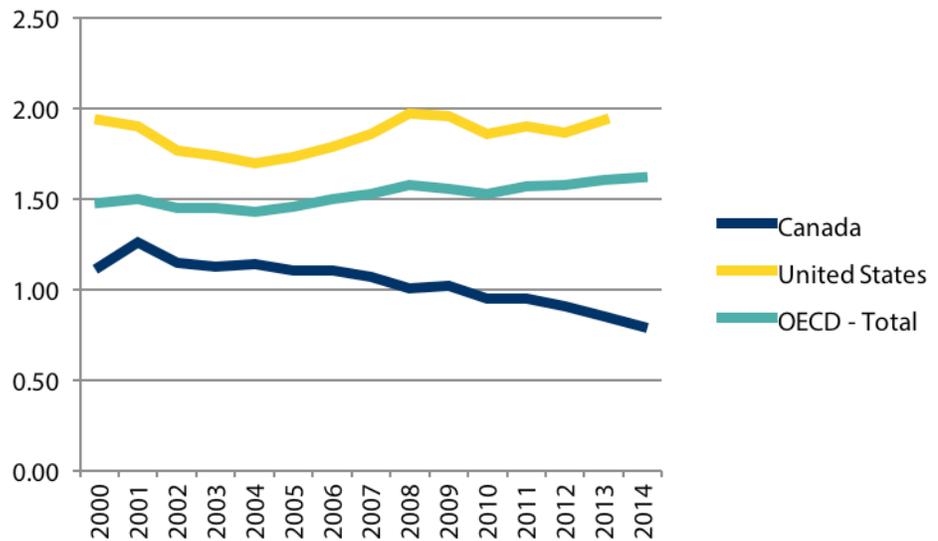
Business Enterprise R&D Spending, 2011 or Most Recent Year
(as a percentage of GDP)



<http://www.conferenceboard.ca/hcp/details/innovation.aspx>

The following chart from the OECD shows how Canada's expenditures compare to the United States and to other OECD countries and the gradual decline in expenditures over time.

BERD as a Percentage of GDP (OECD)



However, the statistics on which these rankings are based may be incorrect. Because of the way that Canada defines R&D and collects that data, BERD may have been underreported since 1997.

How Canada Collects Data

Statistics Canada has explained their collection methodology as follows:

“Prior to 1997, Statistics Canada surveyed all companies that performed or funded R&D in Canada. Those spending a million dollars or more received a detailed questionnaire (the long form) and those spending less received a simpler questionnaire (the short form). Virtually all of these companies also provided information to the Canada Revenue Agency (CRA) in order to claim tax benefits under the Scientific Research and Experimental Development (SR&ED) program.

“For the survey year 1996 Statistics Canada stopped surveying the small performers and funders of R&D in Canada, with the exception of Quebec, to reduce the reporting burden on companies and it replaced the data previously gathered by the survey by administrative data from CRA. The change was made for Quebec in 1997.”

http://www23.statcan.gc.ca/imdb-bmdi/document/4201_D2_T9_V1-eng.pdf

This method of collecting data meant that research and development for smaller companies was restricted to work that meets the Income Tax Act definition of Scientific Research and Experimental Development (SR&ED).

Canadian Definitions of R&D

For larger companies, the definition of R&D used by Statistics Canada until 2014 was:

“Research and development (R&D) is systematic investigation carried out in the natural sciences and engineering by means of experiment or analysis to achieve a scientific or technological advance.”

http://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=assembleInstr&a=1&&lang=en&Item_Id=145527

This corresponds closely to the definition of Scientific Research and Experimental Development (SR&ED), subsection 248(1) of the Income Tax Act:

“Scientific research and experimental development’ means systematic investigation or search that is carried out in a field of science or technology by means of experiment or analysis and that is

(a) basic research, namely, work undertaken for the advancement of scientific knowledge without a specific practical application in view,

(b) applied research, namely, work undertaken for the advancement of scientific knowledge with a specific practical application in view, or

(c) experimental development, namely, work undertaken for the purpose of achieving technological advancement for the purpose of creating new, or improving existing, materials, devices, products or processes, including incremental improvements thereto . . .”

http://www.cra-arc.gc.ca/txcrdt/sred-rsde/clmng/lgblywrkfrsrdnvstmnttxcrdts-eng.html#s1_0

The Income Tax Act definition was based on the first edition of the Frascati Manual, published in 1963. As explained in the current edition: “The model on which the Manual was originally based was that of institutionally structured R&D in the natural sciences and engineering leading to tangible technological innovations in primary and secondary industries.” Thus, the definition used by Statistics Canada when collecting R&D data from 1997 to 2013 was a restrictive definition that focused on technological advances in traditional fields and that corresponded exactly to those amounts reported to CRA for SR&ED eligibility purposes.

OECD Definitions of R&D

The definition of R&D used by most OECD countries is substantially different from Canada's definition of SR&ED. While many reports and papers have noted that Canada, like the rest of the OECD, accepts the Frascati Manual as the internationally recognised methodology for collecting and using R&D statistics, they have failed to recognize this vital difference. The current (sixth) edition of the Manual defines research as follows:

"Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

"The term R&D covers three activities: basic research, applied research and experimental development.

- Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed. R&D covers both formal R&D in R&D units and informal or occasional R&D in other units."

<https://www.admin.ox.ac.uk/researchsupport/applying/frascati/>

The Difference Between Definitions

Canada's definition only recognises work that results in a scientific or technological advance, and excludes work in fields other than traditional science and engineering. The OECD definition includes a broader spectrum of activities that focus on increasing and applying the stock of knowledge, The definition covers:

- R&D in the social sciences and humanities (i.e., the knowledge-based economy: business and financial management, psychology, education, social media, information science, etc.)
- Work that does not necessarily include a scientific or technological advance but draws on existing knowledge for the development or improvement of materials, products, devices or processes.

Because of these differences in definitions, Canada may have been underreporting the nation's expenditures on R&D since 1997.

Statistics Canada does recognize some differences between SR&ED claims and their reporting:

"Generally, the values reported through the survey response should be greater than or equal to the SR&ED tax data. Conceptually, there should be no cases where the reverse occurs."

http://publications.gc.ca/collections/collection_2014/statcan/88-202-x/88-202-x2014000-eng.pdf

However, the difference between what is reported for SR&ED and what SHOULD be reported under the Frascati definition is not only the value of land and buildings used in R&D. It should also include R&D spending in the social sciences and humanities as well as R&D that draws on existing knowledge to develop or improve materials, products, devices or processes.

We have attempted to illustrate the difference by examining SR&ED reports for a series of companies. We must note that the sample size is not statistically significant; therefore, no conclusions can be drawn with regards to the magnitude of the problem. We have tabulated the difference between the total spending for employee salaries for personnel involved in R&D activities and the amount allowed to be claimed for SR&ED purposes. Measuring total R&D salaries will overreport the amount that would be allowed under a Frascati definition, but it is indicative of the problem that the differences in definitions have created.

The following table shows the data for the ten companies we examined:

	R&D	SR&ED	
Company	Salaries (\$)	Eligible (\$)	%
1	117,303	90,487	77%
2	350,502	167,039	48%
3	112,352	108,962	97%
4	237,000	53,769	23%
5	593,648	147,566	25%
6	1,159,803	186,983	16%
7	389,238	115,178	30%
8	473,558	93,828	20%
9	279,010	30,934	11%
10	648,465	187,704	29%
Total	4,360,879	1,182,450	27%

Our conclusion is that for these companies, R&D may be underreported by 73%.

To ensure that Statistics Canada is actually using only SR&ED equivalent data we requested clarification from them. Specifically we asked the following questions:

- In the years before 2014, was any factor used either with the sampled data or the SR&ED data to gross up R&D expenditures from the SR&ED data to make it comparable to the Frascati definition of R&D used by the OECD?
- If so, what was the factor?
- And if so, where did you arrive at the factor used to gross up expenditures?

Their response stated:

“Tax data (ie : SR&ED) is not changed by any factor for RDCI. Any tax data is treated as respondent data. I invite you to read the section on Data quality, concepts and methodology of the 88-202-X publication. You can refer to it here: <http://www.statcan.gc.ca/pub/88-202-x/88-202-x2014000-eng.htm>

Recent Changes at Statistics Canada

A number of changes have been made to Statistics Canada's process for collection of private sector R&D data.

"The Research and Development in Canadian Industry (RDCI) survey was redesigned for reference year 2014.

"The survey became a weighted sample survey with a sample of approximately 8,250 rather than a census survey with 2,000 sampled units and the remainder composed of massively imputed SR&ED units."

http://www23.statcan.gc.ca/imdb-bmdi/document/4201_D6_T9_V1-eng.htm

The definition of R&D was revised to:

"Research and development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge"

http://www23.statcan.gc.ca/imdb-bmdi/document/4201_D7_T1_V1-eng.htm

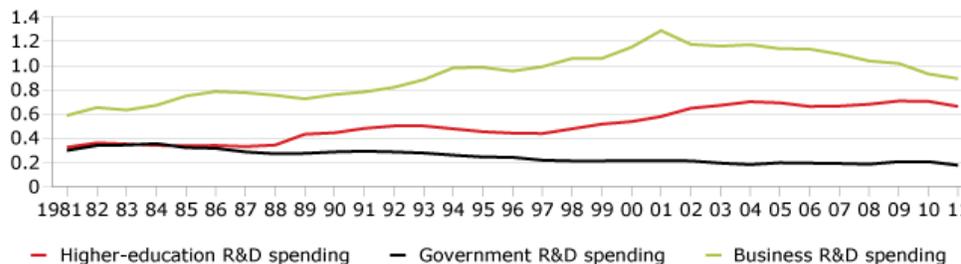
What should be noted from the new definition is that R&D is now defined in accordance with the current Frascati model used by OECD in that it includes the social sciences and the development of new applications based on available knowledge.

However, we have spoken with a number of organizations that have received the survey and, while the government has tried to draw respondents' attention to the new definition, habits appear to die hard as all of the respondents we spoke to indicate that they just used their SR&ED numbers as this was the easiest thing to do.

The Phenomenon of Declining R&D Expenditures

Numerous reports on Canada's innovation economy have pointed out not only that Canada's BERD figures are lower than the OECD average, but that they also showed a gradual decline over time. These reports concluded that the problem was getting worse.

Trends in R&D Spending in Canada by Type
(as a percentage of GDP)



<http://www.conferenceboard.ca/hcp/details/innovation/publicrandd.aspx>

However, this decline too may be due to the methodology used in reporting. From 2013, capital expenditures can no longer be included in claims for SR&ED credits. Claimable amounts paid to contractors are reduced by 20% to cover any elements of capital expenditures. Amounts claimable in lieu of overhead have been reduced. These measures reduce the amounts claimable as SR&ED, which will appear as a reduction in R&D expenditures if the SR&ED data is used.

Also, since the apparent decline in BERD began, as shown above, compliance procedures and reporting requirements for the SR&ED tax credit program have gradually tightened. Some program users have noted that the measures necessary to satisfy the program requirements make claiming no longer worthwhile. Since the recent rate reductions and elimination of capital expenditures, this trend is likely to continue.

Rather than simply demonstrating to CRA's claim reviewers that the work claimed meets the program criteria, as in the past, companies claiming the tax credit must now provide documentary evidence covering these questions:

- Was there a scientific or a technological uncertainty—an uncertainty that could not be removed by standard practice?
- Did the effort involve formulating hypotheses specifically aimed at reducing or eliminating that uncertainty?
- Was the adopted procedure consistent with the total discipline of the scientific method, including formulating, testing, and modifying the hypotheses?
- Did the process result in a scientific or a technological advancement?
- Was a record of the hypotheses tested and the results kept as the work progressed?

The documentation must be created contemporaneously with the research. Material produced later is not accepted as evidence. SR&ED also mandates that firms account for SR&ED expenditures by product and this requirement makes it difficult for firms that use other methods of accounting. In addition, these changes have meant that technological due diligence is no longer an eligible expense.

Since Statistics Canada uses SR&ED data only in respect of approved claims, work for which the documentation is determined to be inadequate will not be included in the total for tabulation of R&D spending by Statistics Canada.

The net effect according to program users is that it is much harder to get SR&ED credits approved than it was in the past.

This may mean that not all R&D that was reported by companies in past years is captured with the tightening of the SR&ED program. Hence, if SR&ED is the number used by Statistics Canada for R&D reporting nationally, then R&D expenditures would have declined as the program was tightened.

Implications

For many years, Canada has been criticized for its failure to compete in international markets because Canadian businesses are not spending enough on R&D. The criticism has grown more alarmist because Canada's already weak performance in innovation seems to have declined even further. Meanwhile we have been creating innovation policies and structuring government expenditures around these alarmist numbers.

However, if we have been using incomplete definitions for R&D that may have led to erroneous conclusions, then does this suggest that we have been developing flawed innovation policies and expenditure programs? And if we have been spending enough, why aren't we doing better?

Unfortunately, without a substantial amount of work, it is unlikely that we will ever know how much business has actually been spending on R&D. Thus we may have lost critical time that could have been productively used to develop a more targeted innovation policy. We can only hope that recent changes to data collection by Statistics Canada will enable us to rectify these problems.

Methodology

The Impact Centre at the University of Toronto set out to address a series of questions related to innovation such as:

- Are Canadians actually bad at innovating, or are past reports skewed?
- Innovation is a non-linear and complex process. If we are bad, what are we bad at?
- Why are we bad at these things?
- What are best practices in areas where we lag?
- How can we improve?

This study attempts to determine why past reports have shown that we spend so much less on BERD than other OECD countries. This is by no means an exhaustive or academically rigorous study. Our intention is to add to the conversation about innovation and identify some reasons why we lag much of the developed world and what we can do about it.

Definitions and program details were obtained from sources cited in the review.

The data for the ten companies we reviewed was supplied by CTAP, a firm of Markham-based SR&ED consultants. This is a small, statistically invalid sample that was used only to identify potential differences between SR&ED eligibility and total expenditures in the area.

We have requested information from Statistics Canada and received confirmation of the methodology used by the agency.

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Kay has wide experience of the SR&ED program, from both government and the private sector. She spent ten years with the Canada Revenue Agency SR&ED Directorate, much of it as National Technology Sector Specialist for Software/IT, responsible for national oversight of IT claim review, and six years as a Senior Director SR&ED with Deloitte's national practice. She currently provides advice to program users through seminars and individual consultations, and writes analyses and position papers on SR&ED policy. She is the author of "Guide to SR&ED for Engineers", a practical guide for program users.

Kay's research experience is in knowledge utilization and intelligent software. Her academic qualifications are M.Sc. (Cognitive Science) and B.A. (Law, Philosophy).

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CTAP SR&ED Consultants specialized services assist Canadian companies to maximize their resources by accessing the research and development tax credit available from the federal (SR&ED CRA) and provincial governments. CTAP SR&ED consultants possess expertise in product development cycle, software development, engineering, manufacturing, and business management, combined with an in-depth knowledge of SR&ED program and its interpretations.

<http://www.ctap.ca>

About the Impact Centre

Science to Society

We believe that science is the foundation for a better quality of life. Our vision is to be a place where you can connect with exceptional research, talent, training, innovative companies, and government to create products and services that benefit society.

Advancing Industry Innovation

We leverage the expertise and resources of universities to create real products and solutions for our clients. Our core competencies are in the natural sciences and engineering.

We catalyze university research to create long-term impact for our industry clients. We accelerate research to market!

Enabling Student Startups

The Impact Centre nurtures the creation and growth of student-led startups that are developing innovative products and services rooted in the natural sciences and engineering.

We provide training to help graduate students, recent graduates, and researchers transform their discoveries into real products and services that benefit society.

Training Innovators and Entrepreneurs

The Impact Centre offers research and industry-relevant training for professionals and students at all levels. We deliver speeches, workshops, undergraduate courses, and coordinate internship placements.

Our initiatives help professionals, undergraduate students, graduate students and postdoctoral fellows develop career skills to enable them to be successful innovators and leaders.

Studying Innovation

The Impact Centre explores questions at the intersection of science, business, policy, and society. We conduct research on all aspects of innovation, from ideation and commercialization to government policy and broader themes such as the connection between science and international development.

We study how companies of all sizes navigate the complex path between a discovery and the market and how their collective innovations add up to create a larger socioeconomic impact.

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