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Challenges to Higher Education in Canada and Australia

Charles Beach
Queen's University

Frank Milne
Queen's University

Department of Economics
Queen's University
94 University Avenue
Kingston, Ontario, Canada
K7L 3N6

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Charles M. Beach

Frank Milne

Economics Department
Queen's University
Kingston, ON

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1. Introduction

This paper provides an overview of the higher education sector in Canada, so it can serve as a comparison to that in Australia. It seeks to identify stresses and challenges to this sector in Canada. The study also seeks to offer possible lessons for the direction of higher education policy in Australia and to raise concerns for the direction in Canada.

The focus of the study is on the period since 2000 when consistent data for Canada largely became available. In 2005, the Rae Report – the last major overall review of higher education in Canada – was published followed by three volumes of evaluative studies of the state of higher education in Canada (Beach, Boadway and McInnis, 2005; Beach, 2005; and Iacobucci and Tuohy, 2005). So earlier and detailed commentaries are readily available from these sources. The present paper includes discussion of both universities as well as colleges that jointly make up the higher education sector in Canada. The perspective of the discussion is largely economic and heavily based on comparative statistics and the incentives they reveal.

The paper proceeds as follows. The next section points out the major distinguishing features of the Canadian higher education system. Section 3 identifies a number of challenges and stresses the higher education sector has been facing in Canada. Then Section 4 examines some background influences on the higher education sector in both Australia and Canada. Section 5 then raises concerns about the growing role of metrics in higher education and the incentive issues they raise. And Section 6 concludes with some lessons to be considered in both countries' tertiary education sectors.

2. Distinctive Features of the Canadian Higher Education System

First off, it should be noted that in Canada constitutional responsibility for education – including for tertiary, post-secondary, or higher education (terms used interchangeably in this study) – lies with the provinces. So rules, regulations, funding and demographic pressures for institutions of higher education vary somewhat across the ten provinces, and especially so between the province of Quebec with its francophone majority and language-based education systems and the rest of the provinces. An overview

of the history of "collaborative federalism" in the higher education area can be found elsewhere (Cameron, 2005; Wikipedia, 2018). Suffice it to say that the areas of direct federal government involvement in higher education since 1996 have been in research grants and research chairs, student aid, and occasional fits of infrastructure investments. So in 2016, for example, federal government grants and contracts accounted for 9.4 percent of total university revenue compared to 40.0 percent from (essentially) provincial sources (CAUBO, 2018, Report 1.1). This compares to 8.6 and 44.7 percent, respectively, in 2000, and 11.7 and 42.8 percent in 2005 (ibid.). The federal share has generally bounced around in response to intermittent federal initiatives, while the provincial share has broadly declined as funding sources have generally shifted to the private sector (see further below).[1]

A second major point of context is that the higher education sector in Canada has a binary structure which includes universities as well as an extensive array of community colleges (henceforth "colleges"). Universities are "[I]nstitutions offering Bachelor's, Master's and/or PhDs", while colleges are "[I]nstitutions offering Applied Master's, Applied Bachelor's or Master's, Bachelor's college diplomas, attestations d'études collégiales (AEC) in Quebec, Associate Degrees and other college programs. Does not include vocational schools" (CAUT, 2018, Table 4.2). The general role or purpose of colleges has been seen as (i) offering more ready access with lower learning barriers to continuing education that could lead into universities, and (ii) providing programs of a more applied nature designed to better address specific workplace needs (Skolnik, 2005, p. 61). There are currently 121 accredited universities (including a few university colleges) – 92 public and 29 private (almost all non-profit) – in Canada and 159 colleges – 132 public and 27 private (all non-profit) (ibid.). The higher education sector is thus relatively decentralized. And within the university sector hierarchical differences are not as strong or marked as in, say, the United States or the United Kingdom, so the university system tends to be more homogeneous than in the latter countries. A popular ranking of Canadian universities has traditionally categorized them into primarily undergraduate schools, comprehensive schools that offer a wider range of

[1] Federal share of community college revenues in less than 2 percent compared to provincial funding share of 62 percent (CAUT, 2018, Table 1.1).

programs, and medical/doctoral schools with major doctoral and professional programs (Mueller and Rockerbie, 2005).

The higher education sector is of substantial size in the Canadian economy. In 2015-16, there were 2.008 million students enrolled in tertiary education out of a Canadian population of 36.3 million. A number of summary higher education statistics for Canada are provided in international comparison in Table 1. Public expenditures on tertiary education as a percentage of GDP in Canada is 1.7 percent, compared to 1.3-1.4 percent in Australia, the United States, the United Kingdom and the OECD average. As a fraction of total government expenditure, the share is also relatively high in Canada. But interestingly, this higher share comes from Canada spending much more on college training (what the OECD refers to as short-cycle tertiary education) than most other countries. As a result, the proportion of 25-34 year olds with tertiary education is again markedly higher than for the other comparators. But a more refined breakdown shows that this is due to a much higher fraction with college education. The fraction with a bachelor's education, while higher than the OECD average, is lower than in Australia, the U.S., and the U.K. The fraction with advanced degrees in Canada is also below that in the U.S. and U.K. However, a relatively high proportion of 30-44 year olds with non-tertiary education parents go on to attain tertiary education in Canada compared to the OECD average (OECD, 2017, Canada Study, p. 3), so the opportunity for advancement into a tertiary education is considered relatively high.

The government share of tertiary education funding in Canada at 48 percent is higher than in the other three comparator countries, though well below the OECD average of 71 percent. The flip side is that the private sector share (largely tuition and fees), at 52 percent, is relatively lower than for the comparators though well above the OECD average. The pattern is generally similar for annual expenditure per student in the tertiary sectors[2]: while the figure for Canada exceeds that for Australia and is well above the OECD average, it is also below that for the U.K. and well below that in the United States.

[2] Expressed in U.S. dollars evaluated in purchasing-parity terms.

The proportion of international students in higher education in Canada at 11 percent is lower than in Australia (at 15 percent) and (excepting colleges) in the United Kingdom, though well above the OECD average. The proportion rises with the level of tertiary education across all countries. In 2015, 11 percent of tertiary foreign students in Canada came from Africa, 4.5 percent from the U.K., 13 percent from Europe (including the U.K.), and 61 percent came from Asia (more than half of whom arrived from China) (Statistics Canada, 2017, p. 75). Forty-one percent of international tertiary students attended schools in Ontario, 20 percent in Quebec, and 19 percent in British Columbia (op cit., p. 68). Bachelor-level tuition fees for domestic students in Canada are about the same as for Australia, though much lower than for the U.S. International-student fees, however, in Canada are more than triple domestic fees and thus exceed those paid by foreign students in both Australia and the United States.

The overall level of R&D expenditures as a fraction of GDP has long been chronically low in Canada as compared, say, to Australia, the United States and even the OECD average. This has long been a public concern and attributed to the private sector in Canada operating as a branch plant to the United States where multinational companies traditionally have invested much more in R&D activities. The level of higher-education sector R&D expenditures as a fraction of GDP, however, is well above the OECD average and considerably higher than that in the United States or United Kingdom. So higher-education sector research activity in Canada stands up well, but can't make up for the traditionally very poor business sector research activity level.

Table 2 provides some background information on the *growth* of the higher education sector in Canada since 2000. Number of students enrolled in higher education has risen pretty steadily since 2000, though the number of domestic students has started to fall off the last five years essentially for demographic reasons. The relatively rapid growth of foreign students in universities has kept the total student numbers rising. The number of graduates has also continued to grow, though at a slower pace. As with other OECD countries, the proportion of the population with tertiary educational attainment also continues to rise. These increases are driven by a rising demand for higher education due to higher average incomes and recognition of the job market benefits of higher education, by rising labour market

needs for skilled labour as technology and trade evolve, by expanding the number of university and college positions available in the tertiary sector, and in Canada's case by relatively high levels of immigration (similar to Australia) where immigrants have traditionally worked hard to see that their children get a university education.

Total university and college revenues have also risen steadily. In terms of revenue sources, the interesting thing to note is the declining share of provincial funding over 2000-2016 from 43.1 to 39.1 percent for universities and from 64.6 to 60.7 percent for colleges, and the increasing share of revenues from student tuition and fees from 18.8 to 27.9 percent in the case of universities and from 18.3 to 25.8 percent for colleges. There has thus been a substantial shift in funding for higher education in Canada over this period from public sources towards direct student or household payments for their education (see further below).

3. Challenges to Higher Education in Canada

In light of these basic background results, several major current challenges are evident for higher education in Canada.

3.1 Public Expenditures on Higher Education Under Pressure

In the mid 1990s, the Canadian federal government sought to reduce its large deficit at the time by initiating a reduction in federal transfers to the provinces for health and social programs. The provinces reacted by cutting its own expenditures in many areas including for higher education and raising user costs including post-secondary tuition fees. Some of the cuts and increases were quite sudden and substantial. By the early 2000s, major concerns were being voiced about underfunding of universities and colleges, accessibility to post-secondary education and training, and the eroded quality of higher education being provided in Canada, especially in the largest province of Ontario (which includes about 40 percent of the tertiary sector). The result was the setting up of a royal commission headed by Bob Rae, a former premier of the province, to offer recommendations to address these problems. While the

commission was provincial, it set the tone for how all the provinces reacted. The Rae Report of February 2005, among other things, proposed a new revenue framework for post-secondary education institutions that offered greater long-run funding security and predictability (Snowdon, 2005). The result is that over the next several years, public funding to universities and colleges increased fairly substantially – see rows 4 and 5 of Table 2 – and indeed real dollar tertiary revenue per student either held stable (for colleges) or even increased slightly (for universities) -- see row 1 of Table 3. The policy arguments at the time focused on the role of colleges and universities in enhancing a more productive and innovative economy and hence economic growth, and in developing a skilled workforce that is more flexible and adaptable to changing labour market needs and that provides positive social and political externalities.

Since the Great Recession near the end of the 2000s, however, government expenditures on higher education have again been under pressure as governments again seek to reduce their deficits. Provincial government budgets are also being squeezed by rising costs of health care with an aging population and from other infrastructure and social needs for a growing urban population, while trying to maintain competitive tax rates relative both to other provinces as well as to the United States next door. As a result, revenues from governments per student in universities in Canada have declined in real terms by about 15 percent between 2010-11 and 2015-16 (row 1 of Table 3). A large portion of this decline was a fall off in direct federal contributions. Colleges did not experience a corresponding decline over this period.

Total university expenditures per student (in real terms) also declined since 2010-11, but by a more muted 3.4 percent (while corresponding figures for colleges went up slightly – see row 2 of Table 3). So this discussion will focus on universities and how they have adjusted to this fall off in public funding. With public sector funding have come public sector equity and other program requirements (without additional funding), and more extensive reporting/monitoring review and administrative costs. Tertiary sector costs also generally go up faster than the CPI used in calculating the above per student figures (Ehrenberg, 2005). As student numbers have risen, so also have the number of university faculty, but less than proportionally. The result has been a substantial increase in overall ratio of students to full-

time teaching faculty – see row 4 of Table 3 – from 22.5 in 2000-01 to 34.8 most recently. This is consistent with larger class sizes, less access to faculty, reduced use of term papers and essays, increase reliance on multiple-choice assignments and exams, and generally reduced quality of post-secondary education (Mahboubi, 2017).

At the same time, universities and colleges are reducing the proportion of faculty who are permanent full-time and increasing their use of temporary, adjunct and part-time employees (row 5). This has been a major issue for several faculty union strikes that have occurred. One other source of income that universities have disproportionately increased over this period is non-government grants and contracts whose share of total university revenue has gone up from 5.1 percent in 2000 to 6.6 percent in 2016 (CAUBO, 2018, Report 1.1). University spending on scholarships and bursaries (in part government mandated) has also steadily risen from 3.6 percent of university expenditures in 2000-01 to 5.7 percent in 2015-16 (CANSIM, Table 477-0059). These funds were thus not available to spend on teaching and research.

The biggest revenue change, however, has been the rising component of tuition and fees (row 6) – essentially set by provincial governments – as governments have shifted the costs of higher education increasingly onto students and households. Between 2000-01 and 2015-16, real tuition and fee costs per student rose by 56.7 percent for universities, and between 2001-02 and 2015-16 went up by 45.4 percent for colleges. Such major shifting of the costs of higher education has serious efficiency and equity concerns (Boadway, 2005; Barr, 2005). But unfortunately no simple formula exists to advise governments on the "best" trade-off between public vs private sharing of the burden of higher education within a mixed economy, though any such formula would reflect the distinct private benefits and social or public benefits of such investments (Green and Iacobucci, 2005). Being able to recognize and empirically evaluate both of these is of considerable import. Riddell (2005), for example, finds that the social returns to an additional year of tertiary education are roughly in the same range as the private returns of 7-10 percent.

One of the leading concerns of reduced government funding and rising user costs is accessibility to post-secondary education. There are at least two aspects of accessibility here. One operates from the

supply side of the tertiary sector and affects the availability of student positions or capacity of post-secondary institutions. The other operates from the demand side of the education market and reflects how higher tuition and fees can reduce student access for those who can't afford to attend (i.e., unequal access), especially for lower- and middle-income households, and moreso for those potentially attending universities than colleges. Fortin (2005), using Canadian and U.S. data, estimates both these effects separately and finds that (i) a 1 percent increase in university tuition levels reduces enrolment rates by about 0.15 percent, while (ii) a 1 percent decrease in provincial funding levels to universities (in terms of per student-age person) yields a decrease in enrolment rates of 0.25 percent. The decreased funding effect to universities is considerably larger than the negative tuition effect on students.

A worrisome consequence of rising student contribution levels has been increasing student debt levels. Large amounts of student debt can reduce a graduate's financial independence and lead to postponed fertility and home ownership, and it can bias a graduate's choice of field of specialization and jobs toward those that are more remunerative than rewarding. There is a complex mix of student loan options with both federal (Canada Student Loans) and provincial (e.g., Ontario Student Assistance) programs – see an overview in Finnie et. al. (2005). In 2013-14, the proportion of full-time university students receiving a Canada Student Loan was 37.0 percent, up from 32.9 percent in 2007-08 and 35.0 percent in 2010-11 (CAUT Almanac, 2018, Table 3.3). Historically low interest rates may be a contributing factor as well. As seen from row 7 of Table 3, rising student debt levels are more a problem of university graduates than of college graduates, though this also reflects the higher expected earnings levels of the former. While figures for 2015-16 are not yet available, there is every reason to expect them to be considerably higher than for 2010-11 because of the big jump in tuition and fee levels. Governments have also been trying to streamline and simplify the loan application processes with corresponding substantial increases in applications. Again, an appropriate mix of loans vs. grants/bursaries for post-secondary students has not been identified, but many precepts and proposals have been offered (Barr, 2005; Carmichael, 2005; Stantcheva, 2017; Marx and Turner, 2018). Canada also does not have an income-contingent student loan system, though Ontario may be moving in this direction.

A further concern is the incentive to bring in foreign students. Funding arrangement concerning foreign students differ across provinces. In Ontario, for example, the provincial government does not provide funding for foreign undergraduate students, but allows the universities to charge much higher tuition fees to foreign students and to keep almost all this tuition revenue for the university's operations. At the margin, then, there is an incentive to raise revenue by increasing foreign student numbers. This generally benefits the better known universities. But foreign student numbers are still considerably below those in Australia or the United Kingdom.

3.2 Role of Government Direction in Post-Secondary Education

The funding system for post-secondary education in Canada arose not through any grand plan based on best principles of public finance, but through an evolution or history of piecemeal developments. And the incentive schemes built in reflect that.

Major sources of federal funding toward post-secondary education in Canada are the Canada Social Transfer and federal-provincial equalization payment programs, both of which are unconditional block transfers to help equalize government expenditure opportunities across provinces, including for tertiary education. But there is no requirement that such funds actually are spent on tertiary education. To the extent that university participation rates are much higher for higher-income families than for lower-income families (Corak et al., 2005), these transfers provide a regressive subsidization of university students and their families. Interestingly, the college participation rates are pretty flat across family income groups (op. cit.). Registered Educational Savings Plan (RESP) instituted by the federal government since 1998 also provide tax-sheltered vehicles (to which the government contributes) for parents saving for their children's future tertiary education. But again the take-up rates rise strongly with family income since low-income households have difficulty finding funds to set aside for future education and high-income families treat this as a tax-reduction opportunity. Since 2017, students can also get a (non-refundable) tax credit – with transferable unused amounts on their tuition expenses. So at the

undergraduate and college levels of post-secondary funding, the role of the federal government is largely indirect.

The great majority of public funding for Canadian tertiary institutions is direct provincial transfers to universities and colleges. These are based on the number of students enrolled ("basic income units" or BIUs) weighted by program enrolled in, part-time vs full-time status, and perhaps year in the program. These are universal programs that apply uniformly to all universities and separately to all colleges within a province, irrespective of quality. The size of the per student (or capitation) transfer varies across provinces. Since post-secondary institutions have substantial overheads (particularly with respect to plant and research equipment), and it can be argued that there are economies of scale in operating a university, marginal costs per student are well below average costs. So a university may wish to raise revenues by increasing number of students. But the provinces typically limit such increases through multi-year corridor funding arrangements. With the declining demographics of young people in some regions (such as the Atlantic provinces), this may be less of a concern on the upside and more of a problem of attracting students from higher-growth regions (such as Ontario) to fill available spaces. Alternatively, universities may wish to raise revenues by raising student tuition levels (or other related costs such as residence fees). But the provinces, in effect, have caps on what tuition the schools can charge, so they have in effect set tuition levels that can vary somewhat across academic programs – higher fees in fields where graduates' incomes are higher and program delivery costs are more expensive – and much less so across schools (see Table 4). Table 5, on the other hand, illustrates some average tuition fees across provinces and fields of study. Some professional university programs (such as an MBA) are not capped in some provinces, so their fees can be much higher (by a factor of 6-10) and vary substantially between schools.

Universities can thus compete for quality of students, but not much on student fees, and the provincial transfers they receive are capitation-based and do not reflect any interactions between research and teaching. Consequently, the Canadian university system is relatively homogeneous across schools in terms of the quality of their undergraduate programs as compared to the United States or United Kingdom

systems, and has relatively little differentiation or hierarchical ranking between schools at the undergraduate level. Performance funding at the undergraduate level is essentially not part of the system. Large schools certainly have more program and course options and there is a whole collection of smaller schools offering just undergraduate programs. They do compete for outside private-sector and government infrastructure and occasional specific program subsidies with varying degrees of success depending on research excellence (e.g., University of Toronto), historical establishment (e.g., McGill University), entrepreneurial success (e.g., University of Waterloo), and geographic location (e.g., University of Alberta and University of Windsor). But there are no Canadian schools at the very top of the world university rankings. The top, the University of Toronto, was ranked 22nd in the Times Higher Education ranking and 28th in the QS world university rankings in 2018. The other regularly top ranked schools in the top 50 international rankings are University of British Columbia and McGill University. On the other hand, the early career average earnings of bachelor's graduates from the bottom third set of universities are not much different from those of graduates from the top third set of universities, certainly no where near as great as average earnings differences between different fields of study (Finnie et al., 2016). So the Canadian market does not distinguish much between undergraduate school program quality.

Whether provincial funding resources should better reflect program quality and how best to do so without extensive public-sector intervention or negative side-effects (such as gaming the system) are certainly valid questions for debate. Green and Iacobucci (2005), for example, suggest making use of available market information on student applications, admission cut-offs, standardized test results of incoming students, and student choices, and on donor market information linked to specific educational initiatives.

Recently, the Ontario government has begun a major initiative to better differentiate the universities (and the colleges) and have them concentrate more on their self-chosen specialized focus. Through a series of multi-year Strategic Mandate Agreements (Ontario, 2018) between each university (and each college) and the province, the former need to decide on how they are going to be assessed on their particular strengths and focus and whether they are going to be assessed as research-intensive or

more teaching-intensive, and then in follow-up SMAs agree on a set of performance metrics (e.g., total tri-council funding per faculty member, number of papers published per faculty member, and number of citations per paper over, say, five years). Future funding, then, will be dependent on numbers of students, but also on how well the university (or college) performs on the agreed-upon metrics.

The growing role of student tuition fees in university resources provides an opportunity to increase program quality and accountability to students. If universities and perhaps separate programs could compete better through tuition levels, they would likely be more responsive to students' preferences and adjust more flexibly and creatively to evolving labour market needs. Greater exposure to market competition for students and a better reflection of program costs would also likely enhance efficiency and productivity in program delivery and allow differentiation and specialization across programs and schools. Again, this would not involve onerous government program reviews and evaluations as it would be done through student self-selection. In order for potential students to pursue their university education based on their educational skills rather than their ability to pay, such a system would have to be combined with a more extensive system of student grants, scholarships and student loans. Canada and the provinces should consider implementing a graduate tax or income-contingent loan program operated through the income tax system (Daniels and Trebilcock, 2005). The experiences of Australia, New Zealand and the United Kingdom should serve as useful in how best to implement such a system (Barr, 2005).

The Canadian higher education sector is already relatively decentralized compared to Australia and the United Kingdom (though less so than in the United States with 50 states and its extensive set of private colleges and universities). This partly reflects that post-secondary education is largely a provincial responsibility in Canada and the uniform capitation funding system used. But the closed-shop union system present at most Canadian schools and a tenure-stream tradition at many universities provide some local faculty resources and possible resistance to prospective central planning-like government regulation of the system (Polster and Amsler, 2017). The above proposals for greater market competition in the university sector would considerably extend the degree of decentralization of the system. But how much

decentralization there should be, what are its structural implications, and what are the trade-offs involved are very much open questions worth further debate (Boadway, 2005).

3.3 Eroding Research Competitiveness and Shifting Research Focus

Canada has had a mixed track record on R&D investment. This has been highlighted in several major reports on the current state of R&D activity in Canada – *State of the Nation 2014* (STIC, 2015), *Investing in Canada's Future: Strengthening the Foundations of Canadian Research* (APFS, 2017), and *Competing in a Global Innovation Economy: The Current State of R&D in Canada* (CCA, 2018). Over the 2009-14 period, Canada produced 3.8 percent of global research publications to rank ninth in the world, down from its previous seventh place position over 2003-08 (CCA, p. xviii). Ranked by national GDP, Canada's publication rate is 12th overall (ibid., p. 38). As a fraction of GDP, total or gross R&D expenditures (or GERD) in Canada rose from 1.865 percent in 2000 to 1.978 percent in 2005, and has since fallen off to 1.649 percent in 2015 (row 1 of Table 6). This declining pattern stands out rather markedly compared to other major countries that have largely seen strong rises in the GERD ratio (Figure 1) and is further highlighted in Figure 2 which illustrates Canada's declining GERD ratio as compared to the strongly rising OECD average GERD ratio. This does not bode well for Canada's long-run research capacity and competitiveness. Doctoral-level graduation rates are also markedly low – in 2013, Canada ranked 22nd among 35 OECD countries (APFS, p. 43).

The largest component and primary driver accounting for this decline has been business enterprise R&D expenditures (or BERD). Not only has this been traditionally low in Canada compared to other major economies – about half the OECD average – but as a fraction of GDP, it has declined by over 23 percent since 2000 (row 2 of Table 6); the number of persons working in business-sector R&D in Canada also fell by 20 percent between 2008 and 2013 (CCA, p. xviii). Overall, Canada ranks only 33nd among 40 OECD economies on a composite index of BERD expenditures over 2006-15 (CCA, pp. xxi, 68) and 34th in trademark and design applications (ibid., p. xxiii).

A number of reasons have been offered for this relatively weak performance. Canada has historically had a major natural resource sector in which R&D investment has not been as strong as in developing high-tech sectors. Large multinational firms operating in Canada tend to concentrate their R&D activity in their home country and near their headquarters, such as in Silicon Valley in California. A portion of the best Canadian technical talent typically moves to the U.S. each year where there are more opportunities available. Many innovative start-ups in Canada are bought out by foreign organizations, and few Canadian firms seem able to grow to sustained large-scale operations. The recent decline in energy prices has also seen a fall-off in energy sector R&D activity.

Within the Canadian R&D community, the higher education sector thus plays a relatively more important role than in other major countries. By 2015, 40 percent of Canada's R&D activity was done in its universities and colleges, up from 28 percent in 2000 (Table 6, row 3). As a fraction of GDP, higher education R&D came to 0.66 vs. an OECD average of 0.42 percent (CCA, p. 14). But here too there are concerns. Federal government funding of R&D – a major support for post-secondary research activity – after rising slightly as a fraction of GDP from 2000 to 2010, fell off markedly in 2015 (even in actual current dollars; row 4 of Table 6), and this decline continued through to 2017. Within the higher education sector, R&D expenditure per researcher flattened out after 2005 (row 5), and in real terms -- after adjusting for CPI inflation – has declined by over 17 percent between 2005 and 2015 (row 6). Canada's higher education R&D expenditure (or HERD) was ranked fourth among OECD countries in 2007, but by 2014 had slipped to seventh place (APFS, p. 33).

Federal government expenditures on R&D activity in Canadian universities are examined in more detail in Table 7. Total federal spending at universities more than doubled between 2000 and 2010 – even in inflation-adjusted terms -- and then fell off markedly by 2015 (rows 1 and 2). But number of university faculty also rose strongly over this period, so on a per full-time faculty basis a substantial fall-off also occurred after 2010 (row 3).

The largest portion of federal funding to Canadian universities comes through research-related grants from three major granting councils – the Natural Sciences and Engineering Research Council, the

Canadian Institute of Health Research, and the Social Sciences and Humanities Research Council – whose funding shares were 42.0 percent, 44.6 percent, and 13.4 percent respectively in 2015-16. The total granting council revenues to universities increased strongly over the period since 2000 (row 4). But in inflation-adjusted terms, they have basically flatlined since 2005 (row 5), and in per full-time faculty inflation-adjusted terms they declined after 2005 (row 6).[3]

Two other sources of federal government support for post-secondary research are the Canada Foundation for Innovation (which helps support equipment and overhead costs) and Canada Research Chairs (which helps retain and attract top research talent to Canadian universities) programs. Together they make up just under 20 percent of total federal funding to universities. While doubtless very helpful in these roles, funding in these programs has not been adjusted upward to account for inflation. At the same time, Canadian universities have faced direct competition from U.S. schools for top talent; and when the Canadian dollar slips significantly below the U.S. dollar, such competitive pressure intensifies and the environment for top talent becomes more precarious (APFS, p. 34).

To help address these pressures, the federal government in 2017 announced a new Canada 150 Research Chairs program in honour of the country's 150th anniversary. While the number of these new chairs is limited, the recent announcement of the first round of 24 foreign scholars appointed is indeed impressive[4] (Axios, 2018). So the competitive situation may be starting to look up.

Funding council priorities have also been shifting away from fundamental research. Direct competitive project funding can be split between independent inquiry-driven investigator-led research, priority-driven research targeted at specific areas or themes identified by the granting authorities, and partnership-oriented research projects that require securing a funding partner such as in business or a

[3] The shift up after 2010 is an artifact related to declining numbers of tenure-stream teaching staff (see Table 3, row 3) as universities have tried to reduce costs by employing increasing numbers of adjuncts, sessional instructors, and part-time teaching staff (APFS, p. 35).

[4] There is the possibility that the 2016 federal election results in the United States made attracting top scholars to Canadian schools somewhat easier. A similar situation occurred at the time of the U.S. involvement in the Vietnam War.

matching grant (such as from a government department or the university itself). Priority areas can change year to year and can include, for example, the environment, energy production from the oil sands, arctic climate change adaptation, regenerative medicine, health in an aging population, wireless networks and services, aquaculture, and pipeline safety (STIC, pp. 61-62). Such a push for partnership funding helps increase industry-financing of higher education R&D. But imposing priority topic areas, matching grant requirements, interdisciplinarity, and explicit practical and/or policy benefits have the effect of favouring applied projects with more immediate practical outcomes (for business and political interests), and disfavouring basic curiosity-driven fundamental research.

> "Between 2007-08 and 2015-16, the inflation-adjusted budgetary enveloped for investigator-led research fell by 3 per cent while that for priority-driven research rose by 3.5 per cent… Our calculations suggest that as the number of researchers grew over this period, the real resources available per active researcher to do investigator-led research declined by about 35 per cent" (APFS, p. 36).

One of the further consequences is that success rates in independent research grant competitions have fallen. Success rates for NSERC discovery grants have declined from about 78 percent in 2002-03 to about 51 percent in 2011-12. Success rates for CIHR operating grants fell from about 33 percent in 2000-01 to about 9 percent by 2012-13 (CAUT, Tables 5.3 and 5.4). Grant amounts are also reduced and incentives are put in place to submit safer, less risky proposals. Low success rates for independent research grants also hurt early-career scholars who are struggling to get established and known for their own work. Research grant opportunities (success rates and generosity) for young researchers in the United States look much more attractive.

The 2017 Advisory Panel for the Review of Federal Support for Fundamental Science report (better known as the Naylor Report after the chair of the panel, the former president of the University of Toronto) was purposely set up to review the above concerns and provide recommendations. This concern was reinforced less than a year later by the Council of Canadian Academics (2018) report which set out in considerable detail how "Canada's international standing as a leading performer of research is at risk due to a sustained slide in private and public R&D investment" (p. 173). Among the many recommendations in the Naylor Report were that (i) base funding for the major federal research granting agencies be

increased from $3.5 billion to $4.8 billion over 4 years in order to restore historical levels of support, (ii) there should be rapid increase in investigator-led research funding to address current imbalances that favour priority-design research, (iii) funding strategies should be harmonized reflecting a life-cycle approach that balances researchers' needs at different stages of their careers, especially for early-career researchers, and (iv) the granting councils should reinvigorate graduate scholarships and post-docs to reflect inflation and competition from the U.S. (APFS, pp. xxv-xxix).

The current federal government has been more sympathetic to the above research funding concerns. The 2018 federal budget included several research funding commitments. Ottawa committed to raising overall funding levels by $3.8 billion spent over five years and raising the granting councils' annual amount by about $450 million by the end of five years. This will involve an increase of 25 percent for basic research and open competition grants and a greater emphasis on supporting early-career researchers (Semeniuk, 2018). So the Naylor Report has had some positive changes. But it remains to be seen how effective and long-lasting these will be.

3.4 Higher Education as a Pathway to Skilled Immigration

Over the last decade, higher education in Canada has come to be seen – in addition to all its standard roles – as a pathway or vehicle to attract high-skilled young immigrants to Canada. Like many developed countries, Canada is facing a natural rate of population growth below the replacement level, so that immigration serves to grow both the economy and the population. Research has shown that three of the most important determinants of immigrant success in a host country are high levels of education, youthfulness at time of arrival, and fluency in the host country's official language(s). Making it relatively easy for foreign students who graduate from a post-secondary school in Canada to apply for landed immigrant status plays into these research findings. Since the education or training was obtained within Canada, the foreign student has had an opportunity to become more familiar with local opportunities and requirements of the Canadian labour market and to become more familiar with either English or French which are critical to functioning in the North American economy (Beach, Green and Worswick, 2011).

Seeking to retain at least some of the foreign post-secondary students helps address many high-tech job vacancies that Canadian employers say they have difficulty finding the skilled talent that they need to grow – especially in the key STEM disciplines. It helps make up for the on-going skilled brain-drain to the United States mentioned in the previous section (Zhao, Drew and Murray, 2000; Robson and Mahboubi, 2018). Many of the high-tech start ups that have sprouted recently have arisen from foreign student graduates of Canadian universities. The children of immigrants also traditionally do very well in the Canadian economy, and the children of highly-educated immigrants even moreso (Finnie, Mueller and Sweetman, 2017).

With these considerations in mind, Citizenship and Immigration Canada[5] established in 2008 a new Canadian Experience Class (CEC) program category for landed immigrants. It targets the two groups of highly skilled temporary foreign workers and recent foreign post-secondary graduates of Canadian schools with qualifying Canadian work experience. These target groups have actual Canadian work experience and educational credentials that are known and understood in the Canadian labour market and have already gained some fluency in either English or French. Temporary foreign worker applicants must have at least two years of full-time Canadian work experience in a high-skill occupation. Foreign-student graduate applicants must have at least one year of full-time Canadian work experience in a qualifying occupation after having completed a required degree or diploma (IRCC, 2015). Since January 2015, CEC class applications have been handled by a new online Express Entry system whereby applicants create an online profile of their skills, work experience, education, ability, any job offer in hand, and demographic details. This electronic profile is then evaluated by a point system or Comprehensive Ranking System. There is also an independent language test requirement. Applicants with the highest scores in this ranking are then invited to apply for permanent resident. All applicants stay in the pool for 12 months. Non-invited applicants can re-apply (so long as they continue to meet the requirements) (IRCC, 2017a,b). This process is an attempt to incorporate both labour market supply and labour market demand factors in

[5] Now renamed Immigration, Refugee and Citizenship Canada (IRCC).

evaluating likely success in the Canadian labour market, as well as flexibility and responsiveness in processing.

The program started off relatively slowly with only 17,815 total CEC new permanent immigrants in 2016, of which 8,246 (or 46 percent) were formerly foreign students of Canadian colleges or universities.[6] Total immigration that year was just over 296 thousand (IRCC, 2017a). In 2017, the total CEC intake jumped significantly to 32,735 (IRCC, 2018).

On how successful this initiative has been the jury is still out. Its relatively slow start may have been affected by the switch in mode of application to an online approach and by determining how much weight in their ranking system to put on having a job in hand at time of application. Within the last couple of years, several colleges – typically in more isolated communities – have worked out agreements with private colleges in more populous communities to admit international students who expect to get a public college diploma that confers eligibility for the CEC program. Since the quality of academic standards is difficult to monitor is such public-private partnership arrangements, the Ontario government recently told such colleges to cease such arrangements (Chiose, 2018). Clearly though, incentives to exploit CEC opportunities have to be thought out and kept an eye on.

Over the last several years, the U.S. economy has experienced a tighter labour market and lower unemployment rate than in Canada, and the Canadian dollar has been worth significantly less than the U.S. dollar so that U.S. salaries look better. The Trump administration trade policies are also raising investment uncertainty and causing capital outflow from Canada to the United States, and a continuing outflow of capital can be expected to lead to an associated loss of talent. There is also hearsay evidence that an increasing fraction of foreign student graduates from high-growth countries (e.g., China) are choosing to return home after graduation than was the case ten years ago. There have also been calls for better federal-provincial policy coordination on skilled immigration issues (Expert Roundtable, 2012) where the federal government seeks to bring in more highly educated high-skilled immigrants while most

[6] All immigration figures include both the principal applicant and any accompanying dependants.

provinces in effect charge very high foreign student fees and effectively limit the number of licenced professionals (such as medical physicians) who are allowed to practice their trade in the name of upholding professional standards. On the other hand, Canada's favourable multicultural environment has gained a lot of international attention in recent years. And following the 2016 U.S. election results, the numbers of foreign student applications to Canadian schools have skyrocketed. It would seem that some wrinkles still have to be worked out, but that this approach has good potential.

4. Background Influences on Canadian and Australian Tertiary Education Systems

So far we have used statistics to compare the Canadian and Australian systems. In this section we will discuss policy and social factors that impact on the performance of both systems, emphasizing the similarities and differences. We will begin with the Canadian System in section 4.1, and then consider the Australian system in section 4.2.

4.1 Demographic, Social and Competitive Influences in Canada

Following the post-World War II baby boom – which was particularly strong in Canada – the Canadian university system expanded rapidly in the 1960's and 1970's. Similar expansions occurred in Australia, U.K., Europe and the U.S. Because of its proximity to the U.S., Canada was strongly influenced by the U.S. university system. Although there has been some influence from the U.K., faculty hiring and course structures increasingly followed U.S. practice. Canadian undergraduates could choose to enrol in any Canadian university or apply to U.S. universities. Similar competition occurred at the graduate level, where it was common for outstanding Canadian graduate students to study in the best U.S. graduate schools. The top Canadian universities hired junior faculty from the top U.S. and Canadian graduate programs. It would not be an exaggeration to say that the Canadian university system was semi-

integrated into the U.S. system. Canadian provinces played the same role as U.S. states in funding and competing for students and faculty in the North American university market. Clearly these factors have played a major role in determining Canadian undergraduate fees, faculty hiring practices and salaries. A major difference was that the U.S. had elite private universities, whereas Canada had the equivalent of the U.S. state university system.

The competitive pressures have not been uniform, in that they were more obvious for the best and most ambitious Canadian universities. In particular, the competition was most intense in STEM disciplines (engineering, physical and biological sciences, and mathematics), where technical skills were easily transportable across international boundaries. This is reinforced by the fact that large STEM projects require heavy infrastructure and major funding, which is easier to obtain in the U.S. because of their much larger research funding base. This can make it harder to keep top faculty in the Canadian STEM disciplines than in some other disciplines. As academic priorities shift towards STEM fields, the pressure of such competition will only increase. Generally there is less international mobility in some of the humanities, social sciences and law where cultural differences are more locally specific and less internationally transportable.

Canada has long developed a tradition of accommodating differences, at least in part because of the role of Quebec in the Canadian political system and being a close neighbour during the U.S. Civil War upheaval, but also because of large regional differences in traditions, economies and perspectives. Accommodating differences impacts the tertiary education sector and its operations. Constitutionally, education is provided by the provinces, while the power of the federal finances and unrestricted taxation (especially following World War II) meant a mixed and diffused system of tertiary education funding and operations, where differences have to be accommodated – whether in language, religion, regional history, or perspectives and priorities. Committees that make funding allocation decisions always have to have regional representations which tend to accommodating differences. The Canadian federal system is quite different from a single-authority top-down decision-making style. It more closely follows the U.S. style of decision-making where there are fifty states and a great variety of different types and qualities of

universities. This mode of operation has also been influenced by the so-called more risk-averse nature of Canadians. The Canadian system traditionally has been more reliant on long-run planning and a broad human capital improvement perspective. It has been wary of adopting various pop trends – which would be harder to implement in such a more diffuse system. It has also been argued that there is a greater sense of responsibility for others and stronger preference for a fairer distribution of resources – often as an explicit regional requirement – than, say, in the U.S. or in a more top-down homogeneous system. And again this works against a centralized uniform system of operation.

A possible problem occurs in the incentive system set up by the presence of large numbers of foreign students, who pay much higher fees than domestic students. Universities can become dependent on maintaining this flow of revenue, especially when governments reduce their funding, requiring foreign fees to cross-subsidize domestic students. Within the traditional academic disciplines, foreign students – especially Asian students – tend to be more concentrated in the sciences and STEM disciplines, perhaps because their knowledge is more "transportable" back home. But in some areas, such as business schools where tuitions are typically very high and disciplines covered are quite mixed in terms of their technical and language proficiency requirements, some foreign students may face difficulties adjusting and completing their studies. This potentially puts the schools in an incentive bind where they are averse to losing the high tuition revenue from foreign drop-outs. They may find it easier to accommodate these students by revising requirements and standards. This can have a deleterious effect on the general quality of education provided to the student body as a whole and can eventually lead to reputational effects.

Conversely, if the monetary incentives are less skewed toward maximizing foreign fee income, the universities can be selective in admitting high quality foreign students. This is apparent especially in the top U.S. and Canadian universities where there is fierce competition for high quality students. These foreign students enrich the national undergraduate and graduate pool, so that the Canadian and U.S. universities will award means-tested scholarships for very good international students. The return to this subsidy is that often talented graduates or post graduates stay in the country adding to the stock of quality

skills in high demand fields. If they return to their own country satisfied with their education, they enrich their own culture by providing needed skills and insights accumulated when they were students.

Unlike the U.K. and Australia, Canada has a significant, healthy college system that trains students in trades and vocations. Some of the large colleges in major urban locations have been upgraded to universities, but the colleges are still a thriving sector, complementing the universities.

Several of the provinces have followed recent tertiary education expansion in the U.K and Australia, dramatically increasing the percentage of the graduating high school cohort attending university and colleges (see Table 2). However, the increase in student load has been accommodated very much by using more adjunct and contract teachers in the earlier undergraduate years. Tenured research faculty often tend to teach in senior undergraduate and graduate programs.

There have been numerous complaints by faculty members in the U.S., U.K., and Canada that the number of university administrators has grown faster than faculty numbers. Numerous reasons have been given for the rapid growth in administration: some are related to increasing government involvement in monitoring research, and requiring social objectives such as inclusiveness and transparency. There is also evidence that administrative salaries are among the highest of academic salaries. (Ontario, for example, requires annual publications of all academic salaries above $100,000.)

4.2 Demographic, Social and Political Influences in Australia

The Australian tertiary education system has long followed the U.K. system. Historically, one can think of the Australian system as a provincial copy of the U.K. system. This has been true of the U.K. style departmental structures with professors, readers, and senior lecturers and lecturers with their salary grade increments. This system has begun to evolve as the U.S. style system has become more common internationally and scholars became more international mobile[7].

[7] See Milne (2001) for a history of the Australian university system and associated policy issues up until 2000.

Australia, like most Western countries expanded its tertiary education system rapidly in the 1960's and 1970's. Growth stagnated in the late 1970's and most of the 1980's. But beginning in the later 1980's, it has expanded rapidly in a sequence of bursts to accommodate a larger cohort of domestic and foreign fee-paying students. These expansions have largely been instigated by federal government policies. These policy innovations have very much followed U.K. policy fashions. For example, the large increase in fee-paying foreign students was presented as a way to "export education" and increase export revenues. A second example was the introduction of contingent loans for students. A third example was the increasing use of various metrics attempting to influence undergraduate/graduate teaching and research in a top-down system of federal government funding and control (see further below). A fourth example was active conversion of tertiary colleges into universities in the late 1980's, ostensibly to increase university competition[8].

More recently, the universities have begun to copy some U.S.-style structures without much acknowledging that the U.S. system is highly variable in quality and function. For example, it may not be widely recognized that some of the most prestigious (private) universities in the U.S. have small undergraduate numbers. Furthermore, these universities have accumulated very large endowments over long periods of time that are used to fund outstanding faculty, provide generous means-tested scholarships for top undergraduate and graduate students, and construct state of the art scientific and engineering facilities. In addition, the U.S. has a number of prestigious private liberal arts colleges that provide excellent undergraduate degrees in the humanities and social sciences. Class sizes in these colleges are generally far smaller than in the large U.S., Canadian, and Australian universities which use the revenue

[8] Since the late 1980's Australia has evolved a Technical and Further Education (TAFE) or Vocational Education and Training (VET) system of colleges and institutes to cater for vocational training. The TAFE/VET system awards an array of certificates and diplomas for training in various trades and vocations. The TAFE system is primarily funded by the states. There have been numerous recent complaints that the TAFE system is under-funded, is demoralised and lacks a coherent governance framework. For an analysis of the policy problems see The Productivity Commission Report (2011) https://www.pc.gov.au/inquiries/completed/education-workforce-vocational/report/vocational-workforce.pdf. It is interesting to compare that report with a critique of the UK vocational training system analysed by Wolf (2011).

from large classes in other fields to cross-subsidise the very expensive sciences, engineering and medical schools (Ehrenberg, 2005).

Unlike Canada, Australia has no equivalent of the province of Quebec that has placed restrictions on acceptable national policies. As a general rule Canadians try to gain consensus in policy decisions, while making due allowance for cultural and regional differences. Canadian culture is typically more restrained and diplomatic than Australian. Anti-intellectualism is quite common in much of Australian society, whereas it is rather less common in Canada. Given that the provinces have control of the tertiary education sector (with federal research funding), there is more inherent diversity of funding sources in Canada. Australia (modeled on the U.K.) adopted a centralised tertiary education system in 1975, controlled by a federal minister overseeing a large department in Canberra. The chief cause of the problems in the Australian tertiary education system is the centralised, top-down system of funding and policy interventions. It can stifle diversity, using crude metrics in attempts to oversee the system. But implementing these metrics can often have unintended consequences as well (see below).

Australian universities are heavily reliant for their financial viability on foreign fee-paying students for undergraduate and graduate programs. This has been an implicit government policy since the late 1980's. This heavy reliance on fee income creates serious incentive problems.

First, fees and government subsidies are predicated on graduation numbers. This can create an incentive for universities to lower standards so that failing students are allowed to graduate. The implication is that there could be a major decline in standards.

Second, fee-paying foreign students cluster in fields that are seen to provide a direct commercial return and where skills are readily transferable internationally. Statistics show that many of these students are clustered in commerce and business-related disciplines. There is thus a strong incentive for universities to use these faculties as cash cows, diluting quality for foreign and domestic students.

Third, given the highly competitive international market for foreign students, there is a strong incentive to indulge in marketing practices to entice students into the Australian universities. These practices may include implicit expectations of becoming an Australian citizen on completion of a degree,

universities indulging in manipulation of data to enhance rankings in international university league ladders, and incentives to increase “research output” as measured by some index of research productivity. Although these metrics appear to enhance quality, attracting fee-paying students to apparently prestigious universities, they can potentially induce precisely the reverse result over a longer time horizon as students may realise that the claims are not consistent with their experience, thus resulting in a loss of reputation. The gross revenue from foreign student fees are also significantly reduced by extensive supporting administration.

As we observed earlier, in the late 1980’s the government created many new universities by relabelling colleges as universities. This created funding problems for these universities in the short run, but as time passed the new universities adjusted. Nevertheless the new universities have never achieved the status of the old traditional universities located in the major cities. Effectively there is a two-tier university system that is reinforced by research funding being principally directed to the major universities.

A perverse consequence of the heavy reduction in training in trades and vocational skills has been serious labour market distortions: there are serious shortages in skilled trades, and significant oversupply in some of the professional areas. Attempts to anticipate labour markets via centralised training plans have a very poor record across many countries. The best one can do is to allow the universities and colleges to be sufficiently flexible so that they can respond rapidly to changes in labour market demands. In addition, it is obvious that tertiary education should encourage intellectual flexibility and skills so that graduates can adapt to changes in labour market demands, driven by technological changes and other factors.

Australian research funding is dominated by the Australian Research Council. This funding source is a federal council that determines research funding for all disciplines. The Canadian system has separate funding bodies for the major research fields. This is an attempt to cater to the various types of research and associated graduates. The Australian system appears to be much less flexible, dominated by the major sciences and technology, and their research and funding requirements.

Complaints about the increasing corporatisation of universities have been commonplace in the U.S., U.K., and Canada. Australia has been no exception. But subjective judgments, based on numerous observations by Australian faculty and visiting Canadian scholars suggest that the degree of bureaucratic control is relatively great in Australia. This occurs at two levels. First there is the minister and federal bureaucracy that continually interferes in general university funding, research funding and student admissions. Canberra is constantly tinkering, thus making long-term university planning difficult. Second, university administrations are continually aware of government surveillance through extensive reporting requirements and other interventions. Political fads and fashions may be imposed on hiring, admissions and research topics, requiring government mandated support groups, monitoring the imposed objectives. The power emanating from the ministry distracts university administrations forcing them to be mendicants lobbying Canberra and addressing political demands.

There have also been media complaints that Australian Vice Chancellors earn much larger salaries compared to many other overseas university principals or presidents. Senior administrative salaries in Australia appear on a much higher scale than is the case in Canada. Given Australian faculty salaries are more comparable to Canada, then there should be an independent analysis of the relative cost of senior Australian university administration.

5. Problems in the Use of Metrics in Tertiary Education[9]

Over the last three or four decades there has been increasing use of metrics (statistical measures) of organizational performance. These measures are constructed from various statistical sources and

[9] This section draws heavily on Muller (2018) especially chapters 1-7 and his bibliography. For a highly insightful, early analysis of the abuses of metrics and their unintended consequences for tertiary education policy, see Wolf (2002). See also Edwards and Roy (2017) for a penetrating critique of the perverse incentives of the use of metrics in rewarding scientific research in the US.

surveys, usually in aggregated form either as tables of summary statistics or even more crudely into single indices.

In order for these to be really useful as indicators of institutional performance, the user will require a detailed knowledge of the sources and construction of these summary metrics. If used with due care they can be used with other softer sources of information to shed light on poor performance or problems that had been hidden in standard reporting. Economists and other social scientists familiar with private and public sector decision-making understand the strengths and weaknesses of metrics, their appropriate application, and dangers in the hands of unfamiliar users.

Metrics became popular early in management science, measuring workforce productivity in simple, repetitive tasks on production lines. They were used in time and motion studies and related fields. The methodology gravitated into management taught in business schools where financial indicators of profitability and performance, and corporate bonus systems were promoted as providing high-powered incentives. The obsession with quarterly earnings and forecasts, feeding into executive bonuses became ubiquitous in the 1980's up until the recent financial crisis. It was well-known from research that these indicators were seriously flawed and often led to perverse short-term incentives. It is ironic that senior corporate executives were being rewarded in a system that was a lucrative version of piece-work incentives for production line employees.

The use of metrics has been bolstered by the growth and complexity of private and public organizations. Senior management wanted simple, reliable measures of productivity and performance in large scale organizations. But these organizations and their activities are often difficult to understand, even by senior management.[10] Complex, technical tasks undertaken by workers several layers below are not observed by senior management, who rely on reports by intermediate management. Often the complexity of technical tasks undertaken by subordinates may not be understood or appreciated by senior

[10] For an analysis of the failure of hard incentives and the constructive role of professional culture and informal incentives in private and public organizations, see Miller(1992) and Miller and Whitford (2016). These two books contain many relevant case studies.

management. This is compounded by senior management concern that subordinates may manipulate data and performance indicators.

As senior management increase surveillance and reporting metrics, relying on them to reward lower levels in the organization, there is a strong incentive for employees to respond by manipulating behaviour to conform to management requirements. Even worse, the metrics can erode trust, weakening professional integrity and codes of behaviour. As many researchers have observed, the incentive is to increase performance in measured activities and reduce performance in unobserved or unreported activity. The latter activities can be important or vital to the long run output of organizations that produce complex, physical products or subtle multi-faceted services.

Management and political ideology combined by arguing that the effectiveness of "high-powered" private sector incentives, driven by selective metrics, could be introduced to transform "inefficient" public sector organizations. Keen observers and researchers of public enterprises had long understood that services of most of these organizations are complex, multi-faceted and hard to capture in a few simple metrics. Attempts to use simplistic metrics for incentives and rewards can thus easily produce unintended perverse outcomes (Miller, 1992; Miller and Whitford, 2016).

In the rest of this section we restrict our attention to the use and abuse of metrics in tertiary education. We begin by acknowledging the importance of understanding basic tertiary education statistics in any country, state or province, and possible problems of measurement and omissions in international comparisons. Early sections of this paper have used statistics to obtain a broad overview, comparing Australian, Canadian and other major tertiary education systems. We are well aware that these statistics on aggregate student numbers, proportions of any age cohort, faculty/student ratios, undergraduate and graduate funding, research funding, etc., are at best partial indicators of tertiary education performance. Often these statistics are supplemented by quality indicators or international league ladders that are at best of questionable accuracy, relying on ambiguous measures that can be easily manipulated by university faculty or administrators. We will outline some such examples.

5.1. Increasing the Percentage of High School Students Going to University: A Free Lunch?

In the late 1990's and early 2000's, a new political fad appeared and became popular in the U.S., U.K., Australia and Canada. The basic idea is an apparently self-evident economic argument: because the average graduate earns more than the average non-graduate, then providing financial and other incentives to increase the percentage of any secondary school graduating class going to university, will increase general productivity in the economy. This hypothesis appears to be supported by aggregate statistics. But it is very much a partial truth.[11]

First, aggregate statistics disguise wide variations in graduate salaries across fields and across graduates of different departments and universities. In a well functioning university system, professional reputations are crucial in attracting good undergraduate and graduate students. It is well known that, in technical fields, private and public-sector employers have their own rankings of university departments. Some employers even contact individual faculty (who are highly respected in teaching and research) for when hiring graduates.

If the increased undergraduate numbers are dominated by weaker students, admitted in the expanded scheme, they will gravitate to less demanding programs, and graduate to less skilled jobs and relatively low salaries. But in addition, they will crowd out non-degree workers for jobs that do not utilise graduate skills. In this case, a university degree is a very expensive signaling device, replacing the cheaper and perfectly adequate high school or vocational college educated student.

Second, if the incentives are to increase student numbers across disciplines, then universities may be faced with a dilution of the average ability of any class – especially in more intellectually demanding disciplines. The consequence is that there are disciplines where there can be very serious pressures to lower standards, especially when funding is tied to class-size numbers and numbers graduating.

Third, even if the extra students graduate from high demand/high quality programs, and the increase in graduate supply exceeds the increase in demand in the field, salaries will be reduced. The

[11] See Wolf (2002) for a lucid discussion.

original high salary, observed by the incoming university student, is a retreating chimera that induces extra graduates into a field. But when the cohort graduates, they will find a crowded job market, reduced financial prospects – and perhaps disillusionment.

5.2. Rewarding Universities by Counting Graduates Produced

In the late 1980's and early 1990's, Australia adopted an incentive scheme for the" production" of undergraduates: universities were rewarded by the number of students they graduated. This incentive scheme with a one-dimensional metric had very perverse incentives. There were no incentives to promote quality. The incentives were to lower standards and graduate as many students as possible. University administrators can point to the lower drop-out rate and much higher graduating numbers as metrics that demonstrate a remarkable increase in the quality of students and instruction. Sadly, the evidence from other metrics, including much anecdotal evidence, suggests otherwise.

One might argue that the scheme produced more graduates, but it did not reduce the numbers of high quality graduates. However, there are too many indications that mass classes and multiple-choice exams are reducing the quality of education for all students in the core disciplines.

Another unintended consequence is that there may be incentives to reduce the commercial value of upper level undergraduate courses, by transferring the same material into masters and other graduate programs. This incentive is amplified when graduate programs in commercially related fields are rewarded with far higher fees than the undergraduate courses they have displaced.

5.3. Incentives to Produce More Research

The U.K. introduced periodic research rankings for universities and departments. The rankings counted the faculty research output, weighting articles by the prestige of the journal. These types of rankings again can introduce perverse incentives. Just before the ranking period, departments could try to induce faculty with long CV's to join their department. Hiring may be calculated to boost the department's score, placing it in a higher category with increased funding. The new hire's salary would be

more than compensated by the increased research funding reaped by the department. The result would be a disruptive churn in faculty for a discipline just before a ranking process. Even worse is the incentive to lure high profile researchers for short periods at lucrative salaries and then claim them (and their research record) as faculty members.

Similar systems in Australia and elsewhere have induced increased quantities of research of possibly dubious quality. For example, researchers can create circles where members capture a journal, citing and publishing each other's research. Niche field journals can spring up to cater for this demand. Some are legitimate and are of reasonable quality, but many are low quality journals aimed at research quantity (Muller, 2018, chap. 7).

If research rankings rely on journal articles, this biases the ranking toward fields that rely mainly on journals for disseminating research. Conversely, the ranking devalues disciplines (e.g., the humanities and some social sciences) that rely heavily on detailed monographs and books, requiring long periods of research and gestation, exploring topics in depth.

When research rankings are used as an input to rank universities for international league ladders, administrators will have strong incentives to bias their research record upwards, favouring disciplines that produce large numbers of articles in "high ranked" journals. The incentive is to have multi-authored short articles that slice the research into as many articles as possible. The rewards can be great if the university has the freedom to set fees, as international fee-paying students often rely on rankings when applying to programs. With the advent of social media, however, this tactic may be becoming counterproductive as students use social media, to communicate with current undergraduates and graduate students inquiring about the quality of teaching and faculty accessibility. A university may have many famous researchers, while relying on adjuncts and/or graduate students to teach most of the undergraduate courses in large classes.

6. Conclusions

This paper has reviewed the Canadian postsecondary education experience since 2000 for possible lessons or helpful perspectives for the Australian situation. It has also raised concerns about some policy directions in the postsecondary sector in both countries, especially with respect to public-sector funding incentives and growing use of performance metrics.

The paper has highlighted several key features of the Canadian tertiary education system that have very much influenced its development.

1. Less-centralized nature: The tertiary educational institutions come under provincial jurisdiction and hence receive capitation funding from ten separate provinces, but also receive research-related funding from the Canadian federal government and its three separate granting councils. The Canadian system is thus less centralized or top-down driven, and has resisted or delayed the advent of top-down metrics in their government funding rules. This, however, may be about to change.
2. Binary structure: Colleges play a major role – along with universities – in the Canadian system. Universities have thus focused on more traditional academic and analytical pursuits and this contributes to their relative homogeneity as compared, say, to the range of alternatives in the U.S. or U.K. university systems.
3. U.S. competition: Ever since the growth spurts of the 1960s and 1970s, the Canadian system has faced direct competition from U.S. schools. The former has thus adopted a generally similar system to the U.S. state-school system, along with its general organization and academic procedures.
4. Public funding under stress: As governments – especially provincial governments – face growing health and social expenditure pressures from an aging population, they are likely to seek ways for tertiary institutions to demonstrate their productivity and performance in competition for public funding. Use of performance metrics is one such route.

5. Weak private-sector R&D: The historically poor record of private-sector R&D activity in Canada creates a greater burden on the need for tertiary education sector-based research and R&D activity if the country is not going to fall further behind the rest of the world.
6. Role of foreign students: There is a consensus in favour of attracting a good number of tertiary foreign students as part of Canada's skilled immigration policy. But funding arrangements can end up having some negative side-effects. A sensible balance needs to be sought.

Several lessons can be offered from comparative experiences in postsecondary education systems.

1. A more centralized tertiary education system is more likely to be vulnerable to government funding providers' imposed cross-system regulation and use of performance metrics.
2. Competition across tertiary education institutions for good students, research funding and the best faculty is a good thing in that it drives excellence, efficiency, responsiveness, and delivery of best product for the students. Allowing schools to differentiate their products so they can better compete based on their relative advantage is definitely worthwhile.
3. Funding colleges to help develop a vibrant system of skilled trades to go with traditional tertiary white-collar training will benefit resource allocation in the labour market and flexible output potential for the economy.
4. In an environment of increasing reliance on student fees, the Canadian tertiary education sector should look to the Australian (and U.K., N.Z.) experience in implementing an income-contingent loan system or graduate tax as an integral part of student funding arrangements.
5. The incentives embodied in the funding arrangements for foreign students should be carefully examined in order to bring about a reasonable balance of benefits for all students.
6. Heavy reliance of top-down imposed simple performance metrics as a basis of funding within a complex tertiary education environment can have major negative unintended consequences. Weight should be put on measures that cannot be so easily manipulated and should reflect peer-group judgement, such as entry student admission cut-off grade averages, peer-reviewed research

funding, success measures of graduating students, and within-discipline department and faculty evaluations.

Table 1

Canadian Higher Education Statistics in International Comparison

	Canada	Australia	United States	United Kingdom	OECD Average
1) Public expend. on tertiary education as pctg of GDP[1]					
- all tertiary	1.7	1.4	1.4	1.3	1.3
2) Public expend. on tertiary education as pctg of total gov. expend.[1]					
- short-cycle	1.6	0.7	n.a.	n.a.	0.3
- bachelor's and above	3.1	3.1	n.a.	n.a.	2.7
- all tertiary	4.6	3.8	3.5	3.0	3.1
3) Educational attainment of 25-34 year olds in 2016: pctg with tertiary education[2]	61	49	48	52	43
4) Educational attainment of 25-64 year olds in 2016[3]: pctg with					
- short-cycle	26	12	11	10	8
- bachelor's	21	25	22	23	16
- master's	10	6	11	12	12
- doctoral	<1	1	2	1	1
5) Share of funding in 2014: pctg[5]					
- public sources	48.4	38.8	34.7	27.9	70.9
- private sources	51.6	61.2	65.3	72.1	28.8
6) Annual expend. per tertiary student in US$(PPP) in 2014[3]	$21,326	$18,038	$29,328	$24,542	$16,143
7) Share of international students in 2014-15: pctg[3,4]					
- short-cycle	9	13	2	5.5	3
- bachelor's	10	13	4	14	4
- master's	14	43	9	37	12
- doctoral	30	34	38	43	26
- all tertiary	10	15	5	18	6
8) Avg. annual tuition fees for FT domestic public school bachelor's students in 2015-16[6] in US$(PPP)	$4,939	$4,763	$8,202	n.a.	n.a.
9) Avg. annual tuition fees for FT international public school bachelor's students in 2015-16[6] in US$(PPP)	$17,498	$15,678	$16,066	n.a.	n.a.
10) R&D expend. as share of GDP: pctg[7]	1.6	2.1	2.7	1.6	2.4
11) Higher edn. R&D expend. as share of GDP: pctg[7]	0.65	0.63	0.39	0.43	0.43

Sources:

1. OECD Education at a Glance 2017 (2017), Table B4.1;
2. Op.cit., Table A1.2;
3. Op.cit., Country Notes;
4. CAUT Almanac (2018), Table 3.27;
5. OECD Education at a Glance 2017 (2017), Table B3.1b;
6. Op.cit., Table B5.1;
7. CAUT Almanac (2018), Table 5.11.

Table 2

Canadian Higher Education Statistics 2000-2015 (Selected Years)

	2000-01	2005-06	2010-11	2015-16
1) Tertiary enrolments ('000)[1]				
University - Can. students	805.4	969.2	1,128.0	1,137.1
- Inter. students	45.7	80.9	107.6	168.6
College - Can. students	490.4	560.4	692.4	647.5
- Inter. students	13.9	22.1	34.3	53.2
Total Tertiary:				
- Can. students	1,295.8	1,529.6	1,820.4	1,785.7
- Inter. students	59.6	103.0	141.8	221.9
2) Tertiary graduates ('000)[2]				
University	176.6	216.5	261.7	307.2
College	141.3	158.9	187.0	205.9
Total tertiary	317.8	375.4	448.6	513.1
3) Tertiary educational attainment as pctg[5]				
Canada - Age 25-64	n.a.	46	50	56
- Age 25-34	n.a.	54	56	61
OECD avg - Age 25-64	n.a.	26	31	36
- Age 25-34	n.a.	32	38	43
4) University revenue sources (millions of dollars)[3]				
Federal	1,554	2,833	3,855	3,245
Provincial	6,989	10,084	13,504	13,577
Tuition & fees	3,053	4,944	7,001	9,695
Total revenues	16,225	24,705	32,554	34,762
5) College revenue sources (millions of dollars)[4]				
Federal	96	114	137	175
Provincial	4,132	4,814	6,463	6,742
Tuition & fees	1,171	1,494	2,042	2,863
Total revenues	6,394	7,593	9,907	11,113

Sources:

1. Statistics Canada, CANSIM, Table 477-0031.
2. Statistics Canada, CANSIM, Table 477-0032; numbers of graduates refer to the years 2000, 2005, 2010, and 2015.
3. Statistics Canada, CANSIM, Table 477-0058. Figures in millions of current Canadian dollars.
4. Statistics Canada, CANSIM, Table 477-0060; first column figures are for 2001-02. Figures are in millions of current Canadian dollars.
5. Statistics Canada, Cat. No. 81-604-X, Table A1.4; figures refer to the years 2005, 2010, and 2015.

Table 3

Further Canadian Higher Education Statistics 2000-2015 (Selected Years)

	2000-01	2005-06	2010-11	2015-16
1) Revenue from governments per student (2000$)[1]				
- Universities	$10,038	$11,082	$11,516	$9,753
- Colleges	$7,678	$7,622	$7,444	$7,479
2) Total expend. per student (2000$)[2]				
- Universities	$18,016	$20,489	$20,784	$20,076
- Colleges	$11,855	$11,797	$11,612	$11,901
3) Full-time university teachers[3]	30,399	36,831	41,934	37,551
4) University student-full-time faculty ratio[4]	22.5	28.5	29.5	34.8
5) Percent of faculty in permanent full-time employment[5]				
- Universities	73.6	66.9	64.7	69.1
- Colleges	70.7	64.1	64.5	62.8
Percent of faculty in temporary part-time employment[5]				
- Universities	12.2	13.4	15.0	15.4
- Colleges	9.8	12.4	15.0	14.5
6) Tuition & fees per student (2000$)[6]				
- Universities	$3,587	$4,241	$4,644	$5,621
- Colleges	$2,127	$2,311	$2,303	$3,093
7) Government-based student loans: Colleges[7]				
- Percent of grads with large debt at graduation	12	12	14	n.a.
- Avg. debt owed at graduation	$12,500	$12,700	$14,000	n.a.
Government-based student loans: Bachelor's[7]				
- Percent of grads with large debt at graduation	32	32	39	n.a.
- Avg. debt owed at graduation	$19,600	$19,600	$22,300	n.a.

Government-based student loans: Master's[7]	26	27	34	n.a.
- Percent of grads with large debt at graduation	$18,400	$19,000	$20,600	n.a.
- Avg. debt owed at graduation				

Sources:

1. See sources in Table 2 on enrolment and revenue sources. In the case of colleges, figures in the first column refer to the 2001-02 academic year. All figures are expressed in real 2000 dollars (based on the CPI deflator).

2. Total expenditures from CANSIM Tables 477-0059 and 477-0061. In the case of colleges, figures in the first column refer to the 2001-02 academic year. All figures are expressed in real 2000 dollars (based on the CPI deflator).

3. Figures in columns 1-3 from CAUT Almanac 2014-15, Fig. 2.1; figure in column is for 2016-17 from the current CAUT Almanac, Table 2.4, accessed 2018-03-21.

4. Figure in column 1 from CAUT Almanac 2003-04, Table 3.3; figures in columns 2-4 calculated from figures in Table 2, row 1, and in Table 3, row 3.

5. CAUT Almanac, Table 2.12, accessed 2018-03-21; figures in column 4 refer to the 2014-15 academic year.

6. See sources in Table 2 on tuition and fee revenues and on enrolment. In the case of colleges, the figure in column 1 refers to the 2001-02 academic year. Again, all dollar figures have been deflated by the CPI.

7. Statistics Canada CANSIM, Table 477-0068, accessed 2012-02-22. College students refers to those tertiary graduates for whom college was their highest diploma/degree; similarly for Bachelor's and Master's students. By "large debt" is meant $25,000 and over. This loan data comes from Statistics Canada's National Graduate Survey which is held only every five years, so the figures for 2015 will not be available for some while. Averages are calculated over those who had such debt.

Table 4

Arts and Humanities Program Tuition Fees for Full-Time Canadian Students at Selected Ontario Universities, 2017-18 (Canadian dollars)

Brock University	6,197 – 6,378	University of Ottawa	6,376 – 6,376
McMaster University	6,329 – 6,329	University of Toronto (includes colleges)	6,400 – 11,520
Queen's University	6,385 – 6,385	University of Waterloo (includes colleges)	6,420 – 7,800
Ryerson University	6,319 – 6,400	Western University	6,338 – 6,338
University of Guelph	6,172 – 6,379		

Source: www.unican.ca/universities/facts-and-stats/tuition-fees-by-university.

Table 5

Weighted Average Undergraduate Tuition Fees for Canadian Students by Selected Provinces and Field of Study, 2017-18 (Canadian dollars)

	Humanities	Social & Behavioural Sciences & Legal Studies	Business, Mgmt. & Pub. Admin.	Physical & Life Science & Technologies
Canada	5,595	5,721	7,068	6,191
Quebec	3,772	2,968	2,731	3,128
Ontario	6,606	6,645	10,024	7,331
Alberta	5,050	5,290	5,868	5,320
Br. Columbia	4,933	5,151	5,298	5,099

Source: Statistics Canada CANSIM, Table 477-0021.

Table 6

Intensity of R&D Expenditure in Canada 2000-2015 (Selected Years)

	2000	2005	2010	2015
1) Total R&D Expend. / GDP (percent)	1.865	1.978	1.830	1.649
2) Business Performed R&D / GDP (percent)	1.124	1.104	0.951	0.860
3) R&D in Higher Edn. / GDP (percent)	0.525	0.672	0.677	0.664
4) Federally-Funded R&D / GDP (percent)	0.322	0.370	0.381	0.280
5) R&D in Higher Edn. per Researcher	$173,960	$219,310	$208,430	$214,150
6) R&D in Higher Edn. per Researcher (2000$)	$173,960	$197,580	$170,840	$163,850

Source: All expenditure figures from CANSIM Table 358-0001.
GDP from CANSIM Table 384-0037.
CPI adjustment for row (6) from CANSIM Table 176-0003.
Researcher figures from CANSIM Table 358-0159.

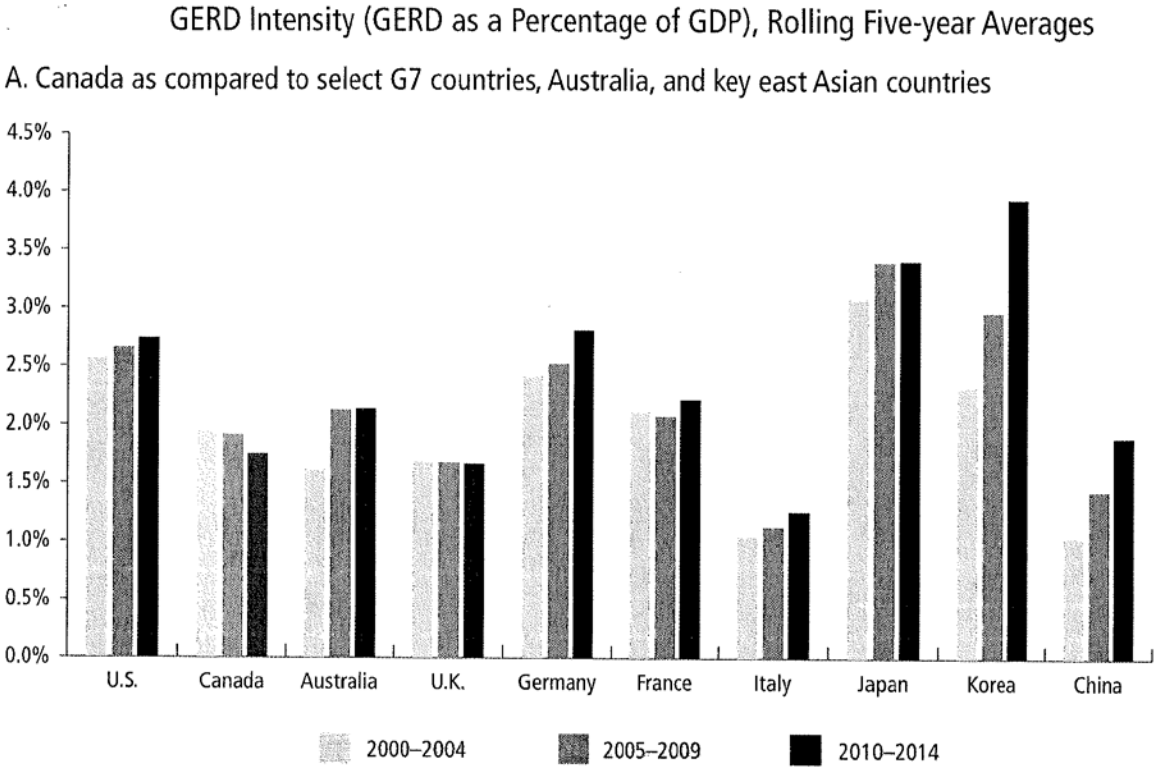
Table 7

Federal Government-Source Revenue to Universities in Canada 2000-2015 (Selected Years)

	2000	2005	2010	2015
1) Total Fed-Source Rev. to Universities (millions of dollars)	1,554	2,833	3,855	3,245
2) Total Fed-Source Rev. to Universities (millions of 2000$)	1,554	2,552	3,160	2,456
3) Fed-Source Rev. per FT Faculty (2000$)	51,120	69,296	75,352	65,417
4) Granting Council Rev. to Universities (millions of dollars)	906.8	1,546.4	1,827.4	1,911.7
5) Granting Council Rev. to Universities (millions of 2000$)	906.8	1,393.2	1,497.9	1,447.2
6) Granting Council Rev. per FT Faculty (2000$)	29,830	37,800	35,720	38,540

Source: All revenue figures from CANSIM Table 477-0058.
FT faculty figures: see Table 3 above; CPI Figures: see Table 6 above.

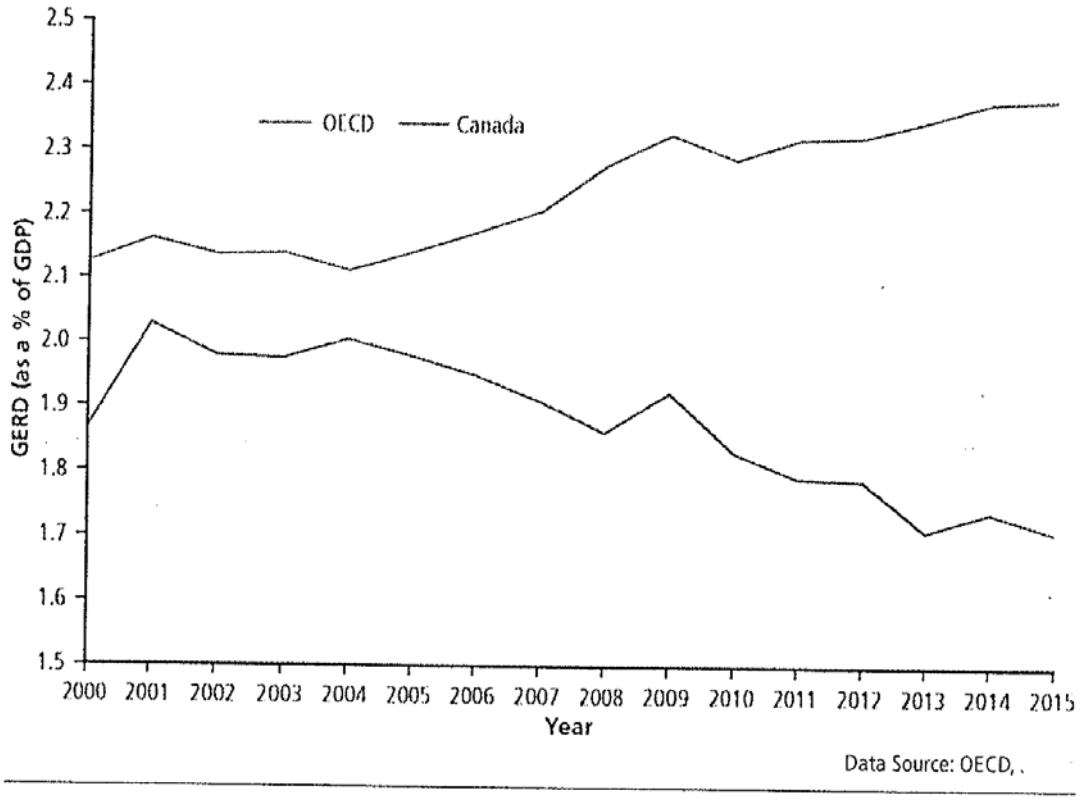
Figure 1



Source: APFS (2017), p. 31.

Figure 2

R&D Intensity in Canada and the OECD, 2000-2015



Source: CCA (2018), p. xix.

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