Knowledge Transfer Through Research Contracting

A Social Sciences and Humanities Perspective

November 2010

THE IMPACT GROUP

Contents

Preface

We wish to thank the Corporate Performance and Evaluation Division for initiating this study. We also thank the many universities who participated in the project.

This report reflects the views of The Impact Group and not necessarily those of the project participants or SSHRC

Knowledge Transfer Through Research Contracting

A Social Sciences and Humanities Perspective

1.0 Introduction

This report was commissioned by the Corporate Performance and Evaluation unit of the Social Sciences and Humanities Research Council of Canada.. The opinions expressed are those of the consultants and not necessarily those of SSHRC.

The report summarizes the findings of a larger study conducted by The Impact Group[1]. The purpose of the study was to explore a major pathway - arguably the major pathway - for knowledge transfer from academic research institutions (universities and hospitals) to the external, non-academic world. Research contracting refers to *research that is performed by universities and hospitals on behalf of third parties under a formal agreement - and excluding research funded by grants and contributions*[2]. SSHRC was one of 11 organizations that helped to support the research[3].

This synopsis reviews some of the findings of the larger study; it also focuses more directly on the results for social sciences and humanities research, and their broader implications.

Participating Institutions

Medical-Doctoral Universities
Dalhousie University
McGill University
Université Laval
University of Manitoba
University of Ottawa
University of Saskatchewan
University of Toronto
University of Western Ontario

Comprehensive Universities
Université du Québec à Montréal
University of New Brunswick
University of Victoria
University of Waterloo (partial data)

Undergraduate Universities
Brock University
Lakehead University
Nova Scotia Agricultural College
Royal Military College
University of Prince Edward Island

Hospitals/Health Authorities
Alberta Health Services
Isaac Walton Killam Health Centre
McGill University Health Centre
Saskatoon Health Region

[1] Knowledge Transfer Through Research Contracting. September 2010.

[2] SSHRC has no contributions, only grants and fellowships.

[3] Other sponsors included: Association of Canadian Academic Healthcare Organizations Atlantic Canada Opportunities Agency; Canada Foundation for Innovation; Canadian Institutes of Health Research; Innovation Saskatchewan; Industry Canada; Natural Science and Engineering Research Council; Research Universities' Council of B.C.; University of Toronto; University of Western Ontario.

2.0 Method

Twenty-one institutions agreed to supply data about their research contracting activities for their 2008 fiscal year or equivalent. The Impact Group provided them with a reporting framework and asked them to provide raw data for analysis in conformity with the framework.

Institutions were asked to provide anonymous data, meaning the contract information could not be tied to a particular contracting organization.

The participating institutions provide a good representation of the universe of post-secondary institutions. Data came from 8 Medical/Doctoral universities, which account for 81% of all postsecondary research activity. Another 4 Comprehensive institutions provided data, as did 5 Undergraduate universities and 4 Hospitals or Health Authorities.

Sampling Strategy			
Institution Type	Original Goal	Final Participants	% of All Research Income *
Medical/Doctoral Universities	7	8	81%
Comprehensive Universities	8	4[4]	14%
Undergraduate Universities	5	5	5%
Research Hospitals/Health Authorities	5	4	- - *
Total	25	21	100%

* Notes: Total research income was $5.53 billion. Source: Research Infosource Inc. Canada's Top 50 Research Universities 2006.
Separate data are not available for Hospital/Health Authority research income. At the present time these revenues are included in the totals of their respective Medical/Doctoral universities. Medical/Doctoral universities are larger institutions with medical schools; Comprehensive universities are large universities without medical schools; Undergraduate universities are smaller universities specializing in undergraduate education.

3.0 Overall Study Findings

This section of our report provides a summary of the key study findings. The next section describes the key findings that are particularly related to sciences and humanities research.

3.1 Knowledge Transfer Mechanisms

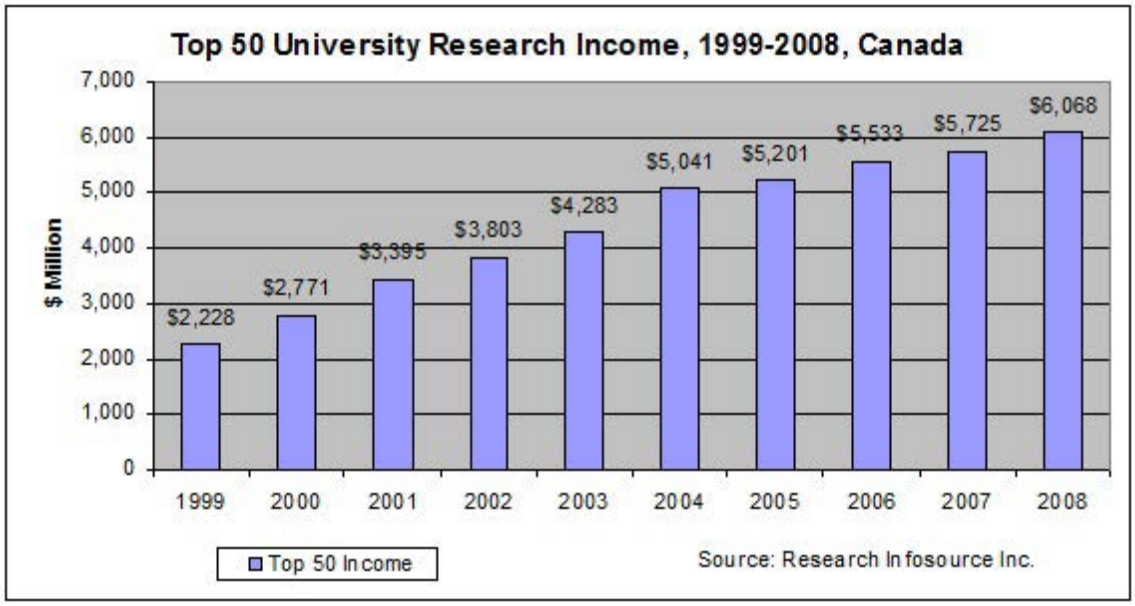
Traditional mechanisms for transferring research knowledge from postsecondary institutions to the external world - as distinct from the "internal" (academic) world - are:

- Student graduates
- Publications (articles, books, monographs)
- Technology transfer (licensing of IP)
- Other (media, private consulting)
- Research contracting

Knowledge that is embodied in students graduating from institutions is usually (and properly) considered the premiere mechanism for knowledge transfer. Publications, while important in an academic context, are mostly directed to an internal academic audience, rather than external audiences, although obviously some "leakage" or crossover occurs. Many academic researchers transmit knowledge through the media. Many also participate in private consulting activities. (Private consulting is probably a large endeavour but there are no data about this as it is considered to be an informal activity.) Research contracting is the subject of this study.

3.2 Research Activity Growing

Research activity at universities and hospitals/health authorities expanded rapidly from 1999 to 2008, rising by 172%. The budgets of all federal granting agencies also expanded significantly during this time. As a result university and hospital research income increased.

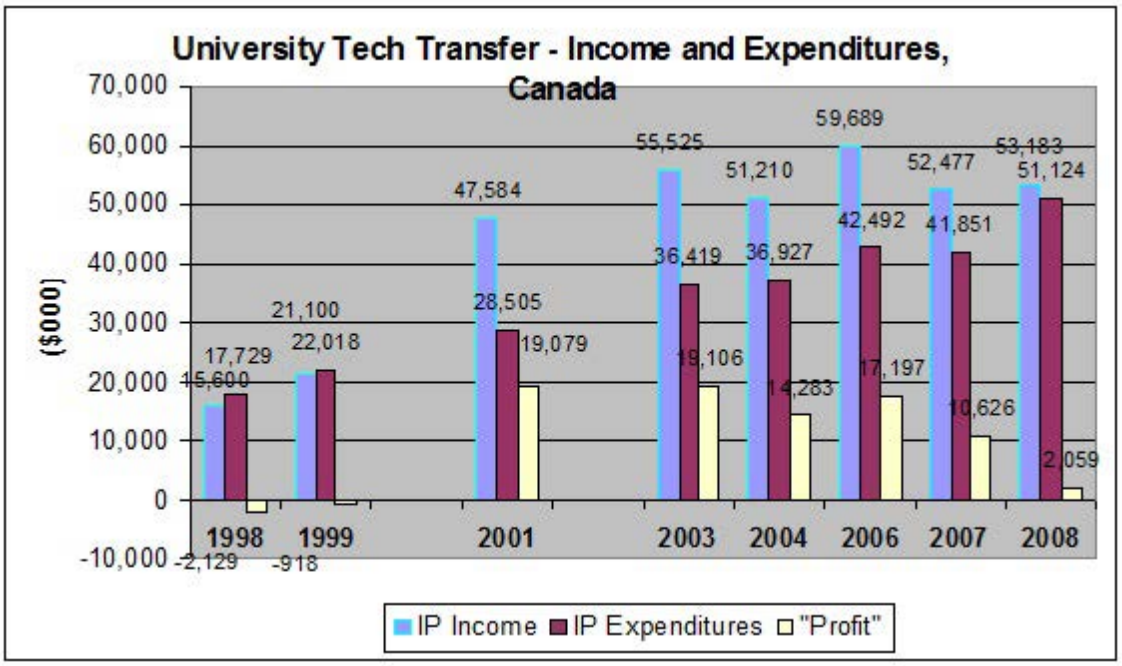


3.3 Technology Transfer Stalling

In spite of the expanding research resources, technology transfer - which is often considered to be a major route for knowledge transfer - has essentially stalled. Total income to all universities and hospitals from tech transfer income peaked at $59.7 million in 2006 and has declined since then. The current figure is about $53 million.

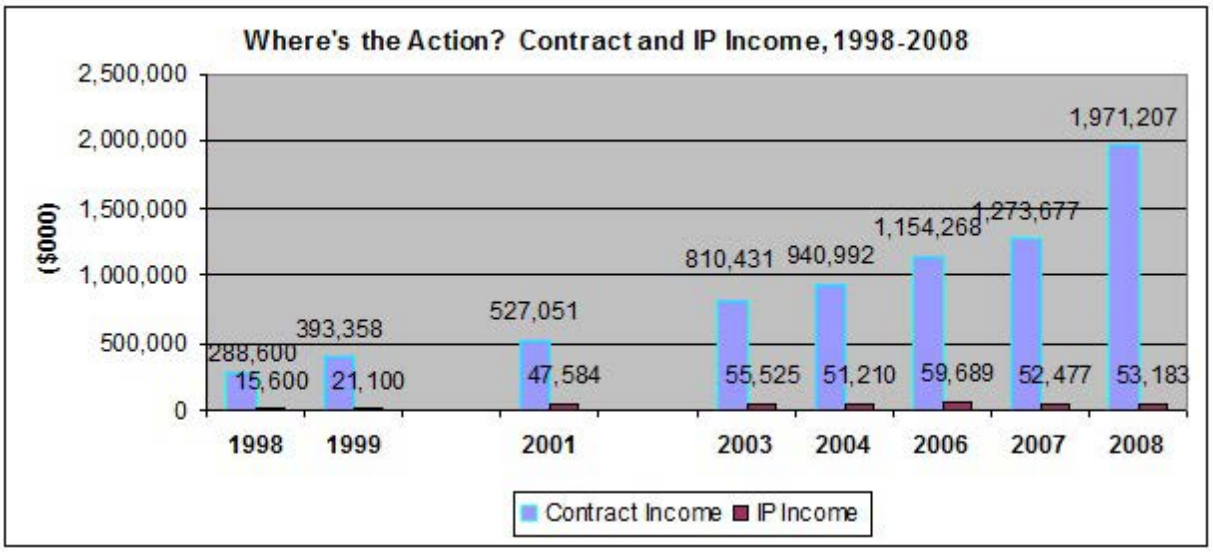
The costs of tech transfer continue to rise (around $51 million in 2008), meaning that the "gross profit" from all activities is about $2 million on a research base of $6 billion (Source: Statistics Canada 88-222). These funds are mostly distributed to inventors - researchers - which means that the "net profit" for the system as a whole is negative (StatCan 88-222).

One is forced to conclude that tech transfer is a limited mechanism for knowledge transfer, albeit an important one.



3.4 Research Contracting Exploding

While tech transfer activities have peaked, research contracting is expanding at a furious pace. (StatCan 88-222)



By 2008, according to Statistics Canada, research contracting income reached over $1.9 billion, which dwarfs the $53 million of tech transfer income. From a purely financial perspective research contracting is clearly the dominant form of knowledge transfer.

3.5 Characteristics of Research Contracting

Research contracting is the epitome of demand-driven knowledge transfer. Whereas tech transfer usually begins with an institution attempting to find a receptor (customer) for a prior scientific discovery, research contracting operates when a receptor (customer) identifies its unique requirements and then seeks out a researcher who can provide the required knowledge.

The relationship is entirely voluntary on both sides. The customer is not compelled to commission the research and the researcher is not compelled to conduct it. Research contracts only come into play when both parties see value in the knowledge exchange. Customers gain knowledge and researchers gain money to pay for student stipends, materials, technicians, etc. Publications may also result.

Research contracting usually operates on the basis of a defined deliverable(s) and milestones. The customer assigns a monetary value to the knowledge exchange (i.e. a contract value) and the supplier (researcher) determines whether or not the sum offered is adequate to conduct the research. Institutions apply an overhead charge to the research to compensate them for the indirect costs[4].

3.6 Research Contracting - Incomplete Picture

Prior to this study the only available information about research contracting came from Statistics Canada. The StatCan data are somewhat incomplete and leave open a number of important questions.

Value of research contracts by sponsor — 2008

	Contracts
	thousands of dollars
Total	1,971,207
Federal government	440,132
Provincial and other levels of government	481,715
Other Canadian sources (business enterprises or organizations)	660,852
Foreign sources (government, business enterprises or organizations)	235,321
Other	153,187

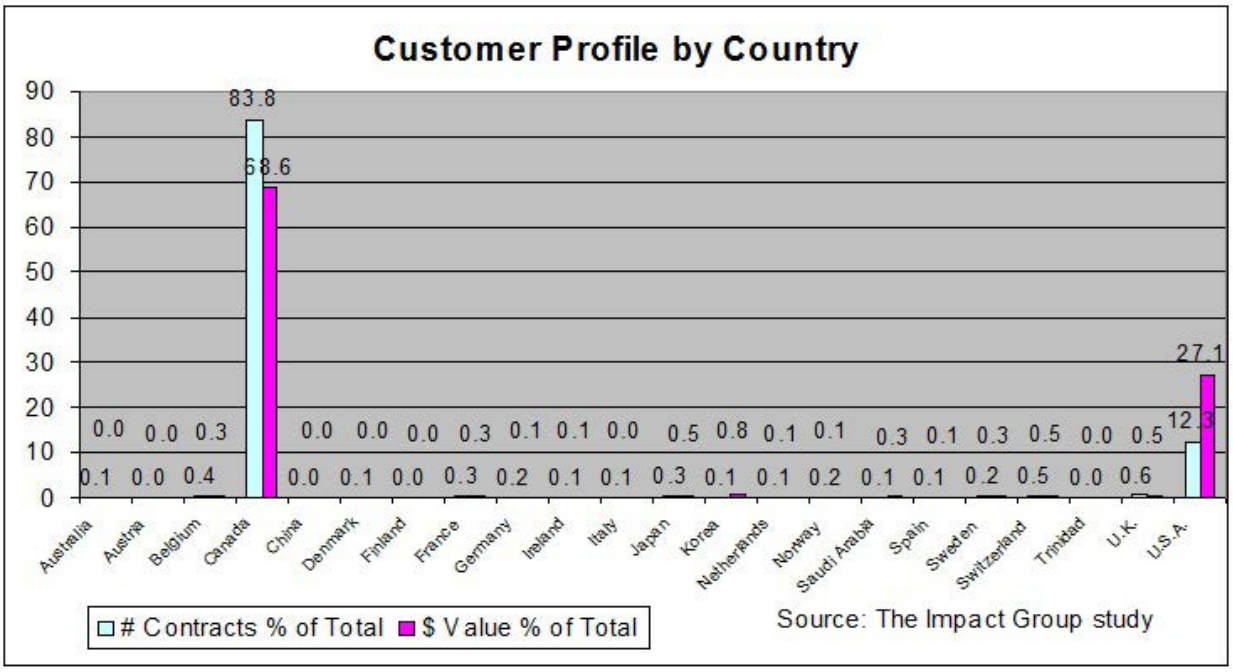
Note(s): Research contracts do not include research grants (e.g. SSHRC, NSERC, CIHR) and multi-year contracts have been prorated for the reference year. Based on the questionnaires received representing 125 responding institutions.

[5]Indirect costs are not standard across institutions and charges can vary depending on the nature of the client (e.g. private versus non-profit) or the institution.

For example, questions remain about the nature of contracting (e.g. scientific disciplines), and details about contracting organizations, countries of origin, magnitude of contracts, etc. This study was intended in large part to fill in the details.

3.7 North American Contracting Dominant

Our study findings revealed that North American sources dominate the research contracting scene (Source *Knowledge Transfer Through Research Contracting. The Impact Group 2010)*. Fully 97% of all contracts emanated in either Canada (83.9%) or the U.S. (12.3%). All other countries - 20 in total - accounted for less than 4% of all contracts. [Note: unless otherwise specified, the following charts are taken from the Impact Group research contracting study.]



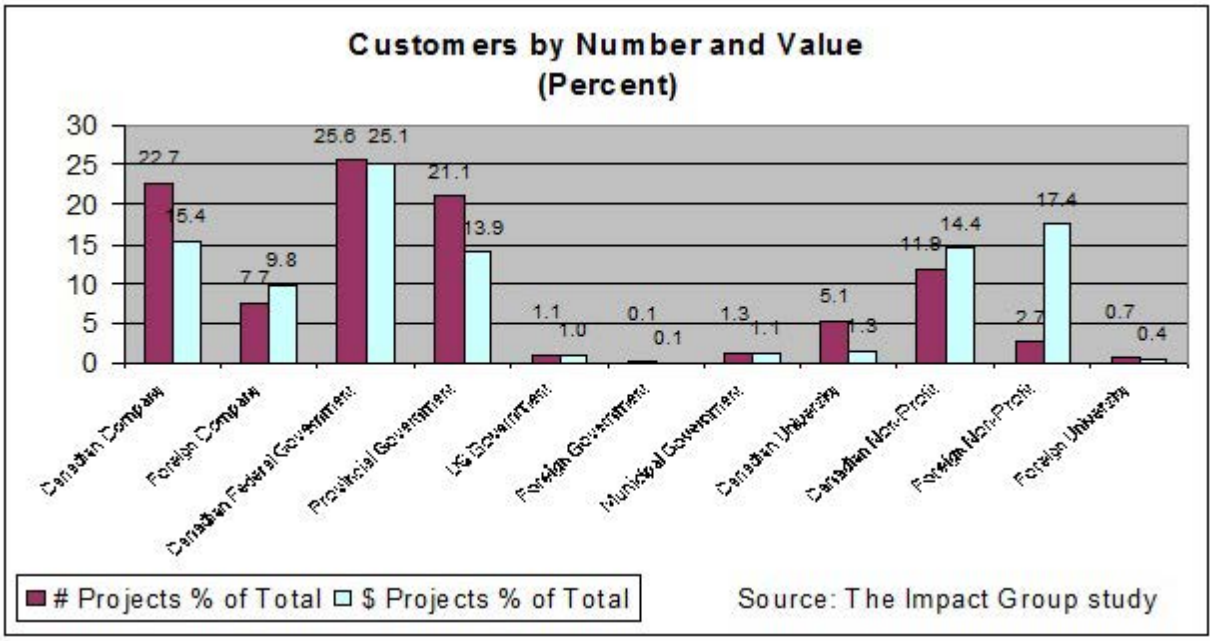
However, the dollar value of Canadian contracts amounted to only 68.6% of the total whereas U.S. contracts accounted for 27.1% of total contract dollars. This indicates that Canadian contracts were smaller on average than U.S. contracts.

Contracts performed for non-Canadian customers represent a form of "knowledge export". They bring foreign resources into the country in exchange for Canadian knowledge.

3.8 Contracts Come From Many Sectors

Canadian companies (22.7% of all contracts), the Federal Government (25.6%) and Provincial Governments (21.1%) were the 3 leading customer groups. The Canadian Non-Profit sector (11.9% of contracts) was also a substantial client group.

However, the relative dollar value of Canadian Company contracts (15.4% of the total) was lower than the number of contracts (22.7%). This is also true for Provincial Government contracts (21.1% of contracts, 13.9% of value).

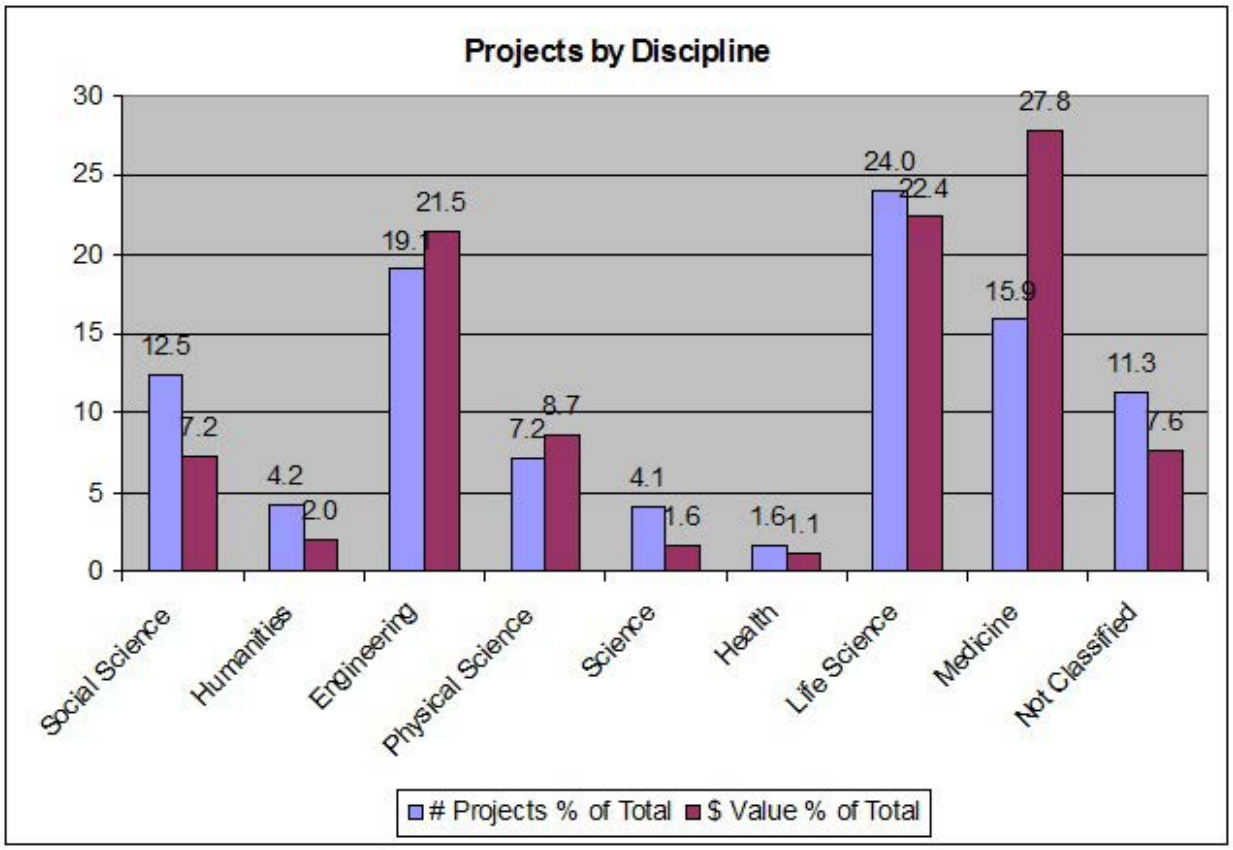


Foreign contracts were usually of higher value, especially for the Foreign Non-Profit sector, where 2.7% of total contracts accounted for 17.4% of total dollar value. Canadian Non-Profit contracts followed a similar pattern; 11.9% of total contracts accounted for 14.4% of contract values. The pattern is repeated for Foreign Companies (7.7% and 9.8%). This confirms the importance of foreign contracts.

3.9 Life/Health Science Contracts Dominant

From a disciplinary (science) perspective it is apparent that research related to the Life/Health sciences is dominant. In fact, over 40% of 1,888 sample contracts let to universities and hospitals/health authorities were classified either as Health (1.6%), Life Science (24.0%) or Medicine (15.9%). The next largest category was Engineering (19.1%). Social Science (12.5%) and Humanities (4.2%) projects together accounted for 16.7% of the contracts classified, by number. There is clearly a large appetite for Canadian expertise in these fields.

(It is important to note that research in Life/Health sciences is funded by many sources; not only CIHR, but NSERC, private non-profit organizations, federal and provincial governments, etc.



3.10 Many Business Sectors Involved

Within the category of "business", it is apparent that many different industry sectors are involved in research contracting.

Contracts by Contractor Type					
Contractor Type	# of Contracts	% of Total		# of Contracts	% of Total
Pharmaceutical & Medicine	158	27.7	Transportation	8	1.4
Engineering & Scientific Services	84	14.7	Comm/Telecom Equipment	7	1.2
Environment	70	12.3	Computer Equipment	7	1.2
Natural Resources	23	4.0	Tourism	6	1.1
Power Generation	23	4.0	Defence	4	0.7
Chemicals & Materials	19	3.3	Economic development	4	0.7
Software & Computer Services	19	3.3	Fabricated Metals Products	4	0.7
Aerospace	16	2.8	Agriculture & Food	3	0.5
Business, Management	14	2.5	Financial Services	3	0.5
Education	12	2.1	Telecommunications Services	3	0.5
Scientific Services	11	1.9	Statistics	2	0.4
Energy, Oil & Gas	10	1.8	Urban studies	2	0.4
Health	10	1.8	Culture	1	0.2
Electronic Parts & Components	9	1.6	Law	1	0.2
Medical Devices and Instrumentation	9	1.6	Machinery	1	0.2
Mining & Primary Metals	9	1.6	Public lottery	1	0.2
Social Sciences	9	1.6	Security	1	0.2
Automotive	8	1.4	Total	571	100.0

3.11 Governments the Primary Beneficiaries

Governments - federal, provincial, municipal, foreign - are the largest customers for research at universities and hospitals. Governments account for 49.1% of all contracts, compared with 30.4% for Industry and 14.6% for the Non-Profit sector.

Governments' voracious appetite for research knowledge reflects the enormous range of issues they are required to administer in a modern society: environment, security and defence, transportation, health, agriculture and food, climate etc. etc. etc. Any of these may have a technological aspect, and all have a social aspect as well. No government could hope (or afford) to maintain the breadth or depth of in-house experience needed to provide it with the scientific knowledge it requires. Thus, universities

and hospitals play a key role in providing supplementary research (indeed, in many instances core research) that modern governments require to fulfil their obligations.

4.0 Social Sciences Findings

This part of our report focuses on study findings that relate to social sciences research in particular.

4.1 A Flavour of Social Sciences Contracts

Social science contracts span a wide range of subjects. Following is a sample of contract titles that were included in this study.

Social Science Contract Titles - A Sample

"Study on the Benefits of Recreational Leases With Particular Focus On Leases for Hunting Wild Game and Water Fowl"

"Tools for assessing and validating First Nations, Métis and Inuit Cultural Appropriateness and Historical Accuracy"

"Economic Impact Study of the Dairy Industry"

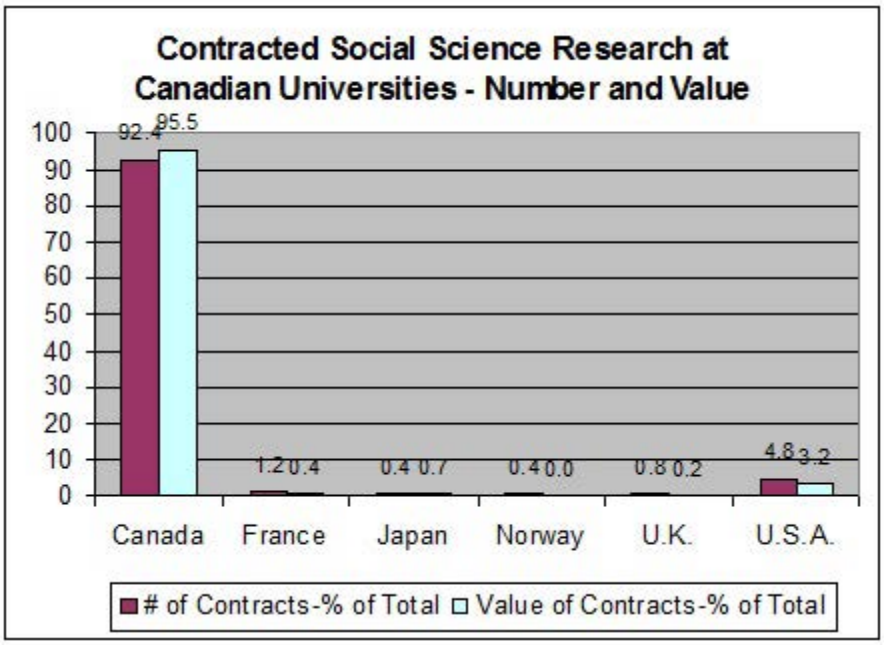
"Financial Aboriginal Enterprise Development: The Feasibility of Using Co-operative Models"

"Enhancing Nurses Access For Care Quality and Knowledge Through Technology"

"Public Policy on Child Health and Development"

4.2 Customers Concentrated in Canada

Whereas 22 countries (including Canada) let contracts of all types to universities and hospitals/health authorities, the range of countries letting social science contracts was much smaller - 6 in total. It seems that contracted social sciences research does not "travel" as well as other types of sponsored social science and humanities research.

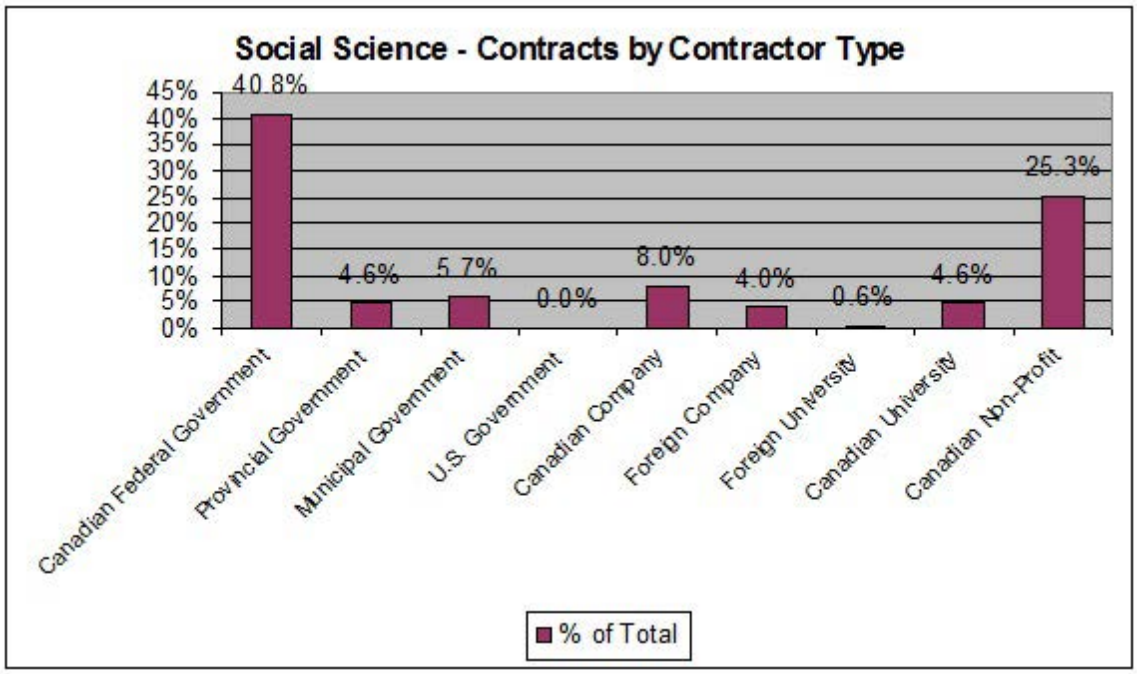


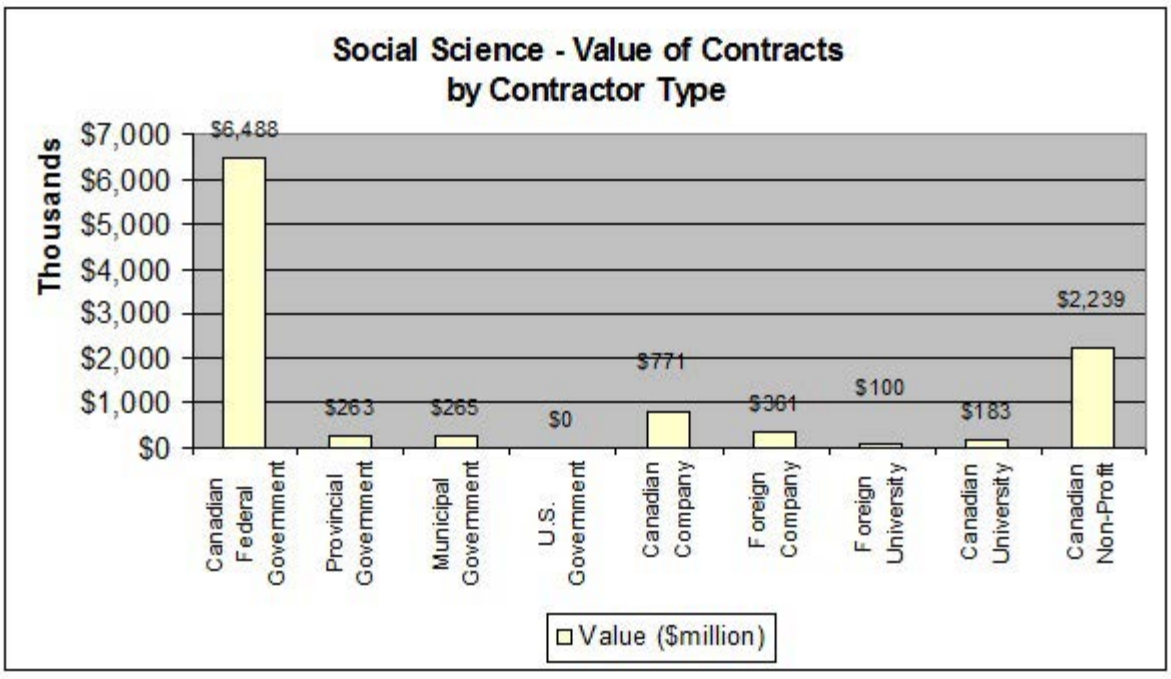
Unlike in other disciplines, Canadian social science contracts, which accounted for 92.4% of the total, accounted for a larger component of total funding (95.5%) than U.S. contracts (4.8% of contracts, 3.2% of contract value). This indicates that Canadian contracts were on average larger than U.S. contracts.

4.3 Federal Government the Largest Single Customer

The Federal Government is by far the largest customer for social science research.
Federal departments and agencies accounted for over 40% of all social sciences contracts let. Given the vast array of social science knowledge that governments require - everything from economics to prison planning, law reform and native land claims - this is not surprising.

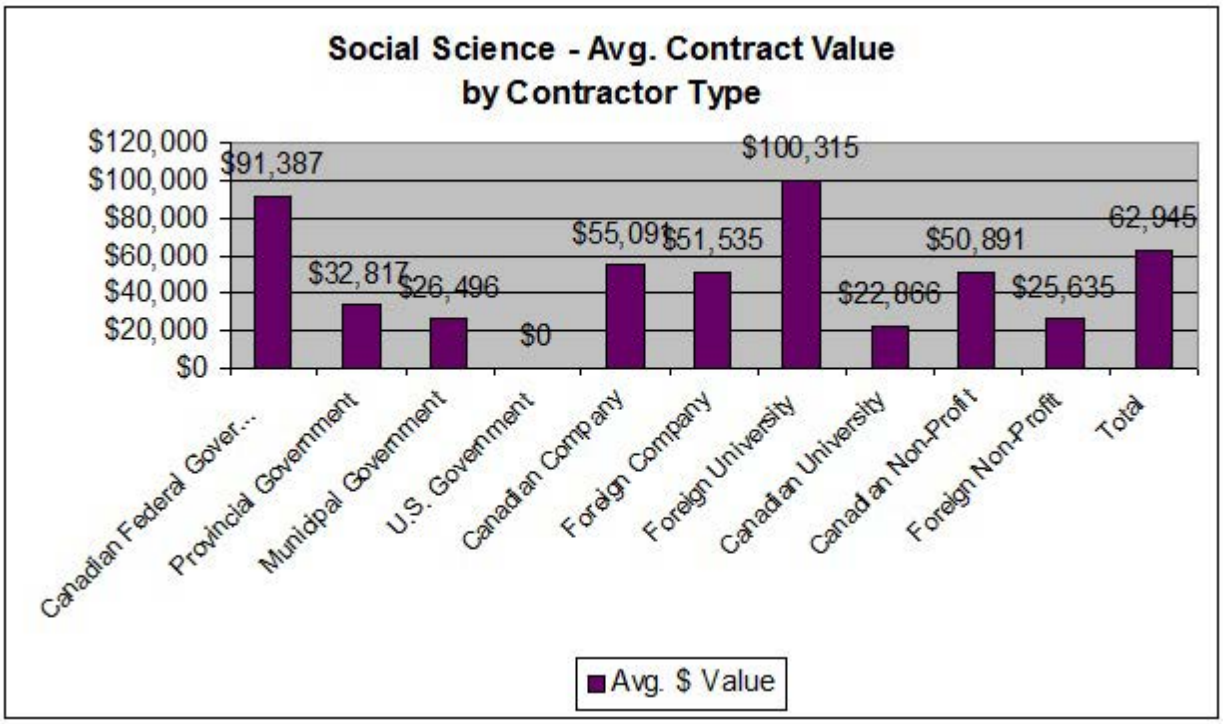
These findings are reflected in the dollar value of contracts by customer type. Federal contracts amounted to about $6.5 million, followed by Canadian Non-Profit contracts at $2.2 million. Canadian businesses were the next largest customers, placing social science contracts valued at $771,000.





Leaving aside a small number of Foreign University contracts in the sample, it is apparent that the average value Federal Government contracts ($91,387) was substantially higher than those of other

contracting groups. Canadian Company ($55,091), Canadian Non-Profit ($50,891) and Foreign Company ($51,535) contracts had very similar values.



5.0 Humanities Findings

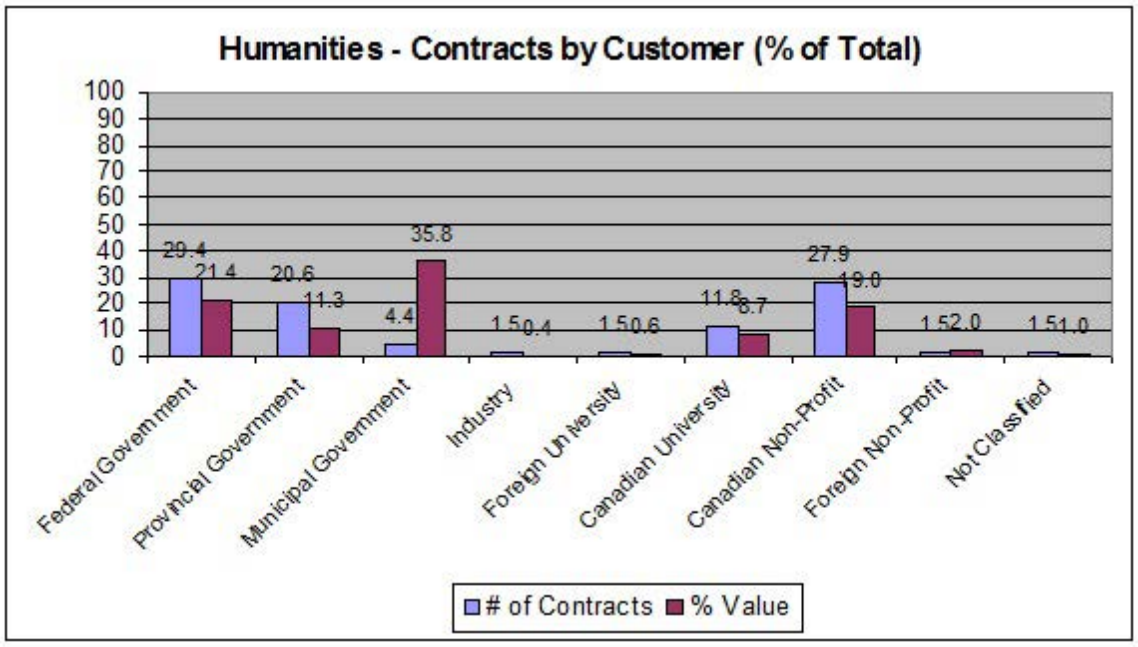
This section analyzes the small number of Humanities contracts that were included in our sample.

5.1 Humanities Contracts Concentrated in Canada

Nearly all 71 Humanities contracts let to institutions emanated from Canadian sources.

5.2 Customer Base More Evenly Distributed

Interestingly, Humanities contracts were more evenly distributed that social science contracts. While the Federal Government remains the largest single customer for Humanities research, when measured by number of contracts (29.4% of the total), the Canadian Non-Profit sector is a close second (27.9% of the total).



What is surprising is that the Municipal Government sector, while accounting for only 4.4% of total Humanities contracts, provided 35.8% of all funds for humanities research. In all other sectors funding levels were less than contracting levels.

6.0 Conclusions and Discussion

a large Based on the data supplied by 20 different research institutions, research contracting is arguably the largest single formal channel for transferring knowledge resulting from the $6 billion+ of annual research activity that takes place at Canada's universities and research hospitals. Valued at over $1.9 billion in 2008, income from research contracting exceeds by nearly 40 times the $53 million of gross technology transfer income generated by all institutions that year - even more so the $2 million of net tech transfer income. In addition, data show that research contracting continues to expand at a rapid pace whereas tech transfer is operating in a steady-state mode.

A key point about research contracting is that it is demand-driven. Customers determine both their own knowledge requirements and the amount of money they are willing to acquire knowledge. Customers represent an in-built "receptor capacity"; they only pay for knowledge they stand ready to use. This contrasts with much of tech transfer activity, in which research comes first and users and applications come second.

Another important point about research contracting is that it is entirely voluntary; neither the contractor (researcher, PI) nor the customer is compelled in any way to participate. In fact, contracts only arise when customer and supplier are in agreement about the course of the research and its exchange value. Indeed, there may be positive dis-incentives to research contracting in the culture and administrative practices of institutions. Professors do not generally receive credit towards promotion and tenure for their research contracting work; indeed, research contracting activities take time away from more potentially beneficial activities, such as teaching and academic publishing.

Nearly all research contracting funds paid are over and above the salaries of the principal investigators, most of whom are on salary. Funds from research contracts thus flow primarily to graduate students, technicians-technologists, and third party suppliers. Institutions typically receive an overhead payment to reimburse them for the indirect costs of supporting the research.

The formal contract research that this study focuses on - research that flows through the books of a university of hospital/health authority - is in addition to what is undoubtedly amount of contract research undertaken by individual faculty on their own time. There are no official data on this activity, but anecdotally it would appear to be large. If the volume of informal (off-the-books) SSH contract research were added to the formal total, then contracting would be an even more important source of knowledge transfer.

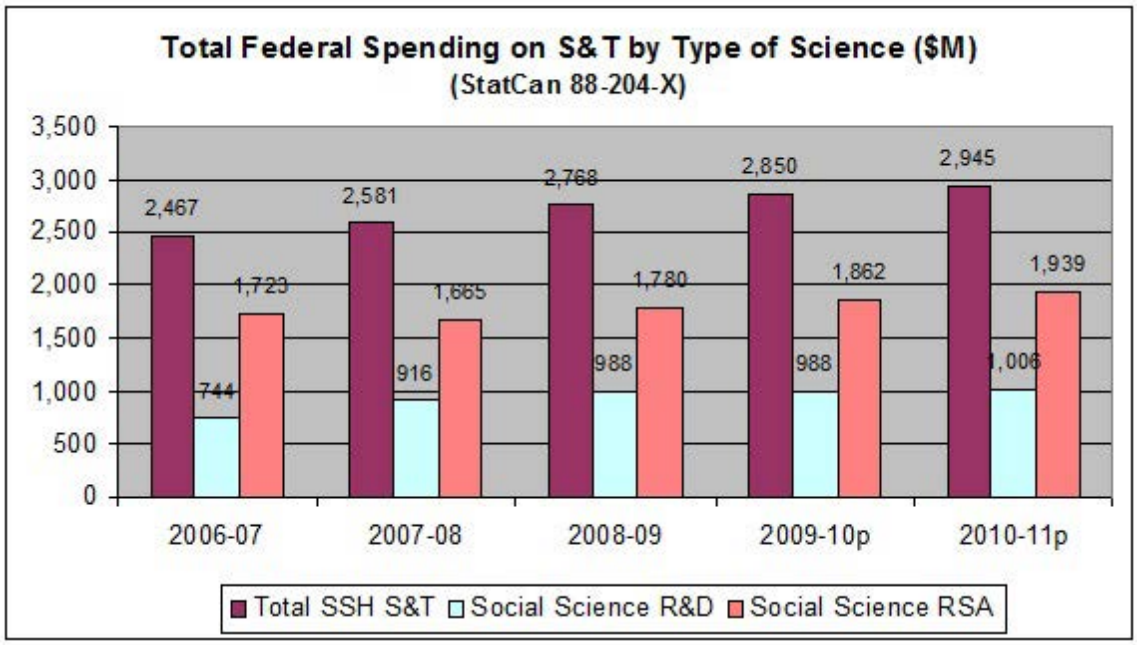
Traditional research that is funded by grants and contributions is critical here; it establishes the foundation of knowledge - the knowledge base - that external customers can draw upon. Without the base of grant-funded research, eventually the "stock" of research knowledge would be depleted and there would be no expertise or infrastructure for outside customers to draw on. So, maintaining a strong base of grant-funded research is crucial. Grant-based research and contract research are not at odds - it is not a matter of one-or-the-other - but should be seen as complementary activities that together strengthen Canada's knowledge base - and knowledge transfer channels.

A simple back-of-the-envelope calculation suggests that the $1.9 billion being spent on contract research employs perhaps 20,000 Canadians (at an average of $100,000 per job). As hardly any funds support PI salaries, most of the funds are used to support graduate students and to pay for the direct and indirect costs of research. Furthermore, contract research gives students a "real world" research experience. Often that experience leads directly to employment with customers. At least, it provides practical outlets for applying research knowledge.

Survey respondents reported initiating 256 Social Science projects worth $17.2 million. Humanities projects contributed an additional 71 contracts valued at $5.0 million. Thus, the combined SSH total was 327 projects valued at $22.2 million. Together, Social Sciences (12.5% of contracts) and Humanities (4.2% of contracts) research accounted for over 16% of all research contracts in our sample. Their combined value was less - about 9.2% of total contract values - but that is characteristic of the inherently lower cost of much SSH research compared with research in health, life sciences, or engineering.

Extrapolating from our sample of 20 institutions - representing roughly 1/3 of all institutions in Canada - to the national total, yields a broad estimate of annual SSH contracting at something in the order of $100 million per year. (However, this is a very rough estimate and would need to be confirmed.) Still, that is an impressive number that indicates a significant demand for research in the social sciences and humanities.

The largest customer by far for SSH research is the Canadian Federal Government. The federal government commissions over 40% of all SSH contracts. This reflects the extremely broad range of knowledge that modern governments require to administer the society, economy and polity. Without access to that knowledge it is hard to see how governments could carry out their work rationally and effectively. Governments need knowledge about demographics, macro-economics, micro-economics, population health and disease trends, military and security threats, telecommunications policy and a legion of other issues that confront them on a daily basis. No government could hope to conduct all the research it requires in-house, so research contracting with external organizations makes eminent good sense. The federal government's requirement for SSH research is reflected in the following chart. The StatCan data referred to indicate that the federal government will spend $2.9 billion on science and technology related to SSH, composed of $1.0 billion of R&D and $1.9 billion of related scientific activities.



To the extent that about 68% of Canada's economy is in the services sector, the amount of research contracting in Social Science and Humanities strikes us as being low. The Canadian Business sector accounted for only about 8% of all research contracts, compared with around 23% for research contracts as a whole. We would consider this to be the "background level" of activity; in other words, the naturally occurring level of contracting without any external incentives, such as SSHRC programs, and in fact, with some positive dis-incentives at work too. A number of factors may be operating here:

- No tradition of formal interaction between the academic SSH community and their counterparts in industry;
- Absence of SSHRC programs specifically dedicated to university-industry interaction;
- Primary focus of SSHRC programming on not-for-profit sector partnerships;
- Ambivalent attitudes of individuals in the SSH community towards working with industry;
- Lack of awareness in the business community about opportunities to commercialize knowledge in the social sciences and humanities; and,
- The likelihood that a considerable amount of informal interaction (e.g. private consulting arrangements) is not captured in the official data.

Interestingly, a major source of external support for research contracting by business - the Canada Revenue Agency's Scientific Research and Experimental Development (SR&ED) tax credit program - explicitly excludes SSH research from eligibility from the program. This undoubtedly removes a source of assistance to business contracting that is available for other forms of research, and a motivation for business to engage more with the higher education sector.

The fact that SSHRC itself has no program that directly and explicitly supports business-university collaborative research (in contrast to collaboration with the non-profit sector) is another mitigating factor. In our view, if SSHRC were to adopt engagement models similar to those at NSERC and CIHR, the volume of research contracting by business could be increased. So, we consider the current level of business contracting to represent a glass half-full, rather than half-empty.

Research contracting is a phenomenon that has been largely overlooked by the policy community. Yet, on the evidence it accounts for about 30% of all university-hospital research activity ($1.9 billion out of $6.0 billion). In our view it represents by far the largest formal channel for knowledge transfer from our institutions of higher education to the outside world and as such is deserving of greater attention and support by the public sector. In fact, the public sector is by far the largest consumer of SSH knowledge, so that it would be in its direct interest to understand and support research contracting.

***