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Bibliometric Analysis of Consumer Issues Research in Canada and in Other Leading Countries

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by

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submitted to

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1 Introduction

Industry Canada's Office of Consumer Affairs (OCA) is currently conducting research on the status of academic consumer research and studies in Canada, particularly as it pertains to public policy and consumer issues. Science-Metrix has been mandated to provide a bibliometric analysis, the objective of which is to assess the extent of Canadian research on consumer issues research (CIR) and the impact of this research as measured by citation frequency. This assessment comprises a comparison of Canada's performance with that of other leading countries in this field as well as an assessment of Canadian universities performance in CIR.

This bibliometric study covers the period from 1996 to 2007 and is based on an assessment of research output published in peer-reviewed papers indexed in the Scopus database. The covered period provides a good compromise between historical depth, which allows coverage of long term trends, and recency, which provide coverage of topics and methods that are currently relevant. Scopus provides a very broad coverage of journals (about 16,000) and includes the full addresses of all authors, as well as references made in published papers. Together with the Web of Science, Scopus is the only database that comprises the data required for in-depth scientometric analyses.

One of the main challenges of this study involved defining the field of CIR and delimiting the core set of papers that would be used as a basis for measurement. The approach used to do so is described in Section 2 of this report, along with a discussion of the implications and limitations of the dataset. This is followed by a description of the indicators used to benchmark Canada's performance in CIR against that of other productive countries in this field; the methods used to compile the statistics are presented at length in Section 2.3. Section 3 presents the results of the current study, and a conclusion and summary of the findings are discussed in Section 4.

2 Methods

This section outlines the methodological approach used to carry out a bibliometric analysis of Canada's performance in the field of CIR relative to other leading countries. An operational definition of consumer research is presented in Section 2.1, whereas the iterative process used to delineate the dataset follows in Section 2.2. Indicators are presented in Section 2.3.

Importantly, there is no doubt that this report is innovative in several ways. Firstly, bibliometrics is not used nearly as frequently to examine the social sciences and humanity as it is in assessing research in the natural sciences and engineering. Also, producing bibliometric statistics in the social sciences and humanities always requires greater care.[1] Finally, to the authors' best knowledge, this is

[1] Archambault *et al.* 2006. Benchmarking scientific output in the social sciences and humanities: The limits of existing databases, *Scientometrics*, 68(3): 329-342.

Archambault É. and Vignola-Gagné É. 2004. *The Use of Bibliometrics in the Social Sciences and Humanities*. Prepared for the Social Sciences and Humanities Research Council of Canada (SSHRC) by Science-Metrix, 84 pages. http://www.science-metrix.com/eng/reports_Downloads.htm

the first report that examines CIR using bibliometric methods. This level of novelty explains why the methodological aspects are presented at such lengths in this report.

2.1 Definition of "Consumer Issues Research"

The operational definition of CIR that was used to delimit the dataset was drawn from the United Nations guidelines on consumer protection[2], as well as from insight derived from previous research performed for the OCA by academics and from the OCA's own perception of the field. As a result, the following factors guided the dataset definition:

- Of particular concern is research linked with consumer protection and empowerment (i.e., how to help consumers to deal effectively with the marketplace and the challenges they face).
- Certain marketing literature—such as that on consumers' psychological issues or on what motivates people to buy goods and services—can play a role in policy.
- Consumer policy research is largely limited to the social sciences and humanities, including behavioural psychology.
- Research on engineering/technical aspects of specific products or systems should be omitted.
- Given the mission of OCA relative to that of other government departments (e.g., Health Canada, the Canadian Food Inspection Agency, and Agriculture and Agri-Food Canada), issues linked with health and food were largely set aside whenever possible.

2.2 Dataset Delimitation

Two information science concepts are central to an understanding of how datasets are built in order to represent activities within a field using bibliometric methods: *recall* and *precision*. Recall is the percentage of records relevant to a field that a search query retrieves from all papers comprised in the database. For instance, if a database contains 100 papers on CIR, and a query captures 92 of them, then the recall is said to be 92% (or 8% false negatives). However, for reasons relating to those outlined below, it is very difficult to assess or even estimate the total number of relevant CIR papers in the database. Precision is the capacity to capture only relevant records—or, conversely, the capacity not to extract false records. For instance, if a query retrieves 100 records, of which 12 are irrelevant (e.g., they are not related to CIR), then the precision would be 88% (or 12% false positives).

Building a dataset on a field of activities is a balancing act—what is known as a "hard combinatorial optimization problem"—between maximizing both recall rates and precision. The problem is that as one seeks to increase recall, errors necessarily creep in and precision declines. In fact, it is commonly recognized in the field of information retrieval that an inverse relationship often exists between precision and recall, where it is possible to increase one but only at the cost of reducing the other.

In a field like CIR, this balancing act rapidly becomes much more of an art form than hard science. Choosing between recall and precision is not an easy decision, and several keyword queries were

[2] United Nations, Department of Economic and Social Affairs (2003). *United Nations Guidelines for Consumer Protection*. Retrieved September 10th, 2008, from http://www.un.org/esa/sustdev/publications/consumption_en.pdf

developed and tested in attempts to increase the recall without compromising precision. None of the queries tested during this study were highly selective, meaning that they invariably retrieved a large number of false positives and exerted an unacceptable toll on precision. This contrasts with work conducted by Science-Metrix in fields such as fuel cells, where it is fairly easy to obtain a dataset with a very high level of precision. In fuel cell research, for example, a precise vocabulary is used in a manner that is nearly unique to this field. In contrast, the vocabulary used by CIR researchers is not specific to the concepts used in the field. In fact, as one manager from Industry Canada remarked, the boundary that distinguishes CIR papers from those that are not related to this field resembles a greyscale rather than a sharp dividing line, and this makes the task of delineating the field much more difficult. In addition, very few journals are specific to the field, and even the most relevant journals also publish articles that have little connection to CIR. These difficulties were thus confronted at every step of the dataset delimitation, as described below.

Defining the dataset was performed using a two-phased process, involving an exploratory phase (Phase 1) and a definition and fine-tuning phase (Phase 2). In Phase 1, keyword search queries were used to extract papers on "consumer issues", and numerous experimental datasets were built using documents representing original contributions to knowledge, collectively referred to as "papers", from the Scopus database hosted at Science-Metrix. The first data collection step entailed extracting every article in the Scopus database for which the title, abstract or author keywords contained one of the following descriptors: consumer, consumers, consumerism, consumption, customer, customers, client, clients, or end-user. More than 200,000 documents were collected, of which about 45,000 contained the exact term "consumer".

Science-Metrix analyzed random batches of these 200,000 documents, looking for keywords related or unrelated to "consumer issues" that would help the building of CIR-focused queries. Several keywords relevant to CIR were thus identified and then tested individually and in combination to assess whether they pointed towards relevant papers. Some keywords were also tested for their capacity to exclude irrelevant documents. Almost all of the irrelevant documents that appeared were linked to the domains of the natural sciences, health sciences, engineering, and technology. This finding essentially confirmed previous research performed for the OCA, which suggested that research appropriate for the OCA's mandate was, by and large, performed in the social sciences, humanities, and management fields.

Two main conclusions were drawn from these initial tests using keyword queries:

- Keywords such as "consumption", "customer", or "client" were linked to a vast number of results that, for the most part, were irrelevant to the subject matter, whereas the term "consumer" was much more frequently associated with the subject matter that is of interest to OCA.
- Inclusion of the subject matter (e.g., protection or privacy) could be useful, but keywords were not enough to effectively exclude irrelevant documents.

After two weeks of intense exploratory work, it became obvious that even with the combination of inclusive and exclusive keywords, it was not possible to produce a satisfactory dataset on CIR in this manner. The terms used in CIR to describe the topics covered in the papers were found to be highly

generic (e.g., sustainability) or discipline-specific (e.g., direct-to-consumer advertising) rather than CIR-specific. Terminological issues explain in part why there are no obvious combinations of specific words that return a large number of papers with a high level of precision. However, these tests had at least one positive outcome, in revealing that the use of the keyword "consumer" in the context of the social sciences, humanities, and business, produced a fairly high proportion of relevant results.

Consequently, Phase 2 began with the creation of a set of "eligible papers" that cover the fields and subfields in which relevant CIR papers should be located (i.e., mainly the social sciences, the humanities, and a number of professional fields). To meet the operational definition adopted for this research, the Health Policy and Services subfield (in the Health Science field) was included in this "eligible dataset", as were selected journals in the subfield of Social Psychology. Fine-tuning tests showed that the set of articles from these health-related fields was more relevant and in greater alignment with the above operational definition when papers that contained keywords relating to experiments, treatment, therapy, diagnosis, psychiatry, and drug abuse were excluded. Furthermore, most fields and subfields in the natural sciences, health sciences and engineering were excluded. There are also a large number of journals for which the academic field is unknown, and these were examined individually to identify and exclude those linked to non-eligible fields.

Following recommendations from the OCA, complete coverage of the following journals was added to the "eligible dataset": the Journal of Consumer Affairs, the Journal of Consumer Policy, the Journal of Consumer Research, and the Journal of Public Policy and Marketing. Also, following Science-Metrix' suggestion and the OCA's approval, the papers associated with the following journals were added: the Journal of Consumer Marketing and the Journal of Consumer Psychology.

The last step in the definition of the dataset was to perform a query in the title, the abstract, or the authors' keywords using the terms "consumer", "consumers" or "consumerism". Only the types of articles that typically contain references and that are commonly cited were retained, as well as articles that had at least one country present in the address field. The resulting dataset contained 15,855 CIR papers published between 1996 and 2007.

A sample of 200 papers was analyzed by three people, and a further sample of 133 papers was later examined by the same three people in addition to a fourth person to determine the proportion of false positives. This analysis revealed that about 26% of the papers were not considered relevant to CIR; therefore, the precision of the dataset is 74%. The dominating research specialties in the resulting dataset are Management & Business and Economics, with about 37% and 25% of papers, respectively (Figure 1). The remaining papers are distributed in over 14 specialties, with no one specialty representing more than 4% of the dataset. Considering that Management & Business and Economics are by far the biggest specialties (i.e., with the largest number of papers) within the Professional Fields and Social Sciences, respectively, in Scopus, it is not surprising that these two specialities also dominate in the CIR dataset.

It should be emphasized that this study does not aim to produce a census of papers in CIR, nor—as this section has demonstrated—would it be possible to do so. Rather, the study aims to benchmark Canadian CIR using a widely recognized set of bibliometric rules and indicators. The main goal of this study is to examine how Canadian research in consumer issues compares to the world research

frontier in this area using metrics such as number of papers, specialization in the field and relative impact, as measured by citations and by measuring the average of impact of journals where research is published. The data produced for this study is also useful for the measurement of core research on CIR in a relative manner—the absolute numbers are not so important, but the relative position of countries and institutions is very telling. If the work of every institution is evaluated in the same manner, no countries or institutions will be advantaged, nor will teams working on a specific issue (consumer protection or consumer sustainability, for instance) be advantaged. All things being equal, the dataset delimitation that was used allows Science-Metrix to provide a fair and relatively robust ranking of core CIR research.

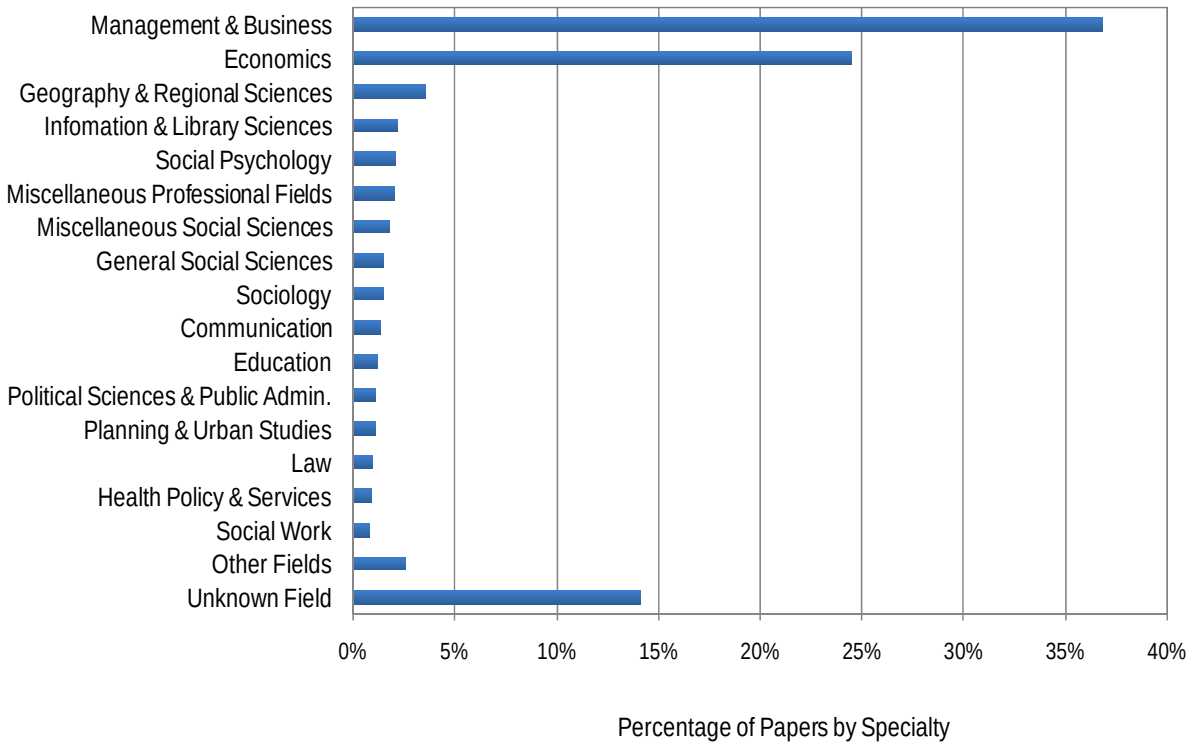

Figure 1 Papers on CIR per Specialty, 1996–2007
Source: Calculated by Science-Metrix using the Scopus Database

2.3 Bibliometric Indicators and Analysis

The following bibliometric indicators were used to produce the data presented in the report.

Number of papers, papers per capita: Number of papers written by authors located in a given geographical or organizational entity (e.g., a country or an institution). The number of papers at the country level is weighted per capita using statistics produced by the US Census Bureau. These statistics are available on an annual basis for every country and are estimated at mid-year.

Growth Index (GI): The growth index is a measure of the increase in the number of papers in a particular field or subfield relative to the increase in the number of papers in the database overall (i.e., of the world). The growth index is computed as follows:

$$\textbf{Growth Index} = \frac{(X_b/X_a)}{(N_b/N_a)}$$, where:

X_a = Papers in CIR between 1996 and 1999;
X_b = Papers in CIR between 2004 and 2007;
N_a = Papers in the whole database between 1996 and 1999;
N_b = Papers in the whole database between 2004 and 2007.

In graphs, the resulting value is distributed evenly between -1 and +1. Consequently, countries that are growing faster than the world average have positive growth index values (GI > 0), whereas the opposite is true for countries growing slower than the world average (GI < 0).

Relative Strength Index (RSI): The RSI indicates the *strength of an entity's growth* by comparing upward and downward movements (i.e., oscillations) in growth over time. It was originally developed in the field of finance to analyze price strength,[3] but can be applied to various other indicators. In this study, the RSI is computed as a static indicator and normalized between 0 and 100, where 0 represents constant decay and 100 represents constant growth. In other words, the higher the RSI value, the more sustained the growth.

Specialization index (SI): The SI is an indicator of *research intensity* in a given entity (e.g., a country or an institution) for a given research area (e.g., a field or subfield), relative to the intensity in a reference entity (e.g., the world). In this case, the reference set of papers was defined as the "eligible dataset", as defined in Section 2.2, to neutralize known biases in the database with regard to social sciences and humanities. When a country is specialized in CIR, it places more emphasis on this field at the expense of other research areas. Specialization is therefore said to be a zero sum game: the higher the level of specialization in a given area, the lower the level of specialization available to fields outside of that area. The SI is formulated as follows:

$$\textbf{SI} = \frac{(X_S/X_T)}{(N_S/N_T)}$$, where:

X_S = Papers from entity X in a given research area (e.g., papers by Sweden in CIR);
X_T = Papers from entity X in a reference set of papers (e.g., total eligible papers by Sweden);
N_S = Papers from reference entity N in a given research area (e.g., world papers in CIR);
N_T = Papers from reference entity N in a reference set of papers (e.g., total eligible world papers).

The resulting values are then evenly distributed between -1 and +1 and an index value above 0 (SI > 0) means that a given entity is specialized relative to the reference entity, whereas an index value below 0 (SI < 0) means the reverse.

Average relative impact factor (ARIF): This indicator is a proxy for the scientific impact of the journals in which an entity publishes. For each journal, an impact factor (IF) is calculated based on the number of citations it received relative to the number of papers it published. Thus, each journal's

[3] Welder, J.W. 1978. A Momemtum oscillator that can help you spot market turns. *Commodities*, 7: 34-35.

IF varies from year to year. The IF of *papers* is calculated by ascribing to each of them the IF of the journal in which they were published, for the year in which they were published. To account for different citation patterns across fields and subfields of science (e.g., there are more citations in biomedical research than mathematics), each paper's IF is divided by the average IF of the papers in its subfield to obtain the Relative Impact Factor (RIF). The ARIF of a given entity is the average of the RIFs of the papers belonging to it. The resulting values are then evenly distributed between -1 and +1. Thus, when the ARIF is above 0 (ARIF > 0), it means that an entity scores better than the world average; when it is below 0 (ARIF < 0), it means that on average, an entity publishes in journals that are not cited as often as the world level.

Average of relative citations (ARC): The ARC is an indicator of the scientific impact of papers produced by a given entity (e.g., a country or an institution). The number of citations received by each paper is counted for the year in which it was published and for the two subsequent years. For papers published in 1996, for example, citations received in 1996, 1997 and 1998 are counted. The only exceptions are 2006, which has a citation window of two years (2006 and 2007), and 2007, which has a citation window of one year, because citation data are not yet available for the subsequent years. To account for different citation patterns across fields and subfields of science (e.g., there are more citations in biomedical research than in mathematics), each paper's citation count is divided by the average citation count of the papers in its subfield to obtain a relative citation count (RC). The ARC of a given entity is the average of the RCs of the papers belonging to it. The resulting values are then evenly distributed between -1 and +1. Thus, an ARC value above 0 (ARC > 0) means that a given entity is cited more frequently than the world average.

3 Assessment of Research by Leading Countries in CIR, 1996–2007

The field of CIR has undergone noticeable growth during the last 12 years. The dataset used in the present study comprises 687 papers published in 1996 and 2317 papers published in 2007. This means that the output in this field has grown 3.4 times during the 12-year period. However, this figure does not paint an entirely precise picture, as it does not take into account the general growth of published research nor any changes in the coverage of the database. Figure 2 presents the growth of research output in CIR as a percentage of total research output (as accounted by the Scopus database). This shows that CIR is growing substantially faster—at more than double the speed—than the world's research output and/or the coverage of the Scopus database.

Figure 2 also presents the research output of the US. As one can see, the US output accounted for more than half of the research production in CIR in 1996, but the pace of growth in the US has been slower than the growth in the field overall. Consequently, the US now accounts for slightly less than half of the output in the field.

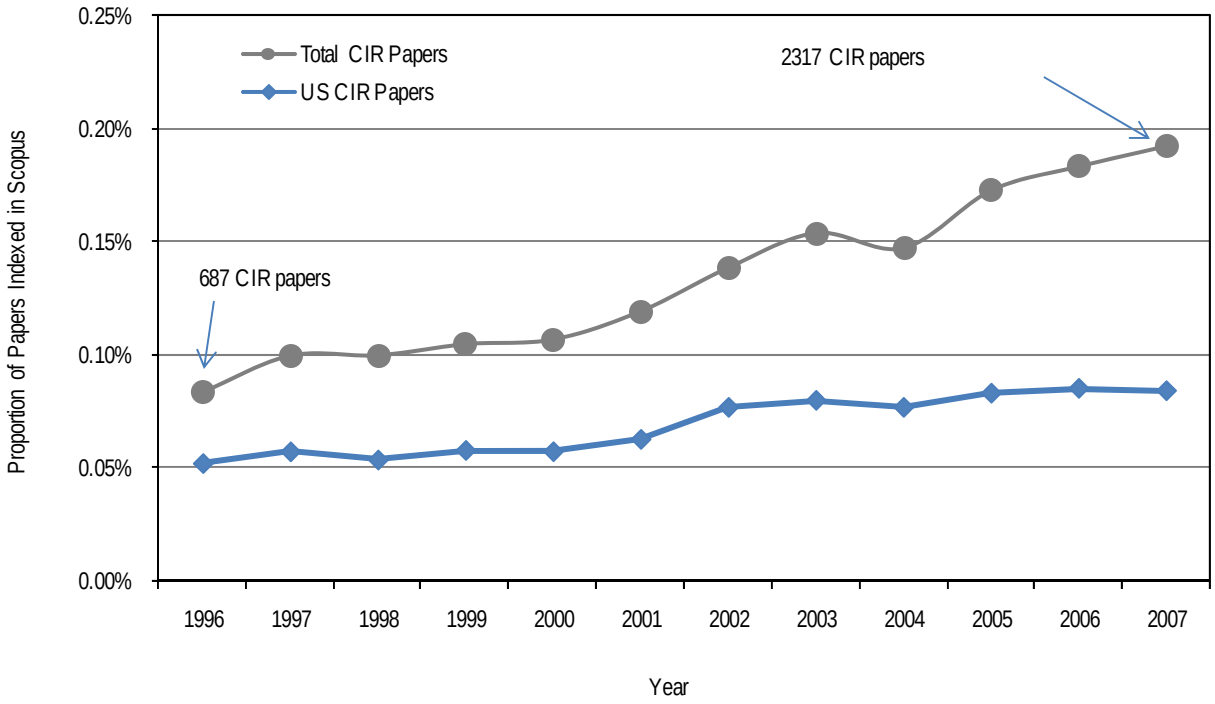

Figure 2 CIR Papers as a Percentage of Indexed Papers, 1996–2007
Source: Calculated by Science-Metrix using the Scopus Database

Other than the US, the only country that clearly stands out in number of publications is the UK (Figure 3). Canada has held the third rank over nearly the whole period. However, in the last two years, Canada's output has not grown as fast as that of some of the other contenders and, in 2006, its output was on a par with that of Australia and China, both of which overtook Canada in 2007. Other than those countries, Germany and the Netherlands were also noteworthy for both their large output and their steady growth.

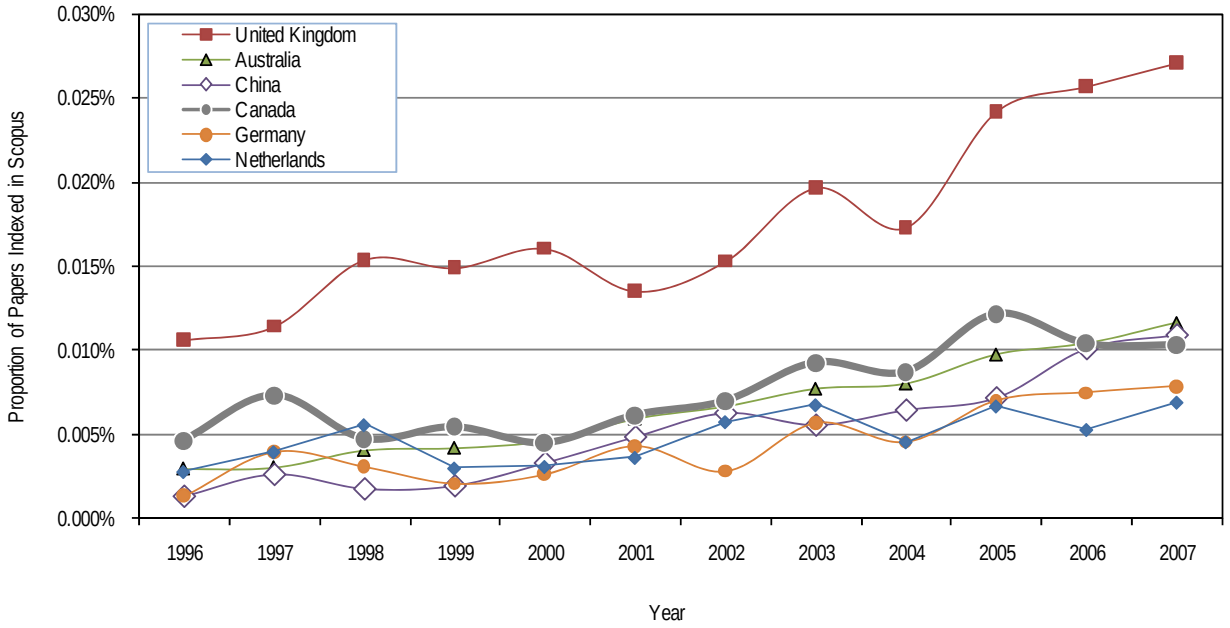

Figure 3 Leading Countries' CIR Papers (% of Indexed Papers), 1996–2007
Source: Calculated by Science-Metrix using the Scopus Database

The growth rate of the largest producers of knowledge on consumer issues varies widely across the board. Figure 4 presents a growth index (GI) on the output of the leading countries in the field. This growth index is obtained by dividing the output published in 2004–2007 by that published in 1996–1999. The resulting value is divided by the world average growth in the field over these same periods and then distributed evenly between -1 and +1. Consequently, countries that are growing faster than the world average have positive growth index values (GI > 0), while the opposite is true for countries growing slower than the world average (GI < 0). Note that, at the world level, the number of CIR papers increased 2.4 times between the two periods; as such, Canada's 2.5 increase between the two periods is slightly above the world level, as shown in Figure 4.

As seen for Canada, the growth in the UK's output is only slightly higher than the world level, and that of the US is negative, meaning that the US is progressively losing ground. Not every English-speaking country has experienced this, however: Australia and New Zealand both exhibit strong growth. Brazil is the fastest growing country, but as one can see in Figure 5, among the leading countries it is also the country that produced the smallest number of papers. China is rapidly increasing its output in CIR, but it should be noted that it is second lowest for papers per capita among the leaders in this field (see Figure 6).

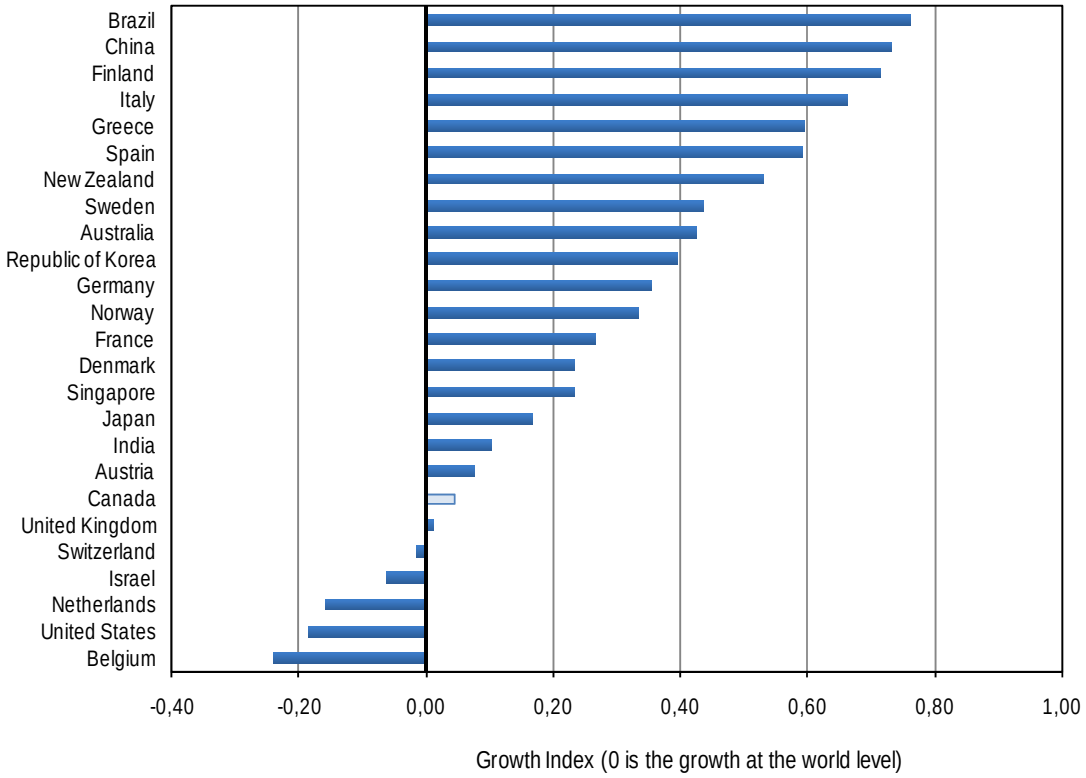

Figure 4 Growth Index of CIR Papers per Country, 1996–2007

Source: Calculated by Science-Metrix using the Scopus Database

With the exception of China, overall output is greatest for English-speaking countries. This is the case both for overall output (Figure 5) as well as for output per capita (Figure 6); however, in the latter case, the output per capita is also high for Nordic countries (Denmark, Sweden, Norway, and Finland) and the Netherlands. In terms of total output, Canada ranks third behind the US and the UK, while Australia ranks fourth. This reflects a bias in the coverage of databases that tends to favour English-speaking countries, especially in the socials sciences and humanities. This bias is due in part to the more local nature of academic work in the social sciences. Indeed, whereas assertions and concepts presented in the natural sciences and engineering are often quite universal, issues addressed in the social sciences are often of a more local or regional interest. Because of this, compared to the natural sciences and engineering, publications in the social sciences are more often in local languages, and these are less likely to have coverage in mainstream databases such as Scopus and the Web of Science.

This bias towards English-speaking publications is also reflected in the number of papers per capita (Figure 6). English-speaking countries appear prominently, as do Nordic, Germanic, or other countries (e.g., the Netherlands) where researchers are known to speak, write and publish more frequently in English than many other non-English-speaking countries.

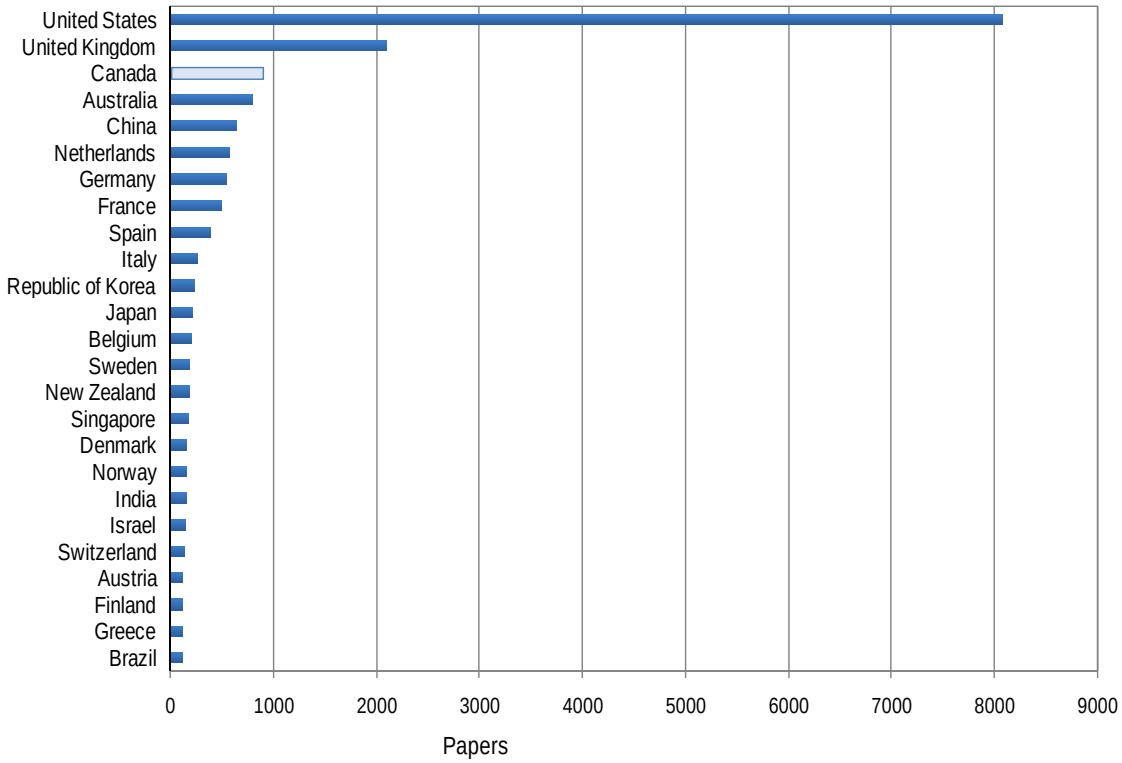

Figure 5 CIR Papers per Country, 1996–2007

Source: Calculated by Science-Metrix using the Scopus Database

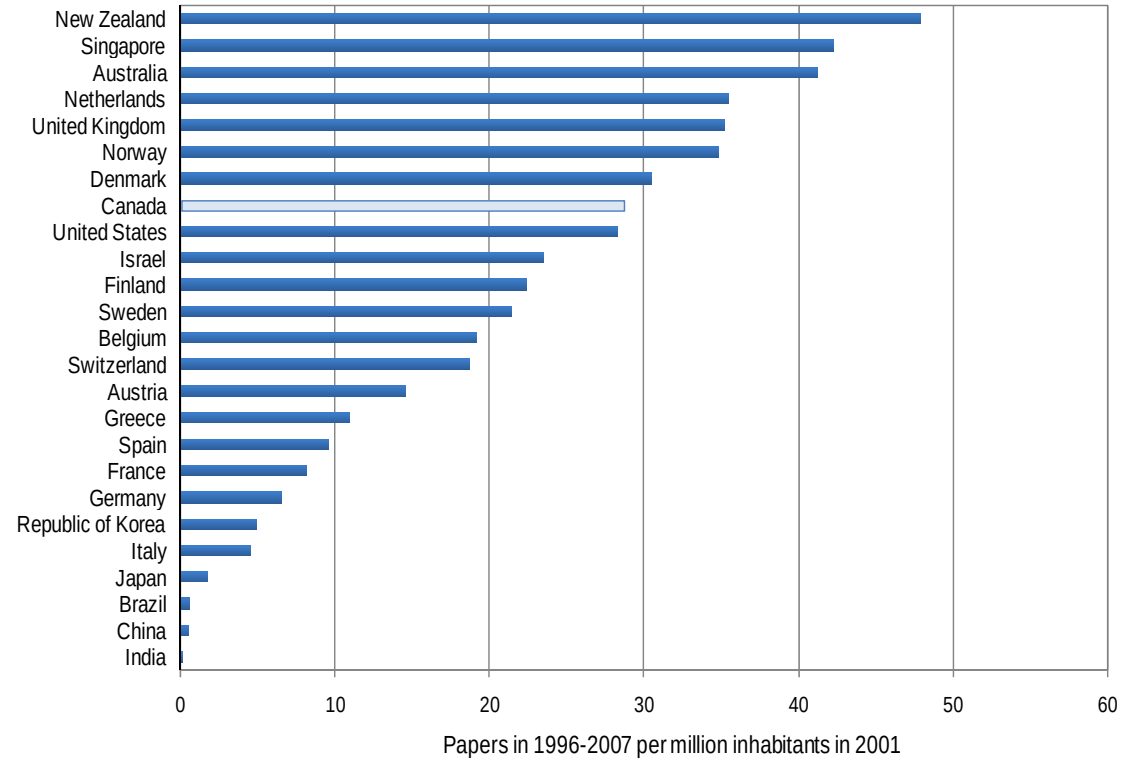

Figure 6 CIR Papers per Capita per Country, 1996–2007

Source: Calculated by Science-Metrix using Scopus & Population Data from the US Census Bureau

One way to alleviate the language bias is to use the specialization index (SI). The SI indicates the intensity of research in CIR relative to "eligible papers" published by the rest of the world (see the definition of "eligible papers" and SI in Sections 2.2 and 2.3, respectively). When a country has an SI score that is greater than 0, it published a greater proportion of its papers in that field than does the rest of the world. If a country's total papers are generally well covered in the database (as would be the case for English-speaking countries), eliminating the size effect due to the extent of this country's coverage in the database will diminish the relative importance of CIR papers in a commensurable manner. Conversely, a country for which papers are not well covered in the database but that publishes a large proportion of its papers in CIR will score higher using the SI rather than based on papers per capita. Thus, the SI provides a less biased portrait of this country's relative contribution to CIR and is a potent indicator of the strength of a country in a field compared to its overall strength in research.

In Figure 7, countries are presented in descending level of specialization in CIR. These data show that Canada is mildly specialized in CIR, ranking 9th among the leading countries in the field. Singapore and Denmark are the most specialized, followed by four countries with nearly identical SI scores: the Netherlands, the Republic of Korea, the US and New Zealand.

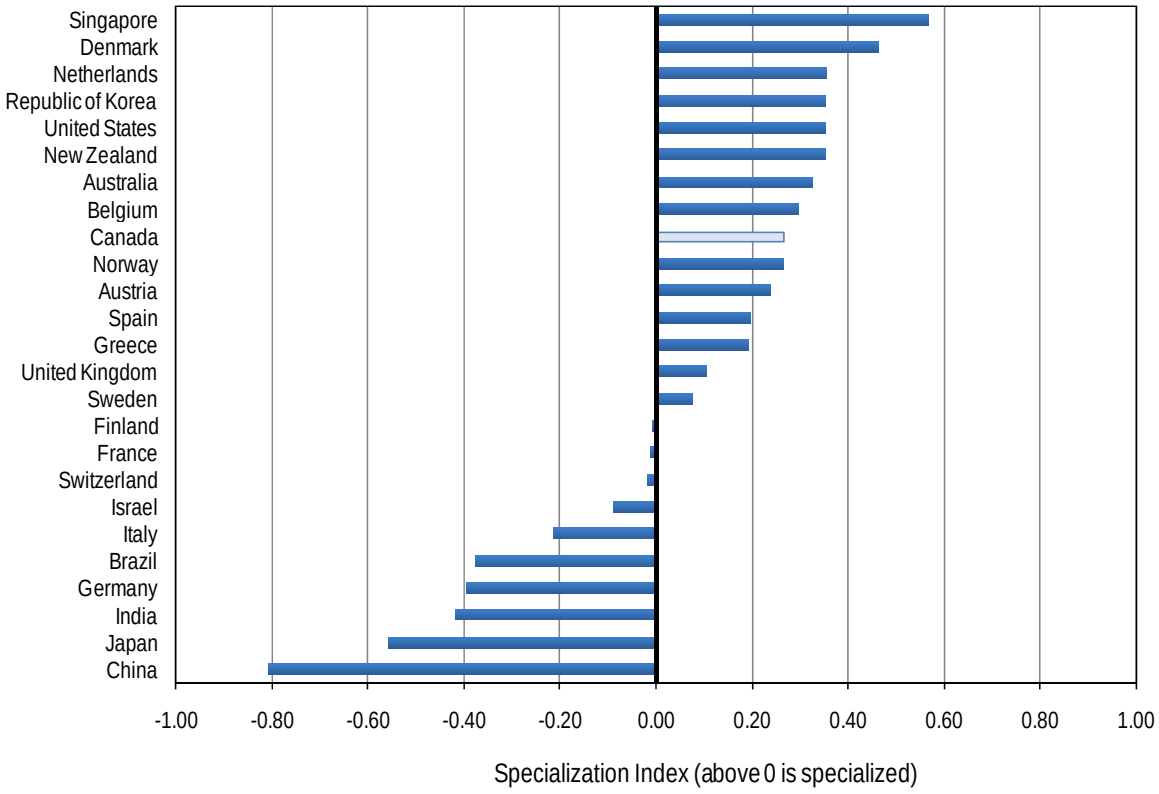

Figure 7 Specialization in CIR by Country, 1996–2007
Source: Calculated by Science-Metrix using the Scopus Database

Thus, these countries likely devote a higher percentage of their social sciences and humanities research activities, and more precisely the pool of papers from which the "eligible papers" dataset was built, to CIR than the world average. The high ranking of the US indicates that it is truly specialized

in CIR, as the bias stemming from its size and the extent of its coverage in the database have been minimized. Other than Singapore and the Republic of Korea, Asian countries are the least specialized among leaders in the CIR field.

Scientific impact and research excellence can be precisely evaluated using two indicators: the average of relative impact factors (ARIF) and the average of relative citations (ARC). As explained in the methods (Section 2.3), the ARIF indicates whether the country published CIR papers in highly-cited journals, with 0 representing the world average. Once again, the US ranked first, followed by Singapore and Canada (Figure 8). Canada's third-place ranking is all the more significant, as most countries publish CIR papers in journals that are less highly cited than the world average. The Netherlands and Israel are the only other countries to publish CIR papers in journals that draw citations more than 5% more frequently than the world average.

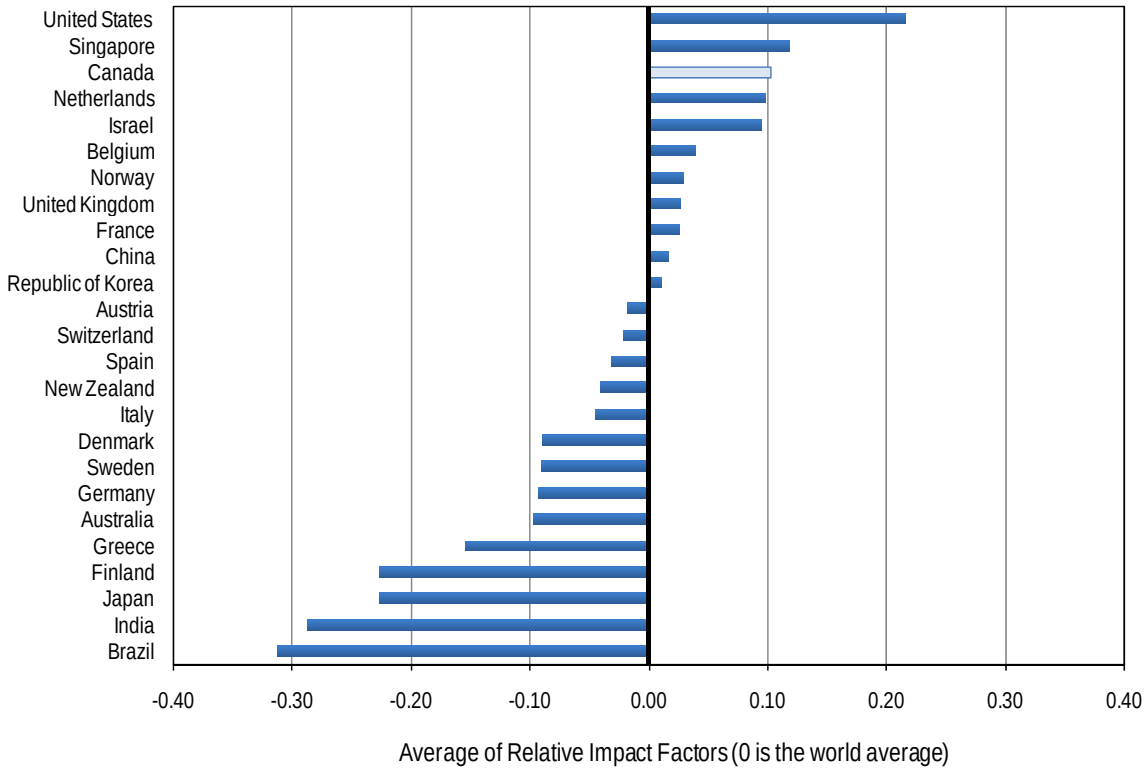

Figure 8 Average of Relative Impact Factors in CIR by Country, 1996–2007
Source: Calculated by Science-Metrix using the Scopus Database

The second scientific impact indicator, the ARC, examines the number of citations received by individual CIR papers rather than those received at the journal level, relative to the number of citations received by other papers in the same subfield. Thus, if a country has a high ARIF score and a low ARC score, it publishes its CIR papers in highly-cited journals but its own papers are not cited frequently by the research community. This is the case for many high-ARIF countries, including Singapore and Canada, although the two latter still rank above the world average. Belgium and the Netherlands both increase their ranking using the ARC rather than the ARIF, ranking 1st and 3rd, respectively. Nordic countries also fare much better when looking at citations received by papers

rather than the ARIF, with Finland, Denmark and Sweden ranking in the top eight and well above the world average. All Asian countries publish CIR papers that are cited less frequently than the world average.

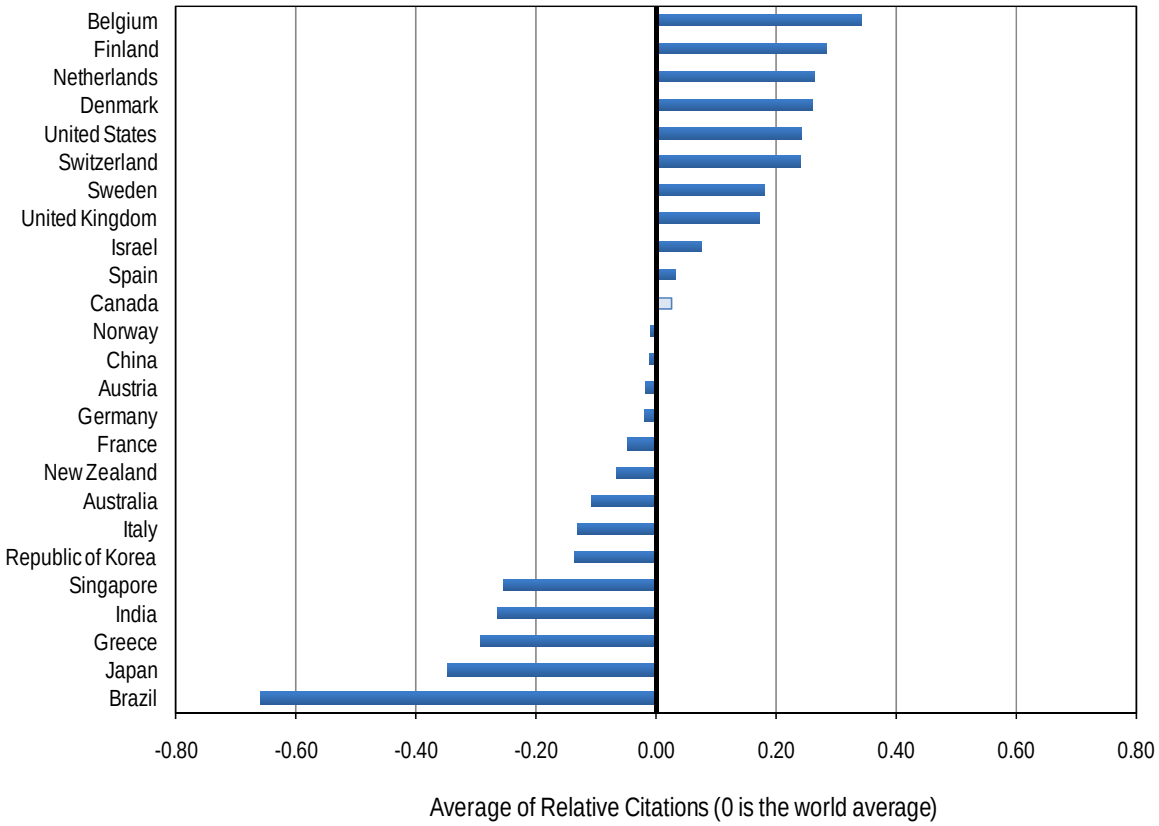

Figure 9 Average of Relative Citations in CIR by Country, 1996–2007

Source: Calculated by Science-Metrix using the Scopus Database

The Dashboard presented in Table I allows for a visual comparison of all indicators presented above. The relative strength index (RSI) has been added to indicate the consistency of growth in the publsihed output in CIR: an RSI of 100 represents constant growth, whereas an RSI of 0 represents a constant decline in production. The countries are ranked according to the number of CIR papers to which they contributed between 1996 and 2007, with the US obviously at the top. The US also scores above the world average in terms of specialization and the two impact indicators, but its growth is slipping relative to the expansion of this field at the world level. The 2nd and 3rd most productive countries, the UK and Canada, have maintained their growth in CIR papers at the world level but are less specialized and have lower impact scores than the US; nevertheless, they remain above the world level for all indicators.

The comparison in Table I suggests that countries that established a productive and high-impact CIR output early on, including the US, Canada, the UK, the Netherlands and Belgium, have maintained higher-than-average specialization and impact levels. However, Nordic countries, Spain, Australia and New Zealand are currently gaining ground in terms of published output, and many already rival Canada and other well-established CIR countries in terms of their specialization and

scientific impact. Rapid growth is also observed in China, the Republic of Korea, and Singapore; these may also become strong contenders if the scientific impact of their papers increases. Japan and India are currently producing papers far below the world level in terms of impact, although the growth in their published output exceeds the world level. Finally, Greece and Brazil are up-and-coming countries in the CIR field but have yet to make a notable scientific impact.

Table I Dashboard for Research Output on CIR in Leading Countries, 1996-2007

Country	Papers	GI [-1:1]	RSI [0:100]	PP [0:∞]	SI [-1:1]	ARIF [-1:1]	ARC [-1:1]
United States	8070	-0.19 ↓	79 △	28 △	0.35 ●	0.22 ●	0.24 ●
United Kingdom	2102	0.01	79 △	35 ●	0.11 ●	0.03 △	0.17 ●
Canada	900	0.04	67 △	29 △	0.26 ●	0.10 ●	0.03 △
Australia	796	0.42 ↑↑↑	99 ●	41 ●	0.33 ●	-0.10 △	-0.11 ◆
China	645	0.73 ↑↑↑↑	88 ●	0.5 ◆	-0.81 ◆	0.02 △	-0.01 △
Netherlands	569	-0.16 ↓	63 △	36 ●	0.36 ●	0.10 △	0.26 ●
Germany	537	0.36 ↑↑	71 △	7 △	-0.40 ◆	-0.09 △	-0.02 △
France	498	0.27 ↑↑	73 △	8 △	-0.01 △	0.03 △	-0.05 △
Spain	383	0.59 ↑↑↑	79 △	10 △	0.20 ●	-0.03 △	0.03 △
Italy	264	0.66 ↑↑↑↑	95 ●	5 ◆	-0.21 ◆	-0.04 △	-0.13 ◆
Rep. of Korea	231	0.39 ↑↑	63 △	5 ◆	0.35 ●	0.01 △	-0.14 ◆
Japan	217	0.17 ↑	76 △	2 ◆	-0.56 ◆	-0.23 ◆	-0.35 ◆
Belgium	197	-0.24 ↓↓	62 △	19 △	0.30 ●	0.04 △	0.34 ●
Sweden	192	0.44 ↑↑↑	74 △	21 △	0.08 △	-0.09 △	0.18 ●
New Zealand	184	0.53 ↑↑↑	67 △	48 ●	0.35 ●	-0.04 △	-0.07 △
Singapore	174	0.23 ↑↑	59 ◆	42 ●	0.57 ●	0.12 ●	-0.25 ◆
Denmark	163	0.23 ↑↑	55 ◆	30 △	0.46 ●	-0.09 △	0.26 ●
Norway	157	0.33 ↑↑	70 △	35 ●	0.26 ●	0.03 △	-0.01 △
India	155	0.10 ↑	74 △	0.2 ◆	-0.42 ◆	-0.29 ◆	-0.26 ◆
Israel	147	-0.06	63 △	24 △	-0.09 △	0.09 △	0.08 △
Switzerland	137	-0.01	59 ◆	19 △	-0.02 △	-0.02 △	0.24 ●
Austria	118	0.07	59 ◆	15 △	0.24 ●	-0.02 △	-0.02 △
Finland	116	0.71 ↑↑↑↑	70 △	22 △	-0.01 △	-0.23 ◆	0.29 ●
Greece	116	0.59 ↑↑↑	62 △	11 △	0.19 ●	-0.15 ◆	-0.29 ◆
Brazil	109	0.76 ↑↑↑↑	80 △	0.6 ◆	-0.38 ◆	-0.31 ◆	-0.66 ◆

Legend: GI, the Growth Index, compares the number of papers published in 2004-2007 to those published in 1996-1999, divided by the world average; RSI, the relative strength index, is a measure of the strength of the growth in publications by a country; PP, the papers per capita, is the number of papers (1996-2007) divided by the population (in millions); SI, the specialization index; ARIF, the average of relative impact factors; ARC, the average of relative citations.

For a given indicator, green circles represent scores above the world level by 1 standard deviation (RSI and PP) or by 10% (normalized scores, SI, ARIF, ARC); yellow triangles represent scores that are not markedly different from the world level; red diamonds represent scores below the world level by 1 standard deviation (RSI and PP) or by 10% (normalized scores, SI, ARIF, ARC). The number of arrows graphically represents the GI scores that differ markedly from the world level:

-0.4 to -0.2	↓↓	0.2 to 0.4	↑↑
-0.2 to -0.1	↓	0.4 to 0.6	↑↑↑
0.1 to 0.2	↑	0.6 to 0.8	↑↑↑↑

Source: Calculated by Science-Metrix using the Scopus Database

Leading Universities in CIR

This section, as well as the following one that centres on CIR in Canada, examines the output of leading organizations in CIR. It is not really surprising that all the leading organizations in terms of CIR published output at the world and at the Canadian levels are universities, that is, no governmental and non-governmental organization nor company is found among the leaders. The 20 leading organizations in CIR, listed according to their published output in this field, are nearly all universities located in the US, with the exception of the National University of Singapore (Table II). The output is dominated by the University of Pennsylvania and the University of California at Berkeley, with 252 and 218 CIR papers, respectively, more than most of the top countries in this field. Many US universities exhibit growth index scores within 10% of the world level, which corresponds to the general trend observed for the US. Notable exceptions are the University of Illinois at Urbana-Champaign and the University of Chicago, with outputs that are decreasing compared to the world, and the University of Florida, Purdue University and Michigan State University, which are gaining ground compared to the world. All 19 US universities publish high-impact papers in high-impact journals except for Iowa State University of S&T and Purdue University, although neither is far from the world level. Researchers at the National University of Singapore have published more CIR papers than many countries, including Austria and Finland, but, like Singapore as a whole, the scientific impact of their papers is below the world average (ARC < 0) despite publishing in high-impact journals (ARIF > 0).

Table II Leading Universities in CIR, 1996–2007

Organisation	Papers	Growth Index	ARIF	ARC
University of Pennsylvania	252	0.0	0.5	0.6
University of California, Berkeley	218	-0.2 ↓	0.5	0.6
U. of Illinois at Urbana-Champaign	179	-0.3 ↓↓	0.2	0.3
Harvard University	178	0.0	0.5	0.7
University of Michigan	169	0.0	0.4	0.5
Ohio State University	168	0.0	0.1	0.3
New York University	165	-0.1	0.5	0.5
Columbia University	164	0.0	0.5	0.5
Northwestern University	160	-0.2 ↓	0.5	0.5
Penn State	157	-0.2 ↓	0.4	0.3
University of Florida	148	0.5 ↑↑↑	0.4	0.3
University of Texas at Austin	147	0.0	0.5	0.5
Iowa State University of S&T	146	-0.1 ↓	0.0	0.1
Michigan State University	136	0.2 ↑↑	0.2	0.4
Stanford University	133	0.1 ↑	0.5	0.7
University of Chicago	128	-0.3 ↓↓	0.6	0.7
Purdue University	126	0.4 ↑↑↑	0.2	0.0
Cornell University	124	-0.1	0.5	0.4
Duke University	120	0.1	0.5	0.7
National University of Singapore	119	0.2 ↑	0.2	-0.1

Source: Calculated by Science-Metrix using the Scopus Database

Leading Canadian Universities in CIR

Leading Canadian universities in CIR, based on the number of papers published between 1996 and 2007, include the country's largest research universities, such as the University of British Columbia (UBC), the University of Alberta and the University of Toronto, which ranked 1st, 2nd and 3rd, respectively (Table III). All three universities published high-impact papers based on the ARC, and both UBC and the University of Toronto also have high ARIF scores. In addition, McGill and Queen's universities exhibit strong scores for both the ARIF and ARC indicators. Many universities published over 25 studies during the 1996-2007 period, but some, such as the Université de Montréal, University of Guelph, York University and the University of Manitoba, do not score highly in terms of scientific impact. Two Canadian universities have departments dedicated, at least in part, to CIR: the Department of Marketing and Consumer Studies at the University of Guelph and the *Département d'économie agroalimentaire et des sciences de la consummation* at the Université Laval, which contributed to 21 papers and thus is not included in the ranking in Table III.

Table III Leading Canadian Universities in CIR, 1996–2007

Organisation	Papers	ARIF	ARC
University of British Columbia	96	0.5	0.2
University of Alberta	72	0.0	0.1
University of Toronto	69	0.4	0.3
Université de Montréal	58	-0.1	-0.1
Concordia University	54	0.1	0.0
University of Guelph	47	-0.2	-0.2
University of Western Ontario	46	0.1	0.0
McGill University	42	0.4	0.4
York University	41	-0.2	-0.1
University of Calgary	36	0.2	0.0
Queen's University	31	0.4	0.2
Simon Fraser University	31	0.1	-0.1
University of Saskatchewan	31	-0.4	0.2
University of Manitoba	28	0.0	-0.5
McMaster University	25	0.1	0.2

Source: Calculated by Science-Metrix using the Scopus Database

4 Conclusion

This study examined the research output of Canada in consumer issues research. The field of CIR presents several characteristics that make bibliometric assessment difficult. Communication of social science research does not generally employ a vocabulary that is specific to a field of inquiry, making it substantially more difficult to distinguish the output that can be clearly attributable to these fields. Moreover, CIR is not a clearly established field of inquiry, and as such it does not possess a customary set of journals for practitioners and researchers in the field. Hence, one cannot rely solely on a list of journals to analyze research output. After several attempts to use a series of precise queries to delineate the field of CIR, it was decided to simply extract papers using the term "consumer" by performing a query in a set of "eligible papers". This "eligible dataset" mainly comprises published papers in social sciences, humanities and professional fields, such as business and management, in addition to carefully selected areas of health research (mainly those linked to policy issues or examining behavioural aspects of consumers). This approach is not perfect as it omits a large proportion of the field, and about one quarter of the dataset was composed of articles that were not considered to belong to CIR. Despite these caveats, the resulting dataset was large enough and precise enough to produce some meaningful statistics on CIR in leading countries.

The field is clearly dominated by the US, which produces nearly half of the published papers. Qualitatively, the research output of the US is also cited much more frequently than the world average in the field, and US papers are generally published in highly cited journals, a fairly robust indicator that this output is of great quality.

At the other extreme, Asian countries such as Japan, China, India and the Republic of Korea are stepping up their published output in the field, but the quality remains generally below the world average. This is neither surprising nor exceptional, as Asian countries often suffer from having a lower level of citedness than the world average for a number of cultural, social and, most importantly, linguistic issues. Asian databases are not well covered in the databases used for bibliometric assessment. In addition, Asian researchers often make references to papers written by English-speakers, but the converse is quite rare. Nevertheless, it is noteworthy that Singapore scores prominently with respect to several of the indicators presented in this report.

The Netherlands and Nordic countries generally perform well, although their output is not growing as rapidly as many others. English-speaking countries, including the UK, New Zealand and Australia, generally do well in terms of number of papers published, but these countries have an advantage due to the language bias of databases used for bibliometric assessment. Only Australia and New Zealand are truly specialized in the field, a measure that is not influenced by inadequate coverage of world languages.

Canada's figures show a greater-than-average performance, but one has to be careful in assessing overall results. Firstly, as noted, there is a language bias that favours English-speaking countries, and this has a noticeable effect in the social sciences when using indicators such as number of papers, number of papers per capita, average relative impact factor, and average relative citations. This bias no doubt contributes to Canada's third place ranking in the field for the number of papers

published. However, the examination of the specialization index shows that Canada ranks ninth in this field. Despite these caveats, these data clearly show that Canada is producing a higher proportion of CIR papers than the world average within a comparable set of papers centred on social sciences, the humanities and professional fields (see the definition of the "eligible dataset" in Section 2). Data indeed reveal that Canada is among the top ten most specializes countries in the field, and this is a significant finding. Overall, Canadian authors in CIR publish their papers in relatively highly cited journals but, despite this, their papers are not cited much more frequently than the world average.

It is important to state that the research on consumer issues found in the CIR dataset is produced from a large variety of standpoints and with many different focal points. For example, an important subset of work within CIR is undertaken with the primary intent of better protecting or advancing consumers' interests, or helping them make relevant choices or develop safe consumption patterns, be it by better understanding consumers' interactions with the marketplace in terms of vulnerabilities or benefits, analysing consumer legislation, regulations and policies, or other similar policy work. These aspects—which are policy-related—contrast with the subject of many papers, which centre on providing businesses with a better understanding of consumer behaviour with a view to improving their commercial prospects. Also, many papers presented work that was interesting from a cognitive standpoint, but did not fall into categories linked with either policy aspects or business interests.

To estimate how Canada's output compared to that of the world, particularly as far as the production of policy-relevant papers was concerned, a sample of papers was sent to four individuals knowledgeable about the CIR field, who were asked to determine whether the papers belonged to policy, business or general interest in CIR, or whether they were outside of the CIR field. This analysis revealed that, in CIR, Canadian researchers publish a smaller proportion of their papers on issues related to policy.

In fact, Canadian authors publish about 30% less papers in this area than what is observed on average for CIR at the world level. More precisely, about 20% of CIR papers by Canadian researchers were deemed to be relevant to policy, compared with 28% at the world level (specialization index of 0.7 obtained by dividing 20% by 28%). It appears that Canadian researchers are more interested in business issues (60% of their CIR-relevant papers) than world researchers as a whole (49% of the papers; thus 60%/49%, meaning an SI value of approximately 1.2 for Canada in business-related output in CIR).

Hence, and in spite of the clearly formulated caveats of this study, one can say with great certainty that Canada is an important producer of papers in CIR, that it produces more papers in this area than it usually does in comparable fields, that the quality of the Canadian output is good but not outstanding, and that Canadian researchers are generally much more interested in the business side of consumer issues than the policy aspects.