

**Final
Report**

DISCUSSION PAPER

**LONG-TERM ECONOMIC IMPACTS OF
HIGH-ACHIEVING INTERNATIONAL
GRADUATES**

SUBMITTED TO

MITACS INC.

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DISCUSSION PAPER: LONG-TERM ECONOMIC IMPACTS OF HIGH-ACHIEVING INTERNATIONAL GRADUATES

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DISCUSSION PAPER: LONG-TERM ECONOMIC IMPACTS OF HIGH-ACHIEVING INTERNATIONAL GRADUATES

1.0 INTRODUCTION

1.1 Final Report

Canada, industrialized nations, and the global economy are moving increasingly into a knowledge and information-based economy that requires high-achievers in sciences, humanities, technology, and business to establish and grow new and expanding economic centres. In order to compete, grow and thrive, Canada, as an industrialized nation with a small population, must keep its existing high-achieving talent and attract high-achievers from other countries.

The pursuit and inclusion of international students at Canadian universities is a well-established practice that produces a number of immediate tangible and intangible benefits, such as direct expenditures by students, and the broadening of perspectives in the classrooms.

With increasing global competitiveness for top talent, Mitacs Inc. has focused its internationalization efforts on targeting high achieving students through its Globalink program, with the belief that top tier high-achievers will provide greater long-term benefits to Canada¹. Although these efforts by Mitacs Inc. are still in the early stages and it is too soon to measure the long-term benefits, there is an opportunity to establish measures by which they may be identified and tracked.

This Discussion Paper presents the key information needed to investigate, track, and measure the relative economic benefits of high-achieving international students versus academically average international students. This begins with defining key terms and exploring methodological implications in Section 2.0.

Tracking the economic impacts of high achieving graduates is problematic as it requires several key definitions of terms that are both ambiguous and difficult to measure, and also necessitates the tracking of individuals over lifetimes, often crossing borders, industries, and professions. The key terms operationalized in Section 2.0 include: “high-achieving,” “international graduates,” and “students and graduates.”

Section 3.0 discusses the identification and tracking of high-achieving students. This section begins by presenting the available data on Canada’s attraction of high-achieving students. This provides the needed context for understanding the importance of global competition for students, and the different models employed to attract the best and the brightest. The models explored here include: the volume-based model; the target-based model; and approaches used by scholarship programs.

Section 4.0 profiles international education in Canada. It explores the trends in international student enrollment in Canada to examine how growth rates have

¹ Mitacs Inc. 2010

developed over time and how they compare with enrollment patterns of Canadian students, and then analyzes the implications of these differences.

Section 5.0 examines the long-term economic impacts of international students as they become members of the Canadian workforce. A variety of impacts are explored, including the impacts of international business activities initiated by international student graduates, and the impacts of personal relationships in the realms of politics, culture, and technology.

The phenomenon of education and business clusters is discussed at the conclusion of Section 5.0. This includes a review of several high-profile business cluster examples including: the Silicon Valley high tech cluster, and the Cambridge University cluster. Clusters in a Canadian context are also discussed. Section 6.0 provides a summary of findings, and directions for future research.

1.2 Background

Mitacs Inc. is a national not-for-profit research organization, based out of the University of British Columbia (UBC), with a focus on unique research and training programs to develop the next generation of innovators with vital scientific and business skills. In partnership with companies, government, and academia, Mitacs supports a new economy using Canada's most valuable resource – its people.

Mitacs delivers six main programs:

- **Accelerate** – connects companies with over fifty research-based universities through research internships for graduate students and postdoctoral fellows, who apply their specialized expertise to business research challenges.
- **Elevate** - Postdoctoral Fellowship program supporting recent Ph.D. graduates working on a two year joint industry-academia research project.
- **Enterprise** - is a competitive six-month internship and business mentorship program that gives graduates of science, technology, engineering, and math (STEM) disciplines an opportunity to work with small to medium-sized enterprises (SME) operating in a STEM sector throughout Southern Ontario.
- **Globalink** - top undergraduate students from around the world participate in a summer research project under the supervision of a Canadian university faculty member, meet with local entrepreneurs and business leaders, and build their professional network and skills.
- **Step** - is Canada's only comprehensive program providing business-ready skills to up and coming graduate and post-doctoral fellows.
- **Outreach** - is making science and mathematics compelling for future researchers through initiatives such as the comedic stage show, *Math Out Loud*, and online quiz game *MathAmaze*.

Mitacs works on behalf of Canadian universities to enhance the recognition and reputation of Canadian universities as world-class destinations for scientific learning and research. Mitacs wants to attract more of the best students from around the world for graduate and post-graduate studies at Canadian universities and possible immigration to Canada.

In particular, Mitacs believes that its program, Globalink, serves as a foundation to attract the top academic graduate students from targeted countries and institutions, and that the exposure to Canada's top university and industry research facilities will result in the further pursuit of doctoral and postdoctoral studies, and in the establishment of related innovative enterprises within Canada.

In order to encourage top international students to consider Canadian universities for graduate studies and careers, Globalink provides bursaries for exceptional international undergraduate students at targeted institutions, supporting a ten to twelve week faculty-supervised research opportunity at a Canadian university. Once in Canada, these students can discover for themselves the well-equipped facilities, the distinguished faculty members, the manifold research opportunities, as well as the many choice locations within Canada for future study, innovation, and business development.

Discussion around the benefits of international education often focuses on the direct economic impact of international students studying in Canada. These benefits do not distinguish between students based on their level of education (undergraduate vs. graduate) or academic performance, except insofar as these variables impact their length of stay, cost of tuition, etc.

This project has been undertaken to investigate the long-term economic benefits that high-achieving international students bring to Canada.

1.3 Project Purpose and Scope

The current project is designed to present the key information needed to investigate, track, and measure the relative economic benefits of high-achieving international students versus academically average international students.

The purpose of this Discussion Paper is to answer two primary questions:

1. Is there any empirical evidence supporting the view that the recruitment of high-achieving graduate students versus average achievers generates more long-term, and greater economic impact within the Canadian economy?
2. If the answer to the first question is yes, how is this impact measured?

Answers to these questions have been realized through the gathering of data and information relating to a subset of five questions:

- Why is there global competition for international students and why are they important?
- What are the long-term economic impacts brought to Canada by international students?
- Are there ways to quantify these economic impacts?
- How is Canada faring in attracting these students?
- Is it possible to explore the different outcomes of high-achieving students versus average students?

2.0 KEY TERMS – HIGH ACHIEVING INTERNATIONAL GRADUATES

There are three elements in the definition of the target population: *high-achieving*, *international*, and *graduates*. These elements must be defined in order to eventually track and measure their economic impacts.

Formulating a concrete definition of *high-achieving*² students is problematic, as judging the quality of a student is largely a subjective process that may deal with objective factors such as grades and publication history, but also involves subjective factors in terms of research, references, institutions attended, and institutional based grading schemes. Complicating the matter further, is that universities measure student success differently. As well, the whole purpose of categorizing students is to support future *high-achieving* graduates.

For this study, the definitions are intimately tied to methodological issues. As such, the definitions below are presented in context with the methodological implications for identifying and tracking high-achieving graduates.

2.1 High Achieving

The first element of the definition is the term *high-achieving* in the context of this study. A basic definition of 'high-achieving students' is those students who achieve greater educational success than the average student. Therefore, a *high-achieving student* has higher than normal grades, higher than normal research potential, a supra-normal publication history, etc., however these and other indicators may be measured. What must be kept in mind is that there is no specific definition, but a loosely defined one that changes with circumstances.

While this project is concerned with the economic prospects and accomplishments of university graduates, the impetus is the concern with people who will establish and/or expand high-end economic operations.

As this study intends to identify measures to track people while they are students and *before* they attain these accomplishments, i.e., as students, the most obvious method of differentiating high-achievers from regular university students is through grades. High-achieving graduates could be defined as those who maintain grade point averages above a particular benchmark, or as those in the top five or ten percent of their class. Where applicable, standardized testing scores could also potentially be used to define high-achievers.

Mitacs' Globalink program specifically targets only those third-year students with very high grades, based on the idea that these high-achievers are more likely to build careers of higher economic value in the long-term, and are also more likely to pursue, be accepted into, and complete graduate studies in the short-term³.

However, once students have been accepted into graduate, doctoral, or even post-doctoral programs, they tend to be high-achievers already compared to the general university population: therefore, while having a strict grade-point average definition of high-achievers for undergraduates, high-achievers could be defined to include all or most students in masters-level programs, all or most students in professional post-undergrad education programs like law and medicine, and all students in doctoral-level programs.

² This term covers other similar labels such as 'top-quality', 'high-quality', 'world-class', 'giftedness', etc.

³ Mitacs Inc. 2010; Athey et. Al. 2007

When looking at tracking students over the long-term, doing so by grade-point average outside of a university context is relatively impossible, although tracking people with graduate, professional, and post-graduate degrees can provide at least some possibilities, even in broad-based Census studies. Further, there can often be some long-term tracking of various scholarship recipients, which, since these awards are based on academic achievement and potential, should help to isolate people deemed high-achievers at some point in their academic careers.

2.2 International Graduates

Mitacs believes there is a need to promote Canadian graduate research opportunities to exceptional international students who are being recruited by universities worldwide. Many international students may not be aware of the numerous excellent post-secondary institutions in Canada, or the diverse regions within which they may subsequently live and pursue a career. The central idea is to bring them to Canada early in their careers in order to influence their education and lifestyle decision-making, and also to build connections with them that they will carry with them throughout their career development.

The internal sub-set of international students is fairly easy to track while attending Canadian universities. The international graduate is perhaps even more challenging to track than a domestic graduate, especially if they leave Canada. For example, an international student with both graduate and post-graduate degrees from a Canadian university, who establishes a joint venture with a Canadian firm co-owned by college roommates and headquartered in another country, may be a rousing success in the Mitacs plan, but remains virtually untrackable, except on an anecdotal basis.

2.3 Students and Graduates

Mitacs efforts to encourage students to study in Canada, through the Globalink program, are designed to encourage these students to both choose graduate studies, and choose to pursue those studies in Canada⁴. The early data from Globalink suggests that the program is having the desired effects, as roughly one-third of the Globalink alumni are indeed applying to Canadian universities for graduate studies. Word of mouth from past Globalink participants is also actively encouraging other international students to seek out opportunities at Canadian universities, and to choose Canadian universities for graduate studies. This is due, in large part, to participants having enjoyed both their professional and personal experiences within the Globalink program.

However, for the purposes of identifying and analyzing the economic impacts of high-achieving graduates, the impacts to be measured are those created, not by students, but by graduates with careers, generally people with graduate and post-graduate degrees. The challenge is tracking graduates and their subsequent incomes and business ventures. Students as a group are readily and easily tracked, since they are registered at universities having relationships and being in compliance with various statistical agencies. Alumni however, are not required to register and report their activities, although some alumni associations and scholarships do track graduates.

⁴ Mitacs Inc. 2010

3.0 IDENTIFYING AND TRACKING HIGH-ACHIEVING STUDENTS

3.1 Canada's Attraction of High Achieving Students

To remain competitive in the global economy, Canada needs to attract the best and the brightest to contribute to our talent pool in many areas – scientific and research development; economic development opportunities; and cultural diversification, just to name a few. International students studying in Canada not only bring in substantial income to the local communities, but may also become a valuable source of highly skilled labour within our economy at a time when the western world is facing potential labour shortages, especially among top talent.

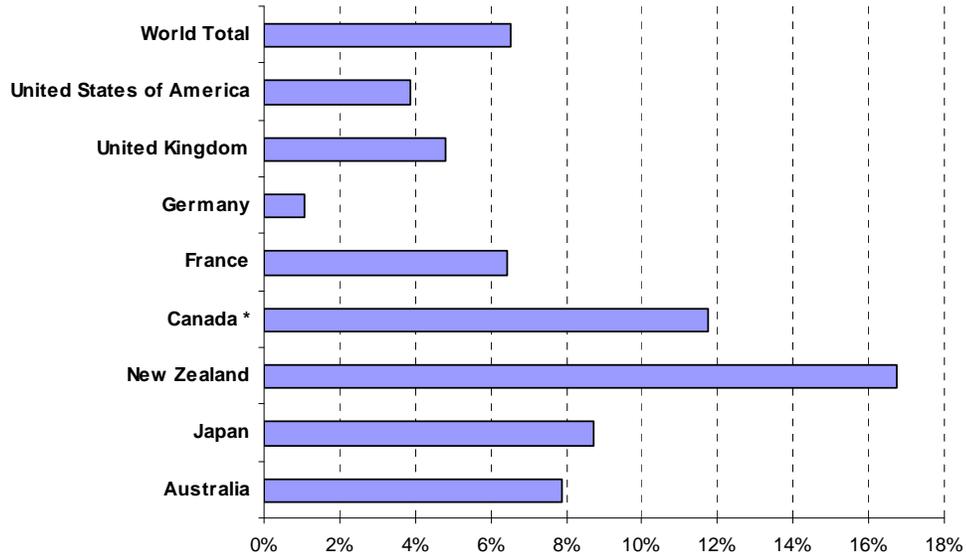
This section presents statistics available from the UNESCO Institute for Statistics regarding international student mobility at the tertiary level by country.⁵ Appendix 2, Table 1 shows the number of international students in selected host countries from 1998 to 2010 (the most recent year for which data pertaining to most countries is available). It shows the number of tertiary level international students in these selected countries as a percentage of the total number of international students studying away from their home country from the same period (i.e., each country's share in the global market).

Figure 1 below, using data presented in Table 2 in Appendix 2, shows the average annual growth rates in the number of international students in these countries during the period from 1999 to 2010 (1998 to 2009 for Canada, as 2009 is the most recent year for which Canadian data is available).

Of all the countries under comparison, New Zealand has experienced the strongest growth in the number of international students choosing that country for college and university education. Canada ranked above average, presenting an average annual growth rate of 12% compared with the 7% growth rate for all countries. Results from these two variables indicate that Canada has made inroads over recent years in attracting international students, especially those at the highest level of education and training.

⁵ The UNESCO Institute for Statistics (UIS) is the statistical office of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and is the UN depository for comparable statistics in the fields of education, science and technology, culture, and communications. Statistics presented in the table refer to the number of in-bound internationally mobile students to selected host countries in International Standard Classification of Education (ISCED) levels 5 and 6, corresponding to technical diploma programs and higher.

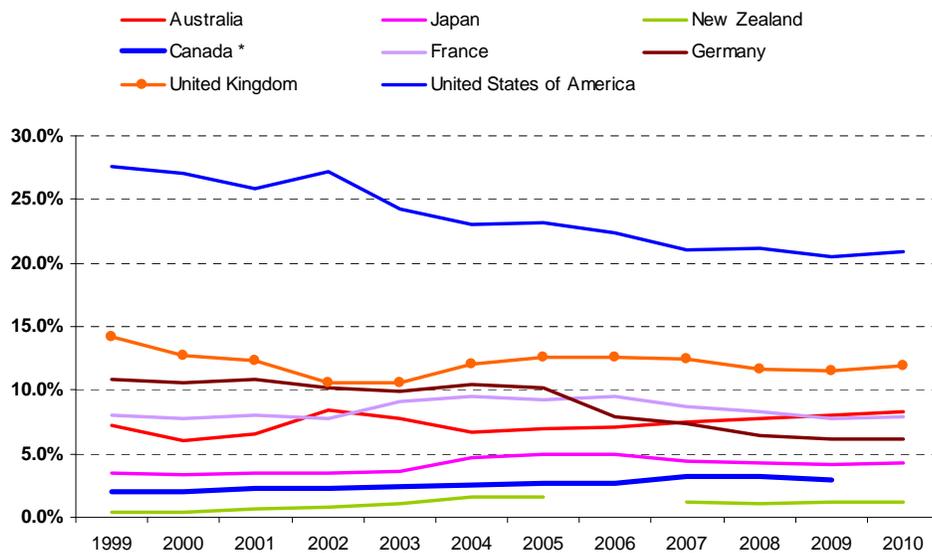
Figure 1: Average Annual Growth Rates of Internationally Mobile Students in Selected Countries, 1999 to 2010



Source: UNESCO, Institute for Statistics.
 * for Canada, growth rate applies to change from 1998 to 2009

Figure 2 indicates that Canada took in about 3% of all international students in the global market, slightly more than New Zealand. Canada’s market share at this level of education has also been growing from 1998 to 2009. By comparison, Australia, a country similar to Canada in size and population, took up 8% of the global market in this area in 2009. Of all these selected countries, the U.S. accounted for the largest market share, at 20.9% in 2010.

Figure 2: Global Market Shares of International Students in Selected Countries, 1999 to 2010



Source: UNESCO, Institute for Statistics.
 * for Canada, shares apply to those from 1999 to 2009

By comparison, during the same period of analysis, the market shares of some other major players in the international tertiary level education services market have been reduced. Specifically, growth of the number of in-bound students to the U.S., U.K., France, and Germany has been below average, and therefore has contributed to the declining market shares in these countries.

3.2 Recruiting High Achieving Students

There are two basic recruitment strategies used when trying to attract high achieving students: 1) Volume-Based Model; and 2) Target-Based Model. Although these strategies are similar in scope and outcome, there are slight differences that make each strategy unique. Both are described below.

3.2.1 Volume-Based Model

The Volume-Based Model attempts to attract high achieving students by first making the destination country a desirable place of study on a broad scale. Ideally, this will create a situation wherein institutions are receiving a high number of applications from international students. These applications can then be assessed and top candidates offered admission. It is hoped that a country will be able to attract and retain a greater number of high achieving students based purely on the volume of applications received.

The benefit of such a strategy is that it will return a larger number of student applications and therefore a greater number of students to choose from in terms of achievement level. Nevertheless, the high number of applications received can also be problematic, as it increases the amount of time and energy necessary to complete the assessment of all the applicants.

The Australian IPRS exemplifies the Volume-Based model⁶. Although the program's mandate is to "maintain and develop international research linkages and aims to support research excellence and research effort within Australia by attracting top quality international postgraduate students"⁷, the program began by attracting as many students as possible, and then measuring the achievement level of the students after the completion of their respective programs. The research has shown that "high quality caliber students are attracted to Australian universities through [the IPRS] program"⁸.

3.2.2 Target-Based Model

The Target Based model aims to attract high achieving students by targeting them directly. In other words, instead of casting a broad net similar to the Volume-Based Model, the Target-Based Model only approaches those students already considered as high achieving. Most scholarship programs would fall under this model. Through this strategy, it is hoped that only the best students will be recruited for national programs.

One of the benefits of this strategy is that resources can be focused solely upon the targeted demographic, making the cost benefit analysis much stronger.

⁶ Department of Innovation, Industry, Science and Research. *International Postgraduate Research Scholarships (IPRS) Program Evaluation*. Canberra: Australian Government, 2010. Print.

⁷ Ibid.

⁸ Ibid.

Likewise, there are also indirect effects like increasing the reputation of the host country in the source country by promoting selective, competitive admissions. Nevertheless, with such a limited focus, other potentially high achieving students may be missed, as achievement levels can be subjective and can only be accurately measured after students complete their programs of study.

An application demonstrating the value of high quality international students was provided by Professor Khee Giap Tan of Singapore's Lee Kuan Yew School of Public Policy at a conference on Canada Asia relations in Vancouver in June 2013. Tan advised that Singapore offers scholarships to promising young people including junior civil servants from other Asian countries. He noted that, over time, many of these become leaders in business, politics and government in their home countries or elsewhere. Singapore benefits from the valuable positive relationships these leaders maintain with the city-state.⁹

Mitacs' *Globalink* program is an example of this type of strategy put to real world use¹⁰. Here, top international students undertake a summer research project under the supervision of a Canadian university faculty member and a graduate student mentor. This will not only help the student to hone research and innovation skills, but will also give them the ability to network with local industry partners and build their professional skills. It is hoped that this program will entice students to return to Canada to further their education and, subsequently, feed back into the Canadian research and innovation sectors.

With this in mind, Mitacs has also created the Globalink Graduate Fellowship for Globalink alumni, and it offers tuition subsidies, financial awards, and research and/or teaching assistantships, to help persuade Globalink graduates to return to Canada to complete their studies in Masters or PhD programs.

3.2.3 Quality Over Quantity

Tertiary education is rapidly becoming "big business" with an estimated annual expenditure of \$ 108 billion worldwide, and \$3.2 billion in Canada alone.¹¹ As a result, countries and even universities tend to pursue the volume-based approach, particularly in many developed countries such as Canada with flat or declining youth populations and enrolments. In addition, in countries like Canada where the seats for domestic students are limited by restricted government funding, institutions are free to offer seats to international students at much higher market rates. These factors present strong incentives for a volume-based approach to recruiting.

This is exactly where some university departments and Mitacs tend to fill the void, as they have more incentive to fill those seats with fewer, higher calibre students. As a national supra-university organization, Mitacs Inc. can provide targeted efforts for recruitment in the sea of volume-based initiatives.

⁹ Khee Giap Tan, Canada Asia 2013 Conference, Vancouver, BC, June 4, 2013

¹⁰ "Globalinks." *Mitacs*. Mitacs, 2012. Web. 7 Mar. 2013.

¹¹ Estimated based on total number of world-wide internationally mobile students of 3,271,287 in 2010 (see Appendix 2) and 95,590 in Canada in 2009.

3.3 Definitions for Scholarship Programs

There are models of national and international scholarships that attempt to allocate resources based upon their definitions and indicators for *high-achieving* students. These models can be used to identify and track the success of high-achieving students beyond academia.

- **Canada - Vanier Canada Graduate Scholarships**

To be considered for the Vanier Canada Graduate Scholarship (Vanier CGS), students must be nominated by a university that receives a Vanier CGS allocation. Because of this, the Vanier CGS does not have an objective definition of high-achieving students, as nominations are based not only on the objectivity of academic excellence, but also on the subjectivity of research and leadership potential, although research potential does court objectivity, as the number of research publications can be measured quantitatively¹².

Nevertheless, one of the criteria of 'eligibility for nomination' for the Vanier CGS is that the nominee must have achieved a first-class average in the last two years of full-time study, as measured by the nominating institution.

As the Vanier CGS is a relatively new program, long-term data showing whether or not the program is attracting high-achieving students is not yet available.

Definition

Therefore, the Vanier CGS definition of a high achiever is someone with a first-class average and excellent research and leadership potential as defined by those assessing the nominations.

- **Canada - Ontario Trillium Scholarship**

The Ontario Trillium Scholarship is awarded to students by individual universities based upon merit and program criteria. Applicants are evaluated in terms of transcripts and grade-point average; letters of recommendation; research contributions; scholarships and awards; plan of study; and curriculum vitae.

Definition

Although there is a set grade requirement (8.0/10 A), other requirements are based on specific academic departments and their research strengths.

- **Canada - Alberta Doctoral Awards for Chinese Students**

The Alberta Doctoral Awards for Chinese Students is a cooperative funding program designed to support Chinese nationals of superior academic standing in undertaking full-time study and research in Alberta. Applications are reviewed by participating Alberta universities, measuring the quality of the application and alignment with research important to the province¹³.

Definition

¹² *Vanier Canada Graduate Scholarships*. Government of Canada. Web. 8 Jan. 2013.

¹³ "2013 Program Guidelines." *Alberta Innovates Technology Futures*. Alberta Innovates Technology Futures. Web. 8 Jan 2013.

There is no specific objective definition of what makes a student high achieving under this criteria, but by looking at differing indicators reviewers choose the best-suited applicants.

- **Canada - University of Manitoba International Graduate Student Entrance Scholarship**

This scholarship targets international graduate students with criteria based upon grades. International students entering their first year of full-time graduate studies in pursuit of a Master's, PhD, or Graduate Diploma may be eligible for this scholarship.

Definition

Academic qualification for this scholarship is a grade point average (GPA) of 3.5 in the previous two years of study.

- **USA - Duke University Talent Identification Program**

The Duke University Talent Identification Program (Duke TIP) works with students, their families, and educators to identify, recognize, challenge, engage, and help students to reach their highest potential. Duke TIP measures giftedness by performance on standardized tests normally reserved for older students¹⁴ to identify and screen academically gifted and talented youth.

Definition

The top 3% are accepted into the TIP program.

- **Australia - International Postgraduate Research Scholarships (IPRS)**

As with the Vanier CGS, eligible Australian universities are responsible for determining the selection process through which the International Postgraduate Research Scholarships (IPRS) are allocated to participants. The general definition of high-achieving is difficult to ascertain, as institutions have different 'merit processes' defined in relation to their individual 'research strengths'. Fortunately, a measurement was devised that purportedly measures the quality of the students attracted by the scholarships, through the placement of IPRS recipients in relation to the university merit based selection process.

The recent *International Postgraduate Research Scholarships (IPRS) Program Evaluation* (2010) found that the criteria for screening applicants were indeed effective. The study found that IPRS recipients routinely ranked in the top ten percent of students on the selected lists.

Definition

The IPRS uses a three-step formula to measure the level of students and define their use of "high-achievers":¹⁵

¹⁴ "About Duke TIP." *Duke TIP*. Duke Talent Identification Program, 2011. Web. 8 Jan. 2013.

¹⁵ Department of Innovation, Industry, Science and Research. *International Postgraduate Research Scholarships (IPRS) Program Evaluation*. Canberra: Australian Government, 2010. Print.

1. Do university officials believe the students attracted by specific programs are of high-quality?
2. How are scholarship recipients situated in terms of university merit ranking?
3. How many students apply for specific scholarships, and how many are successful in the application process?

4.0 INTERNATIONAL EDUCATION

4.1 International Students/Graduates in Canada

This section reviews the trends in international student enrollment in Canada to examine how growth rates have developed over time, examines how they compare with enrollment patterns of Canadian students, and then analyzes the implications of these differences.

Based on the most recent available data pertaining to the number of post-secondary students enrolled in Canadian public colleges and universities, there were approximately 165,370 international students enrolled in the 2010/11 academic year, accounting for 8.5% of all public post-secondary system enrollment. Over the past ten years, enrollment of international students in public Canadian colleges and universities grew much faster than enrollment of their Canadian counterpart. Between the 2000/01 and the 2010/11 academic years, international student enrollment grew 10.7% per year, on average, compared with 2.9% per year for Canadian student enrollment.

Such strong international student enrollment growth attests to the demand for Canadian educational services and the quality of educational services of Canadian colleges and universities, but it is also the result of considerable efforts made on the part of Canadian colleges and universities to attract international students to study and do research in Canada.

According to the most recent available data on the number of graduates from Canadian public colleges and universities, approximately 39,050 international students graduated from Canadian public colleges and universities in the 2010/11 academic year. They accounted for 8.7% of all graduates from the Canadian public post-secondary system in that year.

Similar to enrollment patterns, the number of graduates among international students grew substantially faster than their Canadian counterpart during the period from 2000/01 to 2010/11 academic years, growing at an average rate of 16.6% per year compared to 5.6% per year, respectively.

Such a pool of international students in the post-secondary system and its substantial growth brings significant immediate economic benefits to the economy by virtue of student expenditure and therefore its contribution to the GDP, employment, and government revenue growth. These benefits have been quantified and presented in many previous studies.

In this study, it is argued that international students bring long-term contributions to Canadian society: because they are ambitious, high-achieving, globally mobile early career starters, and because they study in subject areas vital to long-term economic growth, international students who have graduated and chosen to remain in the Canadian labour market contribute to filling critical labour shortages and/or promoting and strengthening business relations between Canada and their countries of origin. These students may also contribute to establishing better political and diplomatic relations between Canada and other economies. Such cooperation can bring political stability and mutual benefits, and can also strengthen cultural diversification within Canada.

The following subsections will provide evidence and models of quantification to support an understanding of the long-term economic, political, social, and cultural benefits brought about by international students.

4.1.1 Fields of Study

According to the 2009 UNESCO Global Education Digest, compared to local students, a higher proportion of all internationally mobile students are enrolled in fields of study such as business, science, and engineering (United Nations Educational, Scientific and Cultural Organization 2009).¹⁶ These international students are ideally positioned to help meet skilled labour needs in areas of high demand within Canada's economy.

This subsection investigates whether data pertaining to global international student enrollment patterns support a similar distribution in Canada.

According to data for the 2010/11 academic year, of all international students enrolled in post-secondary programs in the Canadian public post-secondary system, almost half (48%) were enrolled in one of two fields of study:

1. business, management, and public administration
2. architecture, engineering, and related technologies

By comparison, less than one third (29%) of Canadian students were enrolled in the same fields of study. Even more significantly, among all of the international students who graduated, over half (51%) studied in these two fields, whereas among Canadian graduates less than one-third came from these two fields of study. This implies that international students were more likely to complete their chosen field of study upon graduation.

Detailed data pertaining to student enrollment by field of study combined with level of study point to the fact that, in comparison with their Canadian counterpart, international students in higher levels of study, namely in Master's programs, PhD programs, and above, are even more likely to concentrate in fields such as computer and information sciences and mathematics; physical and life sciences and technologies; and architecture, engineering, and related technologies.

These observations imply that, by virtue of their chosen fields of study, international students can potentially contribute more to the Canadian economy in the long run by contributing to innovation, science, and technology, as well as meeting labour market needs in these important areas.

¹⁶ Internationally mobile students, according to UNESCO Institute for Statistics, are defined as students who leave their country or territory of origin and move to another country or territory with the objective of studying. They can be defined according to the following characteristics:

- Permanent residence: Students can be considered to be mobile students if they are not permanent residents of the host country in which they pursue their studies.
- Prior education: Students can be considered to be mobile students if they obtained the entry qualification to their current level of study in another country. Prior education refers typically to upper secondary education for students enrolled in tertiary programmes.
- Citizenship: Students can be considered to be mobile students if they are not citizens of the host country in which they pursue their studies.

5.0 ECONOMIC IMPACTS

5.1 Domestic Economy

This section addresses efforts to quantify the economic benefits of international students in the long term, as they become members of the Canadian workforce and engage in international business activities.

The first element in the impact of international graduates is their impact on the Canadian workforce. To properly address this potential benefit to the Canadian economy, an ideal model would require data pertaining to the age distribution of international students who have graduated from Canadian colleges and universities; the percentage of graduates who choose to remain in Canada; the percentage of those who have found employment by occupation and the length of time required to find work; and average earnings by occupation. Unfortunately, this level of detailed information is not currently available.

For the purposes of this study, the following is assumed:

- Approximately 12% of graduated international students remained in the Canadian economy and found work in 2010.¹⁷
- The distribution of graduates by field of study, of those who remain in Canada, is the same as the distribution of the overall international graduate population. The distribution of graduates and their occupational groupings would then be as presented in the figure below.

Figure 3: Distribution of International Student Graduates Who Remain in Canada by Field of Study and Assumed Occupational Groups

| Field of Study | Graduates | Occupational Group |
|---|-----------|--|
| Personal improvement and leisure | 11 | Sales and service occupations |
| Education | 129 | Social science, education, government service and religion |
| Visual and performing arts, and communications technologies | 160 | Art, culture, recreation and sport |
| Humanities | 302 | Social science, education, government service and religion |
| Social and behavioural sciences and law | 616 | Social science, education, government service and religion |

¹⁷ According to information available from Citizenship and Immigration Canada pertaining to the number of foreign students transitioning to permanent residency, there were 8,712 students who made this transition in 2010 www.cic.gc.ca/english/resources/statistics/facts2011/temporary/34.asp. Out of these 8,712 individuals, 3,115 became permanent residents through successful economic immigrant applications, while another 1,263 became permanent residents via family class residency. For lack of further detailed information, we have assumed that these two groups of individuals were all from the post-secondary graduate population. Note that we have not included the rest of the 4,334 applicants who made the transition in our calculation as, out of the 8,712 individuals, 4,081 obtained their permanent residency because they were spouses or children of the 3,115 individuals who applied as economic immigrants, 19 obtained their permanent residency as refugees, and another 234 obtained their permanent residency as “other immigrants”.

| Field of Study | Graduates | Occupational Group |
|--|--------------|--|
| Business, management and public administration | 1,590 | Business, finance and administrative occupations |
| Physical and life sciences and technologies | 273 | Natural and applied sciences and related occupations |
| Mathematics, computer and information sciences | 298 | Natural and applied sciences and related occupations |
| Architecture, engineering and related technologies | 630 | Natural and applied sciences and related occupations |
| Agriculture, natural resources and conservation | 69 | Natural and applied sciences and related occupations |
| Health, parks, recreation and fitness | 238 | Health occupations |
| Personal, protective and transportation services | 38 | Sales and service occupations |
| Other instructional programs | 26 | Sales and service occupations |
| Total Graduates | 4,378 | |

On average, these international graduates have taken six years to complete their education and training in Canada, and the average age of international students when they started their education in Canada was 20. This implies that, on average, students start their working career in Canada when they are 26 years of age.

- Earnings of these international graduates are assumed to be the same as the average earnings of the occupational groups they are assumed to be in. Average earnings by occupational group vary, based on five age groups: 15-24 years, 25-34, 35-44, 45-54, and 55 years and over.
- It is further assumed that each individual works until age 62.¹⁸
- It is also assumed that none of these graduated international students who remain in Canada displace a Canadian graduate with the same level of education in the same field of study.

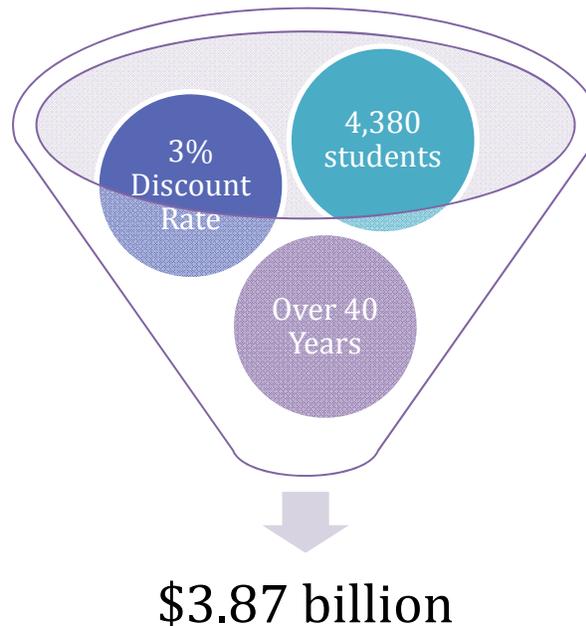
Finally, it is noted that there are a number of adjustments necessary in order to arrive at a valuation of an earnings stream per individual during the course of their working life.

First, the opportunity cost of undertaking a post-secondary education needs to be deducted from the stream of earnings since, by taking up a training program, an individual foregoes the opportunity to earn an income during that period. Secondly, the incremental earnings and opportunity costs of a post-secondary education occur over time and therefore are not a lump sum value. The net present value of a post-secondary education is calculated over an estimated approximate 40-year working career. As such, these annual streams of earnings will be discounted at a discount rate of 3% per annum.

¹⁸ Data from the Labour Force Survey conducted by Statistics Canada (CANSIM Table 282-0051) indicates that the average retirement age of all types of employees in Canada has been over 62 years since 2010.

Under these assumptions and conditions, it is calculated that in 2010, these 4,380 international graduates would contribute a total of \$3.87 billion to the Canadian economy by becoming members of the Canadian labour force and by working in occupations related to their field of study.

Figure 4: Calculation of the Value of International Graduates to the Canadian Economy



5.2 International Business

This subsection presents a review of available data and information pertaining to international students pursuing education and training in Canada and their contribution toward building business relationships. Unfortunately, for the most part, specific quantitative analysis in this regard is not readily available in the Canadian context, other than existing anecdotal evidence.

It is known, however, that within the global knowledge-driven economy, the internationalization of Canada's education and research institutions, through international partnerships and the exchange of talent, is of substantial importance as it supports Canada's science, technology, and innovation agendas¹⁹.

International research collaboration can make a valuable contribution to Canada's innovation and economic future. Collaborating with international partners on major research programs is an efficient means of managing human, financial, and capital resources, especially in disciplines requiring specialized instrumentation or facilities. Research collaboration is also a key factor in recruiting the best and brightest graduate students and researchers.

The role played by highly motivated, intellectual, and entrepreneurial international students engaging in research and innovation, which ultimately lead to job

¹⁹ Advisory Panel on Canada's International Education Strategy (2012). International Education: A Key Driver of Canada's Future Prosperity.

creation and wealth creation, cannot be underestimated. A 2007 U.S. study found that:²⁰

- There was at least one immigrant key founder in 25.3% of all engineering and technology companies established in the U.S. between 1995 and 2005 inclusive.
- It was estimated that together, this pool of immigrant-founded companies was responsible for generating more than \$52 billion in 2005 sales and, as of 2005, creating just under 450,000 jobs.
- Based on analysis of the World Intellectual Property Organization (WIPO) patent databases, it was estimated that foreign nationals residing in the U.S. were named as inventors or co-inventors in 24.2% of international patent applications filed from the U.S. in 2006.
- The trend has been dramatic - according to authors' estimates the contribution of non-citizen immigrants to these international patent applications increased from 7.3% in 1998 to 24.2% in 2006.
- In regional technology centres promoting the growth of engineering and technology companies, the results are even more pronounced.
- For example, over half (52.4%) of Silicon Valley startups had one or more immigrants as a key founder, compared with the California average of 38.8%.
- Another example was in Research Triangle Park, where 18.7% of startups had an immigrant as a key founder, compared with the North Carolina average of 13.9%.

A follow-up study found that:²¹

- The immigrants who are most likely to start engineering and technology companies are better educated than their native-born counterparts, according to Census data (U.S.).
- These company founders are also better-educated than the norm in their respective immigrant groups. In fact, 96% of all immigrant entrepreneurs involved in engineering and technology in the study have completed a bachelor's degree, and 74% hold Master's or PhD degrees. The great majority (75%) of their highest degrees are in science, technology, engineering, and mathematics-related fields.
- More than half of the foreign-born founders of U.S. technology and engineering businesses initially came to the United States to study. Very few came with the sole purpose of starting a company.

These study findings confirm that advanced education in science, technology, engineering, and mathematics is correlated with high rates of entrepreneurship and innovation.

The situation is similar in Canada. A recent Canadian report found that most start-ups by international students are information technology-related (software

²⁰ Wadhwa et.al. 2007a

²¹ Wadhwa et.al. 2007b

and website creation, programming) because they have no impediments like physical location and language barrier or high start up cost.²²

For example, Sylleta (www.sylleta.com), a Canadian clean tech start up, was developed at the University of Toronto, by Nikhil Gunari, a newcomer from India. As co-founder of the company with Professor Gilbert Walker, Gunari explained that after failing to find a job he decided to transform his research into a new company. The technology was successfully tested and now awaits governmental approval.²³

Canadian employers are also aware of the edge international experience can give them in the international marketplace. In a survey undertaken by the Canadian Bureau of Internal Education, 91% of employers said that they value job candidates with international experience because it develops cross-cultural understanding, and 50% said that, all else being equal, they would hire a candidate with study abroad experience over one without.²⁴

Canada's research-intensive universities and industry have a history of working collaboratively to translate Canadian university discoveries into commercial enterprises. Between 2002 and 2005, 99 spin-off companies were created through research undertaken at Canada's thirteen research-intensive universities.²⁵

"Transnational networking is identified as activities that bridge national borders, carried out by ethnic entrepreneurs mainly with their homeland and aimed at both leveraging and utilizing mutually shareable assets such as information, contacts and trust²⁶.

The advantages of transnational business are numerous, for example, the potential for increased revenue, increased job creation, and the potential to promote immigrants' economic advancement both as an individual and community."²⁷

Entrepreneurs

There have been no comparable surveys conducted in Canada: however, there is empirical evidence that points to differences in outcomes amongst immigrant entrepreneurship programs in Canada when compared with the United States. A

²² *Report on Entrepreneurship for Recent Immigrants and International Students*, University of Windsor, 2012 Written By: Anthony Eiyebholoria, 2012 MBA Candidate, Supervised By: Dr Francine Schlosser, Center for Enterprise and Law, University of Windsor, August 2012.

www.uwindsor.ca/cel/system/files/Report%20on%20Entrepreneurship%20for%20Recent%20Immigrants%20and%20International%20Students.pdf

²³ Supporting Immigrant Entrepreneurs, MaRS, Feb 26, 2013 www.marsdd.com/2013/02/26/supporting-immigrant-entrepreneurs/

²⁴ CBIE: Canadian Bureau for International Education www.cbie-bcei.ca/about-ie/facts-and-figures/

²⁵ G13 Submission to Competition Policy Review Panel January 2008. [www.ic.gc.ca/eic/site/cprp-gepmc.nsf/vwapj/Executive_Head_G13Universities.pdf/\\$FILE/Executive_Head_G13Universities.pdf](http://www.ic.gc.ca/eic/site/cprp-gepmc.nsf/vwapj/Executive_Head_G13Universities.pdf/$FILE/Executive_Head_G13Universities.pdf)

²⁶ Salaff et al. 2003; Saxenian 2002

²⁷ *Report on Entrepreneurship for Recent Immigrants and International Students*, University of Windsor, 2012 Written By: Anthony Eiyebholoria, 2012 MBA Candidate, Supervised By: Dr Francine Schlosser, Center for Enterprise and Law, University of Windsor, August 2012.

www.uwindsor.ca/cel/system/files/Report%20on%20Entrepreneurship%20for%20Recent%20Immigrants%20and%20International%20Students.pdf

recent study²⁸ investigated the likely impacts of immigration policies and other institutional/market frameworks on immigrant self-employment outcomes by examining the self-employment experiences of immigrants to Australia, Canada, and the United States.

The study found that immigrants to all three countries had self-employment rates below those of similar native citizens at the time of entry to the destination country: however, over the years there was positive growth in self-employment rates among immigrants in all countries, over and above rates for similar natives. This pointed to the fact that, for many immigrants, starting a business involved a transition from wage employment to self-employment.

Despite very different rates of self-employment across the three countries, it was found that rates of self-employment catch up to and overtake those of similar natives within 10 to 20 years after arrival, suggesting that, regardless of differences in the institutional or country-specific factors that influence rates of self-employment, immigrants adapt to these conditions relatively quickly.

Across three countries (Australia, Canada, USA), there were a great many differences in the earnings outcomes of immigrants relative to natives. While relatively good earnings outcomes among immigrants to the United States are consistent with immigrants possessing higher levels of business skill, the poor earnings outcomes among immigrants to Canada are not.

The United States differs from Australia and Canada in terms of the size of the local market, tax policy, and other institutional factors. In particular, while Canada and Australia have more generous social programs, the US has more favourable tax provisions for entrepreneurs under the income tax system, along with greater access to larger markets. These differences likely favour the United States as a more attractive potential destination for skilled entrepreneurs.

Canada's federal government recently introduced a new program opening the door to the world's start-up entrepreneurs. The Start-up Visa Program aims to connect immigrant entrepreneurs with experienced investors who have expertise in funding and working with start-ups. Successful applicants will receive Permanent Residency. This new program may prove to be a successful venue to improve the potential earnings outcomes for skilled immigrants.

While official statistics may be lacking, there is anecdotal evidence that a significantly high proportion of start-ups in some parts of Canada have at least one co-founder who is a first or second generation Canadian. The online magazine *Yonge Street* recently featured an article relating stories about international students making the transition to the business world through tech start-ups in the Greater Toronto area.²⁹

5.3 Impacts of Personal Relationships

Beyond the direct economic impacts, international and domestic students also generate significant personal impacts that indirectly affect the economy. These range from sharing their experiences of different countries, cultures, and learning approaches, to forming friendships and long-term working relationships with classmates and colleagues. These personal impacts are presented in three

²⁸ Schuetze and Antecol, 2005

²⁹ www.yongestreetmedia.ca/features/immigrantstartups05012013.aspx.

groups, which contain considerable crossover as they are very difficult to isolate and measure.

The political and diplomatic impacts refer to the personal relationships and direct cultural knowledge exchanged when international and domestic students study together. Particularly for high-achieving students, these can result in legacies of cooperation as these students achieve positions of importance in their subsequent careers, either in Canada or in their home country.

The social and cultural aspects may include closer cooperation among international organizations, the swift exchange of ideas and best practices, and levels of personal trust that allow ideas to move quickly and efficiently to effect social change. High achieving students and graduates may be logically assumed to have a higher rate of publication, electronically and in specialized journals, leading to a broad dissemination of their ideas.

These academic and business relationships can lead to direct start-ups amongst classmates, multi-national joint ventures in business or research, or international contacts renewed at a later career stage. The value of intercultural ties in the world of academic research is perhaps best demonstrated by the positive effects engendered by the advent of the worldwide web.

This section presents an overview of each of these categories, along with examples of international graduates educated in Canada who went on to play significant roles in their fields. Across the academic spectrum, from education, law, and economics, to engineering, architecture, and psychology, foreign-born high achieving graduates from Canadian universities have uniformly maintained their commitment to serve whether in Canada, their native country, or within the global community. Some have managed to do all three.

5.3.1 Political and Diplomatic Impacts

Politics and diplomacy are two key components of forming and maintaining research partnerships, aid networks, trade relations, and international defense alliances, all of which influence the global economy. Personal relationships established during post-secondary education have long-lasting impacts as students learn about other cultures and nationalities, discuss international issues and approaches, and form personal ties that may ease both formal and informal global negotiations in the future.

A 2011 report from the Canadian International Council, *Flows of People And The Canada-China Relationship*, emphasizes the value of personal links between individuals, viewing them as a distinct asset in the pursuit of international economic and political ties, and making three related points.

- 1) Of all the reasons for Canada to have a robust and forward-looking China policy, people-to-people linkages is arguably the most fundamental;
- 2) The challenge for policy is to take a holistic and multigenerational view of transnational citizens, rather than to treat international mobility as a problem;

- 3) There is an opportunity now to address these issues in a comprehensive fashion, and to turn potential problems into a competitive advantage for the bilateral relationship.³⁰

Canada's Advisory Panel on International Education stated: "In order to fully realise the multifaceted aspirational goals of internationalisation, the government of Canada should consider co-funding, with academic institutions and/or provincial/territorial governments, a major student mobility programme."³¹

The Advisory Panel also put forward a List of Recommendations that included the following items, linking international education with diplomacy, research, and business:

- 1) Create a Council on International Education and Research CIER to provide policy advice to the ministers of International Trade, Finance, Citizenship and Immigration, and Industry
- 2) Develop comprehensive and multifaceted bilateral agreements with priority countries that focus on all aspects of graduate education and research, supported by appropriate levels of funding.
- 3) Expand and facilitate comprehensive training for embassy staff on Canada's diverse education offerings and study pathways.³²

Canada's Department of Foreign Affairs and International Trade also places a high value on intercultural competencies, viewing them as vital to global success. The Canadian Foreign Service Institute (CFSI), the Government of Canada's Centre of Expertise on learning related to International Affairs, has an International Affairs Curriculum, which includes a course in Intercultural Effectiveness, described as: "Courses and online learning services to support organizations and individuals involved with international activities in developing the intercultural competencies essential for international success."³³

When it comes to diplomacy, "book learning" matters but it isn't everything. According to diplomat Daryl Copeland, diplomacy relies upon a series of personal aptitudes, but he clearly states that adaptability, self-awareness, and life skills, most [of which are] more easily acquired through world travel than through years of formal education, are crucial"³⁴. The travel and education partnership exemplified by the international student experience, combined with the opportunities to form personal relationships with other international students, provides optimal preparation for a career in diplomacy.

High-achieving foreign students have been coming to Canadian universities for over seven decades, and many of them have gone on to play indispensable roles in provincial, national, continental, and global affairs. Some of these graduates

³⁰ Flows of People And The Canada-China Relationship www.opencanada.org/wp-content/uploads/2011/05/Flows-of-People-and-the-Canada-China-Relationship-Kenny-Zhang.pdf

³¹ Aug 2012 Diplomats Support "Two-Way" Mobility With Canada: News And Business Analysis For Professionals In International Education, <http://thepienews.com/news/diplomats-support-two-way-mobility-with-canada/>, www.international.gc.ca/education/report-rapport/strategy-strategie/index.aspx?view=d

³² *Advisory Panel on Canada's International Education Strategy Final Report*, www.international.gc.ca/education/report-rapport/strategy-strategie/index.aspx?view=d#list

³³ International Affairs, www.international.gc.ca/ifait-iaeci/index.aspx?lang=eng&view=d

³⁴ Why Diplomacy Matters More Than Ever, Jan 2013. <http://opencanada.org/features/the-think-tank/essays/why-diplomacy-matters-more-than-ever/>

have served in a series of elected and appointed offices during careers spanning thirty or forty years.

Law

The Honourable Konrad von Finckenstein, Q.C., Germany, (Carleton, Queens, Law) is an arbitrator of complex Canadian and international business issues. Justice von Finckenstein has held a number of prominent positions, including Justice of the Federal Court of Canada, Commissioner of Competition, and Chair of the CRTC.

Economics

Dr. Henryk Kierzkowski (PhD, Queen's), was born in Poland and is an Emeritus Professor in International Economics at the Graduate Institute of International and Development Studies in Geneva: he has also worked on the economic transition in Eastern Europe and, more recently, on globalisation in the world economy.³⁵

Politics

Dr. Vaira Vike-Freiberga, Latvia, (McGill, PhD, '65), spent part of her career in the Department of Psychology at University of Montreal, as well as serving two terms as President of the Republic of Latvia, 1999-2007. She is active in the Baltic States, the United Nations, and the World Economic Forum in Davos.

Other heads of State and Government educated in Canada include Paula Cox, (McGill, BA, '80), former Premier of Bermuda; Liu Chao-Shiuam, (Sherbrook, MSc, '68; Toronto, PhD,'71), President, Republic of China (Taiwan); and Noor Hassanali, (Toronto, LLB, '47), President of Trinidad and Tobago.

5.3.2 Social and Cultural

Any contribution to the social or cultural fabric is difficult to quantify; nevertheless, like art and leadership, everyone knows it when they see it. Foreign born high achieving graduates of Canadian universities have shown both the will and the capacity to address major social and cultural issues, working in Canada and abroad, putting their skills, education, and insight to use in the service of the national and global community. Many of these individuals are not difficult to find, but there is a time component involved: five years after graduation they may be virtually invisible, but ten to twenty years later they are leaders in their field, and have global reputations.

International Education

Professor Michael Omolewa studied at institutions around the world, including UBC and the University of Athabasca for a portion of his PhD studies, and eventually returned to Nigeria. He has held positions as an Ambassador and Nigeria's Permanent Delegate to UNESCO, and is a pioneer in adult education, a

³⁵ Graduate Institute of International and Development Studies
http://graduateinstitute.ch/Jahia/site/iheid/cache/bypass/lang/en/teaching/faculty/retired_professors?alphafilter=abcdefghijklmnopqrstuvwxyz&personnelid=56ca83e43c977cb485b75ec8dc4d2a38

distinguished scholar, civil servant, and diplomat. His contributions impact local and national educational activities in Africa and throughout the world.³⁶

Medicine

Dr. Haile Debas, Eritrea, (McGill, Medicine, UBC, Surgery), is credited with raising standards for medical education, advancing interdisciplinary research, and creating multiple partnership networks to extend healthcare capacity on a global scale. Dr. Debas is the executive director and founder of Global Health Sciences – a program dedicated to improving health and reducing the burden of disease in the world’s most vulnerable populations – and is a member of both the UN Commission for HIV/AIDS and the Global Health Council.³⁷

Literature

Michael Ondaatje, OC, Sri Lanka, (Toronto, BA: Queen’s M.A.) is widely held to be one of the most influential figures in Canadian culture. This multi-talented poet, novelist, editor, and filmmaker won the Governor General’s Award for poetry twice, in 1970, 1978, and again in 1992 for his novel, *The English Patient*.

Austin Clarke, OC, Barbados (University of Toronto), taught creative writing at a number of American universities, and was the cultural attaché to the Barbadian embassy in Washington. He returned to Canada in 1977, served on a number of community boards, and continued to write novels and essays about the West Indian immigrants in Canada and their struggles against racism and economic exploitation, including *The Prime Minister* (novel, 1977), an exposé of corruption in a developing country.

5.3.3 Technology and Business

The mix of high-achieving international and domestic students can also have a tremendous impact in the world of academic accomplishment and business. The ideal is for students to meet, mingle, learn, and create something new, something of value to the world.

Perhaps the most recent example of Sergey Brin and Larry Page meeting at Stanford and subsequently launching Google, best illustrates the dream of educating and supporting high-achieving students. Although Brin was born in Russia, he was raised in the US, so does not qualify as an international student for this study.

A 2011 study by the AUCC identified the following indirect personal impacts on Canadian business: “The skills, knowledge, and expertise of graduates “spill over” to enhance the outputs of other, less-educated workers. Those same skills and the graduates’ ability to adapt and learn on the job help make them more innovative and productive, which directly contributes to the competitiveness of their companies, and drives economic growth.”³⁸

³⁶ University of Oklahoma Outreach - College of Continuing Education

www.halloffame.outreach.ou.edu/2008/omolewa.html

³⁷ UBC Alumni Achievement Awards www.alumni.ubc.ca/2012/awards/haile-debas/

³⁸ Association of Universities and Colleges of Canada, AUCC Trends in Higher Education: Volume 1 – Enrolment.

www.aucc.ca/wp-content/uploads/2011/05/trends-2011-vol1-enrolment-e.pdf

Canada needs top talent. Top talent fuels innovation, and innovation drives economic prosperity. Top talent has the power to propel a society forward.³⁹ Academic research also depends on innovation: the ties between financing from successful businesses and the funds required by researchers and research universities grow significantly from year to year.

In a 2008 paper submitted to the Industry Canada Competition Policy Review Panel, researchers in Italy came to the following conclusions:

- 1) Education and the availability of skilled labour is probably the most fundamental variable for economic growth. This was the case in Ireland, which has the highest student-population ratio in Europe and a focus on international business, engineering, and new technology.
- 2) Access to knowledge and the ability to absorb it are necessary ingredients for competitive performance, at the firm, sectoral, and country level.
- 3) Academic research is increasingly playing a critical role, both as a support to industrial R&D and as a direct source of new innovative opportunities.⁴⁰

Academic research and business are working steadily in Canada to take advantage of partnerships for the mutual benefit of both. Victoria Lennox, a Canadian born entrepreneur and co-founder of Startup Canada, is credited with launching the International Consortium of University Entrepreneurs, which spans 80 universities in 14 countries.⁴¹ Services like this may facilitate the tracking of foreign-born university students who pursue entrepreneurial careers after graduation.

Canada's research-intensive universities and industry have a history of working collaboratively to translate Canadian university discoveries into commercial enterprises. Between 2002 and 2005, 99 spin-off companies were created through research undertaken at Canada's thirteen research-intensive universities.⁴²

Canada's foreign-born graduates are also making their mark. There are many examples of high-achieving international students and their subsequent accomplishments.

Technology

Dr. Lalith Gamage MBCS, CITP, MIEEE, Sri Lanka, (PhD, UBC), maintains educational, scientific, and economic ties within the information technology community. He has served the Government of Sri Lanka in various capacities: Executive Director of Trade Information Network, Sri Lanka Export Development Board, and Chairman of the IT Task Force, Ministry of Enterprise Development, Industrial Policy, and Investment Promotion. Dr. Gamage is the Managing

³⁹ *International Education: A Key Driver of Canada's Future Prosperity*. www.international.gc.ca/education/report-rapport/strategy-strategie/toc-tdm.aspx

⁴⁰ *Developing Competitive Firms and Industries in Global Markets: An Examination of the Experience of Successful Economies*, Luigi Orsenigo and Francesco Laforgia, University of Brescia, Italy. [www.ic.gc.ca/eic/site/cprp-gepmc.nsf/vwapj/Luigi_Orsenigo.pdf/\\$FILE/Luigi_Orsenigo.pdf](http://www.ic.gc.ca/eic/site/cprp-gepmc.nsf/vwapj/Luigi_Orsenigo.pdf/$FILE/Luigi_Orsenigo.pdf)

⁴¹ Canada's Most Fabulous Entrepreneurs, <http://money.ca.msn.com/small-business/gallery/canada%e2%80%99s-most-fabulous-entrepreneurs#image=11>

⁴² G13 Submission to Competition Policy Review Panel January 2008. [www.ic.gc.ca/eic/site/cprp-gepmc.nsf/vwapj/Executive_Head_G13Universities.pdf/\\$FILE/Executive_Head_G13Universities.pdf](http://www.ic.gc.ca/eic/site/cprp-gepmc.nsf/vwapj/Executive_Head_G13Universities.pdf/$FILE/Executive_Head_G13Universities.pdf)

Director/CEO of the Sri Lanka Institute of Information Technology, and is a current Visiting Professor at the Department of Mechanical Engineering, UBC, where he is attached to the Industrial Automation Group: his research interests include Computer Vision, Computational Intelligence, and Robotics.⁴³

Haroon Mirza, Middle East, (Carlton University, 2000), co-founder and CEO of CognoVision: although he arrived in Canada at the age of 13, Mirza serves as an example of what can be accomplished by international students who meet at Canadian universities. The co-founder and CEO of CognoVision, an award winning analytics provider for the Digital Signage and Retail industries that was acquired by Intel in a multi-million dollar deal in 2010, said recently, "My biggest break was being able to start CognoVision with my co-founders Shahzad Malik and Faizal Javer. The stars really had to align for the three of us to start a company. We were all in Ottawa at Carleton University together in 2000."¹⁹

Communications

Vijay K. Bhargava (B.Sc., M.Sc., Ph.D., Queen's) arrived from India in 1966 at age 18: in 1995 he received (posthumously) the McNaughton Medal at the CCECE in Montreal for "outstanding contributions to error control coding for wireless communications and for an unsurpassed record of service to the [engineering] profession". Dr. Bhargava has supervised over 30 graduate students, several of whom now hold important positions in industry and academia⁴⁴, illustrating the exponential generational reach of high achievers, particularly those who maintain their academic ties.

Business

Leslie Vadasz, Hungary, (McGill, Eng. '61), President, Intel Capital: retired 2003. Vadasz, 66, led the Intel design teams that helped develop the first DRAM (dynamic random access memory) chip and Intel's first general purpose microprocessor. Intel CEO Craig Barrett stated, "Les Vadasz has been a source of innovation and strategic guidance throughout Intel's history. He is the ultimate engineer, with a knack for anticipating where the industry is headed and how to position us for success. Much of Intel's leadership position in the chip industry is the result of contributions Les has made."⁴⁵

Other prominent examples of academic accomplishments by foreign-born graduates of Canadian Universities include a number of Nobel Prize winners. These include Val Fitch, US, (McGill, Eng '48), Nobel Prize, Physics, 1964; Walter Kohn, Austria (Toronto, BSc '45, MSc '46), Nobel Prize, Chemistry, 1998; Andrzej Viktor "Andre" Schally, Poland (McGill, BSc '55, PhD '59) Nobel Prize, Medicine, 1977; and Arthur Schawlow, US, (Toronto, PhD '49), Nobel Prize, 1981, Physics. Thomas Ming Swi Cheng, OC, born in China, (McGill, PhD '65), invented the world's first artificial cell.

⁴³ Industrial Automation Laboratory (IAL) of the Department of Mechanical Engineering, UBC
www.researchcentre.apsc.ubc.ca/ialweb/Gamage.htm

⁴⁴ Institute of Electrical and Electronics Engineers (IEEE Canada) www.ieee.ca/awards/bios.htm#

⁴⁵ Longtime Intel Exec Vadasz Steps Down. http://news.cnet.com/Longtime-Intel-exec-Vadasz-steps-down/2100-1014_3-997346.html

5.4 Education and Business Clusters

One of the long-term prospects of recruiting and retaining high-achieving graduates is that they may stay and prosper in conjunction with a Canadian university, enhancing the business clusters surrounding those institutions.

Business clusters are networks of regionally and nationally located businesses, service providers, specialized suppliers, and associated academic institutions, all operating along a value chain in a particular field.⁴⁶ More generally, the cluster effect can be seen in any urban agglomeration where complementary, or similar commercial establishments begin to group themselves together. Clusters typically occur as a result of company competitiveness, which facilitates joint purchasing strategies and the formation of alliances.

Successful clusters are a mixed team of businesses that are internationally and technologically active; are supplementary; and have innovative knowledge-based specialists at their centre, such as research facilities and universities. In order to be internationally active, companies must cross language barriers, possess cultural knowledge, and frequently share personal contacts abroad.

According to Harvard economist, Michael Porter, clusters have the potential to affect competition in three ways:⁴⁷

1. by increasing the productivity of the companies in the cluster
2. by driving innovation in the field
3. by stimulating new businesses in the field

Clusters are based on different kinds of development and knowledge. They can be geographical; sectoral (operating along the same commercial sector); horizontal (interconnected businesses sharing resources); or vertical (operating along a related supply chain).

In the modern global economy sustainable competitive advantage, which requires continual innovation, is moving to the forefront. As a geographical mass, clusters are more efficient, filling industry branches with expertise and knowledge; providing a centralized pool of employees and suppliers; and attracting potential employees to relocate or start-up companies of their own.

Business clusters based on knowledge, also called high-tech clusters, tend to orient themselves towards the knowledge economy and usually have renowned universities and research centers as their nucleus. An excellent example of a high-tech cluster is Silicon Valley with its strong affiliation with Stanford University, described below, along with a similar cluster in the United Kingdom known as Silicon Fen or the Cambridge University Cluster.

Silicon Valley High Tech Cluster

Located in the southern region of the San Francisco Bay Area in northern California, Silicon Valley is home to the world's biggest and most influential technology corporations, as well as thousands of startup companies. Silicon Valley accounts for one-third of all venture capital investment in the United States, making the region one of the leading hubs for high-tech innovation and

⁴⁶ Rowe-Setz J. 2004. Theory of Clusters – A Broad Overview www.caps.am/data.php/853.pdf

⁴⁷ Porter, Michael E. 1998. Clusters and the New Economics of Competition. *Harvard Business Review*

development in the world.⁴⁸

There are approximately thirty-one universities and colleges located in Silicon Valley, but none have contributed as much to the high-tech industry as Stanford University. Ranked as one of the world's top universities, Stanford is an internationally recognized research institute, and a major catalyst in the development of Silicon Valley.

During the 1940s and 50s, Stanford's dean of engineering Frederick Terman, often called "the father of Silicon Valley," would encourage faculty and graduates to start their own companies: two of these were young Bill Hewlett and Dave Packard. Under Terman's leadership, the university aimed to build "steeple of excellence," with remarkable science and engineering researchers who would attract the best students from around the country and the world.⁴⁹

In later years the development of solid-state technology at Stanford brought forth four pinnacle waves of industrial innovation made possible with the support of private corporations like Bell Telephone Laboratories. Through Stanford's institutional leadership, the region saw the birth of several unprecedented discoveries and inventions in the technology sector, one of which dramatically shaped the rise of Silicon Valley: the Internet.

In its wake came the birth of multinational companies like search engine juggernaut Google, founded by Stanford alumni Larry Page and Sergey Brin in 1996. Other companies with strong ties to Stanford include Cisco Systems, Hewlett-Packard Company, Intuit, eBay, and Yahoo! Indian born businessmen and venture capitalist Vinod Khosla is a Stanford graduate as well as the co-founder of Sun Microsystems, located in the Valley. Mao Daolin, a Chinese Internet tycoon and former CEO of Sina.com, traveled to Stanford to obtain his Masters Degree in 1987. Daolin is now a San Francisco based venture capitalist with Walden International Investment Group.⁵⁰

In 2011 and 2012, Stanford received more than \$76.7 million in gross royalty revenue from 660 technologies, and concluded 115 new licenses. Thirty-six of the inventions generated \$100,000, and five generated \$1 million or more. Companies founded by Stanford's entrepreneurs have generated world revenues of \$2.7 trillion annually, creating 5.4 million jobs since the 1930s.⁵¹

Stanford's entrepreneurial spirit may be the most significant factor in the rise of the Silicon Valley business cluster, where world-renowned research facilities and innovative knowledge expertise come together, establishing the university as an educational magnet for high achieving technology students and graduates from outside the region and around the world.

Cambridge University Cluster

Cambridge University, first established in 1209, is one of the world's oldest and most prestigious research universities. It has also had a significant influence in the region's high-tech business cluster. The Greater Cambridge Area, known as

⁴⁸ Hamilton, Andrea M. 2003. Scholar examines links between Stanford and Silicon Valley. Stanford Report.

<http://news.stanford.edu/news/2003/april16/historysusv-416.html>

⁴⁹ www.stanford.edu/about/history/history_ch3.html

⁵⁰ http://chinavitae.com/biography/Mao_Daolin/career

⁵¹ <http://facts.stanford.edu/research/innovation>

Silicon Fen or the Cambridge University Cluster, is a business cluster of some of Europe's top grossing high-technology companies, and is a strong supporter of innovative start-ups. Silicon Fen is home to over 1,500 high-tech ventures in computer services, Internet, software, hardware, electronic office equipment, semiconductors, and telecommunications equipment, employing approximately 45,000 people.

In 2006 the London Business School conducted an intensive study on the region's high-tech companies, all of which were found to share many similar qualities.

1. They were all less than 20 years old
2. They had started international operations early (at an average age of 2.5 years)
3. They had a very high percentage of international revenues (69 per cent on average) with more than 60 percent growth per year
4. They had a strong imperative for venturing overseas due to the relative non-existence of demand for their products and services in the UK's domestic market

It became more apparent that the companies of Silicon Fen were able to grow and tap into global markets because they shared a competitive advantage made possible by their homogeneity and location. As mentioned earlier, competition is crucial for high-tech industries to thrive, and Silicon Fen, with Cambridge University at its core, was able to curate and attract some of the world's top scientists and engineers, creating greater substantial economic impact within both the local, and global economy.⁵²

Business-Academic Clusters in Canada

Business and academic clusters also occur in Canada, particularly around strong research oriented universities such as McGill, the University of Toronto, and UBC. While these clusters have not erupted into full-blown models of Silicon Valley, they are achieving success in their own right. For example, Waterloo and Research-in-Motion have created a burgeoning cluster in the Kitchener-Waterloo area.

As observed in the Silicon Valley and Cambridge examples, international students can play an important role in the development of successful business and academic clusters. Clusters of high achievers can help brand Canada as a destination for academics, students, and start-ups. As such, there is no doubt that, as in all sectors of the economy, the addition of high-achieving international graduates to the research work, academia, and surrounding business communities can help sustain and grow the various clusters in Canada.

⁵² Kudina Alina. 2008. Born Global. Business Strategy Review. London Business School.

6.0 CONCLUSION

6.1 Summary

In this report, the task has been to collect data and information pertaining to the following questions:

- Why is there global competition for international students and why are they important?
- What are the long-term economic impacts brought to Canada by international students?
- Are there ways to quantify these economic impacts?
- How is Canada faring in attracting these students?
- Is it possible to explore the different outcomes of high achieving students versus average students?

Canada, industrialized nations and the global economy are moving increasingly into a knowledge and information-based economy that requires high-achievers in sciences, humanities, technology, and business to establish and grow new and expanding economic centres. In order to compete, grow and thrive, Canada, as an industrialized nation with a small population, must keep its existing high-achieving talent and attract high-achievers from other countries.

The pursuit and inclusion of international students at Canadian universities is a well-established practice that produces a number of immediate tangible and intangible benefits, such as direct expenditures by students, and the broadening of perspectives in the classrooms.

This Discussion Paper presents the key information needed to investigate, track, and measure the relative economic benefits of high-achieving international students versus academically average international students. This begins with defining key terms and exploring methodological implications.

Tracking the economic impacts of high achieving graduates is problematic as it requires several key definitions of terms that are both ambiguous and difficult to measure, and also necessitates the tracking of individuals over lifetimes, often crossing borders, industries, and professions. The key terms differentiated in the report include the loosely defined “high-achieving”, “international graduates,” and “students and graduates”. Defining high-achieving students as undergraduates achieving a specific high end GPA, along with the majority of students pursuing post-baccalaureate programs in Canadian universities, will be the most effective way to capture the cohort in long-term studies.

The identification and tracking of high-achieving students was also discussed. This included the presentation of available data on Canada’s attraction of high-achieving students, which provides the needed context for understanding the importance of global competition for students, and the different models employed to attract the best and the brightest. The models explored here include: the volume-based model; the target-based model; and the approaches used by various scholarship programs.

International education in Canada was profiled by exploring the trends in international student enrollment in Canada to examine how growth rates have developed over time and how they compare with enrollment patterns of Canadian students, and the implications of these differences were analyzed. Over the past ten years, enrollment of international students in public Canadian colleges and universities grew much faster than enrollment of their Canadian counterpart. Compared with domestic students, a higher proportion of all internationally mobile students are enrolled in fields of study such as business, science, and engineering. These observations imply that, by virtue of their chosen fields of study, international students can potentially contribute more to the Canadian economy in the long run by contributing to innovation, science, and technology, as well as by meeting labour market needs in these important areas.

The long-term economic impacts of international students have also been explored, including the earnings potentials as they become members of the Canadian workforce; the impacts of international business activities initiated by international student graduates; and the impacts of personal relationships in the realms of politics, culture, and technology.

The phenomenon of education and business clusters is discussed through a review of several high-profile business cluster examples including: the Silicon Valley high tech cluster, and the Cambridge University cluster. Clusters in a Canadian context are also discussed.

Both the qualitative and quantitative evidence gathered points to the fact that there are real long-term economic benefits for Canada in attracting the top talent. What is lacking at this point is an accurate data tracking mechanism to establish the extent to which high-achieving international students differ from the average cohort when measuring these benefits.

6.2 Further Research

While existing data has been available for use in building up a model examining the economic benefits created by international students through becoming members of the Canadian workforce, and evidence has been brought forward illustrating the intangible benefits accruing to the Canadian economy through connections and relationships from former international students, there are areas where further research is called for.

Further research could be built on the following factors.

- Data on the percentage of international students who choose to remain in Canada to pursue employment, and the average length of time it takes them to find employment, by level of study and by field of study.
- Data on the occupational distribution of those who participate in the Canadian labour force and their earnings patterns.
- Data on the percentage of those who remain in Canada to engage in entrepreneurial activity, by level of study and by the areas of business interest.
- A better understanding of career paths chosen by international students after graduation.
- Criteria of various scholarships to help define high-achievers

- The tracking of former scholarship recipients and alumni, in particular international graduates.
- Economic value/effects of marketing through positioning Canada as a destination for exceptional talent – i.e. the effects of branding Canadian education/research as “elite”.
- An effort to describe (quantitatively or qualitatively) the soft-power impacts of international education, particularly in public diplomacy; conventional diplomacy and trade; and how these relate to targeted recruitment of exceptional students.

Logical next steps would involve a detailed longitudinal analysis of high achieving, international graduates of Canadian universities based on alumni data, scholarship fund data, and/or primary research. Relatively recent graduates as well as earlier students should be followed up, ideally with control groups of Canadian and international students at average rather than high achievement levels. This analysis would cover both employment and entrepreneurial activity. Income, employment, and exports generated could be among the variables examined. Wherever possible, ventures outside Canada should be considered in terms of their domestic impact.

The Asia Pacific Foundation has long talked about Canada’s hidden advantage derived from the extensive contact that occurs between Canadians and individuals from other countries. Nowhere is this advantage greater than when dealing with bright, young educated people who, through study at a Canadian institution, have become familiar with Canada and how Canadian business operates. This advantage should be captured through programs like those offered by Mltacs Inc. It should also be documented and measured.

APPENDIX 1: REFERENCES

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APPENDIX 2: INTERNATIONAL STUDENTS IN SELECTED COUNTRIES

Table 1: Number of Tertiary Level International Students in Selected Host Countries, 1998-2010

| Country | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|--------------------|----------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Australia | 109,437 | 117,485 | 105,764 | 120,987 | 179,619 | 188,160 | 166,954 | 177,034 | 184,710 | 211,526 | 230,635 | 257,637 | 271,231 |
| Japan | 55,751 | 56,552 | 59,691 | 63,637 | 74,892 | 86,505 | 117,903 | 125,917 | 130,124 | 125,877 | 126,568 | 131,599 | 141,599 |
| New Zealand | 5,912 | 6,900 | 8,210 | 11,069 | 17,732 | 26,359 | 41,422 | 40,774 | | 33,047 | 31,565 | 38,351 | 37,878 |
| Canada | 28,116 | 32,466 | 36,450 | 42,711 | 49,572 | 59,067 | 65,001 | 69,126 | 68,520 | 92,881 | 93,479 | 95,590 | |
| France | | 130,952 | 137,085 | 147,402 | 165,437 | 221,567 | 237,587 | 236,518 | 247,510 | 246,612 | 243,436 | 249,143 | 259,935 |
| Germany | | 178,195 | 187,033 | 199,132 | 219,039 | 240,619 | 260,314 | 259,797 | 207,994 | 206,875 | 189,347 | 197,895 | 200,862 |
| United Kingdom | 209,554 | 232,540 | 222,936 | 225,722 | 227,273 | 255,233 | 300,056 | 318,399 | 330,078 | 351,470 | 341,791 | 368,968 | 389,958 |
| USA | 430,786 | 451,935 | 475,169 | 475,168 | 582,996 | 586,316 | 572,509 | 590,158 | 584,719 | 595,874 | 624,474 | 660,581 | 684,807 |
| World Total | 917,247 | 1,635,218 | 1,757,021 | 1,834,161 | 2,142,506 | 2,420,547 | 2,489,251 | 2,542,549 | 2,617,373 | 2,830,829 | 2,947,082 | 3,214,017 | 3,271,287 |

Source: UNESCO Institute for Statistics

Table 2: Tertiary Level International Students in Selected Countries as a Percentage of Global Total, 1998-2010

| Country | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|-------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------|--------------|--------------|--------------|--------------|
| Australia | 11.9% | 7.2% | 6.0% | 6.6% | 8.4% | 7.8% | 6.7% | 7.0% | 7.1% | 7.5% | 7.8% | 8.0% | 8.3% |
| Japan | 6.1% | 3.5% | 3.4% | 3.5% | 3.5% | 3.6% | 4.7% | 5.0% | 5.0% | 4.4% | 4.3% | 4.1% | 4.3% |
| New Zealand | 0.6% | 0.4% | 0.5% | 0.6% | 0.8% | 1.1% | 1.7% | 1.6% | ... | 1.2% | 1.1% | 1.2% | 1.2% |
| Canada | 3.1% | 2.0% | 2.1% | 2.3% | 2.3% | 2.4% | 2.6% | 2.7% | 2.6% | 3.3% | 3.2% | 3.0% | ... |
| France | | 8.0% | 7.8% | 8.0% | 7.7% | 9.2% | 9.5% | 9.3% | 9.5% | 8.7% | 8.3% | 7.8% | 7.9% |
| Germany | | 10.9% | 10.6% | 10.9% | 10.2% | 9.9% | 10.5% | 10.2% | 7.9% | 7.3% | 6.4% | 6.2% | 6.1% |
| United Kingdom | 22.8% | 14.2% | 12.7% | 12.3% | 10.6% | 10.5% | 12.1% | 12.5% | 12.6% | 12.4% | 11.6% | 11.5% | 11.9% |
| USA | 47.0% | 27.6% | 27.0% | 25.9% | 27.2% | 24.2% | 23.0% | 23.2% | 22.3% | 21.0% | 21.2% | 20.6% | 20.9% |
| % of World Total | 91.5% | 73.4% | 70.1% | 70.1% | 70.7% | 68.7% | 70.8% | 71.5% | 67% | 65.8% | 63.9% | 62.4% | 60.6% |

Source: UNESCO Institute for Statistics