

Circum Network inc.
management and research consulting

74 Val Perché Street, Gatineau, Québec J8Z 2A6
(819) 770-2423
service@circum.com
<http://circum.com>

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Canada Graduate Scholarships (CGS) Program and Related Programs Review

Final report

Prepared for

The Interagency Evaluation Steering Committee
c/o Canadian Institutes for Health Research
160 Elgin Street, 9th Floor
Ottawa, Ontario K1A 0W9

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This evaluation study was conducted independently by R.A. Malatest and Associates Ltd. and Circum Network Inc. The contents of this report reflect the findings and conclusions of the evaluation study team, and not necessarily those of the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada, or the Social Sciences and Humanities Research Council of Canada.

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Executive summary

The present evaluation study of the Canada Graduate Scholarships (CGS) program was conducted in preparation for the renewal of its Terms and Conditions. It was conducted for the Presidents of the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Social Sciences and Humanities Research Council of Canada (SSHRC). It was managed by the Interagency Evaluation Steering Committee which is comprised of program and evaluation representatives from all three Agencies as well as Industry Canada.

In the February 2003 budget, the Government of Canada announced substantial funding for the three federal Agencies to introduce a new program: the Canada Graduate Scholarships (CGS); additional funding was extended in the 2007 and 2008 federal budgets. The program benefit is an award of \$17,500 at the Master's level and \$35,000 at the doctorate level. In comparison, NSERC Master's award have a similar value (\$17,300) and agency-specific doctoral awards carry values of \$20,000 (SSHRC), \$21,000 (NSERC) or \$22,000 (CIHR).

The CGS has been incorporated into the selection processes in place for the CIHR Doctoral Research Awards, the NSERC Postgraduate Scholarships, and the SSHRC Doctoral Fellowships. Scholarships for Master's students were not available through CIHR and SSHRC prior to CGS. Upon full implementation, and at annual cost of \$105 million, the Program was going to support 2,000 Doctoral students and 2,000 Master's students each year. CGS scholarships are awarded for three years for Doctoral students and for one year for Master's students.

Evaluation issues

An evaluation framework was produced in March 2007. It identified the following evaluation issues.

Relevance: Is there a continuing need for the CGS Program? Does the Program continue to be consistent with agency and government-wide priorities?

Design and delivery: To what extent is the Program appropriately designed to achieve its objectives? What changes to the CGS Program design would make it more relevant and effective? Is the allocation of the scholarships among the Agencies appropriate given the current distribution of full-time graduate students by group of disciplines? Is the mix of direct and indirect sources of support for graduate students optimal in each agency? To what extent has the Program been delivered by Agencies and universities as intended? To what extent is the CGS Program on track to meet its allotted number of funded Master's and Doctoral students, by agency? Should a portion of CGS and agency scholarships be allocated to certain disciplines or should budgets for disciplines be determined by the number of applications received?

Success: To what extent has the Program achieved its intended outcomes? What are the overall incremental program impacts? To what extent can outcomes be attributed in whole or in part to the CGS Program and/or other scholarship programs? What are the comparative impacts for CGS recipients, graduate students funded through agency-specific scholarship programs and students who rely on other means of support? To what degree have the branding and communications of the Program to relevant stakeholders been successful in distinguishing the CGS from granting agency scholarships? Is the Program's performance monitoring (of outputs and outcomes) appropriate and adequate? Have the Program's activities had any unintended impacts (positive or negative)?

Program cost-effectiveness: Is the Program delivered in a cost-effective manner? Are there more cost-effective ways to deliver the Program under the existing model? Are there alternative, more cost-effective programs/models that could achieve the same objectives?

Evaluation approach

This evaluation is based on a mixture of qualitative evidence (e.g., program documentation, key informant interviews, and a review of other programs) and quantitative evidence (i.e., administrative data and a large survey of

program applicants) where the latter was given most attention, and on the comparison of relevant results obtained by three groups of students, some of whom were involved in the programs and some who were not.

Available documentation was analysed and in-depth interviews were conducted with some 33 individuals to factor into aspects of this evaluation that could not be captured in the student survey.

The student survey benefits from a large sample size of 9,109 respondents and a reasonably good response rate, considering the groups that were targeted. Respondents were shown to be comparable to non-respondents; respondents from the sub-sample subjected to telephone follow-ups were also shown to be comparable to respondents who were not subjected to this type of follow-up.

A large portion of the analysis is based on a comparison of recipients of CGS awards, recipients of regular agency awards and students who applied for an award but did not receive one. These three groups of students are not strictly equivalent: one was considered worthy of the highest honour (a CGS scholarship); another one was identified as highly deserving (and received another agency scholarship); and the third group, while of high caliber (otherwise, universities would not have selected them for the competition), were not attributed a scholarship by the selection committees. However, they all emerge from the same group of "best students"; in fact, at NSERC and SSHRC, only students pre-qualified by universities are allowed to apply for graduate awards. This is a great advantage to this evaluation: because students in the three groups are similar, the difference among them is primarily whether they received an award and which award they received; therefore, differences in how they proceed through graduate studies can be more readily attributed to this key difference. Since there could possibly be other differences among the three groups of students, we implemented multivariate statistical control in order to focus the comparison on the impacts of the scholarships. This way, we controlled for other variables that could possibly explain differences observed in study progress among groups; after these statistical controls, if a difference persists among groups, it can probably be attributed to the effects of the programs.

Notwithstanding the strength of the design and of the data collection, there were some limitations to the available data. Administrative data were produced by three independent organizations, each with their own systems and procedures. While we strived to produce data on the same bases, some of the information produced might not be entirely comparable.

Some of the documentation is dated, even though the environment is characterised by rapid change; this is particularly true of macroscopic information relative to the academic and industrial environments. Also, the in-depth interviews did not necessarily allow to collect evidence that can be cross-referenced against hard facts; in fact, such interviews are often needed where empirical evidence is not available.

The survey of students targeted the first beneficiaries of CGS awards (in 2004, 2005 and 2006) and agency awards winners and applicants from the same years. The relatively short time elapsed between these years and the survey period in 2008 may not have allowed for the materialization of some outcomes, such as degree completion — although the relative brevity of the delay was the same for all three treatment groups.

This evaluation is based on the premise that CGS was designed to impact the behaviour of the best students, to increase the likelihood that they will enrol in graduate studies, that they would complete these graduate studies and that they would study (and later work) in Canada. Therefore, to assess the performance of the program, this evaluation puts this logic to the test and compares study progress for students in receipt of program benefits to those not in receipt. Others have suggested that this is not the appropriate test to perform because, in their view, CGS was created to impact the whole of the graduate student population.

Results and recommendations

This evaluation study has reached a number of conclusions. Those concerning program effects are methodologically strong, thanks to the reliance on a quasi-experimental approach and on multivariate modelling. The evidence concerning issues dealing with program relevance, and design and delivery is softer and must be regarded with more prudence.

This chapter recalls the key conclusions of the evaluation and proposes an interpretation of findings.

RELEVANCE

The evaluation generally supports the notion that there is a continuing need for CGS and related programs, although the evidence is not one-sided.

The first rationale argument is that HQP are in high demand in Canada and that purviews into the near future conclude that it will not decrease any time soon. Canada ranks sixth in a list of developed countries with regard

to the proportion of the population in the HQP category (23%), *ex aequo* with Australia and Korea; this highlights the need for a continuous influx of new HQP. While some studies conducted a decade ago question the existence of "brain drain", this evaluation uncovered that one-quarter of doctoral award applicants who were not studying at the time they were surveyed resided abroad and that one-quarter of award applicants expected to move abroad to study or to start a career. Therefore, there is a risk of loss of highly qualified personnel to other countries but the extent of this risk is uncertain and it is possible that it is countered by influx of HQP from other countries.

The second element of the rationale for the awards programs is that there is a financial barrier to access to graduate studies. This evaluation has found that the debt load of unsuccessful applicants belonging to the program target group is lower (\$17,100) than that of the general graduate student population (about \$20,000). On that basis, we conclude that the award applicant debt load is not a major deterrent to graduate studies. Still on the financial side, Master's level awards were shown to increase total student revenue from all sources by about \$2,500 compared to non-recipients (whereas the award value is approximately \$17,500) while CGS-D increases total revenue by \$9,400 (for an award of \$35,000) and regular doctoral awards increase total revenue by \$1,600 compared to non-recipients (for an award of about \$21,000). Thus, the main income-related effect of awards was to modify sources of revenue away from earned income.

Award programs are associated with results that contribute the overall objectives of HQP supply and research excellence:

- awards represent an incentive to enroll in graduate studies according to the recipients' self-assessment;
- awards increase slightly actual enrolment in graduate studies;
- awards increase recipients' recognition of the federal government's financial support to research training;
- at the Doctorate level, awards increase recipients' involvement in core research activities;
- awards reduce recipients' reliance on paid income and recipients' study related debt;
- awards improve recipients' self-assessed prospects of getting a job in an area relevant to their studies.

With the creation of CGS in 2003 and additional funding brought about in 2007 and 2008, the Government of Canada has demonstrated that it makes the funding of graduate studies an important component of its innovation strategy.

All in all, the rationale for supporting access to graduate studies probably still exists. Whether the best approach is to support academic excellence or to award scholarships on the basis of student financial need is not a closed debate.

Recommendation 1. The Agencies should maintain student award programs.

PROGRAM SUCCESS

The logic of the CGS program is based on a cascade of short term and longer term effects. The following assessment of program success is based on whether or not the evidence from this evaluation shows that these effects took place; this summary factors in varied indicators as well as statistical significance and substantive significance. Where available, multivariate statistical results are the preferred source of information because they provide the most rigorous determination of program effects. Because there is still a debate about whom CGS participants should be compared to, we have offered results comparing them to non-recipients at the Master's level (where only NSERC has specific programs) and to non-recipients and agency-specific award recipients at the doctorate level.

Expected outcome #1: Increased incentive for students to enrol in graduate studies in Canada

The impact of CGS on incentives to enroll in graduate studies was measured by asking students for their self-assessment of this impact. Therefore, only students in receipt of an award could be included in this validation.

Three-quarters of award recipients indicated that the possibility of receiving an award or actually receiving an award were incentives to enrol in graduate studies. One-half said the same about the prestige of the award. However, the results were the same for CGS-D recipients and for regular doctoral awards recipients, thereby demonstrating no incremental impact of CGS in this regard.

Expected outcome #2: Increased enrolment in graduate studies in Canada

After a decade of stagnation, enrolment in graduate studies has been increasing steadily since 2000 — that is, three years before the introduction of CGS. Also, it should be noted that, among award

applicants, enrolment levels were high: 93% of those applying for an award actually enrolled in graduate studies.

Award recipients were about four percentage points more likely to enrol in graduate studies than non-recipients, at the Master's level and at the doctorate level. It was also observed that one-third of Master's applicants who finished their Master's studies continued on to the doctorate level; this was statistically the same for CGS recipients and for regular agency award recipients. Also the same for these two groups was the proportion of Master's students who plan to continue on to a doctorate (one-half).

While some of the findings showed statistically significant differences between recipients and non-recipients, the actual differences were not substantial enough to conclude to a positive effect.

Expected outcome #3: Increased incentives for scholarship recipients to complete studies within a specific time period

As with expected outcome number 1, increased incentives to complete studies within a certain time period were self-assessed and therefore available only from award recipients. While between six (Master's) and seven (doctorate) out of ten award recipients indicated that the award was important in setting the student's pace of study, only one (doctorate) to two (Master's) out of ten stated that awards were important in the time it took the student to complete their study program. Even more important, the answers were statistically the same for CGS recipients and for recipients of regular agency awards.

Expected outcome #4: Increased recognition by the research community of the federal government's financial support for research training

Note that only program applicants were systematically canvassed about their views of the federal government's support of research training; other components of the research community (in particular, the researchers themselves) were not part of this assessment. Among CGS recipients and regular agency award program recipients, about eight out of ten thought that the federal government made a significant contribution to supporting research training in Canada. The results were the same for CGS award recipients and recipients of regular awards. Non-recipients were much less likely to share this view (by about 20 percentage points at the Master's level and 40 points at the doctorate level).

Expected outcome #5: Increased numbers of students completing degrees and doing so in a timely manner

It must be recognized at the outset that many program applicants had not completed their study program at the time of their participation in this evaluation. This was particularly true of students in doctoral studies — which, on average, last longer than the duration of CGS since its inception.

This evaluation can state nonetheless that, among award program applicants, there was an equal probability of having completed the study program in all groups (CGS recipients, regular award recipients and non-recipients) and at both levels (Master's and doctorate). Moreover, for those who had indeed completed their degree, the time to completion was 25 months at the Master's level and 48 months at the doctorate level, and it was the same for CGS recipients, regular award recipients and non-recipients. For those who had not yet completed their degree, expectations were that they would complete in 30 months at the Master's level and in 50 months at the doctorate level — again, without differences among groups. Asked whether they were progressing through their study program at the pace they were expecting, one-half of Master's students indicated that they were on pace or progressing faster than anticipated (same for CGS recipients and non-recipients); at the doctorate level, six out of ten CGS recipients answered the same way, which is ten points more than among agency award recipients and 20 points more than among non-recipients.

All in all, the conclusion is that CGS did not significantly affect the likelihood of completing the study program or the time to completion.

Expected outcome #6: High-quality research training, as well as increased ability to attract and retain experienced researchers

Graduate students proved to be generally satisfied with their research environment. CGS recipients and regular award recipients were equally satisfied with it and slightly more satisfied than non-recipients.

About one-half of all program applicants held teaching assistantship positions; this proportion was the same for CGS recipients, regular award recipients and non-recipients. In parallel, about one-third of applicants held research assistantship positions; recipients were somewhat less likely to hold such positions.

Master's students of all three groups were equally likely to have contributed to academic publications. Among doctorate students, CGS recipients and recipients of regular agency awards had the same number of publications and they had more, on average, than non-recipients.

Among Master's students who completed their degree and held employment, CGS recipients and regular agency award recipients were more likely than non-recipients to hold a job that required the graduate degree they sought. Results at the doctoral level barely reach statistical significance.

From this somewhat limited set of indicators, this evaluation concludes that CGS has had limited impact on the quality of research training offered to students and on the ability of the university system to attract and retain experienced researchers.

Expected outcome #7: Increased capacity to meet demand for HQP in the faculties of Canadian universities and in the public and private sectors

While analyses of these indicators at doctorate level were hampered by limited sample size, at the Master's level, CGS recipients were shown to be more likely to hold a highly-qualified job than non-recipients. By their own account, CGS recipients and recipients of regular agency awards were more influenced by their studies than non-recipients to pursue research or teaching as a profession.

Other indicators of effects on meeting the demand for HQP showed no differences among groups of respondents: they all shared the same sectors of interest with regard to employment; they indicated the same likelihood of continuing on with post-doctoral research; they were equally likely to hold a faculty position after finishing their doctorate program.

Expected outcome #8: Improved branding of Canada as a home of research excellence and Canadian universities as world-class research centres

This evaluation offers limited evidence regarding the improvement of the branding of Canada as a place of research excellence.

The ultimate expected outcome from CGS is "to contribute to Canada's Innovation Strategy to make Canada one of the most innovative countries in the world helping reach the target of moving from 14th place to among the top 5". This evaluation is not in a position to assess whether Canada has progressed toward that goal or whether CGS contributed to progress in that area. A 2007 Conference Board of Canada report entitled *How Canada Performs, A Report Card on Canada* indicated that Canada held the 14th OECD place in Innovation; however, most of the data used in that analysis dated back to 2003 or years prior to the implementation of CGS.

The necessary conclusion from the review of the success of CGS with regard to its stated logic is that the program has had limited impact over and above the regular agency awards at the doctorate level (while providing more funding and an envious branding); at the Master's level, comparisons with non-recipients suggest that CGS has had some of the impacts it was expected to have but that the magnitude of these impacts has been limited.

There is little doubt that federal support to graduate studies is necessary to achieve the innovation objectives of the Government of Canada. This evaluation shows, however, that the theory used in building a case for the CGS program has not met the test of time. Some important questions are still unanswered, though: what is the optimal level of support extended to graduate students? Would need-based support be more effective than excellence-based awards?

Recommendation 2. The logic of the CGS program should be rethought based on the information offered by this evaluation and other studies conducted since the inception of CGS.

A variety of impacts of award programs other than those that comprised the CGS program logic were tested. At the Master's level, the evidence shows clearly that, compared to the absence of support, CGS has significant positive unintended impacts on student income and debt levels, and on the necessity to work for pay while studying. These CGS effects are at par with the effects found for NSERC's PGS-M, which has the same monetary value as CGS-M. Also, Master's award programs were found to have no impact on the research environment in which students work (i.e., the diversity of environments to which they are exposed, their involvement in core research activities, interactions with other researchers).

At the doctoral level, where award impacts could be documented, CGS and related awards produced the same unintended impacts in all areas except those associated with total income, debt and working for pay. Since the value of the CGS doctoral award is two-thirds higher than that of regular scholarships, it should come as no surprise that CGS impacts students' finances. At the doctoral level, as was the case at the Master's level, the branding of CGS as superior scholarship does not appear to produce the unintended impacts we studied.

COST-EFFECTIVENESS AND ALTERNATIVES

This study was limited in its ability to gather objective evidence on program cost-effectiveness. Overall, no significant case was assembled either way.

Agencies have limited levers they can use to improve the supply of HQP. Scholarships and research grants (which translate into indirect support to students) appear to be the two most direct available approaches. Indirect approaches such as general support to research, excellence and indirect costs could contribute to the objective, but in a way that is less obviously tied to the end result.

Indirect support through grants produces outcomes that are different from the objectives of CGS and from the impacts associated with awards. Indirect support generally has a more positive impact on the students' involvement in research, on the diversity of research environments to which the student is exposed, and on interactions with other researchers. While indirect support is associated with higher student income (than the absence of direct and indirect support), it doesn't reduce students' reliance on paid work the way awards do.

Indirect support has no measured impacts on incentives to enrol in graduate studies, recognition of the federal government's financial support for research training, high-quality research, and the branding of Canada as a home of research excellence. In a complex world, where diversity is an efficient strategy to address issues, Indirect support through grants has a role to play in parallel with award programs. Agencies would be warranted to continue studying how to best integrate direct and indirect support in their portfolios.

DESIGN AND DELIVERY

The analysis of design and delivery issues has not uncovered major concerns. Positive features of CGS include: the coverage of the Master's level, the assessment criteria, the application review process and the efficiency of the management of the program.

The large value discrepancy between CGS-D and regular doctoral awards was identified as a bone of contention. One critic of CGS wrote: "The first and most striking problem with the CGS program is that the doctoral scholarships are far too rich [...]. In contrast, some CGS winners, when you add in their teaching assistantships and top-ups provided by some universities, will earn more than \$50,000 annually. This is more than post-docs, sessional lecturers and many assistant professors make [...]." (Siler, 2004)

Additionally, this study demonstrates that, at the doctorate level, providing 67% more funding (the difference between the \$35,000 CGS award and a typical \$21,000 regular agency award) produces limited incremental impacts.

Recommendation 3. The Agencies should consider the possibility of reducing the gap in value between CGS and regular awards at the doctorate level.

The duration of the awards is considered too short by many. In fact, recipients are more satisfied with the money value of the awards than with their duration. The average time to completion of a Master's degree is certainly longer than one year and that of a doctoral degree vastly exceeds three years (six years according to Gluszynski and Peters, 2005). To truly affect the duration of graduate studies, it is likely that a more sustained funding effort is required.

Recommendation 4. The Agencies should consider the possibility of extending the duration of a Master's award to two years and that of a doctoral award to four years.

Of course, doing so would reduce the number of individuals who could be funded. A proper balance should be found between reducing the value of CGS awards and lengthening the period of student support.

The final problem identified is the set of rules concerning use of CGS outside of Canada. Decisions announced in the 2008 Budget open the door to CGS recipients receiving additional funding for short foreign study stints. Still, the logic behind the existing rules is that those who study in Canada are more likely to initiate their career in Canada afterwards. While this may be true, the importance of international networks and of learning under world-renowned researchers should not be understated. Allowing some of the best Canadian students to pursue graduate training outside of Canada could also translate into some of the best foreign students wanting to study with world-class Canadian researchers. For reference, about one-half of graduate students surveyed for this study considered international mobility important to their graduate education.

Recommendation 5. The award programs should not restrict the international mobility of students.

The distribution of CGS funding among Agencies decided by Government is different from that of other types of funding to Agencies: CGS funds are distributed according to the number of graduate students in disciplines associated with each agency whereas other funding does not follow this logic. This is not to say that the logic is faulty; it is a simple observation that it is different.

External communications from the Agencies should be adjusted to reflect the branding of CGS as an exceptional scholarship. As it stands, readily available information on CGS is scattered and factual rather than centralized and inspiring of excellence. Since this is a single program with a single name and a single purpose (albeit delivered by each Agency to its own constituency), an integrated external promotional presence with a single Web point of access should be envisaged. This will require a collaborative effort from the three Agencies.

Recommendation 6. The Agencies should develop an integrated external communication plan for CGS to contribute to its branding as an exceptional award.

A performance monitoring plan exists for CGS. It comprises a set of indicators associated to outputs and short term outcomes. Existing data management systems collect information relative to a small number of these indicators; they are all related in one way or another to the number of scholarships funded. Some other indicators have received some attention to date from NSERC but little to none from CIHR and SSHRC; they relate to degree completion and professional achievements. These latter indicators require that measurement be made some time after degree completion, which adds to the difficulty of obtaining the information.

Recommendation 7. The Agencies should collaborate to develop a workable data collection mechanism for performance information.

While the indicators of performance found in the performance monitoring plan may have been the appropriate ones at the inception of the program, it is not clear that they are still the most useful pieces of information for program managers. Also, there is no definitive indication that existing performance information has been used in managing the CGS program. That could be because program managers now need a different type of performance information than they did at program inception. Finally, some

of the proposed indicators relate to outcomes that are located so far in the future (e.g., program completion) as to make it questionable whether they are performance monitoring indicators or evaluation indicators.

Recommendation 8. The performance monitoring plan for CGS and related programs should be revisited with a view to make it more pertinent to program managers and to better delineate performance monitoring from evaluation assessment.

Study team

Senior evaluator and author **Benoît Gauthier**
Circum Network Inc.

Senior evaluator **Robert Malatest**
R.A. Malatest & Associates Ltd.

Senior analyst **Chris Boughton**
Andreas Rose
Tim Mills
R.A. Malatest & Associates Ltd.

Analysts **Suzanne Bélanger**
Manon Crevier
R.A. Malatest & Associates Ltd.

Scientific authority and project manager **Nicola Lauzon**
Isabelle Mercier
Werner Muller-Clemm
Canadian Institutes of Health Research

Additional agency representatives **Hélène Gauthier**
Jocelyne Manseau-Mandeville
Natural Sciences and Engineering Research Council of Canada
Courtney Amo
Isabella Marcinek
Social Sciences and Humanities Research Council of Canada

Abbreviations

CAGS	.....	Canadian Association for Graduate Studies
CGS	.....	Canada Graduate Scholarships
CIHR	.....	Canadian Institutes of Health Research
DFP	.....	SSHRC Doctoral Fellowships Program
DRA	.....	CIHR Doctoral Research Awards
HQP	.....	highly qualified personnel
IPS	.....	NSERC Industrial Post Graduate Scholarships
OECD	.....	Organization for Economic Cooperation and Development
PGS	.....	NSERC Postgraduate Scholarships
PGS-D	.....	NSERC Doctorate Postgraduate Scholarships
PGS-M	.....	NSERC Master's Postgraduate Scholarships
NSERC	..	Natural Sciences and Engineering Research Council of Canada
SSHRC	...	Social Sciences and Humanities Research Council of Canada

Chapter 1

INTRODUCTION

The present evaluation study of the Canada Graduate Scholarships (CGS) program was conducted in preparation for the renewal of its Terms and Conditions. It was conducted for the Presidents of the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Social Sciences and Humanities Research Council of Canada (SSHRC). It was managed by the Interagency Evaluation Steering Committee which is comprised of program and evaluation representatives from all three Agencies as well as Industry Canada.

An evaluation framework¹ completed in March 2007 identified a number of informational requirements and argued² that the CGS program should be

¹ *Evaluation Framework for the Canada Graduate Scholarships Program (CGS) and Related Programs*, prepared by EKOS Research Associates Inc., dated March 21, 2007.

² From this study Terms of Reference: "The agencies decided that it would be advantageous to simultaneously undertake an evaluation of CGS and similar agency programs for the following reasons: a) these programs serve as the delivery mechanism for the CGS at the doctoral level for all three agencies; b) combining the evaluation of CGS with evaluations of agency specific programs maximizes the agencies' time and resources; c) agency specific scholarship programs are the most logical comparison group for CGS, and a coordinated approach ensures that they are surveyed only once, d) agency specific programs have existed for many years thus outcomes of the programs will be more readily accessible, and could provide benchmarks for further evaluations of CGS."

evaluated in tandem with the other granting agency student award programs; they are:

- CIHR's Doctoral Research Awards (DRA);
- NSERC's Postgraduate Scholarships (PGS) — PGS-M at the Master's level and PGS-D at the doctorate level — and the Industrial Post Graduate Scholarships (IPS); and,
- SSHRC's Doctoral Fellowships Program (DFP).

The mandate given to the evaluation team was "the actual conduct of the CGS evaluation as well as the evaluation of each agency's nearest equivalent program as described above." (*Request for Proposal, June 2007*). Separate evaluation reports were prepared for each agency's own award program(s).

The Evaluation Framework was completed in March 2007. Its preparation involved representatives from NSERC, SSHRC, CIHR, and Industry Canada. The contract to conduct the evaluation study was awarded in July 2007. The design of the study, including all questionnaires and guides, was completed in January 2008. Data collection took place in February and March 2008. Technical reports on the various components of the study were delivered in March and April. Consecutive drafts of the evaluation report were delivered starting in May 2008.

Many individuals and organizations contributed to this evaluation — a diversity that is, in fact, representative of the complexity of the environment of the CGS Program and agency award programs. Students, reviewers, liaison officers and program managers invested time and efforts contributing to this evaluation via interviews, questionnaires, documents, etc.

This document is structured as follows. Chapter 2 presents a description of the programs, including a brief overview of program activities, outputs and outcomes. Chapter 3 of this report describes the evaluation issues and the study approach and methodology. Chapters 4 to 7 deal with the study issues: program relevance, design and delivery, success, and cost-effectiveness. Note that differences among Agencies were not highlighted (although they were controlled for in multivariate statistical models) because CGS is a single tri-agency program and not three programs

implemented by each agency. Chapter 8 concludes the study with overall findings and recommendations.

Chapter 2

PROGRAM DESCRIPTION

Large portions of the program description are reproduced from the *Evaluation Framework* (March 2007).

In the February 2003 budget, the Government of Canada announced substantial funding for the three federal Agencies to introduce a new program: the Canada Graduate Scholarships (CGS). The CGS has been incorporated into the selection processes in place for the CIHR Doctoral Research Awards, the NSERC Postgraduate Scholarships, and the SSHRC Doctoral Fellowships.¹ Upon full implementation, the Program was going to support 2,000 Doctoral students and 2,000 Master's students each year, increasing the number of graduate scholarships supported by the federal government by 70 per cent to almost 10,000. CGS scholarships are awarded for three years for Doctoral students and for one year for Master's students. Scholarships for Master's students were not available through CIHR and SSHRC prior to CGS.

¹ Agency programs are described more fully in the respective Agency-specific reports.

The federal Agencies support graduate students directly through their scholarship and fellowship programs, and indirectly through awards for research performed at Canada's universities. In the 2003 budget the Government committed to creating the new CGS Program at an annual cost of \$105 million when fully phased in. The new program is intended to complement the Government's initiative to create 2,000 Canada Research Chairs, supporting excellence at Canada's universities.

The Program's Terms and Conditions were to expire on May 31, 2008 (a one-year extension has since been awarded). When the program was originally approved, it was on the condition that it would be reviewed in its fourth year. The fourth year review would consider whether the allocation of scholarships should be changed to account for changes in the distribution of full-time graduate students by group of disciplines. This report presents the results of this fourth-year review.

Program objectives. The CGS Program was created in 2003. Its objective is to help ensure a reliable supply of highly qualified personnel (HQP) to meet the needs of Canada's knowledge economy.¹

Program theory. Trends in employment growth in Canada indicate an increasing need for highly qualified personnel. Between 1981 and 2001 in Canada, employment in high-knowledge industries increased 8%, medium-knowledge industries 52%, and low-knowledge industries only 32%.² This corresponded with increased average education requirements for all industry sectors. This increase was most substantial in high-knowledge industries where the university educated share of employment increased from 18% to 29% and where employment growth was 245%.

The strategy to achieve the Program's objective is to provide incentives for increased enrolment in graduate studies in Canada. That is, by awarding scholarships to a larger number of qualifying students and making those

¹ *The Canada Graduate Scholarships Program: Results-Based Management and Accountability Framework*, June 2003.

² René Morissette, Yuri Ostrovsky and Garnett Picot. *Relative wage patterns among the highly educated in a knowledge-based economy*. Statistics Canada, September 2004.

awards financially attractive, the Program aims to improve the attractiveness of pursuing graduate studies in Canada relative to the immediate financial reward of employment or the attractiveness of financial packages offered by foreign universities.

CGS is branded as a very prestigious award. This is intended to help distinguish the Program from the other scholarships provided by the Agencies and provide an additional incentive for students to enter and remain in graduate studies.

When the Program was created, its objective was to support the Government's goal to make Canada one of the most innovative countries in the world by moving from fourteenth place to among the top five in R & D investment per capita in the OECD. To conduct the amount of research needed to rank in the top five, Canada needs an additional 100,000 highly qualified R & D employees, of whom a significant fraction must be researchers with advanced degrees.¹ To help develop those researchers, the Government's Innovation Strategy document — *Achieving Excellence* — sets the target of a 5% increase per year in graduate student enrolment at Canadian universities and it identifies doubling the number of federal government Master's and Doctoral scholarships as a priority for achieving this target.

Although gross domestic expenditures on research and development (GERD) increased each year between 2001 and 2005, these increases have not kept pace with either growth in GDP or population. The ratio of GERD to gross domestic product has declined each year from 2001 (2.09%) to 2005 (1.92%). Similarly, the GERD per capita decreased from 2001 (\$701.10) to 2005 (\$688.07).²

The CGS objective is consistent with the objectives of CIHR, NSERC and SSHRC whose mandates include providing financial assistance for future generations of researchers in the humanities and social sciences, natural sciences, engineering and health research disciplines. This financial

¹ The Canada Graduate Scholarships Program: Results-Based Management and Accountability Framework, June 2003.

² Statistics Canada, *Innovation and Analysis Bulletin*, June 2003.

assistance is provided based on merit (rewarding excellence) and not on need.

The theoretical rationale for CGS scholarships was reiterated in the 2007 federal Budget which included additional funding to awards "to encourage Canadians to pursue advanced studies" (Department of Finance Canada, 2007, 208). This decision was meant to contribute to Canada's "knowledge advantage" which, in turn, would feed into a "stronger", "safer", and "better" Canada.

The 2008 federal Budget continued emphasizing the CGS program theory. It included a new \$25 million, two-year investment to establish a new award for top Canadian and international doctoral students (the Vanier scholarship). This was positioned as an investment in people aimed at "developing the best-educated, most-skilled and most flexible workforce in the world." (Department of Finance Canada, 2008, 104) — which is related to the government's economic plan, *Advantage Canada*, aimed at enhancing long-term prosperity.

Logic model. Exhibit 2.1 reproduces the logic model on which the evaluation framework was built. The next paragraphs provide details about this logic, as explained in the evaluation framework, and supplements the description with data on the five years of existence of CGS.

Inputs. The Agencies received annual appropriations for a portion of the administration and communications costs of the CGS Program for the first three years (i.e., 2003-04 to 2005-06). As of 2006-07, the costs of operating the Program, as well as the costs incurred in developing and implementing the accountability/evaluation framework and the audit framework, are being sourced from each granting agency's regular operating budget. Exhibit 2.2 outlines the annual appropriations by each agency for the CGS Program from 2003-04 to 2007-08.

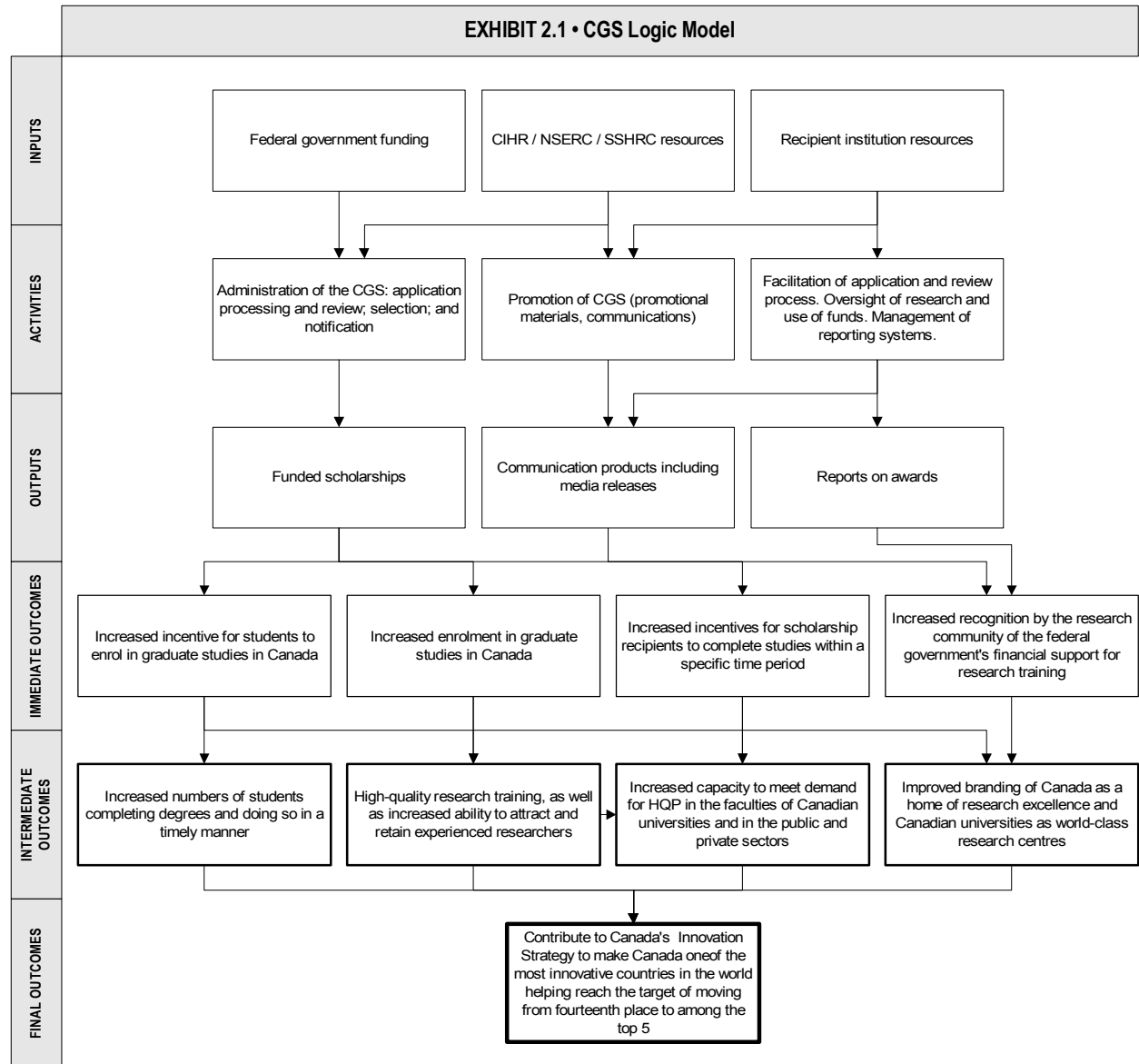


EXHIBIT 2.2
Agency Appropriations for the CGS Program

	2003-04	2004-05	2005-06	2006-07	2007-08
CIHR	\$2.5M	\$5.5M	\$8.5M	\$10.5M	\$10.5M
NSERC	\$7.5M	\$16.5M	\$25.5M	\$31.5M	\$31.5M
SSHRC	\$15.0M	\$33.0M	\$51.0M	\$63.0M	\$65.9M
Total	\$25M	\$55M	\$85M	\$105M	\$107.9M

Source: *Evaluation Framework*, March 2007, and Agency updates.

Funding for the Program was allocated among the three Agencies in proportion to the estimated distribution of the graduate student community. Based on the statistics available at the time, the allocation was determined to be the following: 10% to CIHR, 30% to NSERC, and 60% to SSHRC.

Activities. The main deliverers of the CGS Program are the three Agencies. The Agencies are responsible for setting the application deadlines and selection procedures for the CGS Program, which are posted on each agency's Web site. The selection process is administered by each agency and involves a review of the merit of the applications by a review committee comprised of researchers with experience supervising graduate students. The use of existing scholarship mechanisms at each of these Agencies, with proven procedures and appropriate assessment tools, is intended to ensure that CGS are awarded to graduate students whose performance and careers are likely to lead to the achievement of Program objectives.

At the Doctoral level, the CGS Program is managed in parallel with each agency's Doctoral scholarship program. The application process for the CGS Doctoral award is integrated with each granting agency's Doctoral scholarship application process. The eligibility requirements for agency Doctoral scholarships and CGS are very similar; however, the value of CGS awards are substantially larger per annum than agency scholarships. At the Master's level, NSERC has a common application process and eligibility requirements with its Postgraduate Scholarship program, while SSHRC and CIHR each have a specific application process for their Master's level CGS. In addition to the Master's level CGS, CIHR offers an Industry Partnered

Graduate Training Award with the same value and similar eligibility requirements. NSERC offers the Industrial Post Graduate Scholarships at the Masters' and doctorate levels. The CGS is the only Master's level scholarship offered by SSHRC.

The **universities** have an important role as co-deliverers of the CGS Program, with CIHR at the Master's level and with NSERC and SSHRC at both the Master's and Doctoral levels. CGS awards are not paid directly to students; instead they are paid to recipient institutions. The recipient institutions administer the scholarship accounts and, where appropriate, the research allowance accounts on each granting agency's behalf. In addition to administering the scholarships, the recipient institution administrators advise graduate students on program policies and procedures, screen applications, oversee the conduct of research and the use of scholarship funds, and manage reporting systems, all in close cooperation with the Agencies. The cost of providing these services is borne by the institution.

Key responsibilities of the universities for CGS at each agency are as follows.

- **CIHR.** For CGS Master's award candidates, universities are involved in setting the deadline for applications and conduct a pre-selection process at the level of the university. Given that CIHR provides each Canadian institution with an allocated number of submissions, institutions are expected to conduct a pre-selection process before forwarding the allocated number of submissions to CIHR. In addition, the universities are responsible for disbursing funds to the award holders on behalf of CIHR, ensuring conditions are met prior to releasing the funds, and issuing tax forms to students.
- **NSERC.** The major responsibilities of the universities are to: rank each Master's and Doctoral scholarship in eight broad discipline categories; decide the distribution of applicants by discipline and level to fill their NSERC quota; submit to NSERC lists of the ranked applicants recommended; verify that successful applicants meet all the conditions of the award; pay students their awards according to the university's payment schedule; administer an annual progress report on NSERC's behalf; and issue tax forms to students.

- **SSHRC.** Universities have responsibilities for: evaluating their students' applications (at the department and/or faculty of graduate studies level); submitting A-list applications to SSHRC (as opposed to B-list applications, which are not recommended for awards); verifying that successful applicants meet all the conditions of the award; paying students their awards according to the university's payment schedule; administering an annual progress report on SSHRC's behalf; and issuing tax forms to students.

Key activities are as follows:

- **Administration of the CGS Program.** The Agencies are responsible for the administration of the CGS competition and the day-to-day management of the CGS Program. Competitions are held annually for the scholarships to be funded. All funding decisions are based on an arm's length and peer-reviewed assessment of applications by expert panels. In addition, ongoing performance monitoring is conducted independently by each of the Agencies. Evaluations will be conducted through a committee composed of the three Agencies and Industry Canada (the Interagency Evaluation Steering Committee).

Note that this evaluation was unable to collect factual information on the costs incurred by Agencies in the management of CGS and related programs. This is because such costs are not tracked separately in Agencies' financial systems.

- **Promotion of the CGS Program.** Program promotion includes various internal and external communications activities designed to make students and universities aware of the existence of the CGS funding.
- **Management and oversight of applications, scholarship funds and research.** To facilitate the application and review process and the post-award management of funds, administrators of recipient institutions advise graduate students on Program policies and procedures, screen applications, oversee the conduct of research and the use of scholarship funds (including the implementation of policies on integrity and ethics relative to any research allowance component of the scholarship), and manage reporting systems, all in close cooperation with the Agencies. The cost of providing these services is borne by the institution.

Exhibit 2.3 reports the number of applications received by Agencies with regard to their scholarship programs. Only the CIHR and SSHRC Master's CGS awards are subject to direct applications; there is no particular application process for the other four CGS components which are managed in tandem with regular agency award programs.

EXHIBIT 2.3
Number of applications to CGS and agency scholarship programs

	2003-04	2004-05	2005-06	2006-07	2007-08
MASTERS					
CIHR	0	312	327	346	357
NSERC	1,757	1,717	1,779	1,747	1,639
SSHRC	990	1,766	2,139	2,432	2,576
DOCTORATE					
CIHR	561	652	804	799	814
NSERC	1,086	1,248	1,582	1,571	1,496
SSHRC	3,224	3,871	4,378	4,824	4,721

Source: administrative data.

Outputs. Outputs refer to the tangible products, goods and services that are produced by the Program activities.

- **Funded scholarships.** As a result of the peer-reviewed competitions, new CGS recipients are selected and funded by each of the three Agencies on an annual basis.
- **Communications products.** Communications and promotional materials include news releases and Web sites.
- **Reports on awards.** Annual reports, which are submitted by each of the Agencies, constitute an important source of data for input into the performance-based management system. In addition, periodic evaluation reports will be produced. CGS recipients also submit annual progress reports at their university.

Exhibit 2.4 contains the basic parameters of the scholarships offered by the CGS program and by the Agencies outside of CGS. It shows that the benefits from the CGS scholarships are substantially larger than those of

regular agency programs at the doctoral level, but that, at the Master's level, at NSERC where a comparison can be made, the benefits are similar.

EXHIBIT 2.4
Basic Program Parameters

	CIHR		NSERC		SSHRC	
	CGS	Agency's	CGS	Agency's	CGS	Agency's
MASTERS						
Name	CGS Master's	(none)	CGS-M	PGS-M	CGS Master's	(none)
Duration (years)	1		1	1	1	
Annual value (\$)	17,500		17,500	17,300	17,500	
DOCTORATE						
Name	CGS Doctorate	DRA	CGS-D	PGS-D	CGS Doctorate	DFP
Duration (years)	3	3	3	3	3	4
Annual value (\$)	30,000	21,000 ¹	35,000	21,000	35,000	20,000
Annual research allowance (\$)	5,000	1,000				

Source: Evaluation Framework, March 2007.

Note: scholarships are not subject to income tax.

¹ \$26,000 for awards held outside Canada.

Exhibit 2.5 reports the number of CGS and agency scholarships awarded over the past five years.

EXHIBIT 2.5
Number of CGS and agency scholarship award recipients

	Type	2003-04	2004-05	2005-06	2006-07	2007-08
MASTERS						
CIHR	CGS-M	0	74	184	275	350
NSERC	CGS-M	133	347	577	651	746
	PGS-M	2,040	1,687	1,258	994	984
SSHRC	CGS-M	811	973	1,253	1,187	1,287
TOTAL	CGS	944	1,394	2,014	2,113	2,383
	Agency	2,040	1,687	1,258	994	984
DOCTORATE						
CIHR	CGS-D	70	142	215	285	397
	DRA	407	336	182	91	86
NSERC	CGS-D	140	288	442	599	676
	PGS-D	1,747	1,169	1,326	1,467	1,640
SSHRC	CGS-D	0	409	801	1,180	1,213
	DF	1,414	1,378	1,357	1,255	1,260
TOTAL	CGS	210	839	1,458	2,064	2,286
	Agency	3,568	2,883	2,865	2,813	2,986

Source: administrative data.

Note: the counts are for recipients. Each doctorate level recipient is accounted for in each of the years of funding.

Immediate outcomes. Immediate outcomes refer to external consequences (e.g., changes, benefits) attributed to the Program as a direct result of an activity taking place or an output being produced. Immediate outcomes take place over the short-term.

- **Increased incentives for students to enrol in graduate studies in Canada.** The scholarships are intended to increase incentives for recipients to enrol in Master's and/or PhD programs by providing them with stable financial support. The scholarships increase the attractiveness of enrolling in graduate studies in Canada relative to employment or graduate studies at foreign universities. Also, they reduce some of the long-term financial problems that graduate students face by reducing their reliance on student loans.

- **Increased enrolment in graduate studies in Canada.** By increasing the number, and attractiveness, of graduate scholarships available to undergraduate and graduate students and reducing their reliance on student loans, the scholarship should contribute to increased enrolment in graduate studies in Canada.
- **Increased incentives for scholarship recipients to complete studies within a specific time period.** By providing CGS recipients with stable financial support for a specific period of time, the Program is intended to help students complete a Master's and/or PhD program in a timely manner (e.g., because they would not need to take a part-time job).
- **Increased recognition by the research community of the federal government's financial support for research training.** The federal government's commitment to CGS will lead to increased recognition by the research community of financial support for Canadian research training as students and researchers become increasingly aware of the scholarships and as they are branded as a prestigious award. This will contribute to the branding of Canada as a positive environment in which researchers from all disciplines are appreciated, welcomed and supported. This support will also be there in a very practical sense as experienced researchers will have a stable supply of assistants funded through CGS.

Intermediate outcomes. Intermediate outcomes refer to external consequences that flow from the immediate outcomes. Intermediate outcomes tend to take place over the medium-term (usually three to five years or more).

- **Increased numbers of students completing degrees and doing so in a timely manner.** The immediate outcomes of increased incentives to enrol in and complete graduate studies in Canada are intended to support this intermediate outcome.
- **High-quality research training, as well as increased ability to attract and retain experienced researchers.** The high value, prestigious CGS award may improve recipients' access to high-quality research training (e.g., because they may be more likely to study with a high-quality supervisor in a high-quality research environment). In addition, this award/incentive should help to attract

(as graduate students) and retain experienced researchers in Canada.

- **Increased capacity to meet demand for HQP in faculties of Canadian universities and in the public and private sectors.** Over the longer term, the CGS Program will contribute to ensuring that there is an adequate supply of highly qualified personnel in the faculties of Canadian universities as well as an increased capacity to meet demand in private and public sector organizations. This will happen through high-quality research training, as well as attraction and retention of experienced researchers.
- **Improved branding of Canada as a home of research excellence and Canadian universities as world-class research centres.** The immediate outcome of increased recognition by the research community of the federal government's financial support for research training, coupled with the enrolment of excellent graduate students supported by the prestigious CGS, is expected to contribute to an improved branding of Canada as a home of research excellence and Canadian universities as world-class research centres.

Final outcomes. The final outcome is an external consequence to which the intermediate outcomes contribute (along with other factors beyond the CGS) and supports the overall objective of the Program. The final outcome takes place over the longer-term.

- **Contribute to Canada's Innovation Strategy to make Canada one of the most innovative countries in the world.** Ultimately, the intermediate outcomes of the CGS Program should contribute to the federal government's Innovation Strategy and, specifically, will help to achieve the target of moving Canada from fourteenth place to the top five in terms of innovation as measured by the OECD.

Governance and accountabilities. The authorities to implement the CGS Program reside in the CIHR, NSERC, and SSHRC Acts, specifically CIHR Act, Sections 5(b) and 26(a); NSERC Act, Section 4(2)(a); and SSHRC Act, Section 4(2)(a). The Acts specify the constitution of Governing Councils that have the power to expend, for the purposes of the Acts, any money appropriated by Parliament for the work of the Agencies or received by them through the conduct of their operations. The Agencies receive

funding through annual parliamentary appropriations. The Governing Councils and their standing committees oversee the program activities, which include the development, delivery and ongoing evaluation of program elements in order to meet the evolving needs of students, researchers and Canadians.

Each program is managed separately by each agency in light of differences in curricular requirements, research practices and the assessment of the excellence of a candidate across the three discipline groupings. Day-to-day administration is provided by each agency's respective division responsible to deliver scholarship and fellowship programs.

Scholarships are not paid directly to the students. They are paid to recipient institutions, which administer the scholarship accounts, and, where appropriate, the research allowance accounts, on the granting agency's behalf. Administrators of recipient institutions advise graduate students on Program policies and procedures, screen applications, oversee the conduct of research and the use of scholarship funds, and manage reporting systems, all in close cooperation with the Agencies. The cost of providing these services is borne by the institution. The recipient institution is responsible for notifying the granting agency if there is any change in the scholarship holder's enrolment status or if their progress is unsatisfactory. The award may be terminated at any time by the scholarship holder or the granting agency.

Chapter 3

EVALUATION APPROACH

This chapter explains the evaluation approach and methodology. The evaluation study is based on a combination of qualitative and quantitative evidence gathered from literature, documentation, key informant interviews and survey research.

3.1 Evaluation issues

The following issues and questions for the present evaluation were identified during an evaluation planning process, which resulted in the *Evaluation Framework for the Canada Graduate Scholarships Program (CGS) and Related Programs*, dated March 21, 2007. This evaluation framework was approved by all three Agencies and by Industry Canada. The objective of the present evaluation is to answer these questions.

Relevance

- 1.1 Is there a continuing need for the CGS Program?
- 1.2 Does the Program continue to be consistent with agency and government-wide priorities?

Design and delivery

- 2.1 To what extent is the Program appropriately designed to achieve its objectives?
- 2.2 What changes to the CGS Program design would make it more relevant and effective?
- 2.3 Is the allocation of the scholarships among the Agencies appropriate given the current distribution of full-time graduate students by group of disciplines?
- 2.4 Is the mix of direct and indirect sources of support for graduate students optimal in each agency?
- 2.5 To what extent has the Program been delivered by Agencies and universities as intended?
- 2.6 To what extent is the CGS Program on track to meet its allotted number of funded Master's and Doctoral students, by agency?
- 2.7 Should a portion of CGS and agency scholarships be allocated to certain disciplines or should budgets for disciplines be determined by the number of applications received?

Success

- 3.1 To what extent has the Program achieved its intended outcomes?
 - a) Increased incentives for students to (1) enrol in, and (2) complete graduate studies in Canada (Master's and/or PhDs)
 - b) Increased enrolment in graduate studies in Canada

- c) Increased recognition by the research community of the federal government's financial support for research training
- d) Increased numbers of students completing (or expecting to complete) graduate degrees in a timely manner
- e) High-quality research training; increased ability to attract and retain experienced researchers
- f) Expected increased capacity to meet demand for highly qualified personnel (HQP) in public and private sector organizations
- g) Recipients/highly qualified personnel holding (or expecting to hold) positions in the faculties of Canadian universities
- h) Improved branding of Canada as a home of research excellence and Canadian universities as world-class research centres

3.2 What are the overall incremental program impacts? To what extent can outcomes be attributed in whole or in part to the CGS Program and/or other scholarship programs?

3.3 What are the comparative impacts for CGS recipients, graduate students funded through agency-specific scholarship programs and students who rely on other means of support?

- a) Reasons for attending graduate school
- b) Expected completion date
- c) Career goals and aspirations
- d) Interaction with faculty on research projects
- e) Loans/debt worries
- f) Sources of support (for both scholarship and non-scholarship students)
- g) Employment during graduate school
- h) Mobility
- i) Barriers to continuing post-graduate studies
- j) Marketability (especially for PGS-IPS comparison)
- k) Amount of funding
- l) Type of projects
- m) Industry projects/collaborations
- n) Professional skills development (CGS, PGS, IPS)

- 3.4 To what degree have the branding and communications of the Program to relevant stakeholders been successful in distinguishing the CGS from granting agency scholarships?
- 3.5 Is the Program's performance monitoring (of outputs and outcomes) appropriate and adequate?
- 3.6 Have the Program's activities had any unintended impacts (positive or negative)?

Program cost-effectiveness

- 4.1 Is the Program delivered in a cost-effective manner?
- 4.2 Are there more cost-effective ways to deliver the Program under the existing model?
- 4.3 Are there alternative, more cost-effective programs/models that could achieve the same objectives?

3.2 *Evaluation design*

This evaluation study design is based on a mixture of qualitative and comparative evidence from multiple sources. Both descriptive and comparative data were employed.

Descriptive data

Descriptive data were assembled using existing documentation, administrative data bases, key informant interviews and a survey of students. Using these descriptive data, we can develop profiles (for example, the level of student debt) and we can report perceptions of program impacts and effects. As is often the case in program evaluation, descriptive data offer rich contextual information but limited definitive evidence of program effects.

Comparative data

Program impacts and effects are more convincingly demonstrated using comparative data. This evaluation study benefits from the comparison of responses from three categories of students: (1) students who received CGS funding, (2) students who received a scholarship from another agency program, and (3) students who did not receive funding from one of the three agency-specific programs (but could have received funding from a provincial government or a university).

Comparing data obtained from Groups 1 and 2 contributes to the demonstration of the impact of the CGS Program over and above that of other agency scholarship programs. It allows us to determine whether the CGS approach is associated with more positive results than these other programs.

Comparing information from Groups 2 and 3 parcels out the effects associated with the federal scholarship model itself. Together, the analysis of the results in the three groups of students allows us to document the impacts that are related to federal scholarships from the impacts that are CGS-specific.

Statistical tests

In making comparisons among groups of students, it is important to base conclusions on statistical tests which distinguish the statistically supported inferences from the results that may be due to mere chance.

The dependent variables were specified in the analysis plan. Where the dependent variable was naturally of a continuous nature (e.g., expenses), it was kept as such. In instances where the dependent variable could be represented as a quasi-continuous variable or as a dichotomous variable (e.g., opinions on seven-point scales), the latter form was used to avoid making assumptions about the normality of the distribution of the dependent variable.

Bi-variate analyses involved breaking down the dependent variable according to award groups, within levels of study. There were three award

groups (or treatment groups): CGS award recipients, recipients of regular agency awards and non-recipients. At the Master's level, only NSERC offers an agency award (PGS-M); therefore, results at the Masters's level are presented in two ways: singling out NSERC students so as to offer a three-way comparison of award groups and comparing CGS recipients to non-recipients across all three Agencies. The bi-variate statistical tests were a binomial test of difference of proportions for categorical data and a t-test of the difference of means for continuous data. These statistical tests included a Bonferroni correction.

Multivariate analyses were conducted to better isolate the differences in the dependent variables associated with the award groups from the possible contaminating influence of significant distinguishing factors associated with the award groups. Logic models were used for dichotomous dependent variables; ordinary least squares multiple regression was used for continuous dependent variables. All independent variables were coded as binary variables to avoid any assumption regarding the functional form of the relationships; all used an effect-coding scheme except the two variables representing the award groups which were dummy-coded with the non-recipient group left as the reference category. The list of independent variables is presented in Appendix A; it stems from the literature review conducted on access to graduate studies, a summary of which is found in Appendix B. In all cases, the models were built in a stepwise fashion where all independent variables were entered sequentially according to their explanatory power; independent variables representing the award groups were entered last in a forced manner.

3.3 Documentation and administrative data

Relevant administrative data were identified from the *Evaluation Framework*. Particular attention was paid to Section 3.3 Currently Available Performance Information and Section 4.2 Evaluation Issues/Questions, Indicators and Data Sources of the framework. They were used to compile a list of relevant data, which was in turn submitted to CIHR, SSHRC and NSERC in order to confirm/refute the availability of such data. Once

feedback was received from the three Agencies, a request was made for the data to be produced.

Administrative data were not necessarily available from all Agencies. Also, some data were available on paper only, that is, data was collected but not recorded electronically into a database. Therefore, some of the expected administrative data could not be retrieved and some evaluation indicators could not be informed as expected. They will be addressed through other lines of evidence, such as survey, literature review, or interviews.

3.4 *Review of other programs*

As background information, a brief overview of research funding initiatives within Canada and other countries that may be considered comparable to CGS was conducted. The main objectives of this overview were to help place the CGS program into the context of Canadian and international programs designed to support students, and to help contextualize and interpret the results.

Comparable programs were selected based on the following criteria:

- the program is funded and administered by a government department or agency;
- the program provides funding for graduate students, either at the Master's level, at the Doctoral level or at both Master's and Doctoral levels;
- one of the program's main objective is to retain or attract national graduate students (i.e. the program is not intended for international students); and
- need-based scholarships or bursaries are excluded.

Within a jurisdiction, efforts were made to select programs that are open to students from all disciplines/fields.

An Internet scan was conducted in order to identify initiatives similar to the CGS program; 19 initiatives were identified (9 Canadian and 10 international).

Information was obtained by means of Internet searches for documentation from primary sources funding (i.e. Government and Research Council Web sites in the US, UK and Australia, and Canadian Government Web sites). These sources were supplemented by searches of secondary sources such as institutions and financial aid departments.

3.5 **Interviews**

Twenty-three interviews were conducted with a total of thirty-three respondents, as two or more people participated in some interviews. Interviews were conducted with program management staff at CIHR, SSHRC and NSERC, senior federal government officials at other relevant departments, peer reviewers, university representatives and university / student associations.

EXHIBIT 3.1
Number of interviews and interviewees by sector

Subgroup	Interviews	Respondents
Program management at CIHR, SSHRC, NSERC	7	13
Senior federal government officials	3	4
Peer reviewers / selection committee members	6	6
University representatives	5	6
University / student associations	2	4

The key purpose of these interviews was to provide context and depth to the analysis of some issues that could not be handled with justice on a quantitative basis.

3.6 **Survey of students**

Questionnaire design and pretest

The student questionnaire was designed to feed directly into the information needs of each evaluation issue. On January 29, 2008, 260 e-mail invitations were sent to pretest the CGS student questionnaire. Six days later, 57 individuals had completed the questionnaire and 10 more had initiated it without completing it. Of these 10, 5 only read the introduction page.

Objectively, the pretest questionnaire took 29 minutes to complete, on average, including the time respondents took to supply comments on the questionnaire. The subjective duration reported by respondents was 23 minutes, on average. Fifty out of 57 respondents (88%) who completed the questionnaire indicated that its length was reasonable.

As part of the pretest, participants could leave comments related to any of the questions of the questionnaire as well as regarding the entire experience, at the end of the questionnaire. To the extent possible, comments were acted upon.

Sampling

A group of 26,207 students was identified as belonging to the population of students who have presented applications for master's or doctoral awards to one of the three Agencies in 2004, 2005 and 2006.

Initially, it was planned that only 8,194 sampled individuals would be invited to complete the study questionnaire. However, because of the low marginal cost of additional invitations to the on-line survey and with a view to ensure that sufficient completed questionnaires would be collected, all 26,207 students were invited by e-mail to complete the questionnaire.

Protocol

On February 8 and 9, 2008, potential respondents received an e-mail invitation to complete the survey via the Web. A first reminder was sent to non-respondents, also by e-mail, on February 15 and 16, 2008, and a second reminder was e-mailed on February 22 and 23, 2008. Of the 26,207 students targeted by the invitation, the sampling frame lacked an e-mail address for 1,046 and the message could not be delivered (bounced) to 4,514.

Respondents were provided with a secure link to a personalized questionnaire. All communications between the respondent and the server were SSL-encrypted. Respondents could stop answering the questionnaire and resume on the same questionnaire page in another sitting.

Respondents were provided with an e-mail address to ask questions or voice concerns. A few hundred such messages were handled by the Malatest hotline service.

Telephone reminders were initiated on February 13, 2008 with individuals who were part of the sub-sample of 8,194 and for whom we did not have a current e-mail address. All non-respondents belonging to the sub-sample of 8,194 were added to the telephone follow-ups on February 23, 2008. Telephone follow-ups continued until March 3, 2008.

Field results

The raw response rate in the sub-sample subjected to telephone follow-ups was 42% while it was 31% in the group that was not subjected to telephone follow-ups. The overall raw response rate was 35%. This response rate does not exclude individuals for whom no contact information was available. The original research designed planned for 3,932 questionnaire completions; by extending the pool of potential respondents from a sample to the population, the number of completions could be increased to 9,109, that is, 232% of the original completion target. Exhibit 3.2 documents the number of responses obtained from each group of program recipient and non-recipient, and from each agency.

Non-response and response bias

With an overall response rate of 35%, the representativeness of the respondent group must be assessed. We are able to compare respondents to non-respondents with regard to the following characteristics (and only those characteristics as other data are not available):

- the reference agency;
- the level of study;
- the success of the application;
- the year of application.

Since the first three characteristics were used to stratify the population and draw non proportional samples for follow-up purposes, it is not surprising to find that respondents are different from non-respondents in these regards. These differences can be corrected using *ex-post facto* weighting.

The likelihood of responding was higher among doctoral students than master's students — it could be because the e-mail addresses were more likely still active for doctoral students who are involved in longer-term programs.

The response rate was lowest for unsuccessful applicants, followed by regular agency program successful applicants, with CGS awards providing the highest response rate. One explanation of this situation is that the questionnaire was positioned mostly as a CGS questionnaire, so that regular program awards may not have felt as concerned with it as CGS awards. As for unsuccessful applicants, comments left indicated that there is a tangible level of acrimony such that the drive to assist is less than among successful applicants.

We found that recency of application correlated with more participation. Here again, the recency of the e-mail information may factor in. As a consequence, we used year of application in the weighting scheme. However, it should be noted that there could be a bias here in that older, unsuccessful applicants may have been more difficult to reach than more recent, successful applicants.

In view of these observations, a weighting scheme was developed to redress the sample of respondents to the proportions observed in the population for the cross-classification of these four characteristics.

Sampled vs. non sampled participants

One final concern has to do with the equivalency of the answers provided by the sampled and non sampled groups of respondents. If it can be shown that their answers are similar, we will be able to merge sampled and non sampled participant answers in the analysis of the results.

We compared the answers provided by the two groups throughout the questionnaire. While there were statistically significant differences between the groups¹, on key outcome variables, the answers of the two groups were either not statistically different or were statistically significant but with actual differences that were not meaningful. For example, a difference between a proportion of 30% and a proportion of 32% may be statistically significant with large enough samples, but not meaningful in substantive terms.

Key indicators that the two groups are similar include (no statistically significant difference in the following):

- whether the respondent has completed the program of study;
- whether the respondent is still studying in original program;
- number of years before completing the program of study;
- enrolment in another university program;
- current student status (statistically significant but substantively the same);
- involvement in research with the supervisor (statistically significant but substantively the same);
- importance of the scholarship;
- having held a job during graduate studies;
- closeness of job to graduate studies;
- geographical location after graduate studies (intention);
- likelihood to pursue a career in research.

¹ Statistical significance is relatively easy to reach with a sample as large as the one available here.

We merged the answers of sampled and non sampled cases so as to benefit from the full power of a large data set in the upcoming analysis.

Weighting

A weighting scheme was developed to redress the distribution of the sample of respondents to the distribution of the population for the cross-classification of the following four factors:

- the reference agency;
- the level of study;
- the success of the application;
- the year of application.

The weighting scheme has a minimum value of 0.46 (2005 CIHR Doctorate CGS awards) and a maximum value of 5.05 (2004 NSERC Master's award unsuccessful applicants). The variance of the weight variable is 0.466.

Sampling precision

Factoring in a design effect equal to the variance of the weighting scheme plus one and based on a confidence level of 95%, Exhibit 3.2 presents the level of precision obtained in each of several relevant subgroups of the student survey sample for a proportion of 50% (the maximum variance of a binary estimate).

EXHIBIT 3.2
Sample precision

	CGS		Agency award		No award	
	Precision	n	Precision	n	Precision	n
Master's						
All	±2.8	1816	±5.1	532	±4.0	882
CIHR	±9.5	156			±10.4	131
NSERC	±5.0	554	±5.1	532	±7.3	266
SSHRC	±3.6	1106			±5.4	485
Doctorate						
All	±3.3	1303	±2.8	1861	±2.3	2715
CIHR	±8.0	218	±9.6	152	±5.3	510
NSERC	±6.0	385	±4.0	902	±6.9	292
SSHRC	±4.5	700	±4.2	807	±2.7	1913

Note: margins of error are for a proportion of 50% at a confidence level of 95%, factoring in the design effect associate with the weighting scheme, without correction for finite population.

3.7 Evaluation strengths and limitations

This evaluation is based on a mixture of qualitative and quantitative evidence where the latter was given most attention, and on the comparison of relevant results obtained by three groups of students, some of whom were involved in the programs and some who were not.

Available documentation was analysed and in-depth interviews were conducted with some 33 individuals to factor into aspects of this evaluation that could not be captured in the student survey.

The student survey benefits from a large sample size and a relatively good response rate, considering the groups that were targeted. Respondents were shown to be comparable to non-respondents; respondents from the sub-sample subjected to telephone follow-ups were also shown to be comparable to respondents who were not subjected to this type of follow-up.

Much of the analysis presented in this report is based on a comparison of recipients of CGS awards, recipients of regular agency awards and students who applied for an award but did not receive one. These three groups of students are not strictly equivalent: one was considered worthy of the highest honour (a CGS scholarship); another one was identified as highly deserving (and received another agency scholarship); and the third group, while of high caliber (otherwise, universities would not have selected them for the competition), were not attributed a scholarship by the selection committees. However, they all emerge from the same group of "best students"; in fact, at NSERC and SSHRC, only students pre-qualified by universities are allowed to apply for graduate awards. This is a great advantage to this evaluation: because students in the three groups are similar, the difference among them is primarily whether they received an award and which award they received; therefore, differences in how they proceed through graduate studies can be more readily attributed to this key difference. Since there could possibly be other differences among the three groups of students, we implemented multivariate statistical control in order to focus the comparison on the impacts of the scholarships. This way, we controlled for other variables that could possibly explain differences observed in study progress among groups; after these statistical controls, if a difference persists among groups, it can probably be attributed to the effects of the programs. Factors that were subjected to statistical control are listed in Appendix A and the literature on which the selection of these factors was based is presented in Appendix B. Notwithstanding our efforts, it is possible that some significant factor was left uncontrolled.

Notwithstanding the strength of the design and of the data collection, there were some limitations to the available data. Administrative data were produced by three independent organizations, each with their own systems and procedures. While we strived to produce data on the same bases, some of the information produced might not be entirely comparable.

Some of the documentation is dated, even though the environment is characterised by rapid change; this is particularly true of macroscopic information relative to the academic and industrial environments. Also, the in-depth interviews did not necessarily allow to collect evidence that can

be cross-referenced against hard facts; in fact, such interviews are often needed where empirical evidence is not available.

The survey of students targeted the first beneficiaries of CGS awards (in 2004, 2005 and 2006) and agency awards winners and applicants from the same years. The relatively short time elapsed between these years and the survey period in 2008 may not have allowed for the materialization of some outcomes, such as degree completion — although the relative brevity of the delay was the same for all three treatment groups.

This evaluation is based on the premise that CGS was designed to impact the behaviour of the best students, to increase the likelihood that they will enrol in graduate studies, that they would complete these graduate studies and that they would study (and later work) in Canada. Therefore, to assess the performance of the program, this evaluation puts this logic to the test and compares study progress for students in receipt of program benefits to those not in receipt. Others have suggested that this is not the appropriate test to perform because, in their view, CGS was created to impact the whole of the graduate student population.

Chapter 4

RELEVANCE

In brief

The evaluation generally supports the conclusion that there is a continuing need for CGS and related programs. HQP are in high demand in Canada and purviews into the near future conclude that it will not decrease any time soon. Canada ranks sixth in a list of developed countries with regard to the proportion of the population in the HQP category; this highlights the need for a continuous influx of new HQP.

According to information offered by students, there is a risk of loss of highly qualified personnel to other countries but the extent of this risk is uncertain and it is possible that it is countered by influx of HQP from other countries. Most graduate students do not amass a very large study-related debt, making the financial barrier to obtaining of a graduate degree a less than compelling argument for student support.

Award programs are associated with results that contribute the overall objectives of HQP supply and research excellence.

4.1 *Is there a continuing need for the CGS Program?*

The CGS program and related agency programs are founded on the hypothesis that the cost of financing graduate studies is a significant barrier to access. Moreover, they were initiated because of the perception of a need to augment the number of graduates from Master's and doctorate programs available to universities, the private sector and the public sector where the demand for highly qualified personnel exceeds the supply.

Assessment of the supply of and demand for HQP

Statistics Canada defines highly qualified personnel as "an individual with a university degree at the bachelor's level and above" (McKenzie, 2007). However, CGS and related programs focus on the Master's and doctoral levels.

Relevant data on the supply of HQP in Canada are relatively rare. In 2006, 774,655 people had a Master's degree and 142,180 people had a Doctorate degree in Canada according to Statistics Canada (2008a). The same report indicates that the proportion of the population with a university degree at the bachelor's level or above stands at 23% in Canada. This places Canada sixth behind Norway and the United States (30%), the Netherlands (28%), Denmark and Iceland (26%); and *ex aequo* with Australia and Korea. Japan (22%) and Sweden (21%) follow. Canadian universities have been graduating about 4,000 PhDs a year (CAGS, 2006b).

Various indications point to an increasing demand for HQP.

- From 1991 to 2001, the labour force increased by 1.3 million people and 50% of that growth was in occupations requiring a university degree (Statistics Canada, 2003).
- According to HRSDC's 2006 National Occupational Classification, 10.9% of all Canadian occupations require a university degree

(excluding management positions). If management occupations are included, then 12.2% of all occupations require a university degree.

- The proportion that HQP (bachelors and above) represent of the workforce has grown from about 16% in 2001 (Statistics Canada, 2003), to 22% in 2005 (Lapointe et al., 2006) and 23% in 2006 (Statistics Canada, 2008b).
- From 2006-2015, two out of every three job openings will require post-secondary education (university, college or apprenticeship). The highest rate of expansion will be in occupations requiring a university degree (annual average rate of 1.6%). This will represent 70% of all new job openings in 2006-2015 (Lapointe, Dunn, Tremblay-Côté, Bergeron and Ignaczak, 2006).
- For the past few years, the fastest growing industries were those who required the highest level of education and employers are now looking for employees with an advanced degree and those who have research and analytical skills (AUCC, 2005).
- Today's industries are knowledge intensive, that is, they require their employees to bring new knowledge and ideas to their companies to create new technologies in order for them to stay competitive and survive (AUCC, 1996).
- Bégin-Heick & Associates (2001), Berkowitz (2003) and the Canadian Association for Graduate Studies (CAGS) (2004) estimated that Canada needed to replace 30,000 to 40,000 university professors by 2010-11 in order to fill the vacancies from retirements and create new positions to meet enrolment demand. Half of these positions were expected to be in the Humanities and Social Science fields.
- According to Vinet (2002), cited in Borgmann Crago (2002), the government of Canada estimated that 50,000 more researchers were needed in the non-university sectors of the economy in order to meet its objective to rank fifth in the world in R&D among OECD countries.

There appears to be a continued need to increase the proportion of Canadians who complete graduate studies.

According to key informants, the key challenges to ensuring a supply of HQP in Canada are (1) increasing the number of graduate students in Canada, both from within Canada and by attracting the best from abroad and (2) continuing to reduce the brain drain problem by ensuring opportunities for young Canadians to increase their skills and ensure we do not lose them. To that effect, reasonable level of funding must be offered to attract students and places must be developed in universities.

Loss of highly qualified personnel

Information available from the student survey is somewhat contradictory. Also, the evidence available from the survey of students regarding this issue is limited by the fact that the sample is not representative of the graduate student population: it includes only students who have applied for awards. However, the data are representative of individuals who are considered to be amongst the best Canadian graduate students.

The proportion of award-deserving students leaving Canada is not inconsequential: 7% of individuals who applied for a Master's award and who are not currently students reside outside of Canada (n=900); the figure is 23% at the doctoral level (n=758). Moreover, 21% of individuals who applied for a Master's award who are currently students "expect to move outside Canada to continue [their] training and/or to start [their] career" (n=1,831); the figure is 26% at the doctoral level (n=4,927). This mirrors the result obtained by Darren King (2008) from the 2004-2005 Survey of Earned Doctorates.

These results are dampened by the observation that 3% of individuals who applied for a Master's award who are currently students intend to work outside of Canada once they graduate (n=1,812); the figure is 7% at the doctoral level (n=4,484).

Notwithstanding the demonstrations offered by Helliwell (1999), Drew, Murray and Zhao (2000), and Helliwell and Helliwell (2001), these observations support the notion that there is still a risk of loss of highly

qualified personnel to other countries. The data produced by this evaluation situate this risk within a wide range — from 7% to 26% at the doctorate level, depending upon the indicator used. These data also do not account for the influx of HQP from other countries into Canada.

Assessment of students' financial and other needs

Another rationale for the existence of CGS and related programs is the perceived financial hardship of graduate students as well as the level of debt they contract by the end of their studies.

The sources available on this issue don't actually support this perception. Gluszynski and Peters (2005) reported that 56% of doctorate students did not accrue a debt to finance their graduate education and that only 14% had a debt higher than \$20,000. Based on the 2004-2005 Survey of Earned Doctorates, Darren King (2008; 17) indicated that "59% of students reported having no debt from their graduate studies and 50% reported having no debt from either their graduate or undergraduate studies upon completion. [...] Fifteen percent of the 2004/2005 graduates reported owing over \$20,000 from their graduate studies." At the Master's level, the average debt was \$20,300 in 2006 (CAGS, 2006a).

According to the student survey conducted as part of this evaluation, students who are not supported by CGS or agency award programs (but who could receive support from the provincial government or from the university) declared an annual income of \$27,200 on average in their last year of study, and household expenses of \$27,500.¹ Combining numbers for Master's and and doctorate levels, the accumulated study-related debt averaged \$17,100. Debt levels for subgroups are reported in Exhibit 4.1.

¹ The caveat concerning the representativeness of the results expressed earlier applies here again.

EXHIBIT 4.1
Study-related debt for various subgroups of unsuccessful applicants

	Study-related debt (\$)		n	
	Master's	Doctorate	Master's	Doctorate
SSHRC	18,935	19,644	430	1,719
NSERC	9,859	12,148	193	297
CIHR	13,191	13,021	131	466
Total	15,674	17,623	754	2,482

Source: survey of students.

Some have suggested that students in the sample used in this study (i.e., arguably the best graduate candidates since they were pre-selected by universities for the award programs) may be atypical in that they may have benefited from financial awards all along for the very reason that they are among the best students. That may be the case, but it does not negate the argument that students targeted by the excellence scholarships do not carry a heavy debt load. They are the target population for these programs and they are in this situation.

There is no objective rule to determine whether a given debt load is a financial hardship and a deterrent to graduate studies. This evaluation has found that the debt load of unsuccessful applicants belonging to the program target group is lower (\$17,100) than that of the general graduate student population (about \$20,000). On that basis, we conclude that the award applicant debt load is not a major deterrent to graduate studies.

Unique contribution of award programs

One other reason for supporting award programs is that they produce results that are significant and unique. Borrowing from evidence to be discovered in Exhibits 6.20 and 6.36 in Chapter 6, we can establish that award programs are associated with the following contributions:

- awards represent an incentive to enroll in graduate studies according to the recipients' self-assessment;

- awards increase slightly actual enrolment in graduate studies¹;
- awards increase recipients' recognition of the federal government's financial support to research training;
- at the Doctorate level, awards increase recipients' involvement in core research activities;
- awards reduce recipients' reliance on paid income and recipients' study related debt;
- awards improve recipients' self-assessed prospects of getting a job in an area relevant to their studies.

Demand for the scholarship programs

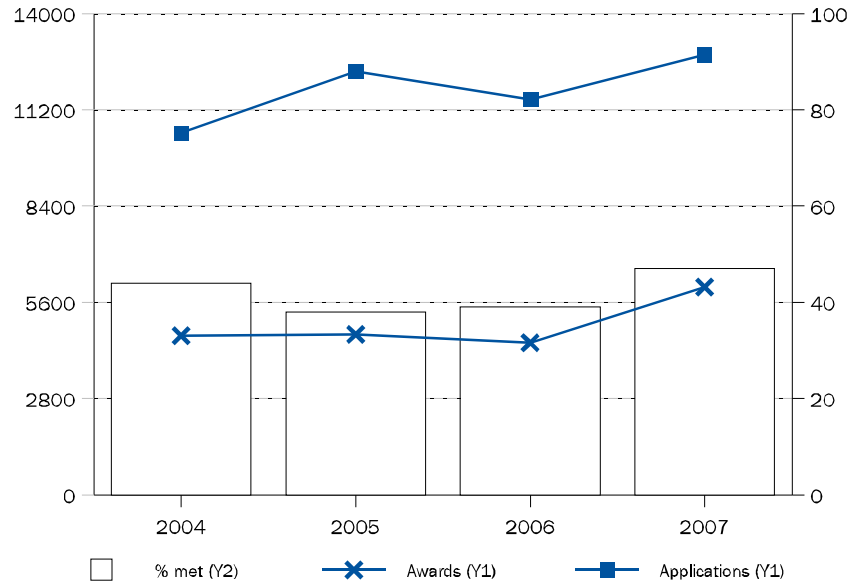
One last indicator of program relevance would be an increase in the number of applications received and, possibly, a decrease in the proportion of the applications that the programs are able to meet. Note that, because universities filter applications and limit their numbers, this logic is not left to play out naturally and, hence, this indicator is faulty. Note also that a comparison of the number of awards handed out to the total graduate student population would not be appropriate since only the best students are eligible to CGS and Agency awards.

Exhibit 4.2 describes how the number of applications to CGS and related programs and awards from CGS and related programs has not changed much over the past four years, since the introduction of CGS. Similarly, the proportion of applications that are met with a positive response has decreased from 44% to 38% and then 39% between 2004 and 2005 but it has increased to 48% in 2007.

This indicator does not suggest that the need for the program is growing, but it is a weak indicator because of the extensive pre-selection of award applications performed by universities. In effect, these numbers may well not be reflective of the reality of the need for funding.

¹ Data presented later (page 62) show that 4% of CGS students would not have enrolled in graduate studies without CGS support. Assuming the program lets 2,000 Master's awards and 2,000 doctoral awards, the program would then contribute to 80 students accessing each level of study. This incremental effect would come at a cost of \$650,000 per student (2,000 Master's awards at \$17,500 plus 2,000 doctoral awards at \$35,000 total \$105,000,000. That sum divided by 160 equals \$656,250).

EXHIBIT 4.2
Applications and scholarships awarded



Perspectives from key informants

Informants were unanimous in stating that they believed that there would be far fewer students undertaking post-graduate studies if there were no CGS or agency-specific awards. Canada would then have difficulty in filling research positions in academia and industry. Another effect would be that the time to completion for post-graduate studies would be extended significantly, thus further impacting the supply of HQP. It would make it more difficult for universities to attract students and keep them, and the onus would fall more on the universities and the provincial governments. It was also mentioned that without the CGS and the agency-specific awards there would be higher instances and higher levels of student debt.

4.2 Does the Program continue to be consistent with agency and government-wide priorities?

The Federal Budget of 2007 sent strong signals of the importance that the Government of Canada attaches to supporting graduate studies and CGS in particular.

The budget document outlines actions related to a "stronger", "safer", and "better" Canada. According to the 2007 Budget, a stronger Canada will be achieved through a stronger economy via five areas of action (Department of Finance Canada, 2007, 149): fiscal action, infrastructures, entrepreneurship, taxation and knowledge. Within the "knowledge advantage", a number of initiatives are described. CGS is introduced as follows (Department of Finance Canada, 2007, 208-209):

The ability of Canadian firms to be at the forefront of research and innovation depends crucially on their access to highly skilled personnel. To encourage more Canadian students to acquire advanced skills, Advantage Canada committed to increasing graduate scholarship support.

To encourage Canadians to pursue advanced studies, the granting councils provide internationally competitive financial support to the best Canadian graduate students through Canada Graduate Scholarships. These scholarships are provided to the top 2,000 masters and 2,000 doctoral students each year. Students at the master's level receive one-year awards worth \$17,500, while doctoral students receive three-year awards worth \$35,000 per year. To recognize the outstanding contributions of Canadian researchers and entrepreneurs who have made a real and lasting impact on our lives, Canada's New Government will be dedicating Canada Graduate Scholarships to the memory of Sir Frederick Banting and Dr. Charles Best, Alexander Graham Bell, and Joseph-Armand Bombardier:

- In health-related studies, through the Canadian Institutes of Health Research (CIHR).

- In natural sciences and engineering, through the Natural Sciences and Engineering Research Council of Canada (NSERC).
- In the social sciences and humanities, through the Social Sciences and Humanities Research Council of Canada (SSHRC).

To enable additional young Canadians to pursue graduate-level studies, Budget 2007 provides \$35 million over two years to expand these scholarships. When the new scholarships are fully in place, the councils will support an additional 1,000 graduate students each year, including 400 new scholarships delivered by each of CIHR and NSERC, and 200 delivered by SSHRC.

The fact that the key messages on graduate awards and CGS were repeated in the Budget speech itself (Flaherty, 2007, 16) is additional demonstration of the importance that the Government attaches to these programs.

The 2008 Budget plan includes yet another measure: "Providing \$3 million over two years to establish a new international study stipend for Canada Graduate Scholarship recipients who wish to study at international institutions." (Department of Finance Canada, 2008, 14) This supplement will have a value up to \$6,000 for one semester of foreign studies.

Budget 2008 also includes a new \$25 million, two-year investment to establish a new award for top Canadian and international doctoral students (the Vanier scholarship). This was positioned as an investment in people aimed at "developing the best-educated, most-skilled and most flexible workforce in the world." (Department of Finance Canada, 2008, 104) — which is related to the government's economic plan, *Advantage Canada*, aimed at enhancing long-term prosperity.

The link between agency-specific programs and agency priorities is presented in the agency program reports.

Chapter 5

DESIGN AND DELIVERY

In brief

The analysis of design and delivery issues has not uncovered major concerns. Positive features of CGS include: the coverage of the Master's level, the assessment criteria, the application review process and the efficiency of the management of the program.

Areas of concern include: the large value discrepancy between CGS and regular awards, limited funding, the duration of the awards and the rules concerning use of CGS outside of Canada. Students were more satisfied with the money value of the awards than with their duration.

This distribution of CGS funding among Agencies decided by Government is different from that of other types of funding to Agencies: CGS funds are distributed according to the number of graduate students in disciplines associated with each agency whereas other funding does not follow this logic. This is not to say that the logic is faulty; it is a simple observation that it is different.

Details on program delivery mechanisms are presented starting on page 10 of this report. In particular, the involvement of universities is detailed starting on page 11.

5.1 To what extent is the Program appropriately designed to achieve its objectives?

Evidence of progress to date toward achievement of Program objective / expected results

Achievement of the program objectives would suggest that the programs are appropriately designed. Chapters 6 and 7 will supply information on objectives achievement.

Stakeholder opinions on program design

Stakeholders were generally of the view that CGS and related programs are well designed.

- Offering awards at the Master's level was seen as a positive feature. The advent of the CGS also increased the number of awards overall.
- The assessment criteria are good, although a few thought they are too rigid and too academic.
- They are peer reviewed which ensures excellence and a high level of adjudication integrity.
- They are managed efficiently, with low administration costs — although a few informants felt that is not appropriate to have the universities be delegated the administration of the awards.

Notwithstanding this generally positive view, some stakeholders raised the following issues.

- The value discrepancy between CGS and other programs creates different tiers of awards. Some were of the view that a larger number of awards of a lower dollar value would be better than a smaller number of richer awards. Some others indicated that awards could be larger to keep up with living costs.
- Because of limited funding, the accessibility bar is very high and some very qualified students do not receive awards.
- Some informants were not comfortable with the duration of the awards; they suggested that a longer duration would better assist students.

- One aspect of the program design is controversial: CGS cannot be used outside Canada; this penalizes students who want to study abroad. Some informants defended this aspect of CGS on the basis that Agencies want the students to remain in Canada after their doctorates.

Student satisfaction with program characteristics

Master's students in receipt of a CGS award are less satisfied with the one-year duration of the award (72%) than with the amount of funding (88%). At NSERC, where agency-specific awards exist at the Master's level, satisfaction with the two features is the same for CGS awards and PGS-M awards; in fact, these awards are for the same duration and amount.

EXHIBIT 5.1
Student satisfaction with program design features

Satisfaction with...		CGS (a)	Agency award (b)
Master's			
The number of years that funding was available to you under the scholarship	All	72%	
	NSERC	83%	83%
The amount of funding available to you under the scholarship	All	88%	
	NSERC	89%	89%
	n	All	1,498
Doctorate			
The number of years that funding was available to you under the scholarship		73% ^b	66% _a
The amount of funding available to you under the scholarship		96% ^b	78% _a
	n	1,433	1,823
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level.			

At the doctoral level, CGS award recipients are somewhat more satisfied (by seven percentage points) of the duration of their award — although it

is objectively the same except at SSHRC where doctoral fellowships can last up to four years. They are clearly more satisfied (by 18 percentage points) with the amount of funding — which is objectively larger. Almost all doctoral CGS award recipients expressed satisfaction with the amount of funding they received.

5.2 What changes to the CGS Program design would make it more relevant and effective?

As already indicated, key informants' main issues with the current CGS design were related to the value discrepancy between CGS and other programs; limited funding that constrains accessibility; the duration of the awards; and limitations to studying abroad.

Key informant recommendations, while not consensual pointed toward reducing the funding gap between CGS and related awards; reducing the value of CGS awards and increasing the number of awards; lengthening the period of funding to two years at the Master's level and to four or five years at the doctorate level; and allowing international studies.¹

Other suggested modifications included the following:

- increasing the number of awards to stimulate graduate studies and thereby meet the demands of the economy over the next decade;
- adjusting the adjudication schedule to announce winners six to eight weeks earlier;
- automatically increasing the value of the awards based on inflation;
- increasing the public recognition to celebrate excellence;
- eliminating the use of the letter of reference that some see as of little value;
- increasing the emphasis in the research project.

¹ "The CGS program is wrong to place opportunity costs (ranging from \$30,000 to \$60,000 over four years) on students who pursue their doctorate outside of Canada. This penalizes students who get into such elite universities as Harvard and Oxford, or whose research may require them to be in a particular geographic or cultural area outside of Canada. Many faculty in Canada did not receive their doctoral training in Canada, particularly at the University of Toronto and McGill. Also, since just a small percentage of Canadian scholarship winners take their scholarships abroad, graduate programs are not besieged with a mass exodus of human capital in the first place." (Siler, 2004)

5.3 *Is the allocation of the scholarships among the three Agencies appropriate given the current distribution of full-time graduate students by group of disciplines?*

CGS funds were initially distributed among Agencies according to the enrolment statistics available at the time. The allocation was the following: 10% to CIHR, 30% to NSERC, and 60% to SSHRC. This was later revised to the following proportions: 16% to CIHR, 32% to NSERC, and 52% to SSHRC.

It is very difficult to breakdown student enrolment according to agency disciplinary focus. The main reason is that CIHR does not support only health disciplines; it supports researchers from any disciplines who study health-related issues. Consequently, this evaluation is not in a position to assess the match between the current CGS fund breakdown and enrolment.

Most key informants felt that the allocation of the CGS scholarships among the three Agencies is appropriate given the current distribution of full-time graduate students by group of disciplines. Some informants felt that CIHR should have a larger allocation. In most cases these informants were program managers at CIHR or university representatives who work with this agency. A few informants stated that the SSHRC share is too low as 55% of graduates are in the SSHRC area and they have access to fewer grants. There are limited other funding opportunities for students in the SSHRC disciplines.

Government priorities are best determined by the decisions made and the actions taken. Exhibit 4.2 compares the amounts spent on CGS by each agency to other types of agency expenditures and to new funding extended by government in the 2007 budget. This information suggests that the logic of distribution of CGS funding among Agencies departs from other government decisions attached to Agencies. This is not to say that the logic is faulty; it is a simple observation that it is different.

EXHIBIT 5.2
Indicators of government priority

	Spent on CGS in 2007	Agency expenditures, 2006-2007	Spent on scholarships, fellowships, prizes in 2006- 2007	New resources to Agencies in Budget 2007
CIHR	\$10.2 M	\$843.3 M	\$190.4 M	\$37 M
NSERC	\$36.7 M	\$895.4 M	\$123.7 M	\$37 M
SSHRC	\$61.7 M	\$327.2 M	\$96.7 M	\$11 M
% distribution				
CIHR	9%	41%	46%	44%
NSERC	34%	43%	30%	44%
SSHRC	57%	16%	24%	13%

Source: administrative data.

5.4 ***Is the mix of direct and indirect sources of support for graduate students optimal in each agency?***

Little information was amassed on this issue as part of the evaluation study. Key informants did not comment on it and no information was garnered from the literature.

The survey of students allows us to document the proportion of students who were in receipt of indirect support (defined as "amounts paid to you to conduct your own research" in the questionnaire) and the average value of such support.

The proportion of students in receipt of indirect support is higher among those who did not receive an award (except for SSHRC students where there is no difference). The incidence of receipt of indirect support is highest among CIHR Master's students (24%) but, even in this particular case, it is limited to one-quarter of students.

EXHIBIT 5.3
Students in receipt of indirect support

	% in receipt of indirect support			n		
	CGS (a)	Agency awards (b)	No award (c)	CGS	Agency awards	No award
Master's						
SSHRC	6%	—	8%	985		469
NSERC	11%	9% _c	15% ^b	469	458	224
CIHR	11% _c	—	24% ^a	143		143
Doctorate						
SSHRC	11%	9%	10%	821	807	1929
NSERC	4% _c	7% _c	18% ^{ab}	470	976	334
CIHR	8% _c	8% _c	18% _{ab}	231	152	498

^a The value is statistically different from that of the CGS group at least at the 0.05 level.

^b The value is statistically different from that of the agency-award group at least at the 0.05 level.

^c The value is statistically different from that of the no-award group at least at the 0.05 level.

Sample sizes don't allow the same level of detail with regard to the average value of the indirect support. It can be observed nonetheless that doctorate level indirect support is larger than Master's level indirect support for SSHRC and NSERC students (but not CIHR students). Also, SSHRC indirect support is smaller than support of NSERC and indirect support of NSERC is smaller than that of CIHR.

Indirect support tends to be somewhat larger for non-award students than for students in receipt of awards. Recipients of agency-specific awards also receive somewhat more in indirect support than CGS award recipients.

EXHIBIT 5.4
Value of indirect support

	Average indirect support of those in receipt of indirect support		n	
	Master's	Doctorate	Master's	Doctorate
SSHRC	3,802 ^a	6,503 ^b	101	359
NSERC	7,105 ^a	10,150 ^b	126	145
CIHR	11,621	13,015	51	122
CGS	5,057 ^c	5,925 ^c	129	128
Agency award ¹	6,591	7,414 ^c	41	155
No award	7,712 ^d	9,498 ^{de}	108	343

^a The value is statistically different from that of the doctorate at least at the 0.05 level.

^b The value is statistically different from that of the Master's at least at the 0.05 level.

^c The value is statistically different from that of the no-award group at least at the 0.05 level.

^d The value is statistically different from that of the CGS at least at the 0.05 level.

^e The value is statistically different from that of the regular agency award group at least at the 0.05 level.

¹ NSERC at the Master's level.

From these data, it is not possible to determine if the mix of direct and indirect support to students is optimal. It can be observed, though, that the highest frequency of indirect support is among students who did not get an award from CIHR at the Master's level, and that the proportion reached 24% in that group.

Key informants were not unanimous on this issue. Many were in favour of as much direct support as possible but some noted a trend away from such support. Most did not know how the current situation could be improved, though one university association representative noted that it is not a case of "either / or" but a need for more of both direct and indirect funding. This was echoed by a peer reviewer informant who said that there is never enough money and changing the mix would not make much of a difference. Another said that, although the balance is good, the overall level of support is not sufficient. There is a concern that, if student funding is insufficient, students might have to take on teaching work — with negative impacts on their research.

5.5 To what extent has the Program been delivered by Agencies and universities as intended?

Informants were asked if there have been changes in the programs since 2003. Many informants were unaware of any significant changes while others mentioned what they often referred to as “relatively minor tweaks to the programs”.

These changes were:

- there have been more scholarships added in 2007. Key informants found this appropriate.;
- recent name changes (e.g., Bombardier etc.);
- changed timing /deadlines;
- for CGS-M, the description has been made more detailed as students had trouble filling out the form previously;
- since the introduction of CGS-M, NSERC has changed its own Master's award program to one year from two years previously; candidates can request an extension;
- adjustments have been made in the electronic submission and electronic review for both CGS doctoral and CIHR doctoral awards. The CGS-M application will become electronic next year.

Despite some minor changes, informants were all of the opinion that the CGS is delivered as originally intended.

Promotion of the CGS program was one of the activities expected to take place as part of program administration. The purpose of this promotion was to make students and universities aware of the existence of CGS and, logically, to contribute to the branding of CGS as an award for exceptional academic performance.

The public presence of CGS was tested by conducting Internet searches on Google and on each of the agency Web sites, searching for "Canada Graduate Scholarships". The rationale for this analysis is that Internet searches are arguably the most common method of information retrieval for the current student population.

The top three results of the Google search were pages on each of the agency Web sites relative to the CGS program guidelines. Other hits on the first page of search results included a critical examination of CGS and a list of graduate scholarships posted by the British Council.

On the agency Web sites, the first page of search results identified program guidelines and forms, press releases, and lists of award recipients with their research topic. There is a fair degree of consistency in the information supplied by the Agencies. However, it is globally factual rather than promotional. This emphasises the fact that there appears little unified communication planning among the Agencies with regard to the branding of CGS as an exceptional award.

5.6 To what extent is the CGS Program on track to meet its allotted number of funded Master's and Doctoral students, by agency?

The original plans for CGS were that 2,000 awards would be offered at the Master's level and 2,000 at the doctorate level. In 2007, additional funds were made available.

Exhibits 5.5 and 5.6 demonstrate that program delivery was well synchronized with plans. It took three years to ramp up the Master's component to 2,000 awards and four years to do the same with doctorate awards. Also, program management reacted quickly to the additional resources made available in 2007.¹

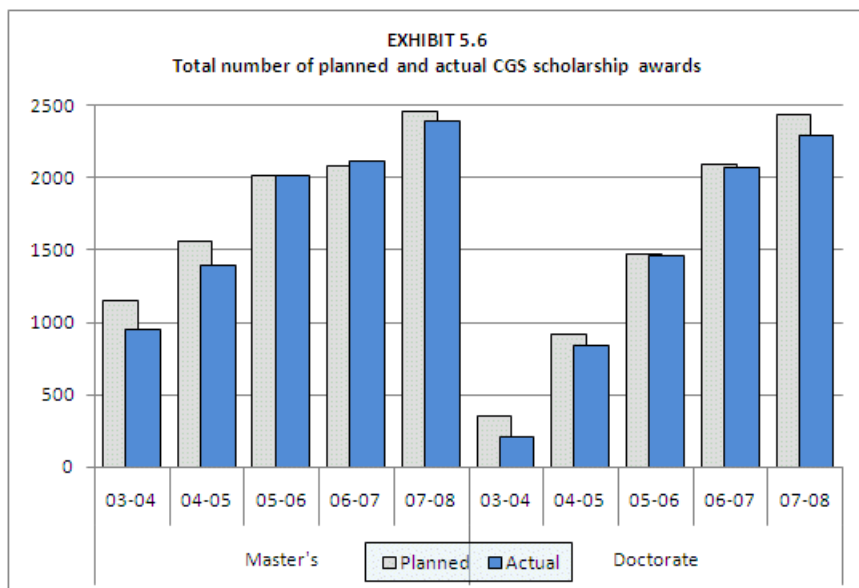
That said, in 2007-2008, the program was 5% short of the planned number of awards at the Master's level (2,383 versus 2,500) and 6% short at the doctorate level (2,286 versus 2,434).

¹ Planned awards for CIHR in 2006-2007 and 2007-2008 are estimates.

EXHIBIT 5.5 • Planned and actual CGS scholarship awards

		2003-04	2004-05	2005-06	2006-07	2007-08
MASTERS						
CIHR	Planned	200	200	200	275	350
	Actual	0	74	184	275	350
NSERC	Planned	129	343	557	600	800
	Actual	133	347	577	651	746
SSHRC	Planned	813	1,015	1,251	1,200	1,300
	Actual	811	973	1,253	1,187	1,287
TOTAL	Planned	1,142	1,558	2,008	2,075	2,450
	Actual	944	1,394	2,014	2,113	2,383
DOCTORATE						
CIHR	Planned	200	200	200	285	400
	Actual	70	142	215	285	397
NSERC	Planned	150	300	450	600	800
	Actual	140	288	442	599	676
SSHRC	Planned	0	415	815	1,200	1,234
	Actual	0	409	801	1,180	1,213
TOTAL	Planned	350	915	1,465	2,085	2,434
	Actual	210	839	1,458	2,064	2,286

Source: administrative data.



5.7 *Should a portion of CGS and agency scholarships be allocated to certain disciplines or should budgets for disciplines be determined by the number of applications received?*

Although one government informant noted that there is currently a view that we should start targeting a few specific areas in which Canadians can be leaders and have an impact (such as environmental health, natural resources, energy), most key informants were firmly against the notion of any form of targeting.

Several informants stated that students should make their choices regarding what they see as opportunities, and excellence should be the basis for determination of support.

Some informants, particularly at the universities, held strong opinions that there should be no trying to predict which disciplines or research topics might be important for the future.

None of the informants provided views on the suggestion that budgets for disciplines should or should not be determined by the number of applications received.

Chapter 6

SUCCESS

In brief

The evidence indicates that awards (CGS or related awards alike) were associated with positive outcomes with regard to: increased real enrolment in graduate studies in Canada (in a limited way); increased subjective incentives for students to enrol in graduate studies; increased recognition by the research community of the federal government's financial support for research training; high-quality research (in a limited way); improved branding of Canada as a home of research excellence and of Canadian universities as world-class research centres.

The award programs (CGS and related programs alike) had no demonstrated impact on the following outcomes: continuing doctoral studies after a Master's degree; increased capacity to meet demand for HQP; and, HQP holding positions in the faculties of Canadian universities. More time may be required to see these possible outcomes materialize.

The areas where CGS had an incremental impact over and above that of regular award programs involved: timely completion of graduate degrees (in a limited way and mostly at the doctorate level); and, contribution to the attraction and retention of experienced researchers (at the Master's level).

With regard to unintended effects associated with CGS and other award

programs, the evidence shows clearly that CGS at the Master's level has significant positive unintended impacts but that these impacts are at par with those of NSERC's PGS-M. The difference between CGS-M and PGS-M is in the branding of the CGS award as a recognition of the cream of the crop. It appears that this recognition does not produce the unintended impacts analysed here.

At the doctoral level, where award impacts could be documented, CGS and related awards produced the same unintended impacts in all areas except those associated with total income and working for pay. Since the value of the CGS doctoral award is two-thirds higher than that of regular scholarships, it should come as no surprise that CGS impacts students' finances. At the doctoral level, as was the case at the Master's level, the branding of CGS as superior scholarship does not appear to produce the unintended impacts we studied.

6.1 To what extent has the Program achieved its intended outcomes?

This issue comprises a number of facets.

a. Increased incentives for students to enrol in, and complete graduate studies in Canada (Master's and/or PhDs)

Overall, there has been a significant (57%) increase in full-time graduate studies enrolment (Masters and PhD) from 1996-2006 (AUCC, 2007). According to CAGS (2006b), student enrolment at the Master's level was stable from 1992 to 1998 and has been increasing slightly every year since 1998. However, the increase has been more pronounced since 2000. At the Doctoral level, student enrolment has been relatively stable from 1992 to 2000 and has been increasing slightly since then.

Factors associated with enrolment growth in graduate studies include job requirement inflation (AUCC, 2005), increased research support from federal and provincial governments and increased university operating budgets from the provincial governments (AUCC, 2002) and, more generally, government investments in education.

In the next 10 years, enrolment growth is expected to be between 9% and 18% but it will depend on the country's ability to supply and finance the resources required to accommodate this growth (AUCC, 2007).

The survey of students conducted as part of this evaluation provides empirical evidence concerning the impact of CGS and related programs on enrolment in graduate studies and completion time.

According to three-quarters of scholarship recipients, the possibility of receiving a scholarship and actually receiving a scholarship were important incentives to enroll in graduate studies. This is true at the Master's level as well as at the doctorate level. The prestige of the scholarship was an incentive to enroll for about one-half of award recipients. The proportion was the same among regular award recipients and recipients of CGS at the doctoral level. At the master's level, (NSERC) CGS recipients assigned somewhat more importance to the prestige of the scholarship than recipients of regular PGS-M awards (the difference is six percentage points but it is statistically significant).

Almost four NSERC Master's CGS recipients in ten (39%) stated that a regular agency scholarship would have been as meaningful to them as a regular PGS-M award. The proportion of doctorate award recipients sharing this view is 24%.

EXHIBIT 6.1
Importance of various factors in the decision to
enroll in graduate studies

(% important)		CGS (a)	Agency award (b)
Master's			
The possibility of receiving a scholarship	All	70%	
	NSERC	75%	71%
Receiving a scholarship	All	73%	
	NSERC	81%	77%
The prestige associated with the scholarship	All	45%	
	NSERC	48% ^b	42% ^a
	n	1,511	
	NSERC	433	434
Doctorate			
The possibility of receiving a scholarship		72%	69%
Receiving a scholarship		73%	71%
The prestige associated with the scholarship		49%	47%
	n	1,456	1,850
^a The value is statistically different from that of the CGS group at least at the 0.05 level.			
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.			

Between 2004 and 2006, according to program data, 13,129 different individuals were offered a CGS scholarship. Of them, 961 (7%) declined the offer. Based on the survey data, among the students who were offered a CGS scholarship and who were still studying at the time of the survey, 95% of those who accepted the scholarship studied in Canada whereas 52% of those who declined it studied in Canada. This cannot be construed as a retention effect of the program however since program guidelines generally forbid CGS award recipients from studying outside the country. In fact, 37% of those who declined the CGS award did so because of their plans to study outside of Canada; 22% decided not to pursue graduate studies while 16% changed their field of study and 18% accepted another scholarship.

Graduation rates vary greatly across universities and across disciplines (CAGS, 2004). At Master's level, graduation rates vary from a low of 53% in Humanities to a high of 93% in Life Sciences. At the Doctoral level, graduation rates vary from a low of 34% in Humanities to a high of 92% in Life Sciences (Berkowitz, 2003).

Since our study sample goes back only to 2004, it is not surprising that only about one-half of Master's students had completed their degree at the time of the survey. Among all Master's students, where the situation of CGS recipients can be compared to students who did not get an award, there is no statistically significant difference in degree completion up to that point. Among NSERC Master's students, recipients of PGS-M awards were more likely to have completed their degree than CGS recipients or non-recipients. However, this difference was reversed in the multivariate model tested.

At the doctorate level, recipients of agency-specific awards were twice as likely to have completed their degree at the time of the survey than CGS recipients and students who did not get an award (19% vs. 9% and 10%). However, after statistical control in a multivariate model, this effect disappears and CGS recipients turn out to have a lower likelihood of completion of their doctorate degree at the time of the survey than students in the other two groups.

EXHIBIT 6.2
Completion of degree

% who have completed their degree	CGS (a)	Agency award (b)	No award (c)
Master's			
All	58%	—	56%
NSERC	43% _b	52% ^a	48%
n	1,558	—	771
n NSERC	450	446	196
Doctorate			
All	9% _b	19% ^{ac}	10% _b
n	1,481	1,895	2,568

^a The value is statistically different from that of the CGS group at least at the 0.05 level.

^b The value is statistically different from that of the agency-award group at least at the 0.05 level.

^c The value is statistically different from that of the no-award group at least at the 0.05 level.

b. Increased enrolment in graduate studies in Canada

Likelihood to enroll in graduate studies was four percentage points higher among students who were offered a CGS award. This difference was observed at the Master's and at the doctorate level. Regular agency awards produced the same effect as CGS awards. These results were confirmed by multivariate analyses although the positive effect of doctoral CGS awards did not quite reach the expected level of statistical significance.

EXHIBIT 6.3
Enrolment in graduate studies

% who have enrolled in graduate studies	CGS (a)	Agency award (b)	No award (c)
Master's			
All	98% ^a		94% _c
NSERC	97% ^c	99% ^c	88% _{ab}
n	1,597		836
n NSERC	469	458	224
Doctorate			
All	97% ^c	98% ^c	93% _{ab}
n	1,522	1,935	2,761

^a The value is statistically different from that of the CGS group at least at the 0.05 level.

^b The value is statistically different from that of the agency-award group at least at the 0.05 level.

^c The value is statistically different from that of the no-award group at least at the 0.05 level.

c. Proportion of CGS Master's award recipients who continue with Doctoral studies, compared to proportion for regular agency-specific programs

About one-third of students who applied for a Master's award and who have (successfully or not) completed their Master's program have continued on to the PhD level. The proportion is the same for students in receipt of awards or not (and whether in simple bivariate form or within a multivariate model).

More than one-half of Master's students plan to attain the PhD level. Here again the results are the same whether or not the students were in receipt of an award. In fact, within a multivariate model, Master's award recipients demonstrated a lower likelihood of planning to continue on to the PhD level.

EXHIBIT 6.4
Master's students continuing to the doctoral level

	CGS (a)	Agency awards (NSERC only) (b)	No award (c)
% of Master's students who have continued to a PhD among those who have completed or left their Master's program (ns)	34%	34%	29%
n	847	198	402
% of Master's students who plan to attain the PhD level (ns)	58%	54%	58%
n	1,597	458	836

d. Increased recognition by the research community of the federal government's financial support for research training

This evaluation did not pursue the opinions of all components of the research community with regard to the federal government's financial support for research training — only those of some key informants and of applicants for awards.

Key informants were aware of the benefits of CGS and related programs and of the fact that the programs are federal actions. Because they are in direct receipt of the funding, students were thought by key informants to know the origin of the funds. A program management informant felt that the universities recognize CGS as a federal contribution to research training this but hold mixed feeling because of the gap in funding between CGS and related programs.

Award recipients (CGS or regular agency awards) are almost twice as likely as non recipients to consider that the "federal government makes a very significant financial contribution to support research training in Canada". At the doctoral level, CGS scholarship recipients provide somewhat more support to this notion than recipients of agency awards. These results are confirmed by multivariate analyses.

EXHIBIT 6.5
Perceptions regarding the federal contribution to research training

% who agree that "The federal government makes a very significant financial contribution to support research training in Canada"	CGS (a)	Agency award (b)	No award (c)
Master's			
All	82% ^c		48% _a
NSERC	85% ^c	84% ^c	61% _{ab}
n	1,597		836
n NSERC	469	458	224
Doctorate			
All	88% ^{bc}	83% _a ^c	47% _{ab}
n	1,522	959	2,761

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

e. Increased numbers of students completing (or expecting to complete) graduate degrees in a timely manner

Gluszynski and Peters (2005) reported that it takes on average 70 months (6 years) to complete a doctoral program. However, there are variations according to the field of study with Humanities (82 months) and Social Sciences (77 months) taking longer and Physical Sciences (65 months), Mathematics, Computer and information Sciences (65 months), Health Sciences (64 months), Engineering (62 months) and Chemistry (61 months) taking less time. Berkowitz (2003) reported similar results from a cohort of doctoral students from 1992 to 2002. At the Master's level, Berkowitz found that it took students from 3 to 9 terms to complete their degree. The lowest was found in the Humanities (3 terms).

According to this evaluation's student survey, Master's students who completed their degree took a little more than two years to do so.¹ Those who have not yet completed it expect that it will take them about six months longer. CGS recipients appear to have adopted a somewhat faster pace.

Within multivariate models, the estimates are that Master's CGS recipients actually completed their degree 1.1 months before regular agency award recipients and of students who did not get an award; the difference between the latter two groups does not reach statistical significance. Among those who have not yet completed, expectations are that regular award recipients will complete their program 2.7 months earlier than others. Estimates for CGS recipients and those who did not receive an award are not statistically different.

At the doctoral level, no difference in actual time of completion reached statistical significance in the multivariate tests even though CGS recipients appeared to have completed their program slightly faster than those who did not receive an award. With regard to forecasted time to completion, CGS recipients estimate that they will take 3 months less than the other two groups to complete their degree.

¹ Note that the fact that some students were still working on their degree when they filled out the questionnaire tends to lead to an under-estimation of the duration of studies.

EXHIBIT 6.6
Months to complete a graduate degree

Months to complete the degree	CGS (a)	Agency award (b)	No award (c)
Master's, actual months for those who have already completed			
All (n)	25 _c (802)		27 ^a (371)
CIHR (n)	26 _c (59)		29 ^a (66)
NSERC (n)	25 _{bc} (157)	28 ^a (188)	29 ^a (71)
SSHRC (n)	25 _c (586)		26 ^a (234)
Master's, forecasted months for those who have not already completed			
All (n)	30 (728)		31 (380)
CIHR (n)	36 (74)		36 (66)
NSERC (n)	31 (286)	33 (253)	33 (121)
SSHRC (n)	28 (368)		29 (193)
Doctorate, actual months for those who have already completed			
All (n)	48 _c (109)	52 (136)	52 ^a (166)
CIHR (n)	56 (12)	54 (11)	52 (40)
NSERC (n)	47 (64)	49 (153)	50 (21)
SSHRC (n)	48 (33)	52 (125)	52 (105)
Doctorate, forecasted months for those who have not already completed			
All (n)	50 _{bc} (1,348)	56 ^{ac} (799)	54 ^a _b (2,336)
CIHR (n)	52 (215)	51 (137)	52 (426)
NSERC (n)	47 (389)	48 (781)	48 (281)
SSHRC (n)	51 _{bc} (744)	56 ^a (662)	55 ^a (1,629)

^a The value is statistically different from that of the CGS group at least at the 0.05 level.

^b The value is statistically different from that of the agency-award group at least at the 0.05 level.

^c The value is statistically different from that of the no-award group at least at the 0.05 level.

About one-half of Master's students who did not receive an award indicated that their progress was according to plans or ahead of plans. CGS recipients at the Master's level were of this view 60% of the time. While the difference is statistically significant at this level, it does not survive the test of the multivariate model: accounting for other aspects

distinguishing CGS recipients from other students, there is no difference in progress through the program at the Master's.

At the doctoral level, progress is fastest for CGS recipients, followed by regular award recipients and then by those who did not receive an award. These differences are statistically significant even in the multivariate model.

Key reasons for being behind schedule are: the research taking longer than expected (23%), lack of funding for living expenses (15%), personal reasons (13%) and teaching assistantship (12%). Key reasons for being ahead of schedule are: having maintained one's research focus (20%), having maintained the same supervisor (19%), good funding for living expenses (14%), personal reasons (13%), and good funding for the research project (14%).

EXHIBIT 6.7
Progress through the study program

% whose progress through the study program in accordance with your original plan or ahead	CGS (a)	Agency award (b)	No award (c)
Master's			
All	56% ^c		47% _a
NSERC	60% ^b	47% _a	51%
n	1,597		836
n NSERC	450	446	196
Doctorate			
All	59% ^{bc}	49% ^c	41% _{ab}
n	1,522	959	2,761

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

Awards were considered important by recipients in affecting the pace of their progress through their Master's degree (60%) and their doctoral

program (more than 70%). However, in this regard, CGS award recipients attributed the same importance to the award they received as did recipients of regular awards of theirs. This is true of both the Master's and the doctorate level.

Awards appear to have a lesser effect on time to program completion: about one-third of CGS Master's award recipients indicated such an effect; the proportion is less among doctoral award recipients (6% for CGS, 11% for regular awards). At the doctorate level, regular awards were rated as more important than CGS awards in affecting time to program completion.

EXHIBIT 6.8
Importance of awards regarding the pace of studies

		CGS (a)	Agency award (b)
	(% important)		
Master's			
The pace of your progress through the study program	All	60%	
	NSERC	54%	55%
The time it took you to complete the program	All	34%	
	NSERC	21% _b	28% ^a
n	All	1,597	
	NSERC	469	458
Doctorate			
The pace of your progress through the study program		71%	75%
The time it took you to complete the program		6% _b	11% ^a
n		1,522	959

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.

f. High-quality research

The quality of the research environment was represented by students' satisfaction with regard to nine aspects of the environment in which respondents studied. The answers to the nine questions were averaged to

produce a scale of satisfaction with the research environment (Cronbach's alpha = 0.82). Scores can vary between 1 and 7.

The data show that award recipients were more satisfied with their research environment than non-award recipients, by a relatively small but statistically significant margin. There was no statistically significant difference between CGS recipients and agency award recipients, though.

These results are valid for the Master's level and the doctorate level, and they hold under multivariate analysis.

EXHIBIT 6.9
Satisfaction with the research environment

(average on a 7-point scale)	CGS (a)	Agency award (b)	No award (c)
Master's			
All	5.6 ^c		5.4 _a
NSERC	5.7 ^c	5.6 ^c	5.4 _{ab}
n	1,534		766
n NSERC	443	442	193
Doctorate			
	5.7 ^c	5.7 ^c	5.5 _{ab}
n	1,463	932	2,536

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

About one-half of Master's students hold positions of teaching assistant. The proportion is statistically the same in all three groups. Regarding teaching assistantship at the Master's level and teaching or research assistantship at the doctorate level, CGS recipients and regular award recipients appear less involved than students without these awards.

EXHIBIT 6.10
Teaching and research assistantship

% with teaching or research assistantship		CGS (a)	Agency award (b)	No award (c)
Master's				
% with teaching assistantship	All	49%		49%
	NSERC	61% ^b	53% ^a	54%
% with research assistantship	All	34%		36%
	NSERC	24% ^{b,c}	16% ^{a,c}	35% ^{ab}
	n	All	1,597	836
	NSERC	469	458	224
Doctorate				
% with teaching assistantship		47% ^c	47%	52% ^a
% with research assistantship		23% ^{b,c}	32% ^{a,c}	37% ^{ab}
n		1,522	959	2,761
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level. ^c The value is statistically different from that of the no-award group at least at the 0.05 level.				

Publications are another indicator of excellence. At the Master's level, there are few statistically significant differences in the number of presentations, articles or research papers produced by CGS recipients, regular award recipients and students not in receipt of these awards. In fact, none of the differences hold under the multivariate models.

At the doctoral, the opposite is true. Award recipients made more presentations and published more articles and research papers than students who did not receive the awards. This holds in the multivariate models. CGS recipients and regular agency award recipients had similar rates of publication.

**EXHIBIT 6.11
Publications**

		CGS (a)	Agency award (b)	No award (c)
Master's				
Oral or poster conference presentations	All	2.5		2.5
	NSERC	2.6	3.0 ^c	2.4 ^b
Articles	All	0.7		0.7
	NSERC	0.8	0.8	0.9
Research papers, books, book chapters and technical publications	All	0.6		0.6
	NSERC	0.6 ^c	0.6 ^c	1.0 ^{ab}
n		All	1,556	819
		NSERC	457	215
Doctorate				
Oral or poster conference presentations		5.6 ^c	6.9 ^{ac}	4.8 ^{ab}
Articles		2.3 ^{bc}	2.0 ^a	1.4 ^{ab}
Research papers, books, book chapters and technical publications		1.5 ^c	1.5 ^c	1.1 ^{ab}
n		1,513	950	2,744
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level. ^c The value is statistically different from that of the no-award group at least at the 0.05 level.				

g. Increased ability to attract and retain experienced researchers

Among Master's students who completed their degree and held employment at the time of the survey, award recipients are more likely than non-recipients to hold a job that corresponds to their professional expectations. Moreover, CGS participants are more likely than the other two groups to hold employment that is related to their graduate studies. These results are supported by multivariate analyses.

These relationships are not replicated at the doctorate level in that the differences don't reach statistical significance — except for regular agency

award recipients being more likely than non-recipients to report employment that is related to their studies.

EXHIBIT 6.12
Likelihood of holding a job requiring high qualifications

% of students who have completed their degree and current hold a job		CGS (a)	Agency award (b)	No award (c)
Master's				
% whose current job corresponds to their professional expectations	All	72% ^c		51% _a
	NSERC	78% ^c	67% ^c	45% _{ab}
% whose employment is related to the graduate studies pursued	All	80% ^c		65% _a
	NSERC	88% ^{bc}	72% _a	60% _a
% whose current job demands a graduate degree	All	62% ^c		44% _a
	NSERC	67% ^c	58% ^c	37% _{bc}
% whose job demands a graduate degree in their field	All	56% ^c		40% _a
	NSERC	55%	52%	39%
n	All	581		280
	NSERC	83	126	43
Doctorate				
% whose current job corresponds to their professional expectations		85%	80%	73%
% whose employment is related to the graduate studies pursued		93%	95%	88%
% whose current job demands a graduate degree		91% ^c	81%	73% _a
% whose job demands a graduate degree in their field		92%	93% ^c	82% _b
n		99	123	152
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level. ^c The value is statistically different from that of the no-award group at least at the 0.05 level.				

Among Master's students who completed their degree and held employment at the time of the interview, award recipients were more likely than non-recipients to hold a job that required the graduate degree they sought (supported by multivariate analyses). It is less clear whether award

recipients required a degree in their field of study more often than non-award recipients. Results are similar at the doctorate level, but are barely statistically significant.

EXHIBIT 6.13
Sector of employment

	In which sector are you employed?		In which sector do you expect to work once you graduate?	
	Master's	Doctorate	Master's	Doctorate
ALL STUDENTS				
Private sector	30%	11%	22%	11%
Government	21%	8%	21%	11%
University	37%	75%	52%	76%
Not-for-profit	12%	6%	5%	3%
n	1,285	589	1,690	4,157
SSHRC				
Private sector	26%	5%	10%	5%
Government	25%	9%	24%	9%
University	35%	78%	59%	82%
Not-for-profit	14%	8%	7%	3%
n	805	280	758	2,563
NSERC				
Private sector	43%	18%	34%	21%
Government	13%	7%	17%	12%
University	35%	72%	46%	66%
Not-for-profit	9%	4%	3%	1%
n	387	261	788	1,100
CIHR				
Private sector	17%	4%	25%	18%
Government	17%	13%	23%	15%
University	59%	79%	48%	64%
Not-for-profit	7%	4%	3%	3%
n	92	48	146	492

Note: $p(\chi^2) < 0.05$ except CIHR current employment.

The employer of the plurality is the university sector. This is more likely the case among doctorate students than Master's students. The private sector is the second most frequent employer, followed closely by government.

Roughly three-quarters of Masters' students who were recipients of awards indicated that their graduate studies increased their desire to pursue a career in research or teaching. This is somewhat more than among students who did not get these awards where about two-thirds shared this feeling. The results are supported by multivariate analyses.

Similar results were obtained among doctorate students although the proportion holding this feeling was larger than among Master's students.

EXHIBIT 6.14
Desire to pursue a career in research or teaching

% who agree that "The experience I have gained during my studies has increased my desire to pursue a career in research or in teaching that requires my level of training"	CGS (a)	Agency award (b)	No award (c)
Master's			
All	77% ^c		66% _a
NSERC	76% ^c	74%	68% _a
n	1,597		836
n NSERC	450	446	196
Doctorate			
All	84% ^c	85% ^c	75% _{ab}
n	1,522	959	2,761

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

h. Expected increased capacity to meet demand for highly qualified personnel (HQP) in public and private sector organizations

Several key informants noted that it is too early to make a determination of the success of CGS and related programs with regard to meeting the demand for HQP. However, according to key informants, the increased funding that came with the inception of CGS is bound to provide more HQP to the public and private sectors. However, one informant noted that, while this increased availability may assist some companies, it will not have an impact on a macro-economic level.

Between eight and nine in ten students think they are likely to pursue a career in research or in teaching requiring their level of training. The proportion is the same for all groups of award recipients or non-recipients, within the Master's and the doctorate segments. These results are confirmed by multivariate analyses.

There is also a high level of consensus on the fact that graduate studies are an important element of students' career goals: upwards of 90% agree with this notion. Here again, the proportions are the same, within degree levels, for all three groups of recipients and non-recipients (and in bivariate and in multivariate analyses).

About two in three Master's students indicated that they know what their career goals are. There is no variation among groups of recipients and non-recipients in this regard, even within the multivariate analysis. Doctorate students are somewhat more likely to know their career goals (upwards of 80%) but recipients of agency awards are somewhat more so than CGS award recipients (including in the multivariate model).

EXHIBIT 6.15
Research and training as career goals

		CGS (a)	Agency award (b)	No award (c)
Master's				
% of students likely to pursue a career in research or teaching	All	83% ^c		78% _a
	NSERC	81%	77%	78%
% for whom graduate studies are an important element of their career goals	All	94% ^c		89% _a
	NSERC	92%	91%	87%
% who know what their career goals are	All	72%		74%
	NSERC	64%	65%	66%
n	All	1,066		543
	NSERC	383	329	167
Doctorate				
% of students likely to pursue a career in research or teaching		90%	90%	87%
% for whom graduate studies are an important element of their career goals		96%	96%	94%
% who know what their career goals are		80% _b	85% ^a	82%
n		1,362	788	2,384
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level. ^c The value is statistically different from that of the no-award group at least at the 0.05 level.				

i. Recipients/highly qualified personnel holding (or expecting to hold) positions in the faculties of Canadian universities

Be they Master's students or doctorate students, award recipients or not, graduate students were mostly interested in employment at universities, followed by government, the private sector and the not-for-profit sector. Bi-variate and multivariate tests all conclude that membership to one award group or the other is unrelated to the employment sectors of interest.

EXHIBIT 6.16
Interest in employment in various sectors

% very much or extremely interested in employment in various sectors		CGS (a)	Agency award (b)	No award (c)
Master's				
Private sector	All	44%		48%
	NSERC	53%	57%	57%
Government	All	55%		55%
	NSERC	55%	53%	47%
University	All	73%		70%
	NSERC	68%	60%	67%
Not-for-profit	All	39%		36%
	NSERC	33%	36%	31%
n	All	1,080		553
	NSERC	387	335	167
Doctorate				
Private sector		34%	30% ^c	36% ^b
Government		47%	46%	49%
University		82%	85%	83%
Not-for-profit		34%	36%	36%
n		1,382	803	2,421

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

Likelihood of pursuing post-doctoral research is partly dependent upon having received an award — until contextual factors are taken into consideration. Regular agency award recipients display a likelihood of pursuing post-doctoral research that is not statistically different from that of CGS recipients, award recipients overall are more likely to adopt this path than non-recipients. However, this conclusion is voided by the multivariate analysis which demonstrates that other factors are at play and explain the difference between these two groups.

EXHIBIT 6.17
Post-doctoral research

	CGS (a)	Agency award (b)	No award (c)
% of doctorate students who continued with post-doctoral research	65% ^c	50% ^c	44% ^{ab}
n	119	306	188

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

Of all students in the sample who completed a doctorate degree, about one-fifth held faculty positions. On the surface, it seemed as though recipients of regular awards were less likely to hold such positions than students who received no award. However, this conclusion was contradicted by the multivariate analysis that concluded that there were no statistically significant differences among the three groups.

EXHIBIT 6.18
Likelihood of holding a faculty position

	CGS (a)	Agency award (b)	No award (c)
% of doctorate students who hold a faculty position	13% ^b	14% ^c	23% ^a
n	119	306	188

^a The value is statistically different from that of the CGS group at least at the 0.05 level.

j. Improved branding of Canada as a home of research excellence and Canadian universities as world-class research centres

According to some key informants, because CGS is for Canadians only and can only be used in Canada, it cannot have the same world-wide impact

as some other programs (such as the Canada Research Chairs Program) which receive more international attention.

Master's students averaged about one presentation at an international conference. Recipients of regular agency awards averaged slightly (but significantly) more presentations at international conferences than Master's students who did not receive an award. These results are confirmed by the multivariate analyses.

At the doctoral level, award recipients produced about one more presentation than those without awards. Although the multivariate model brings the estimates of the differences down somewhat, it confirms this general pattern.

EXHIBIT 6.19
Presentations made at international conferences

Average number of presentations at international conferences	CGS (a)	Agency award (b)	No award (c)
Master's			
All	0.7		0.6
NSERC	0.9	1.0 ^c	0.8 _b
n	1,588		830
n NSERC	468	457	224
Doctorate			
All	2.6 ^c _b	2.9 ^{ac}	1.9 _{ab}
n	1,518	945	2,737

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

6.2 ***What are the overall incremental program impacts? To what extent can outcomes be attributed in whole or in part to the CGS Program and/or other scholarship programs?***

Program success was described in the previous section. Exhibit 6.20 provides a snapshot of findings regarding the incremental impact of CGS and related programs.¹ This summary is mainly based on the multivariate models developed using student survey data and the comparison of the treatment groups. The quality of the available evidence is also depicted.

The evidence indicates that the awards programs (CGS or related awards alike) were associated with **positive outcomes** with regard to:

- increased real enrolment in graduate studies in Canada (in a limited way);
- increased subjective incentives for students to enrol in graduate studies;
- increased recognition by the research community of the federal government's financial support for research training;
- high-quality research (in a limited way);
- improved branding of Canada as a home of research excellence and Canadian universities as world-class research centres.

Award programs (CGS and related programs alike) had **no significant impact** on the following outcomes:

- continuing doctoral studies after a Master's degree;
- increased capacity to meet demand for HQP;
- HQP holding (or expecting to hold) positions in the faculties of Canadian universities.

More time may be required to see these possible outcomes materialize.

¹ Results concerning indirect support will be used in the next section.

EXHIBIT 6.20
Summary of findings on program success

	Master's				Doctorate				Quality of the evidence
	CGS	Agency award	All awards	Indirect support	CGS	Agency award	All awards	Indirect support	
Increased incentives for students to enrol in graduate studies			Positive	N/A			Positive	N/A	Moderate ¹
Increased incentives for students to complete graduate studies	Nil	Negative		Nil	Negative	Positive		Nil	Moderate ²
Increased enrolment in graduate studies in Canada			Limited positive	Nil			Limited positive	Nil	Strong ³
Proportion of CGS Master's award recipients who continue with Doctoral studies			Nil	Nil			N/A		Moderate ²
Increased recognition by the research community of the federal government's financial support for research training			Positive	Nil	Nil		Positive	Nil	Strong ³
Increased numbers of students completing (or expecting to complete) graduate degrees in a timely manner	Limited positive	Nil		Nil	Limited positive	Limited positive		Nil	Strong ³
High-quality research			Limited positive	Nil			Limited positive	Nil	Strong ³
Increased ability to attract and retain experienced researchers	More positive	Positive		Nil			Nil	Nil	Moderate ⁴
Expected increased capacity to meet demand for highly qualified personnel (HQP) in public and private sector organizations			Nil	Nil			Nil	Nil	Weak ⁵
Recipients/highly qualified personnel holding (or expecting to hold) positions in the faculties of Canadian universities			Nil	Nil			Nil	Nil	Moderate ²
Improved branding of Canada as a home of research excellence and Canadian universities as world-class research centres	Nil	Limited positive		Limited positive			Positive	Nil	Weak ⁵

¹ Self-assessed impacts.

² Limited time to document effects.

³ Comparisons could be drawn among treatment groups and time elapsed since the award was not a factor.

⁴ Small sample sizes.

⁵ Limited indicators.

The areas where **CGS** had an **incremental impact** over and above that of regular award programs were:

- timely completion of graduate degrees (in a limited way and mostly at the doctorate level);
- contribution to the attraction and retention of experienced researchers (at the Master's level).

6.3 What are the comparative impacts for CGS recipients, graduate students funded through agency-specific scholarship programs and students who rely on other means of support?

The evaluation also verified the existence of a number of other effects that funding may have on graduate students. CGS and related programs are not accountable for producing these effects but they would constitute positive, unintended consequences.

Reasons for attending graduate school

The primary reason for which students attend graduate school is their deep interest in the field of study; more than 90% indicated that as an important factor. The distant second most important reason is the challenge itself, followed by the necessary credentials. The relative and absolute importance scores provided by Master's students are very similar to those of doctorate students.

Where differences exist among award groups, award recipients (sometimes CGS recipients, other times agency award recipients) tend to assign more importance than students who did not receive awards. All in all, no telling pattern emerges from the comparison of reasons for attending graduate school according to award groups.

EXHIBIT 6.21
Reasons for attending graduate school

% stating that the following were important in their decision to enroll in a graduate study program		CGS (a)	Agency award (b)	No award (c)	All students
Master's					
Your deep interest in the field of study	All	90% ^c		83% _a	91%
	NSERC	90%	92% ^c	86% _b	
The necessary credentials for a desired position	All	63% ^c		53% _a	61%
	NSERC	61%	62%	55%	
The challenge alone or the goal for its own sake	All	70% ^c		66% _a	72%
	NSERC	68%	70%	74%	
Contributing to the improvement of the quality of life for Canadians	All	56% ^c		50% _a	55%
	NSERC	50%	52%	48%	
Encouragement from faculty	All	57% ^c		45% ^a	54%
	NSERC	53%	52%	45%	
n	All	1,597		836	3,139
	NSERC	450	446	196	
Doctorate					
Your deep interest in the field of study		93% ^c	95% ^c	85% _{ab}	94%
The necessary credentials for a desired position		69% ^c	71% ^c	62% _{ab}	69%
The challenge alone or the goal for its own sake		69%	70%	65%	71%
Contributing to the improvement of the quality of life for Canadians		60% ^c	58%	56% ^a	59%
Encouragement from faculty		58% ^c	62% ^c	46% _{ab}	54%
n		1,522	959	2,761	5,507
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level. ^c The value is statistically different from that of the no-award group at least at the 0.05 level.					

Interaction with faculty on research projects

Respondents were asked to rate how involved they were in eleven research-related activities, with your supervisor and other faculty. Subjected to factor analysis, the data showed that there were three relevant grouping of the eleven activities. They were:

- core research activities: participating in designing research projects and methodology; collecting data and information; analyzing research results; presenting research results at conferences; publishing articles or books about research results; using laboratory equipment and instruments;
- research support activities: writing grant proposals / applications; providing administrative support in the context of a research project; managing databases;
- research in different environments: conducting research in an interdisciplinary environment; conducting research in collaboration with the private sector, not-for-profit, government.

Average values of involvement were calculated for each student on each scale (Cronbach alpha: core research activities, 0.88; research support activities, 0.67; research in different environments, 0.51).

Graduate students were more involved in core research functions than they are in research support activities. The lowest scores were given to participation in research taking place in multi-disciplinary or non-academic settings.

The different award groups depicted similar patterns of participation to research activities. The two statistically significant differences in multivariate analyses were (1) that recipients of NSERC Master's awards were more involved than non-award recipients in research in different environments (but not CGS award recipients) and (2) that award recipients at the doctoral level (CGS and agency awards) were more involved in core research activities than non-recipients.

EXHIBIT 6.22
Involvement in research activities

Involvement in research activities (average on a 7-point scale)		CGS (a)	Agency award (b)	No award (c)
Master's				
Core research activities	All	4.0		3.9
	NSERC	5.3	5.2	5.0
Research support activities	All	3.2		3.2
	NSERC	3.4	3.4	3.3
Research in different environments	All	3.0		2.9
	NSERC	3.4 _b	3.9 ^{ac}	3.2 _b
n	All	1,558		771
	NSERC	450	446	196
Doctorate				
Core research activities		4.6 ^{bc}	3.8 _a	3.9 _a
Research support activities		3.4	3.3	3.3
Research in different environments		3.1 ^{bc}	2.7 _a	2.9 _a
n		1,481	946	2,568
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level. ^c The value is statistically different from that of the no-award group at least at the 0.05 level.				

From a purely descriptive standpoint, it is interesting to note that about 80% of graduate students indicated that they had frequent interactions with researchers in their discipline at their institution. One-third of graduate students interacted with researchers from other disciplines within their institution. Proportions in touch with researchers in other institutions were lower for Master's students while doctorate students were in touch with researchers from their discipline in other institutions as much as they were in touch with researchers from other disciplines at their own institution.

EXHIBIT 6.23
Interactions with other researchers (levels of study)

% involved at least frequently in interactions with researchers from...	Master's level (a)	Doctorate level (b)
your discipline at your institution	80% ^b	78% _a
other disciplines at your institution	33%	34%
your discipline at other institutions	19% _b	33% ^a
other disciplines at other institutions	5% _b	9% ^a
n	3,139	5,508

^a The value is statistically different from that of column a at least at the 0.05 level.

^b The value is statistically different from that of column b at least at the 0.05 level.

Factor analysis indicated that responses to these four questions measure one common underlying factor that we labelled "interactions with other researchers". We built a summary score out of the average for these four answers (Cronbach alpha = 0.69).

Differences in the level of interaction with researchers according to the award groups appear minimal. NSERC CGS-M students may have declared a slightly higher level of interactions than NSERC non-recipients, but this difference disappeared in the multivariate model. Multivariate analysis suggests that regular agency award recipients at the doctorate level enjoy slightly more interactions with researchers but the difference is small (albeit statistically significant).

EXHIBIT 6.24
Interactions with other researchers (treatment groups)

Interactions with researchers (average on a 7-point scale)	CGS (a)	Agency award (b)	No award (c)
Master's			
All	3.9		3.8
NSERC	4.0 ^c	3.9	3.8 _a
n	1,558		717
n NSERC	450	446	196
Doctorate			
All	4.2 ^c	4.2 ^c	4.0 _{ab}
n	1,481	946	2,568

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

Sources of support

CGS recipients at the Master's level declared annual income about \$2,500 larger than non-recipients and equal to the income of NSERC PGS-M recipients. Non-recipients at the Master's level received more income in the form of loans (some \$3,000 vs. \$1,150 for CGS recipients), assistantships (\$6,500 vs. \$4,400), earned income (\$3,300 vs. \$1,500) and indirect support (\$1,200 vs. \$500), but considerably less as excellence-based awards (\$8,000 vs. \$17,000) as can be expected. At the Master's level, therefore, the awards appear to augment students' income by about 10% and to reduce the students' loan and work-for-pay burden. The total debt load of award recipients is less than that of non-recipients, and CGS recipients fare even better than regular award recipients in this regard. Multivariate analyses support these conclusions.

EXHIBIT 6.25 • Sources of income

Students' average income (\$)	ALL AGENCIES			NSERC ONLY		
	CGS (a)	Agency award (b)	No award (c)	CGS (a)	Agency award (b)	No award (c)
Master's	ALL AGENCIES			NSERC ONLY		
Loans from your friends and family?	350 _c	—	668 ^a	205 _c	280 _c	734 ^{ab}
Loans from others, including financial institutions?	803 _c	—	2,298 ^a	401 _c	758 _c	1,363 ^{ab}
Money given to you (excluding loans)?	426	—	627	432	310	375
Teaching assistantships?	2,884 _c	—	3,381 ^a	3,127 ^b	2,346 _a	3,518 ^b
Research assistantships?	1,609 _c	—	3,105 ^a	1,336 _c	1,047 _c	3,752 ^{ab}
Other earned income?	1,461 _c	—	3,312 ^a	614 _c	1,264	1,876 ^a
Excellence-based awards?	17,170 ^c	—	8,024 _a	19,211 ^c	18,411 ^c	10,458 _{ab}
Need-based award (e.g., bursary)?	119 _c	—	536 ^a	105 _c	128 _c	544 ^{ab}
Amounts paid to you to conduct your own research?	489 _c	—	1,156 ^a	857	701 _c	1,385 ^b
Other sources?	375	—	482	417	222	424
TOTAL	25,860^c	—	23,443_a	26,983^c	26,240	24,149_a
Total study-related debt	9,312 _c	—	15,660 ^a	6,547 _{bc}	7,566 ^a _c	10,929 ^{ab}
Modelled difference from no-award (p<0.01)				2,758	2,309	—
	n 1,061	—	535	379	332	159
Doctorate						
Loans from your friends and family?	192 _c	550 _c	914 ^{ab}			
Loans from others, including financial institutions?	410 _c	914 _c	1,639 ^{ab}			
Money given to you (excluding loans)?	340 _c	574	630 ^a			
Teaching assistantships?	2,630 _{ab}	3,422 ^a _b	4,320 ^{ab}			
Research assistantships?	1,391 _c	1,849 _c	2,981 ^{ab}			
Other earned income?	1,227 _c	2,131 _c	4,937 ^{ab}			
Excellence-based awards?	29,280 ^{ab}	19,658 ^a _c	10,224 _{ab}			
Need-based award (e.g., bursary)?	150 _c	230 _c	512 ^{ab}			
Amounts paid to you to conduct your own research?	569 _c	572 _c	1,305 ^{ab}			
Other sources?	283 _c	495	676 ^a			
TOTAL	37,265^{bc}	30,672^a_c	28,261_{ab}			
Total study-related debt	8,778 _{bc}	12,755 ^a _c	17,641 ^{bc}			
Modelled difference from no-award (p<0.01)	9,353	1,568	—			
	n 1,365	799	2,361			

^a The value is statistically different from that of the CGS group at least at the 0.05 level.

^b The value is statistically different from that of the agency-award group at least at the 0.05 level.

^c The value is statistically different from that of the no-award group at least at the 0.05 level.

At the doctorate level, CGS recipients reported annual incomes 22% (and some \$6,600) higher than recipients of regular agency awards who, themselves, reported annual incomes 9% (and \$2,400) higher than non-recipients. Compared to regular award recipients, CGS award recipients enjoyed smaller loans (some \$900) and less earned income (\$2,200 including assistantships). The total debt load of award recipients is considerably less than that of non-recipients, and CGS recipients fare even better than regular award recipients in this regard. These results are supported by multivariate analyses.

Employment during graduate school

Including those who declared that they typically did not work for pay during their graduate program, CGS recipients at the Master's level averaged 7 hours of paid work per week which is less than the 12 hours worked by non-recipients. NSERC PGS-M recipients worked a number of hours similar to that worked by CGS recipients.

Differences according to award groups are more striking at the doctorate level. Recipients of regular agency awards worked almost twice as many hours per week as CGS recipients, and non-recipients worked even longer hours.

Results at the Master's and doctorate level are supported by multivariate analyses.

EXHIBIT 6.26
Hours of employment during graduate studies

Weekly hours of employment during graduate studies	CGS (a)	Agency award (b)	No award (c)
Master's			
All	7.1 _c		11.7 ^a
NSERC	3.6 _c	4.1 _c	6.6 ^{ab}
n	1,558		771
n NSERC	450	46	196
Doctorate			
All	4.9 _{bc}	9.0 ^a _c	12.1 ^{ab}
n	1,481	946	2,568

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

Obtaining an award decreased the likelihood of working during graduate studies. At the Master's level, CGS and the NSERC regular program showed similar impacts in this regard (particularly evidenced by the multivariate models but already present in the bi-variate results).

At the doctorate level as well, the award programs appeared to have similar results with regard to employment during graduate studies although regular agency programs did not produce as much of an effect as CGS.

At both graduate levels, CGS had a large effect on the reasons why students take on employment: CGS recipients were two to four times more likely to indicate that they worked by choice (rather than by obligation) compared to non-recipients. Recipients of agency awards fell between the two other groups.

EXHIBIT 6.27
Working during graduate studies

		CGS (a)	Agency award (b)	No award (c)
Master's				
Had a paid job during the graduate program	All	67% ^c		74% ^a
	NSERC	47% ^c	41% ^c	58% ^{ab}
Had an academic job	All	54% ^c		50% ^a
	NSERC	43% ^b	32% ^{ac}	47% ^b
n	All	1,558		771
	NSERC	450	446	196
(If had a job) job contributed to the CV (very much or extremely)	All	58% ^c		46% ^a
	NSERC	55%	54%	44%
(If had a job) worked by choice	All	38% ^c		18% ^a
	NSERC	61% ^{bc}	46% ^{a c}	31% ^{ab}
n	All	1,036		564
	NSERC	214	188	111
Doctorate				
Had a paid job during the graduate program		54% ^{bc}	76% ^a	76% ^a
Had an academic job		49% ^{bc}	69% ^{ac}	61% ^{a c}
n		1,481	946	2,568
(If had a job) job contributed to the CV (very much or extremely)		69% ^c	67% ^c	50% ^{ab}
(If had a job) worked by choice		62% ^{bc}	26% ^{a c}	14% ^{ab}
n		807	705	1,931
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level. ^c The value is statistically different from that of the no-award group at least at the 0.05 level.				

Mobility

Students viewed awards as providing them with more freedom to study where they wanted, rather than as a constraint to this freedom of mobility. We interpret this to mean that the funding offered by these scholarships

allow students to be mobile whereas, without the scholarship, they would have been constrained to an institution that would have demanded less of a financial investment from them.

At the Master's level, CGS recipients found the award more liberating than non-recipients did of the awards they have received from non-federal sources. Within NSERC, PGS-M recipients thought their award provided them more freedom than recipients of non-federal awards but less than CGS recipients. Multivariate analyses supported the impact of federal scholarships but placed PGS-M at par with CGS-M at NSERC.

At the doctorate level, all scholarships were equally associated with more freedom to choose the university. This result was supported by multivariate analyses.

EXHIBIT 6.28
Mobility for scholarship recipients

% who stated that the scholarship increased their freedom to study where they wanted	CGS (a)	Agency award (b)	No award (c)
Master's			
All	64% ^c		43% _a
NSERC	75% ^{bc}	66% _a ^c	44% _{ab}
n	1,541		480
n NSERC	441	439	136
Doctorate			
All	67% ^c	63% ^c	46% _{ab}
n	1,474	946	1,745

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

International mobility was considered important to their graduate education by one-half (54%) of all students who took a stand on that question (n = 8,295). Students associated with CIHR gave it somewhat less

importance (48%) followed by students from NSERC (53%) and students from SSHRC (56%). CGS recipients were least likely to value international mobility for themselves (49%) followed by unsuccessful applicants (55%) and recipients of regular agency awards (57%).

Barriers to continuing graduate studies

Two-thirds of Master's students and more than one-half of doctorate students indicated that they would have pursued graduate school even without scholarship support. The proportions are the same for CGS recipients and recipients of regular agency awards.

A larger proportion, hovering around three-quarters of students, stated that they would have proceeded more slowly without scholarship support. Here again, there is no distinction between CGS and regular agency awards.

These results were corroborated by multivariate analyses.

EXHIBIT 6.29
Barriers to graduate studies

		CGS (a)	Agency award (b)
Master's			
% who stated that they would have continued to pursue graduate school even without scholarship support	All	65%	
	NSERC	58%	58%
% who stated that they would have proceeded more slowly without scholarship support	All	73%	
	NSERC	71% ^b	64% _a
n	All	1,511	
	NSERC	433	434
Doctorate			
% who stated that they would have continued to pursue graduate school even without scholarship support		56%	57%
% who stated that they would have proceeded more slowly without scholarship support		80%	83%
n		1,456	939
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level.			

Marketability

According to a large majority of students, graduate studies improved their prospects of getting a permanent job in an area relevant to their studies. At both the Master's and doctorate levels, award recipients were more likely to feel that way than non-recipients but CGS recipients no more than regular agency award recipients. These differences were confirmed by multivariate analyses.

EXHIBIT 6.30
Impact of studies on getting employment in a related area

% who stated that graduate studies improved their prospects of getting a permanent job in an area relevant to their studies	CGS (a)	Agency award (b)	No award (c)
Master's			
All	89% ^c		76% ^a
NSERC	89% ^c	91% ^c	79% ^{ab}
n	1,430		715
n NSERC	404	405	172
Doctorate			
All	93% ^c	93% ^c	80% ^{ab}
n	1,342	872	2,270

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

At both the Master's and doctorate levels, the visibility of the awards to peers and professors was similar, at about 80%, for CGS as well as for regular agency programs. Upwards of 90% of students were proud to tell others about their award; pride was at the same level for CGS awards and regular agency awards. Multivariate analysis supported these findings.

EXHIBIT 6.31
Visibility of award recipients

Visibility		CGS (a)	Agency award (b)
Master's			
% whose peers were aware of their award	All	80%	
	NSERC	81% ^b	87% ^a
% whose professors were aware of their award	All	80%	
	NSERC	78%	78%
% proud to tell others about their award	All	91%	
	NSERC	90%	89%
n	All	1,511	
	NSERC	433	434
Doctorate			
% whose peers were aware of their award		81%	82%
% whose professors were aware of their award		81%	84%
% proud to tell others about their award		89%	90%
n		1,456	939
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level.			

Bi-variate analyses show barely any differences between CGS award recipients and regular agency award recipients with regard to two indicators of academic marketability: they are equally likely to indicate that the award was important in their choice of a supervisor and in the interest that supervisors showed for them. The one exception is that CGS recipients at the doctoral level assigned more importance to their award in the interest that supervisors extended them.

However, in the multivariate analyses, these CGS recipient indicators were shown to be significantly lower than those of regular agency awards — with the same exception as above where the difference simply disappeared.

EXHIBIT 6.32
Academic marketability

		CGS (a)	Agency award (b)
Master's			
% who indicated that the award was important in their choice of supervisor	All	31%	
	NSERC	44%	45%
% who indicated that the award was important in the interest of supervisors	All	41%	
	NSERC	57%	53%
n	All	1,511	
	NSERC	433	434
Doctorate			
% who indicated that the award was important in their choice of supervisor		27%	25%
% who indicated that the award was important in the interest of supervisors		33% ^b	28% ^a
n		1,456	939
^a The value is statistically different from that of the CGS group at least at the 0.05 level. ^b The value is statistically different from that of the agency-award group at least at the 0.05 level.			

Professional skills development

Students rated the improvement of thirteen different skills during their graduate program. The percentage of students citing improved skills ranged from 49% for societal and civic responsibilities to 90% for knowledge of the discipline. There were no meaningful differences between skill improvement patterns at the Master's and the doctorate levels.

EXHIBIT 6.33
Skills improvement during graduate studies (level of study)

% who rated their skills improvement at least noticeable	Master's level (a)	Doctorate level (b)
Theoretical/knowledge of the discipline	90% _b	91% ^a
Analytical techniques/Experimental methods	86% ^b	84% _a
Research competence	85%	84%
Report writing and publication	81%	80%
Critical and creative thinking	80%	79%
Research and project management	73%	71%
Communication and interpersonal skills	72%	72%
Personal effectiveness	70%	71%
Knowledge translation/transfer	70%	70%
Leadership	64% _b	68% ^a
Teaching competence	63% _b	69% ^a
Integrity/ethical conduct	60% ^b	57% _a
Societal/civic responsibilities	49%	49%
lowest n	2,537	4,269

^a The value is statistically different from that of column a at least at the 0.05 level.
^b The value is statistically different from that of column b at least at the 0.05 level.

Subjected to factor analysis, the data showed that there were two relevant grouping of the thirteen skill areas. They were:

- personal and interpersonal skills: communication and interpersonal skills, personal effectiveness, integrity/ethical conduct, teaching competence, leadership, research and project management, knowledge translation/transfer, societal/civic responsibilities;
- intellectual skills: theoretical/knowledge of the discipline, analytical techniques/experimental methods, report writing and publication, critical and creative thinking, research competence.

Average values were calculated for each student on each scale (Cronbach alpha: personal and interpersonal skills, 0.91; intellectual skills, 0.87).

With an average of 5.7 on a scale from 1 to 7, intellectual skills saw more improvement than personal and interpersonal skills that averaged 4.9.

There were no differences among award groups, at either level, in the improvement of personal and interpersonal skills (either in bi-variate or multivariate analyses). Improvements of intellectual skills were somewhat larger in award groups at the Master's level and in comparison to the non-recipient group (bi-variate and multi-variate) but there were no differences between CGS recipients and regular agency program recipients. Improvements in intellectual skills appeared somewhat more important among regular agency award recipients at the doctoral level compared to both the CGS group and the group of non-recipients; this finding was supported by the multivariate analyses.

EXHIBIT 6.34
Skills improvement during graduate studies (treatment group)

Skill improvement during the program (average on a 7-point scale)		CGS (a)	Agency award (b)	No award (c)
Master's				
Personal and interpersonal skills	All	4.9		4.8
	NSERC	4.8	4.9	4.7
Intellectual skills	All	5.7 ^c		5.5 ^a
	NSERC	5.7 ^c	5.8 ^c	5.5 ^{ab}
n	All	1,558		771
	NSERC	450	446	196
Doctorate				
Personal and interpersonal skills		4.9	5.0 ^c	4.8 ^b
Intellectual skills		5.7 ^c	5.8 ^c	5.6 ^{ab}
n		1,481	946	2,568

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

Treatment extended by the department, centre, unit or program

Between 80% and 90% of students indicated that their department, centre, unit or program treated them well. Award recipients were

somewhat more likely to take that position than non-recipients but there were no significant differences between CGS recipients and recipients of regular agency awards. These results were validated in multivariate analyses.

EXHIBIT 6.35
Treatment extended by the department

% who stated that their department treated them well	CGS (a)	Agency award (b)	No award (c)
Master's			
All	88% ^c		82% ^a
NSERC	91% ^c	87%	83% ^a
n	1,558		771
n NSERC	450	446	196
Doctorate			
All	89% ^c	86% ^c	79% ^{ab}
n	1,481	946	2,568

^a The value is statistically different from that of the CGS group at least at the 0.05 level.
^b The value is statistically different from that of the agency-award group at least at the 0.05 level.
^c The value is statistically different from that of the no-award group at least at the 0.05 level.

Synthesis of unintended effects

Unintended effects are changes brought about by the program but that were not part of the original program logic or program rationale. Exhibit 6.36 provides a synthesis of the unintended effects associated with CGS and other award programs. It shows clearly that CGS at the Master's level has significant positive unintended impacts but that these impacts are at par with those of NSERC's PGS-M. Note that PGS-M offers benefits that are very similar to those of CGS-M in terms of the value and duration of the award. The difference is in the branding of the CGS award as a recognition of the cream of the crop. It appears that this recognition does not produce the unintended impacts analysed here.

At the doctoral level, where award impacts could be documented, CGS and related awards produced the same unintended impacts in all areas except those associated with total income and working for pay. Since the value of the CGS doctoral award is twice that of regular scholarships, it should come as no surprise that CGS impacts students' finances. At the doctoral level, as was the case at the Master's level, the branding of CGS as superior scholarship does not appear to produce the unintended impacts we studied.

EXHIBIT 6.36
Summary of unintended impacts

	Master's				Doctorate				Quality of the evidence
	CGS	Agency award	All awards	Indirect support	CGS	Agency award	All awards	Indirect support	
Conducting research in various environments		Positive		Positive			Nil	Positive	Strong ¹
Involvement in core research activities			Nil	Positive			Positive	Nil	Strong ¹
Interactions with other researchers			Nil	Positive		Limited positive		Positive	Strong ¹
Student income			Positive	Positive	More positive	Positive		Positive	Strong ¹
Student debt	More positive	Positive		Nil	More positive	Positive		Nil	Strong ¹
Student work-for-pay burden			Positive	Nil	Positive			Nil	Strong ¹
Hours working for pay			Positive	Nil	More positive	Positive		Nil	Strong ¹
Working during graduate studies			Positive	Nil			Positive	Nil	Strong ¹
Freedom to study where one wants			Positive	N/A			Positive	N/A	Strong ¹
Pursuing graduate school (and pace)			Positive	N/A			Positive	N/A	Weak ²
Improvement in the prospects of getting a job in an area relevant to the studies			Positive	Nil			Positive	Positive	Strong ¹
Skill development			Nil	Nil			Nil	Nil	Moderate ²

¹ Comparisons could be drawn among treatment groups and time elapsed since the award was not a factor.

² Self-assessed impacts.

6.4 *To what degree have the branding and communications of the Program to relevant stakeholders been successful in distinguishing the CGS from granting agency scholarships?*

To some key informants, the CGS doctoral award has been successful in branding itself as different from related awards simply by its name and its financial value. These key informants believe that students are happy to get an award labelled as the "Canada Graduate Scholarship" because it is a global name that is tied in with being the top.

However, a program manager said that some students are confused as to what they have to apply for. A university representative also did not feel that there had been the desired level of success in this regard: "CGS hasn't gotten the attention it deserves. People still see it as part of the Agency programs. It has not filtered down to professors and students – to them it is part of the same thing."

A student association informant commented that the initial branding was good, but the secondary branding (e.g. Bell, Bombardier) is not taken very seriously.

A peer review informant felt that there has not been a good job of branding and that the programs have not been showcased well. He suggested the need to profile some of the excellent people and link their potential to the scholarship received.

6.5 *Is the Program's performance monitoring (of outputs and outcomes) appropriate and adequate?*

The CGS performance measurement strategy developed as part of the CGS RMAF is reproduced in Exhibit 6.37.

EXHIBIT 6.37
CGS Performance Monitoring Indicators and Data Sources

Performance area	Indicators	Data source / collection method	Timing / frequency	Status	
OUTPUTS					
Funded scholarships	A	Number of scholarships funded	Administrative Data	Every 1-2 years	Available
	B	Amounts allocated to the funded scholarships	Administrative Data	Every 1-2 years	Available
	C	Incremental increase in total agency resources for student support (# of FTEs, salary dollars)	Administrative Data	Every 1-2 years	Available
Communication products	D	News releases	Administrative Data	Annually	Unavailable
	E	Reports on awards	Administrative Data	Annually	Unavailable
IMMEDIATE OUTCOMES					
Increased incentives for students to enrol in & complete Masters and/or PhDs	F	Number of students registered in Masters and/or PhDs	Statistical reports	Annually	Unavailable
Increased recognition by the research community of the governments financial support for research training	G	# of researchers / students aware of the support	Researcher / University / graduate student surveys	Annually	Unavailable
INTERMEDIATE OUTCOMES					
Increased numbers of students completing degrees in a timely manner	H	# and % of students fulfilling degree requirements within time limits	Administrative data, Statistics Canada data, recipient survey	Bi-annually	Unavailable
High-quality research training, as well as increased ability to attract and retain experienced researchers	I	Number of recipients completing their program	Recipient survey	Bi-annually	Unavailable
	J	Recipient satisfaction	Recipient survey	Bi-annually	Available at NSERC
	K	Number of recipients employed in skilled jobs (in Canada) by sector after they leave graduate programs	Recipient survey	Bi-annually	Unavailable
	L	% of graduates working in chosen fields	Recipient survey	Bi-annually	Unavailable
Increased capacity to meet demand for HQP in the faculties of Canadian Universities and in the public & private sectors.	M	Number of recipients employed in skilled jobs (in Canada) by sector after they leave graduate programs	Administrative data, Stats Canada data	Bi-annually	Unavailable
	N	Expert assessment of supply and demand for HQP	Industry Associations	Bi-annually	Unavailable
	O	Demands for HQP met	Industry Associations	Bi-annually	Unavailable

Exhibit 6.37 also reports whether the information is available, according to the information garnered from agency personnel responsible for performance monitoring data collection.

Information related to scholarships funded is available. The three Agencies have established program applicant data bases that are well maintained, if separate from one another — well enough maintained to implement successful surveys of participants and non-participants as part of this evaluation. Applicant data bases include contact information (name, address, telephone number, e-mail address) as well as information regarding the award sought (type of award, period of funding, proposed location of tenure).

Other indicators require special data collection in the form of surveys or secondary data analysis. Only NSERC has taken steps up to now to implement follow-up data collection with award recipients. NSERC has been running an exit survey for several years; invitations to take part in this survey are sent to students at the conclusion of their award period. For many, however, and particularly at the doctorate level, the end of the award period does not correspond to the completion of the degree. Thus, the NSERC exit survey, while collecting information that can be useful in assessing program performance, is limited in its application. SSHRC is currently planning a similar exit survey.

A "career survey" implemented several years after the end of the funding period could better measure program performance with regard to degree completion and professional achievements. The three Agencies are currently discussing the planning and implementation of such a survey.

Interestingly, SSHRC and CIHR request that award recipients complete a Notice of Receipt of Degree form when they complete their degree. The information from this source could be used to inform one of the performance indicators (degree completion). It seems that SSHRC and CIHR do receive such forms (the proportion of award recipients who complete the form is not known at this point though it appears to be higher at the Master's level than at the doctorate level) and the information is captured in the corporate data bases, but left unused.

It should be noted that data collection efforts are limited to award recipients. Giving meaning to outcome data requires comparison to some benchmark (e.g., the proportion of award winners who complete their degree is more meaningful if compared to the proportion of students without awards who also complete their degree). Since no primary data collection on outcomes is carried out on unsuccessful applicants, the comparison will need to be to the general population of graduate students. NSERC representatives are currently working at securing such information. However, because it will be very general (total student population whereas award winners are supposed to be the cream of the crop), it may have limited outcome demonstration value.

Finally, while the indicators of performance found in the performance monitoring plan and listed earlier may have been the appropriate ones at the inception of the program, it is not a given that they are still the most useful pieces of information for program managers in order to steer the program. There is no definitive indication that this set of indicators has been used in managing the CGS program.

Chapter 7

COST-EFFECTIVENESS AND ALTERNATIVES

In brief

This study was limited in its ability to gather objective evidence on program cost-effectiveness. Overall, no significant case was assembled either way.

Agencies have limited levers they can use to improve the supply of HQP. Scholarships and research grants (which translate into indirect support to students) appear to be the two most direct available approaches. Indirect approaches such as general support to research, excellence and indirect costs could contribute to the objective, but in a way that is less obviously tied to the end result.

Indirect support produces statistically significant results that are different from the objectives of CGS and from the impacts associated with awards. Indirect support generally has a more positive impact on the students' involvement in research, on the diversity of research environments to which the student is exposed, and on interactions with other researchers. While indirect support is associated with higher student income, it does not reduce students' reliance on paid work the way awards do.

7.1 *Is the Program delivered in a cost-effective manner?*

This evaluation was unable to collect factual information on the costs incurred by Agencies in the management of CGS and related programs. Even if such data had been available, a complete picture of program costs would have to include the efforts expended by universities in screening applicants and in managing the awards, as well as volunteer time provided by review committee members. Such information is not available.

Based on non systematic information available to them, all but two of the key informants stated that the programs are delivered by the Agencies in an effective manner: “The peer review is key to these scholarships, an effective way to administer them and efficient with low overheads.”; “We have adjudicated an enormous number of files quickly and fairly.”; “Prompt, handle details well and adjudication is well handled.” The two informants who said that they are not delivered well cited a scheduling issue and the handling of the Master’s program through SSHRC.

7.2 *Are there more cost-effective ways to deliver the Program under the existing model?*

A minority of key informants were of the opinion that there were any more effective ways or models for delivery of these programs. Suggestions made by these informants included:

- using a a single application window;
- offering a fully electronic application process;
- removing the letters of reference.

7.3 *Are there alternative, more cost-effective programs / models that could achieve the same objectives?*

The fundamental objectives of CGS and related program is to facilitate access to graduate studies and to augment graduation rates in order to improve the supply of HQP to the Canadian economy. The awards programs use the direct financing of the best graduate students as a means to that end, based on the assumption that financial hurdles are the key barriers to access and completion of graduate studies. Other avenues are conceivable.

Literature review

The direct financing of students can be offered by universities as an attractor to graduate studies and to their institution (Bégin-Heick & Associates, 2001). As an example, the University of Ottawa actively promotes its graduate scholarship package.¹

Successfully increasing graduate enrolment also requires that institutions be ready to accept more students. According to the AUCC (2002, 2005, 2007), there is a clear link between funding received by universities and enrolment (ability to meet the demand). Historically, when funding was higher, faculty numbers were higher and more students enrolled in universities (AUCC, 2007).

The supply of HQP can also be increased by ensuring the quality of programs and appropriate times to completion, by attracting more students to programs and by ensuring that universities have enough human resources (faculty and internationally recognised researchers) to be able to meet the demand, attract students and offer high-quality education (AUCC, 2005).

¹ See, for example, <<http://www.etudesup.uottawa.ca/Default.aspx?tabid=1458>> and <<http://www.youtube.com/v/oilUhMXo4yo&hl=en>>. Visited on May 23, 2008.

Funding researchers is another way to ensure a sufficient supply of HQP because researchers can provide indirect support to the student of their choice, whether national or international. Indirect support is a grant paid to the student to work on their thesis in the researcher's area of work (CAGS, 2005).

New immigration policies allowing highly skilled immigrants to work in Canada have been an important factor in the HQP increase observed in the past few years. According to the 2001 Census of Population, nearly half of HQP were recent immigrants to Canada (McKenzie, 2007).

The conclusion from this brief overview of the literature is that the Agencies have limited levers they can use to improve the supply of HQP. Scholarships and research grants (which translate into indirect support to students) appear to be the two most direct available approaches. Indirect approaches such as general support to research, excellence and indirect costs could contribute to the objective, but in a way that is less obviously tied to the end result.

Impacts of indirect support

Awards and indirect support are somewhat competing forms of assistance to graduate students. Awards are provided directly to the student while indirect support transits via a researcher's research grant.

Our student sample included a subgroup of individuals who declared that part of their income was from "amounts paid to you to conduct your own research". They were considered in receipt of indirect support. In all multivariate analyses conducted toward findings presented in Chapters 5 and 6, the unique effect of indirect support (compared to the absence of a CGS or related award) was isolated. The results of these analyses are found in Exhibits 6.20 and 6.36.

From Exhibit 6.20, which synthesises impacts related to CGS program objectives, it can be seen that indirect support produces no results of the sort: indirect support is not associated with increased incentives to enrol in graduate studies, with the recognition of the federal government's support

of research training, with attraction and retention of experiences researchers, etc.

However, from Exhibit 6.36, it can be concluded that indirect support has a different set of impacts compared to awards. Indirect support generally has a more positive impact on the students' involvement in research, on the diversity of research environments to which the student is exposed, and on interactions with other researchers. While indirect support is associated with higher student income (similar to the effect of regular awards and less than CGS), they don't reduce students' reliance on paid work the way awards do.

Chapter 8

CONCLUSIONS AND RECOMMENDATIONS

This evaluation study has reached a number of conclusions. Those concerning program effects are methodologically strong, thanks to the reliance on a quasi-experimental approach and on multivariate modelling. The evidence concerning issues dealing with program relevance, and design and delivery is softer and must be regarded with more prudence.

This chapter recalls the key conclusions of the evaluation and proposes an interpretation of findings.

8.1 **Relevance**

The evaluation generally supports the notion that there is a continuing need for CGS and related programs, although the evidence is not one-sided.

The first rationale argument is that HQP are in high demand in Canada and that purviews into the near future conclude that it will not decrease any

time soon. Canada ranks sixth in a list of developed countries with regard to the proportion of the population in the HQP category (23%), *ex aequo* with Australia and Korea; this highlights the need for a continuous influx of new HQP. While some studies conducted a decade ago question the existence of "brain drain", this evaluation uncovered that one-quarter of doctoral award applicants who were not studying at the time they were surveyed resided abroad and that one-quarter of award applicants expected to move abroad to study or to start a career. Therefore, there is a risk of loss of highly qualified personnel to other countries but the extent of this risk is uncertain and it is possible that it is countered by influx of HQP from other countries.

The second element of the rationale for the awards programs is that there is a financial barrier to access to graduate studies. This evaluation has found that the debt load of unsuccessful applicants belonging to the program target group is lower (\$17,100) than that of the general graduate student population (about \$20,000). On that basis, we conclude that the award applicant debt load is not a major deterrent to graduate studies. Still on the financial side, Master's level awards were shown to increase total student revenue for all sources by about \$2,500 compared to non-recipients (whereas the award value is approximately \$17,500) while CGS-D increases total revenue by \$9,400 (for an award of \$35,000) and regular doctoral awards increase total revenue by \$1,600 compared to non-recipients (for an award of about \$21,000). Thus, the main income-related effect of awards was to modify sources of revenue away from earned income.

Award programs are associated with results that contribute the overall objectives of HQP supply and research excellence:

- awards represent an incentive to enroll in graduate studies according to the recipients' self-assessment;
- awards increase slightly actual enrolment in graduate studies;
- awards increase recipients' recognition of the federal government's financial support to research training;
- at the Doctorate level, awards increase recipients' involvement in core research activities;
- awards reduce recipients' reliance on paid income and recipients' study related debt;

- awards improve recipients' self-assessed prospects of getting a job in an area relevant to their studies.

With the creation of CGS in 2003 and additional funding brought about in 2007 and 2008, the Government of Canada has demonstrated that it makes the funding of graduate studies an important component of its innovation strategy.

All in all, the rationale for supporting access to graduate studies probably still exists. Whether the best approach is to support academic excellence or to award scholarships on the basis of student financial need is not a closed debate.

Recommendation 1. The Agencies should maintain student award programs.

8.2 Program success

The logic of the CGS program is based on a cascade of short term and longer term effects that were presented in the logic model (Exhibit 2.1). The following assessment of program success is based on whether or not the evidence from this evaluation shows that these effects took place; this summary factors in varied indicators as well as statistical significance and substantive significance. Where available, multivariate statistical results are the preferred source of information because they provide the most rigorous determination of program effects. Because there is still a debate about whom CGS participants should be compared to, we have offered results comparing them to non-recipients at the Master's level (where only NSERC

has specific programs) and to non-recipients and agency-specific award recipients at the doctorate level.

Increased incentive for students to enrol in graduate studies in Canada		
CGS-M vs. non-recipients	Cannot conclude	?
CGS-D vs. regular D-awards	No effect	✘
CGS-D vs. non-recipients	Cannot conclude	?

Expected outcome #1: Increased incentive for students to enrol in graduate studies in Canada

The impact of CGS on incentives to enroll in graduate studies was measured by asking students for their self-assessment of this impact. Therefore, only students in receipt of an award could be included in this validation.

Three-quarters of award recipients indicated that the possibility of receiving an award or actually receiving an award were incentives to enrol in graduate studies. One-half said the same about the prestige of the award. However, the results were the same for CGS-D recipients and for regular doctoral awards recipients, thereby demonstrating no incremental impact of CGS in this regard.

Increased enrolment in graduate studies in Canada		
CGS-M vs. non-recipients	No effect	✘
CGS-D vs. regular D-awards	No effect	✘
CGS-D vs. non-recipients	No effect	✘

Expected outcome #2: Increased enrolment in graduate studies in Canada

After a decade of stagnation, enrolment in graduate studies has been increasing steadily since 2000 — that is, three years before the introduction of CGS. Also, it should be noted

that, among award applicants, enrolment levels were high: 93% of those applying for an award actually enrolled in graduate studies.

Award recipients were about four percentage points more likely to enrol in graduate studies than non-recipients, at the Master's level and at the doctorate level. It was also observed that one-third of Master's applicants who finished their Master's studies continued on to the doctorate level; this was statistically the same for CGS recipients and for regular agency award recipients. Also the same for these two groups was the proportion of Master's students who plan to continue on to a doctorate (one-half).

While some of the findings showed statistically significant differences

between recipients and non-recipients, the actual differences were not substantial enough to conclude to a positive effect.

Increased incentives for scholarship recipients to complete studies within a specific time period		
CGS-M vs. non-recipients	Cannot conclude	?
CGS-D vs. regular D-awards	No effect	✘
CGS-D vs. non-recipients	Cannot conclude	?

Expected outcome #3: Increased incentives for scholarship recipients to complete studies within a specific time period

As with expected outcome number 1, increased incentives to complete studies within a certain time period were self-assessed and therefore available only from award recipients. While between six (Master's) and seven (doctorate) out of ten award recipients indicated that the award was important in setting the student's pace of study, only one (doctorate) to two (Master's) out of ten stated that awards were important in the time it took the student to complete their study program. Even more important, the answers were statistically the same for CGS recipients and for recipients of regular agency awards.

Increased recognition by the research community of the federal government's financial support for research training

CGS-M vs. non-recipients	Positive effect	✓
CGS-D vs. regular D-awards	No effect	✗
CGS-D vs. non-recipients	Positive effect	✓

Expected outcome #4: Increased recognition by the research community of the federal government's financial support for research training

Note that only program applicants were systematically canvassed about their views of the federal government's support of research

training; other components of the research community (in particular, the researchers themselves) were not part of this assessment. Among CGS recipients and regular agency award program recipients, about eight out of ten thought that the federal government made a significant contribution to supporting research training in Canada. The results were the same for CGS award recipients and recipients of regular awards. Non-recipients were much less likely to share this view (by about 20 percentage points at the Master's level and 40 points at the doctorate level).

Increased numbers of students completing degrees and doing so in a timely manner

CGS-M vs. non-recipients	No effect	✗
CGS-D vs. regular D-awards	No effect	✗
CGS-D vs. non-recipients	No effect	✗

Expected outcome #5: Increased numbers of students completing degrees and doing so in a timely manner

It must be recognized at the outset that many program applicants had not completed their study program at the time of their participation in

this evaluation. This was particularly true of students in doctoral studies — which, on average, last longer than the duration of CGS since its inception.

This evaluation can state nonetheless that, among award program applicants, there was an equal probability of having completed the study program in all groups (CGS recipients, regular award recipients and non-recipients) and at both levels (Master's and doctorate). Moreover, for those who had indeed completed their degree, the time to completion was 25 months at the Master's level and 48 months at the doctorate level, and it was the same for CGS recipients, regular award recipients and non-recipients. For those who had not yet completed their degree, expectations were that they would complete in 30 months at the Master's level and in 50 months at the doctorate level — again, without differences among groups. Asked whether they were progressing through their study program at the pace they were expecting, one-half of Master's students indicated that they were on pace or progressing faster than anticipated (same for CGS recipients and non-recipients); at the doctorate level, six out of ten CGS recipients answered the same way, which is ten points more than among agency award recipients and 20 points more than among non-recipients.

All in all, the conclusion is that CGS did not significantly affect the likelihood of completing the study program or the time to completion.

High-quality research training, as well as increased ability to attract and retain experienced researchers

CGS-M vs. non-recipients	No effect	✘
CGS-D vs. regular D-awards	No effect	✘
CGS-D vs. non-recipients	No effect	✘

Expected outcome #6: High-quality research training, as well as increased ability to attract and retain experienced researchers

Graduate students proved to be generally satisfied with their research environment. CGS recipients and regular award recipients were equally satisfied with it and slightly more satisfied

than non-recipients.

About one-half of all program applicants held teaching assistantship positions; this proportion was the same for CGS recipients, regular award recipients and non-recipients. In parallel, about one-third of applicants held research assistantship positions; recipients were somewhat less likely to hold such positions.

Master's students of all three groups were equally likely to have contributed to academic publications. Among doctorate students, CGS recipients and recipients of regular agency awards had the same number of publications and they had more, on average, than non-recipients.

Among Master's students who completed their degree and held employment, CGS recipients and regular agency award recipients were more likely than non-recipients to hold a job that required the graduate degree they sought. Results at the doctoral level barely reach statistical significance.

From this somewhat limited set of indicators, this evaluation concludes that CGS has had limited impact on the quality of research training offered to students and on the ability of the university system to attract and retain experienced researchers.

Increased capacity to meet demand for HQP in the faculties of Canadian universities and in the public and private sectors

CGS-M vs. non-recipients	No effect	✘
CGS-D vs. regular D-awards	No effect	✘
CGS-D vs. non-recipients	No effect	✘

Expected outcome #7: Increased capacity to meet demand for HQP in the faculties of Canadian universities and in the public and private sectors

While analyses of these indicators at doctorate level were hampered by limited sample size, at the Master's level, CGS recipients were shown to

be more likely to hold a highly-qualified job than non-recipients. By their own account, CGS recipients and recipients of regular agency awards were more influenced by their studies than non-recipients to pursue research or teaching as a profession.

Other indicators of effects on meeting the demand for HQP showed no differences among groups of respondents: they all shared the same sectors of interest with regard to employment; they indicated the same likelihood of continuing on with post-doctoral research; they were equally likely to hold a faculty position after finishing their doctorate program.

Improved branding of Canada as a home of research excellence and Canadian universities as world-class research centres

CGS-M vs. non-recipients	Insufficient evidence	?
CGS-D vs. regular D-awards	Insufficient evidence	?
CGS-D vs. non-recipients	Insufficient evidence	?

Expected outcome #8: Improved branding of Canada as a home of research excellence and Canadian universities as world-class research centres

This evaluation offers limited evidence regarding the improvement of the branding of Canada as a place of research excellence.

The ultimate expected outcome from CGS is "to contribute to Canada's Innovation Strategy to make Canada one of the most innovative countries in the world helping reach the target of moving from 14th place to among the top 5". This evaluation is not in a position to assess whether Canada has progressed toward that goal or whether CGS contributed to progress in that area. A 2007 Conference Board of Canada report entitled *How Canada Performs, A Report Card on Canada* indicated that Canada held the 14th OECD place in Innovation; however, most of the data used in that analysis dated back to 2003 or years prior to the implementation of CGS.

The necessary conclusion from the review of the success of CGS with regard to its stated logic is that the program has had limited impact over and above the regular agency awards at the doctorate level (while providing more funding and an envious branding); at the Master's level, comparisons with non-recipients suggest that CGS has had some of the impacts it was expected to have but that the magnitude of these impacts has been limited.

There is little doubt that federal support to graduate studies is necessary to achieve the innovation objectives of the Government of Canada. This evaluation shows, however, that the theory used in building a case for the CGS program has not met the test of time. Some important questions are still unanswered, though: what is the optimal level of support extended to graduate students? Would need-based support be more effective than excellence-based awards?

Recommendation 2. The logic of the CGS program should be rethought based on the information offered by this evaluation and other studies conducted since the inception of CGS.

A variety of impacts of award programs other than those that comprised the CGS program logic were tested. At the Master's level, the evidence shows clearly that, compared to the absence of support, CGS has significant positive unintended impacts on student income and debt levels, and on the necessity to work for pay while studying. These CGS effects are at par with the effects found for NSERC's PGS-M, which has the same monetary value as CGS-M. Also, Master's award programs were found to have no impact on the research environment in which students work (i.e., the diversity of environments to which they are exposed, their involvement in core research activities, interactions with other researchers).

At the doctoral level, where award impacts could be documented, CGS and related awards produced the same unintended impacts in all areas except those associated with total income, debt and working for pay. Since the value of the CGS doctoral award is two-thirds higher than that of regular scholarships, it should come as no surprise that CGS impacts students' finances. At the doctoral level, as was the case at the Master's level, the branding of CGS as superior scholarship does not appear to produce the unintended impacts we studied.

8.3 Cost-effectiveness and alternatives

This study was limited in its ability to gather objective evidence on program cost-effectiveness. Overall, no significant case was assembled either way.

Agencies have limited levers they can use to improve the supply of HQP. Scholarships and research grants (which translate into indirect support to students) appear to be the two most direct available approaches. Indirect approaches such as general support to research, excellence and indirect costs could contribute to the objective, but in a way that is less obviously tied to the end result.

Indirect support through grants produces outcomes that are different from the objectives of CGS and from the impacts associated with awards. Indirect support generally has a more positive impact on the students' involvement in research, on the diversity of research environments to which the student is exposed, and on interactions with other researchers. While indirect support is associated with higher student income (than the absence of direct and indirect support), it doesn't reduce students' reliance on paid work the way awards do.

Indirect support has no measured impacts on incentives to enrol in graduate studies, recognition of the federal government's financial support for research training, high-quality research, and the branding of Canada as a home of research excellence. In a complex world, where diversity is an efficient strategy to address issues, Indirect support through grants has a role to play in parallel with award programs. Agencies would be warranted to continue studying how to best integrate direct and indirect support in their portfolios.

8.4 *Design and delivery*

The analysis of design and delivery issues has not uncovered major concerns. Positive features of CGS include: the coverage of the Master's level, the assessment criteria, the application review process and the efficiency of the management of the program.

The large value discrepancy between CGS-D and regular doctoral awards was identified as a bone of contention. One critic of CGS wrote: "The first and most striking problem with the CGS program is that the doctoral scholarships are far too rich [...]. In contrast, some CGS winners, when you add in their teaching assistantships and top-ups provided by some universities, will earn more than \$50,000 annually. This is more than post-docs, sessional lecturers and many assistant professors make [...]." (Siler, 2004)

Additionally, this study demonstrates that, at the doctorate level, providing 67% more funding (the difference between the \$35,000 CGS award and a

typical \$21,000 regular agency award) produces limited incremental impacts.

Recommendation 3. The Agencies should consider the possibility of reducing the gap in value between CGS and regular awards at the doctorate level.

The duration of the awards is considered too short by many. In fact, recipients are more satisfied with the money value of the awards than with their duration. The average time to completion of a Master's degree is certainly longer than one year and that of a doctoral degree vastly exceeds three years (six years according to Gluszynski and Peters, 2005). To truly affect the duration of graduate studies, it is likely that a more sustained funding effort is required.

Recommendation 4. The Agencies should consider the possibility of extending the duration of a Master's award to two years and that of a doctoral award to four years.

Of course, doing so would reduce the number of individuals who could be funded. A proper balance should be found between reducing the value of CGS awards and lengthening the period of student support.

The final problem identified is the set of rules concerning use of CGS outside of Canada. Decisions announced in the 2008 Budget open the door to CGS recipients receiving additional funding for short foreign study stints. Still, the logic behind the existing rules is that those who study in Canada are more likely to initiate their career in Canada afterwards. While this may be true, the importance of international networks and of learning under world-renowned researchers should not be understated. Allowing some of the best Canadian students to pursue graduate training outside of Canada could also translate into some of the best foreign students wanting to study with world-class Canadian researchers. For reference, about one-half of graduate students surveyed for this study considered international mobility important to their graduate education.

Recommendation 5. The award programs should not restrict the international mobility of students.

The distribution of CGS funding among Agencies decided by Government is different from that of other types of funding to Agencies: CGS funds are distributed according to the number of graduate students in disciplines associated with each agency whereas other funding does not follow this logic. This is not to say that the logic is faulty; it is a simple observation that it is different.

External communications from the Agencies should be adjusted to reflect the branding of CGS as an exceptional scholarship. As it stands, readily available information on CGS is scattered and factual rather than centralized and inspiring of excellence. Since this is a single program with a single name and a single purpose (albeit delivered by each Agency to its own constituency), an integrated external promotional presence with a single Web point of access should be envisaged. This will require a collaborative effort from the three Agencies.

Recommendation 6. The Agencies should develop an integrated external communication plan for CGS to contribute to its branding as an exceptional award.

A performance monitoring plan exists for CGS. It comprises a set of indicators associated to outputs and short term outcomes. Existing data management systems collect information relative to a small number of these indicators; they are all related in one way or another to the number of scholarships funded. Some other indicators have received some attention to date from NSERC but little to none from CIHR and SSHRC; they relate to degree completion and professional achievements. These latter indicators require that measurement be made some time after degree completion, which adds to the difficulty of obtaining the information.

Recommendation 7. The Agencies should collaborate to develop a workable data collection mechanism for performance information.

While the indicators of performance found in the performance monitoring plan may have been the appropriate ones at the inception of the program, it is not clear that they are still the most useful pieces of information for program managers. Also, there is no definitive indication that existing performance information has been used in managing the CGS program. That could be because program managers now need a different type of performance information than they did at program inception. Finally, some of the proposed indicators relate to outcomes that are located so far in the future (e.g., program completion) as to make it questionable whether they are performance monitoring indicators or evaluation indicators.

Recommendation 8. The performance monitoring plan for CGS and related programs should be revisited with a view to make it more pertinent to program managers and to better delineate performance monitoring from evaluation assessment.

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APPENDIX A

Independent variables in multivariate models

Independent variables used in the multivariate models

Concept	Source	Treatment	Resulting variables	Reference category	Coding
Treatment group	Administrative data	Creation of two dichotomous variables	i_cgs, i_regular	No award	Dummy coded
In receipt of indirect support	Q45I	Creation of a dichotomous variable for those declaring indirect support	i_stipend	No indirect support	Dummy coded
Study level	PP_LEVEL	Creation of a dichotomous variable for the doctorate level	i_doctorate	Master's	Effect coded
Agency	Administrative data	Creation of two dichotomous variables	i_nserc, i_cihr	SSHRC	Effect coded
Application year	Administrative data	Creation of two dichotomous variables	i_2005, i_2006	2004	Effect coded
Gender	Q69	Creation of a dichotomous variable for women	i_women	Men	Effect coded
Age at application	Administrative data and Q70	Creation of two dichotomous variables	i_25_29, i_30_99	18 to 24	Effect coded
Study and research skills	Q74A, Q74B	Creation of a dichotomous variable isolating those declaring above average study skills (6 and 7 on a 7-point scale) and above average research skills (6 and 7 on a 7-point scale)	i_grad_skills	Lower study and research skills	Effect coded

Living arrangements	Q72B	Creation of three dichotomous variables	i_with_parents, i_with_roommates, i_with_partner	Living alone	Effect coded
Presence of dependants	Q73	Creation of a dichotomous variable for those with dependants	i_dependants	No dependants	Effect coded
Type of university at undergraduate level	Q75	Creation of two dichotomous variables	i_no_medecine, i_small_uni	University with medecine	Effect coded
Undergraduate grade point average	Q76A, Q76C	Creation of a dichotomous variable for those with GPAs of A or A+ or 90% or more	i_undergrad_gpa	Lower undergraduate GPAs	Effect coded
Research at the undergraduate level	Q80A	Creation of a dichotomous variable isolating those declaring frequent contact with research at the undergraduate level (6 and 7 on a 7-point scale)	i_undergrad_research	Less frequent contact with research	Effect coded
Mother's degree	Q78	Creation of three dichotomous variables	i_mother_undergrad, i_mother_masters, i_mother_doctorate	No university degree	Effect coded
Father's degree	Q78	Creation of three dichotomous variables	i_father_undergrad, i_father_masters, i_father_doctorate	No university degree	Effect coded
Encouragement from entourage	Q80B, Q80C	Creation of a dichotomous variable isolating those declaring high levels of encouragement from entourage (6 and 7 on a 7-point scale for both family and people close)	i_encouragement	Lower encouragement	Effect coded
Part time studies	Q5, Q6	Creation of a dichotomous variable isolating those who went from full-time to part-time studies	i_moved_to_parttime	Did not move to part time	Effect coded
Time devoted to studies	Q7	Creation of a dichotomous variable isolating those with higher than average time devoted to studies	i_time_devoted	Lower than average	Effect coded
Firmness of field selection	Q32A	Creation of a dichotomous variable isolating those who were very firm in their selection of a field of study (6 and 7 on a 7-point scale)	i_certain	Those who doubted	Effect coded
Exchanges with peers and faculty	Q32C, Q32D	Creation of a dichotomous variable isolating those with frequent exchanges with peers and faculty (6 and 7 on a 7-point scale for both)	i_exchanges	Fewer exchanges	Effect coded

Efforts invested	Q32E	Creation of a dichotomous variable isolating those who invested all of their efforts in their studies (6 and 7 on a 7-point scale)	i_effort	Lower effort	Effect coded
Personal development	Q32F	Creation of a dichotomous variable isolating those who considered that graduate studies were integral to their personal development (6 and 7 on a 7-point scale)	i_personal_develop ment	Not an integral part	Effect coded
Forecasted effect of the degree	Q64C, Q64D	Creation of a dichotomous variable isolating those who considered that their degree will help them find a job (6 and 7 on a 7-point scale on two scales)	i_help_find_job	Smaller forecasted effect	Effect coded
Coping with stress	Q32G	Creation of a dichotomous variable isolating those who coped well with stress (6 and 7 on a 7-point scale)	i_cope_with_stress	Difficulty coping with stress	Effect coded

APPENDIX B

Models of retention and attrition

Examining the process by which students in a postsecondary establishment choose to continue (retention) or to abandon (attrition) their studies is the basis for understanding who completes their studies and why, as well as provides insight into what could be done to encourage students to pursue education beyond the bachelor's degree. For that reason, a review of conceptual models was undertaken in order to assist in the development of the student questionnaire and to gain a better understanding of the attrition and retention processes and the potential role of a modified graduate student funding program. The purpose of this appendix is therefore to introduce some of the most relevant conceptual models and to link them to the research at hand.

It should be noted that little to no literature was identified that dealt with the factors attracting students specifically to graduate studies; specifically, our sources document the dynamics of retention and attrition of students already enrolled at the undergraduate level.

A number of attempts have been made to conceptualize students' decisions to continue or abandon their studies at the post-secondary level. Some of these conceptual models, although developed some time ago, are still in use today. The two most commonly referenced and used models are presented in this section. These two models examine undergraduate student retention. A third model was also identified in the course of the review. This last model examines graduate student retention and is also presented in this section.

Tinto's Conceptual Model for Dropout from College

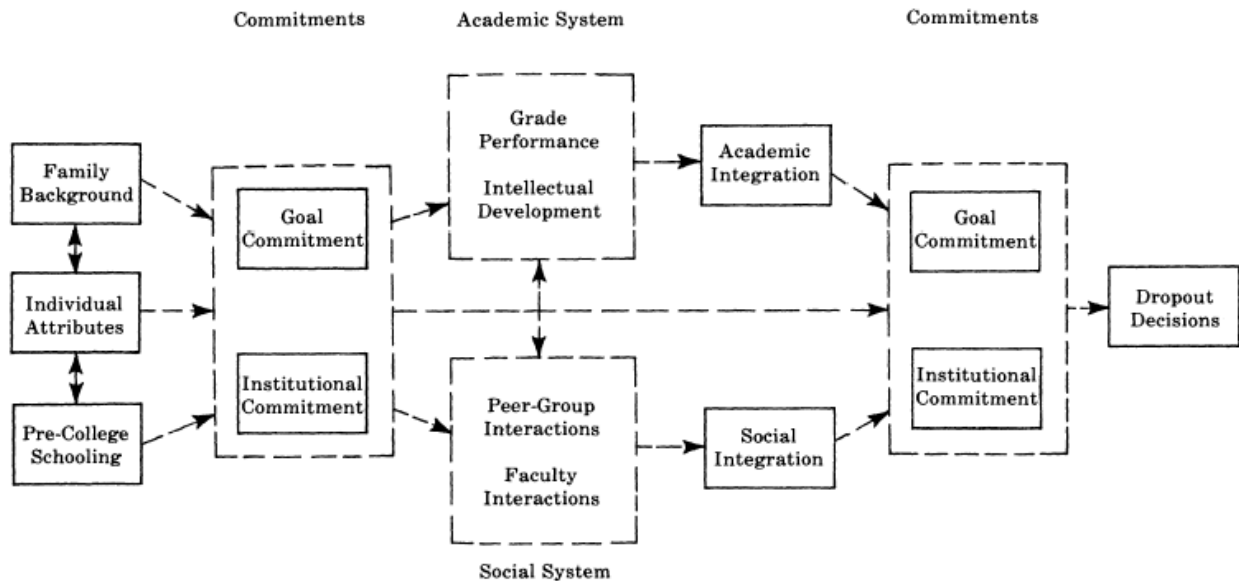
Although dated, Tinto's model is still taken into account in most current research.

Tinto first developed his theoretical model in 1975 in an attempt to explain the processes of interaction between the individual and the institution that lead differing individuals to drop out (Tinto, 1975:90). Although Tinto's model may appear dated, it is still relevant. As qualified in a review of literature conducted on behalf of the Canada Millennium Scholarship Foundation, Tinto's model is "the main model of student attrition to emerge in this period, and the one that is still taken into account in most current research" (Grayson & Grayson, 2003:11). The Consultants also noted the lasting contribution of Tinto's model as all related literature that was reviewed for this literature review cited Tinto's model.

In developing his model, Tinto synthesized studies in the area of college persistence/dropout and presented or interpreted what these studies' results implied about the process of dropping out. Overall, family background, individual attributes, past educational experience, goal commitment, institutional commitment, academic integration, social integration and institutional characteristics were among the broad characteristics or predictors of persistence or attrition included in the model.

Tinto's model postulates that a student's level of commitment changes prior to dropping out. That is why, in Tinto's model, goal and institutional commitment appear before integrating the academic and social systems and after that integration. According to Tinto, a student's level of commitment can be explained by the theory of cost-benefit analysis, in which a student's perception of studying (e.g. academic attainments, personal satisfactions, friendships) and associated costs (e.g. financial, time, dissatisfaction, academic failures) affect the level of commitment (Tinto, 1975: 97-98). When the costs exceed the benefits, the level of commitment towards education changes and the student leaves for a more beneficial alternative (e.g. employment).

EXHIBIT B.1
Tinto's Student Dropout Model



The theory of cost-benefit analysis, as described by Tinto, may be applied to the decision to pursue graduate studies. Upon completing their undergraduate studies, students' decision to pursue their studies at the graduate level is likely to be driven by the perception of benefits that outweigh the costs. The perception of benefits and costs is likely to vary between students who pursue studies at the graduate level, those who end their studies after obtaining their undergraduate degree, and those who leave before obtaining their degree (either at the undergraduate or graduate level). Therefore, when examining why some students pursue graduate studies and others do not, it is important to examine several areas that may impact students' decision (e.g. family, schooling, individual characteristics, grades, socialization, etc.) and not only the cost of attending graduate studies per se. Note that there is no specific indication in this model of the role of student funding in maintaining commitment.

Bean & Metzger's Conceptual Model of Non-Traditional Student Attrition

Bean & Metzger's model focuses on non-traditional students, a profile that graduate students are more likely to fit.

Following the footsteps of Tinto, Bean & Metzger sought to develop a conceptual model of student attrition for non-traditional undergraduate

students (Bean & Metzger, 1985). Bean & Metzger's model is described as one of the most important critique of Tinto's model (Grayson & Grayson, 2003:15). While the basis of their model was drawn from models of traditional students such as Tinto's, the substance of the model was developed through an extensive review of literature on non-traditional undergraduate students.

In this model, a non-traditional undergraduate student is identified as one that:

- Is older than 24, or does not live in a campus residence (e.g. is a commuter), or is a part-time student, or some combination of these three factors;
- Is not greatly influenced by the social environment of the institutions; and
- is mainly concerned with the institution's academic offerings (especially courses, certification, and degrees).

This is particularly interesting within the context of this evaluation as Bean & Metzger's model may lend itself more to the study of graduate students' persistence than Tinto's model. Graduate students likely fit the above profile of non-traditional students (e.g. are older, likely to commute, concerned with academic offering, etc.).

While some determinants are consistent with Tinto's model presented earlier, Bean & Metzger's model also includes new determinants, as shown in Exhibit B.2. In presenting each element of their model, the authors cited relevant research that had been conducted at that time. The various indicators used in these studies, as well as the ones proposed by Bean & Metzger, include background, academic and environmental variables as well as academic and psychological outcomes. The inclusion of environmental and psychological variables (which are excluded in Tinto's model) may draw a clearer picture of those who pursue graduate studies and why.

In this model, student finances are explicitly included as an environmental determinant, The greater availability of scholarships such as the CGS could contribute to reducing dropout through this pathway.

EXHIBIT B.2
Bean and Metzger's Model of Non-Traditional Student Attrition

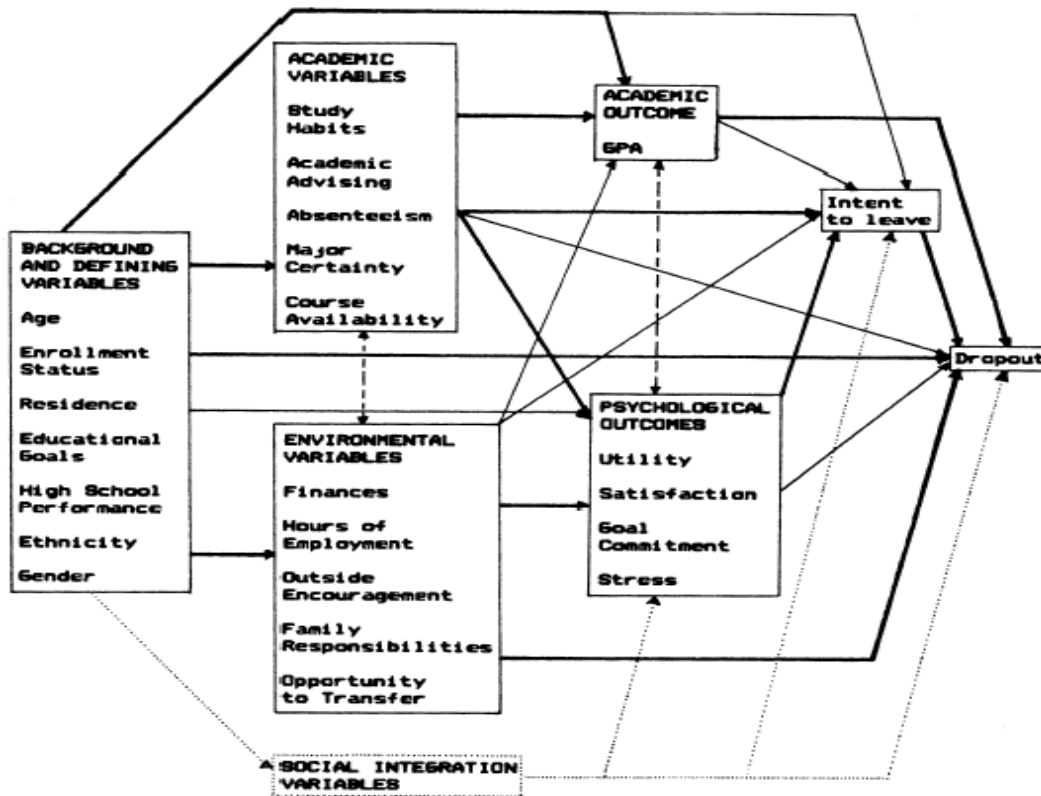


FIGURE 1. A Conceptual Model of Nontraditional Student Attrition.

Key: → Direct effects
 → Direct effects presumed most important
 ↔ Compensatory interaction effects
 ⋯ Possible effects

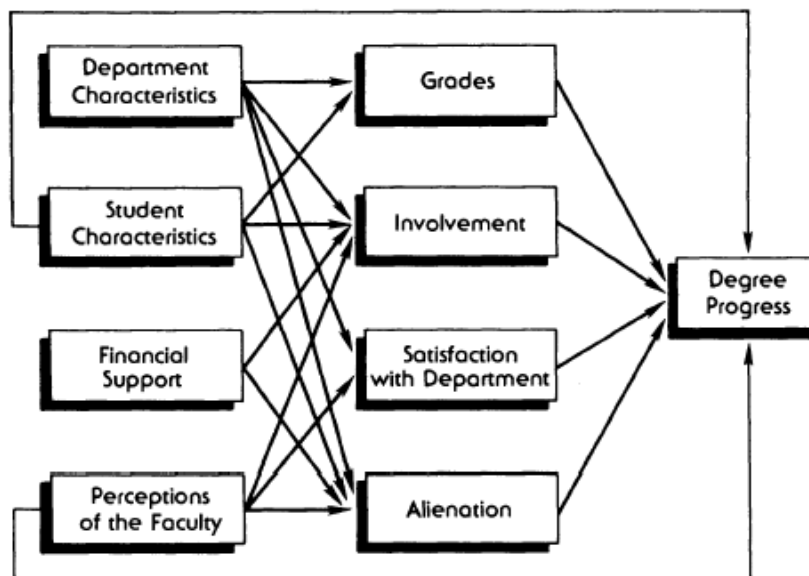
Unlike Tinto's model, Bean & Metzger's model excludes parents' education and social integration as having a direct impact on student attrition. Additionally, as a result of their literature review, Bean & Metzger excluded parents' education from their model. They found no research on the effect of parents' educational level on the persistence of students who had been independent from their primary family for a substantial period of time (Bean & Metzger, 1985:499). They proposed that, if parents' educational level is to be examined, it should be included as one of the background variables, such as age, enrolment status, high school performance, gender. Also, Bean & Metzger's model omitted social integration as a factor influencing attrition as they found that most attrition research that

examined social integration rarely found it to be a major factor in retention of non-traditional students (Bean & Metzger, 1985:520). For that reason, social integration is only included in the model as a possible effect.

Girves & Wemmerus' Conceptual Model of Graduate Student Degree Progress

Despite extensive research, only one model was found that dealt specifically with persistence among graduate students. This model, developed by Girves & Wemmerus, sought to link department and student characteristics, financial support, and student perceptions of the faculty with student grades, involvement in the program, satisfaction with the department, and alienation (Girves & Wemmerus, 1988:163). The model is based on the undergraduate models developed by Tinto and Bean & Metzger, as presented in this review, and includes other factor that the authors felt were fundamental to the graduate education experience.

EXHIBIT B.3
Girves & Wemmerus' Model of Graduate Student Degree Progress



In order to measure retention, Girves & Wemmerus examined degree progress, where a Master's degree has two steps (course work and earned degree) and a doctoral degree has three steps (course work, general examination, and earned degree). This definition allowed for the

measurement of retention in terms of degree progress rather than, for example, in terms of semesters.

As a result of an empirical study, Girves & Wemmerus found that grades were the main predictor of Master's level students' progress and that involvement was the main predictor of doctoral level students' progress.¹

Following the development of their model, Girves & Wemmerus proceeded with an empirical study to test the model. They found that grades were the main predictor of Master's level students' progress and that involvement was the main predictor of doctoral level students' progress; satisfaction/alienation did not predict progress at any level (Girves & Wemmerus, 1988:186). Note that these findings are somewhat in agreement with Bean & Metzger's decision to include social integration factors solely as limited or indirect influences of student attrition. Other findings from Girves & Wemmerus' study were that the relationship with the faculty and the department characteristics were important at both Master's and doctoral levels; that the type of financial support played a more important role at the doctoral level and that student characteristics were more influential at the Master's level (Girves & Wemmerus, 1988:186). Based on these findings, Girves & Wemmerus produced empirical models for Master's and doctoral level students. Given that this is the only empirical study using this model that was found in this literature review, the empirical models are not included in this summary.

Other Research/Empirical Studies

While a number of studies have been undertaken to examine student retention and attrition, it should be noted that findings from these studies often contradicted each other, not only demonstrating the limitations of the conceptual models, but also making it difficult to paint the profile of students. For example, the authors of *Research on Retention and Attrition* examined who left college/university and why (Grayson & Grayson 2003). To do so, they reviewed American and Canadian evidence on post-secondary student attrition. Overall, the only factor that consistently had a positive effect on whether an individual pursued their studies was the intention to return the following year. Other factors, such as gender, academic integration, social integration, social-economic status (SES), and high school grades had a positive effect, no effect or a negative effect depending on the student population being studied.

¹ Empirical models illustrating these relationships are not included in this report. First, the Consultants elected to present conceptual models rather than empirical ones. Second, these empirical models would be the result of a sole empirical study as no other study on graduate students were identified during the literature review.

One Canadian study, *Bachelor's graduates who pursue further postsecondary education* (Butlin, 2001), was identified during the literature review. As its title reads, the study examined Canadian university students who pursued postsecondary education after obtaining their bachelor's degree.¹ Using data from the 1992 National Graduates Survey of 1990 Graduates (NGS) and the 1995 Follow-up of 1990 Graduates Survey (FOG), the author identified the following as indicators (controlling for other factors) of participation in graduate studies (Butlin, 2001):

- Bachelor's graduates who studied part-time had lower odds of participating in Master's or doctoral programs.
- Graduates with \$15,000 or more in student loans had higher odds of participating in Master's and doctoral programs.
- Men had greater odds of participating in Master's and doctoral programs.
- Graduates whose parents had a university degree had higher odds of participating in Master's and doctoral programs.
- Bachelor's graduates with more than two years of work experience had lower odds of participating in Master's and doctoral programs.

Similar to the Canadian study, an American study using data from the Baccalaureate and Beyond Longitudinal Study (B&B) from students in their last year of college in 1992-1993, with follow-ups in 1993-1994 and in 1997, was also reviewed. This study, by Mullen, Goyette & Soares (2003), found that:

- Parents' education had a positive influence on enrolment in professional and doctoral programs, a modest influence on enrolment in Master's program, and no effect on enrolment in MBA programs.
- The odds of entering a Master's program were greater for women but the odds of entering other types of programs (professional, MBA, doctoral) were greater for men.
- Age had a negative effect on enrolment in first-professional or doctoral programs but no effect on enrolment in MBA or Master's programs.

¹ Further education includes all levels of post-secondary education, i.e.c, community college/trade-vocational college, university certificate or diploma, bachelor's degree, first professional degree, or Master's or doctoral degree.

Differences among different studies may be the result of differences between student populations and institutions or the use of diverging definitions of attrition, for example, in the definition and measurement of “drop-out”.

Conclusion

This review of conceptual models and studies of student attrition shows that multiple determinants and their interactions are involved. Graduate student funding is likely one among many determinants, and may be more important for some types and levels of students than for others.