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There must be a better way of distributing grant funds

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There must be a better way of distributing grant funds

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Like most academics in Canada, I have been actively applying for grants over the past number of decades. A while ago I did a stocktaking of the benefits and costs of all the effort I have put into getting external peer reviewed money. I knew I had been successful, generating enough resources to do everything I wanted and enough to share with other colleagues and students. So, I have no complaints about the outcomes. Rather, I was surprised that many of the competitions I engaged with had relatively poor returns, both for my personal effort and quite possibly for the group of scholars competing against me in those competitions.

Professor Rosalind Edwards from the London School of Economics captured my sense of unease in a recent review exploring why an estimated 37% of UK academic research was unfunded by external grants. She observed that many faculty spurned grant writing because “the effort involved in writing the application, and the time spent waiting for an outcome with a high likelihood of failure, could be better spent actually doing the research, especially where opportunities came up at short notice.”¹

That led me to explore the calculus for the Canadian scholarly granting space. Canada has three main academic research agencies – the Canadian Institutes for Health Research (CIHR), the Natural Science and Engineering Research Council (NSERC) and the Social Sciences and Humanities Research Council (SSHRC) – which in 2021-22 appropriated approximately \$3.7 billion, much of it through competitive grants to scholars and academics in Canada. The competition for these grants involves about 46,000 full time faculty, about 200,000 graduate

¹ <https://blogs.lse.ac.uk/impactofsocialsciences/2020/08/13/unfunded-research-why-academics-do-it-and-its-unvalued-contribution-to-the-impact-agenda/>

research students and a smaller but important group of professional researchers hosted in eligible post-secondary institutions.

SSHRC Program Logic Using 2018 Competition Year Data			
Program data from SSHRC	Connection	Insight	Partnership
Apps	3,298	18,050	1,948
Success rate	54.2%	32.0%	40.1%
Successful applications	1,788	5,776	781
Awarded funds (total)	\$44,300,000	\$671,100,000	\$318,800,000
Average award	\$24,783	\$116,188	\$408,117

As a social scientist focused on innovation policy I was (and still am) largely funded by SSHRC (often in combination with NSERC) and other peer reviewed programming outside the Tri-Agency Space. I used my SSHRC focused efforts to explore the economics of the choices we make. When I did this analysis in 2020, SSHRC had three main programs: Connections Grants, Insight Grants and Partnership Grants. In 2018 Connections Grants were designed to be one-year programs costing \$7K-\$50K; Insight Grants could take 2 to 5 years and range from \$7K to \$400K; and Partnership Grants 4 to 7 years and max out at \$2.5 million. Overall, in 2018, the agency distributed about \$1.3 billion, about 4%, 65% and 31% to the three programs respectively. The average Connection Grant was \$25K, Insight Grants averaged \$116K and the Partnership Grants came in at an average of \$408K.

Analytical approach

To explore this topic I constructed a basic benefit-cost model.

Using SSHRC data for the number of applications, the actual success rates and the funds awarded in 2018, one can construct a model that shows the individual and program level trade-offs inherent in the construction of our competitive granting system.

I assumed a prospective applicant is an average tenured faculty member (earning \$150K), which was about the median income in the post-secondary university system in Canada in 2018. Each faculty was assumed to be paid for 1,650 hours of work per year (based on the USFA Collective Agreement). The average overhead applied by universities for grants outside the Tri-Agency envelop was set to about 40%. A ball-park estimate is that the salary related charges are in the range of 20% (pensions, CPP, EI, WCB and other direct charges on labour) and the plant, equipment and supports generate an additional 20%, for an average 40% overhead.

Assumptions	
Annual Salary of average applicant	\$150,000
Annual paid hours per year per applicant	1,650
Institutional Overhead	40%

This following analysis was done in an Excel spreadsheet (printout in the appendix).

The individual calculus

For an individual deciding whether to compete in a competition for grants, there are two basic perspectives.

First, at the most basic, one could look at the benefit-cost ratio if one assumes one might be successful. For the sake of simplicity, we will assume the applicant will win the average award in the program they are interested in. Talking with colleagues, I hear a wide range of estimates of how much effort they have to make to develop a successful application. I tried to guesstimate an average effort per program. If investigators invested 100, 250 and 800 hours respectively in the Connections, Insight and Partnership Grant programs, using the salary and overhead rates assumed above, the individual costs for each completed application would be \$9,091, \$22,272 and \$72,727 respectively. Compared to the average award, the successful applicants would each gain somewhere between 32% and 56% of the resources they had put in.

Investigator logic	Connection	Insight	Partnership
Hours per app (all investigators on team)	100	250	800
Cost to each applicant	\$9,091	\$22,727	\$72,727
Benefit to winning applicants	\$24,783	\$116,188	\$408,117
Net benefit for grant winners	\$15,692	\$93,460	\$335,390
Ratio of benefit to cost for investigators	2.7 - 1	5.1 - 1	5.6 - 1

There is no definitive data about how much people invest in these competitions, but it is pretty clear that few if any rational investigators would invest more than they could gain. The break-even effort for the Connection Grant is 275 hours, for the Insight Grant it is 1,275 hours and for the Partnership Grant it is 4,450 hours. My sense is that few applicants invest that amount of energy, so if you think you will win the award for most of these grants, there is a personal rationale for applying.

Second, there is the problem that not everyone can win. About 32-54% of the applicants make the correct choice in investing the effort as they recoup all of their efforts and have more funds to invest. The 46-68% of the applicants who fail to win any money lose some or all of their investment, and arguably they might have done better to just get on and do the research without funding. Deciding whether to play is at least partly based on your individual risk tolerance.

If we all acted as strict optimizers (the way economists hypothesize or even assert we should act), then we would only act if the mathematical expectation of our personal actions significantly exceeded zero. Calculated as [(payoff*probability) - sunk cost], the mathematically expected payoff for the average team of applicants is 72% to 85% below the net benefits for winners for the various programs. For the two smaller programs, the mathematically expected payoffs are so small that any risk averse individual might totally discount any benefit. That probably goes a long way to explain why more than a third of UK scholars (and undoubtedly a similar number in Canada) choose to forgo the granting game.

Investigator logic	Connections	Insight	Partnership
Net benefit for grant winners	\$15,692	\$93,460	\$335,390
Mathematical expectation for average applicant	\$4,341	\$14,453	\$90,928

Of course, we are all at a different stage in our career. When I ran the same analysis using my actual salary as a full professor with 25 years’ service, I discovered that my personal mathematical expected return from applying for a Connections Grant was negative while the return to an Insight Grant was so near to zero as to make it a poor choice. The only program that offered any real return on my effort, expectations adjusted, was the Partnership Grant and even it was not a great return for the effort required.

When one does this analysis also matters. Canada’s Fundamental Science Review Report (2017) observed that a shift in funding away from federal research councils caused a drop of over 30% in available resources per researcher between 2007 and 2015. Clearly, if payouts for winners are larger, or the probability of success is higher, the calculations would be different. I checked for the program results for 2023 and note that all three SSHRC programs have reported more applications, a higher success rate and larger average awards, which may address some of this issue.

The logic at the program level

Quite often what we do as individuals may make sense, however, the aggregate effects of our discrete actions can and often do create larger problems. At the program level, the logic for our existing system is problematic, given the overheads and administrative costs for managing the adjudication process.

There are no documented costs of adjudicating a grant, but I have assigned a token rate of \$1,000 per application. Most grants go through some form of internal review and compliance before being submitted to the granting agency that then recruits a minimum of 2 peer reviewers who

provide anonymous written reviews which are then adjudicated by a panel of reviewers. The token amount would cover approximately 8-10 hours of professional time at market rates. The analysis also accounts for the fact that the Partnerships Program invests a modest \$20K grant to assist teams that get past the letter of intent stage. Then we need to account for the fact that institutions incur overhead costs on every activity. While many agencies do not pay any or full overheads as policy, those costs do accrue and need to be recognized.

Looking only at the program level, all of the teams and the adjudication costs and related benefits are shown below. Connections grants cost more to develop and adjudicate than they deliver while Insight and Partnership grants deliver 12% and 25% more than the development and adjudication costs. While the connections grant is arguably a wealth consuming program, the returns for the other two programs are far from impressive.

Program logic	Connections	Insight	Partnership
Total cost to SSHRC and investigators	\$45,272,545	\$592,368,182	\$239,249,818
Total benefit to winning applicants	\$44,300,000	\$671,100,000	\$318,800,000
Net benefit for program	-\$972,545	\$78,731,818	\$79,550,182
Ratio of net benefit to total benefit for program	-2%	12%	25%

Breakeven time for programs

Comparing the funds allocated by program with the efforts and costs expended by the agencies, the host universities and the investigators, we can impute the breakeven hours per app for each program. While the breakeven for Connection Grants at the individual level is 150 hours, when program costs are added, the breakeven effort drops below 100 hours per team. Correspondingly, the breakeven for Insight Grants is probably 410 hours for the teams but only about 285 hours at the program level and 1800 hours for individual teams building Partnership Program grants but as little as 1,120 hours at the program level. I know the last Connection Grant I was part of took more than that and the Partnership Grants I have been part of have consumed some multiple of

that number, albeit spread over two or more years of development and so often not noticed or counted.

How can we do better?

Research races and lotteries are notoriously inefficient ways to allocate effort and rewards. Many investigators spend too much effort to awards, suggesting that at the program level we have created an inefficient allocation process where the sum of the individual costs exceeds the aggregate benefits awarded in some areas and delivers poor return in other areas. Given our inability to fully discern probabilities, we regularly invest more in aggregate than the value of the award.

All jurisdictions have some forms of competitive grants, but many allocate some of their efforts more on collective capacity and effort than on the unique plans and attributes of scholars pitching competitive projects. Canada's allocation methods predominantly involve extensive ex ante oversight and evaluation. Universities in the US follow a similar path but with lower probabilities of success and higher returns to winners, which undoubtedly helps to screen out marginal performers and reduce the dead weight loss of the competitive process.

Others have worked to balance that with allocations based on ex-post review of outputs and impact. The UK Research Excellence Framework undertakes a system wide peer review of the higher education sector; those reviews then drive about £2 billion of annual, quality-related research grants to support research, which is larger than the combined granting councils which offer competitive grants. Most European countries, and Australia, have similarly adopted blended systems, all which offer the prospect of lower transactional costs and support for longer-term research efforts.

Surely there must be a more efficient and effective way to motivate and support scholarly research in Canada.

Appendix: SSHRC Program Logic

Using 2018 Competition Year Data

Program data from SSHRC	Connection	Insight	Partnership
Apps	3,298	18,050	1,948
Success rate	54.2%	32.0%	40.1%
Awarded funds (total) *	\$44,300,000	\$671,100,000	\$318,800,000
Successful applications	1,788	5,776	781
Average award	\$24,783	\$116,188	\$408,117

Investigator logic (assumptions and implications)

• Hours per app (all investigators)	100	250	800
• Person days per app (hours per app/7.5 hours per day)	13	33	107
• Annual Salary of applicants	\$150,000	\$150,000	\$150,000
• Annual hours (collective agreement)	1,650	1,650	1,650
• Overhead	1.4	1.4	1.4
• Individual Cost to all applicants	\$9,091	\$22,727	\$72,727
• Individual Benefit to winners	\$24,783	\$116,188	\$408,117
• Net benefit for grant winners	\$15,692	\$93,460	\$335,390
• Ratio of net benefit to total benefit	273%	511%	561%
• Mathematical expectation for individual applicant	\$4,341.47	\$14,452.78	\$90,927.76

Program logic (assumptions and implications)

• Adjudication cost per application	\$1,000	\$1,000	\$1,000
• Cash costs (funded by SSHRC)			\$20,000
• Hours per app (all investigators)	100	250	800
• Annual Salary	\$150,000	\$150,000	\$150,000
• Annual hours (collective agreement)	1650	1650	1650
• Overhead	1.4	1.4	1.4
• Cost to SSHRC and investigators	\$45,272,545	\$592,368,182	\$239,249,818
• Benefit to winning applicants	\$44,300,000	\$671,100,000	\$318,800,000
• Net benefit for program	-\$972,545	\$78,731,818	\$79,550,182
• Ratio of net benefit to total benefit	-2%	12%	25%

Break even time invested (hours)

• Individual (winners)	148	409	1,801
• Program	98	285	1,121

* Funds are allocated over 2-5 years but are not discounted to the present, which inflates their value.