

“A Meritorious Alberta Advantage”

Slide deck for UCGSA's white paper on a merit-based research scholarship funding model



GRADUATE
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Summary

- Graduate students now perform the majority of teaching and research in universities. Because of this, university operating funding is integral for compensating graduate students for their work.
- They're also a key linkage between universities and the private sector, and therefore play a major role in commercialization and the generation of external, non-government funding.
- Graduate student funding in Alberta is uncompetitive from both a national and international perspective.
- **Using a three-tiered, merit-based scholarships can increase graduate stipends to competitive levels and further commercialization.**
- This scholarship model can also be made revenue-neutral.
- These scholarships won't fully make up for lost operating grant revenue or be as effective at increasing accessibility as non-repayable needs-based grants, but this scholarship model can nonetheless make Alberta's graduate programs—and economy more broadly—more dynamic and competitive.

Part One: What is a graduate student, anyways?

Graduate students are workers

- Graduate students play an essential role in the university's two core functions: research and teaching.
 - Sessional instructors, teacher's assistants.
 - Research assistants, co-authors, researchers.
- Research and business testimony shows that graduate students are *the* key linkage between universities and businesses:
 - Act as a bridge connecting faculty members to commercialization opportunities;
 - Perform vital support work that lessens businesses R&D costs;
 - Conduct research that is easily commercializable;
 - Active in the generation of IP for companies.
- Economic benefits:
 - Teaching creates human capital;
 - Research/commercialization powers innovation.

We face unique costs

- Average age of UCalgary graduate student ~ 35 years old.
- Nearly a third of us have at least one dependent (spouse, child, elderly parent, etc...)
- Means we face the combined costs of a student *and* a “typical” Albertan:
 - Tuition/fees -> student costs
 - Rent, childcare, school fees -> normal adult costs

We respond to incentives

- Like all economic actors, we “go where the grass is greener”
 - i.e., we’ll avoid areas with high costs and low stipends, and gravitate to areas with high stipend/cost-of-living ratios.

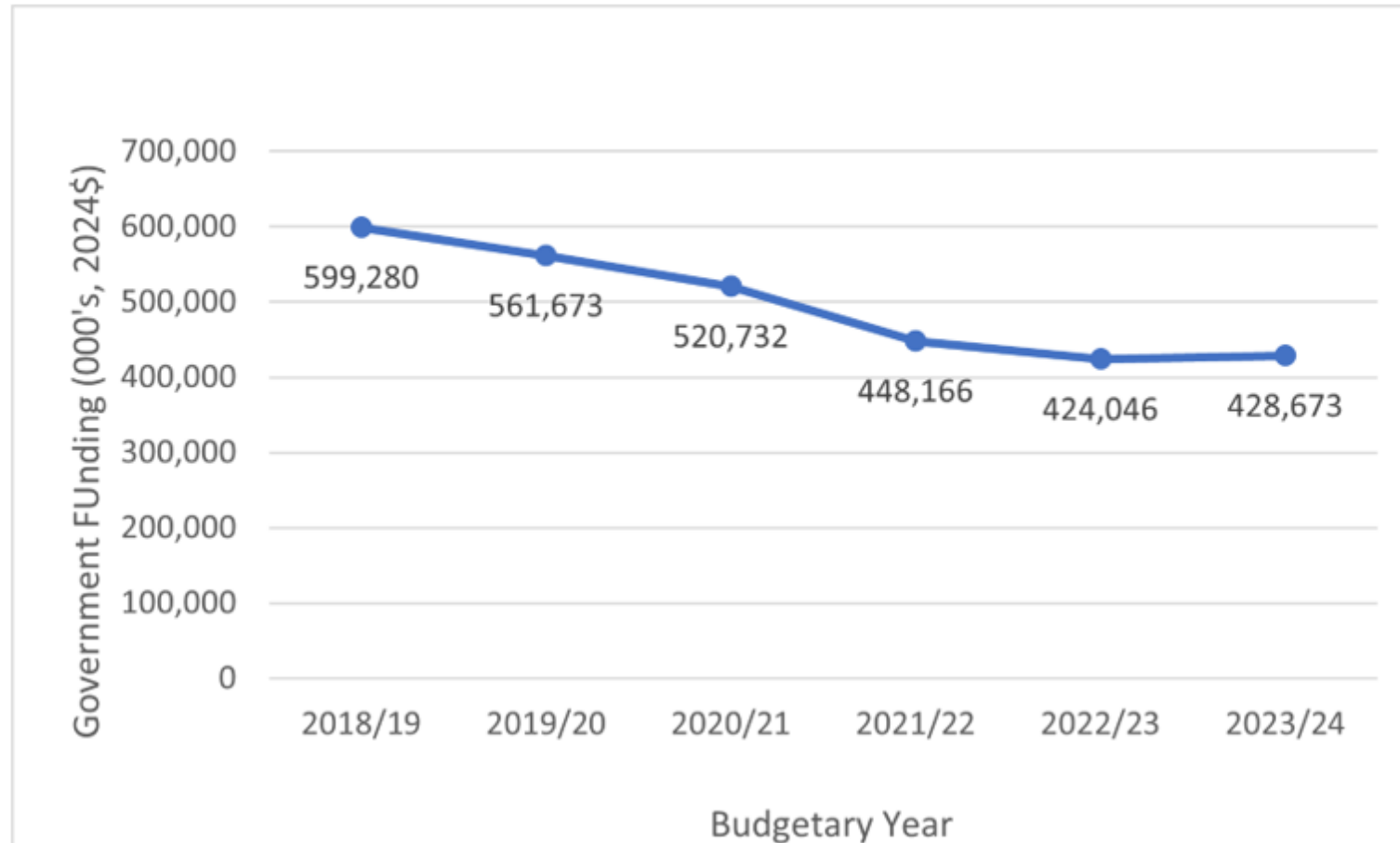
Part Two: The Current State of Graduate Funding in Alberta

Operating Funding: The Province, Private Sector, and Tuition

- Because graduate students are so closely integrated into university operations, our pay depends heavily on university operating funding.
- For this reason, all external sources of funding—from government or the private sector—can enhance graduate student wages.
- Tuition, by contrast, is effectively a wage cut. Raising tuition to increase graduate student pay is self-defeating unless some graduate students are excluded from funding all together (“robbing Peter to pay Paul”)
- The problem: external funding sources have declined substantially

Ministry of Advanced Education Operating Grants (October 2024 CPI)

Fig.1. Real Advanced Education Operating Grant Funding to UCalgary, 2018/19 to 2023/24⁸⁴



Other GoA grants and Alberta Health

Fig.2. Real Other Government of Alberta Funding to UCalgary, 2018/19 to 2023/24⁸⁵

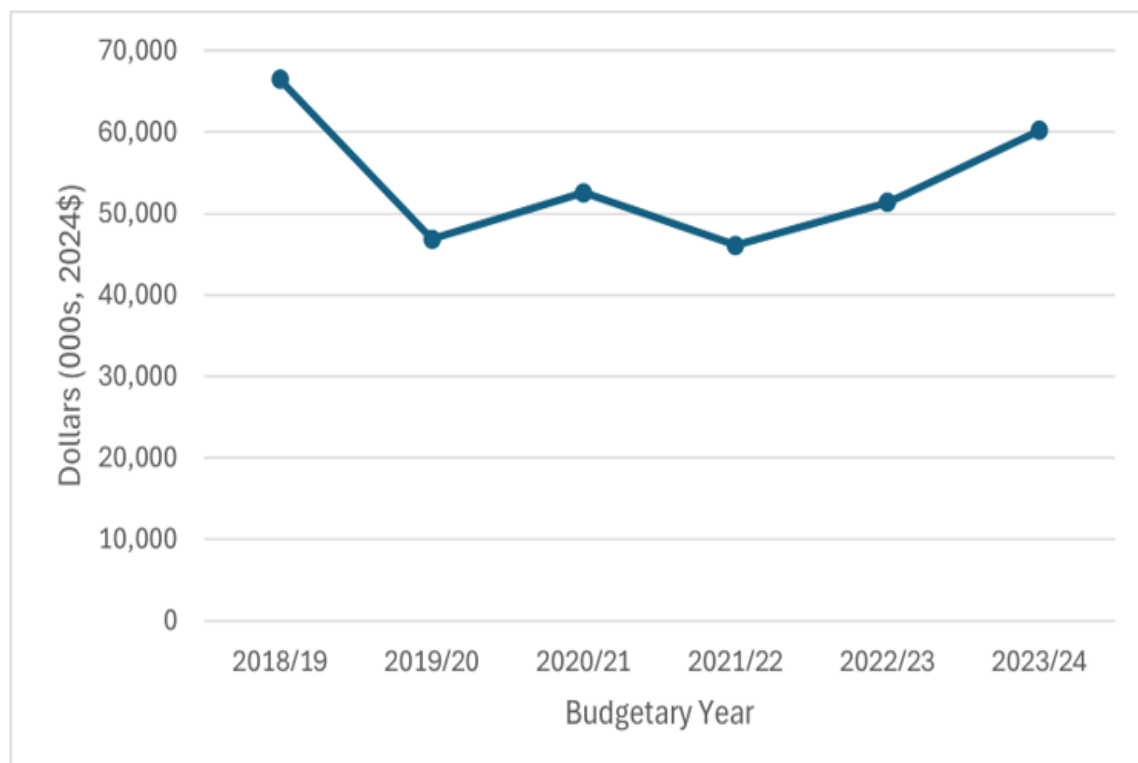
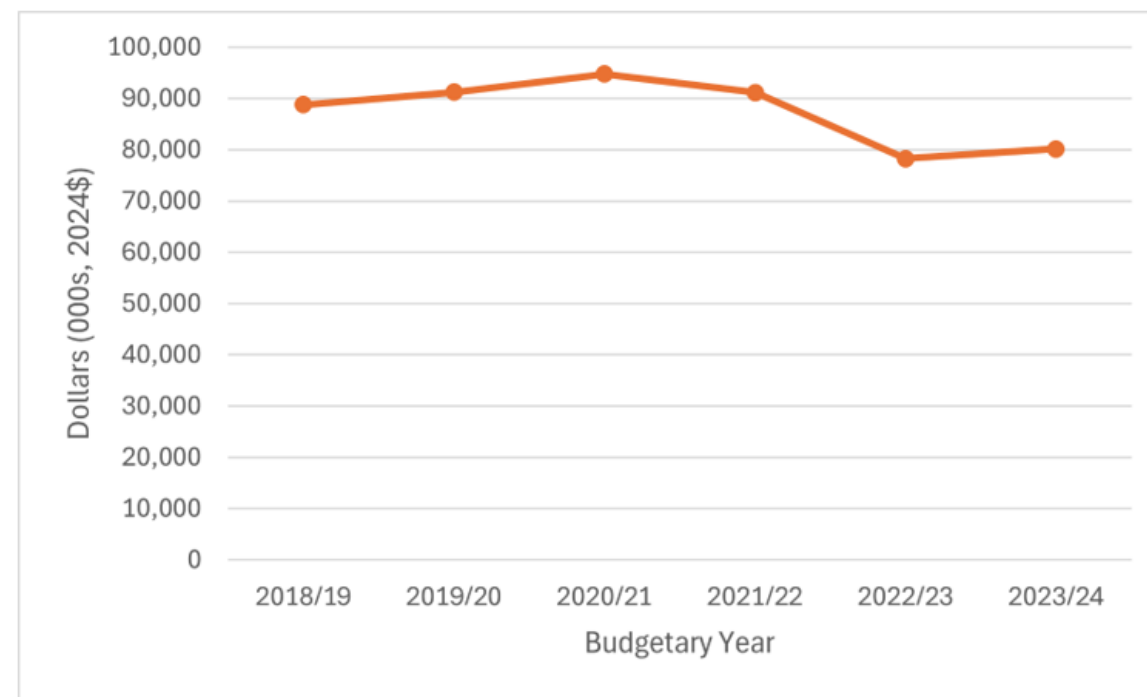
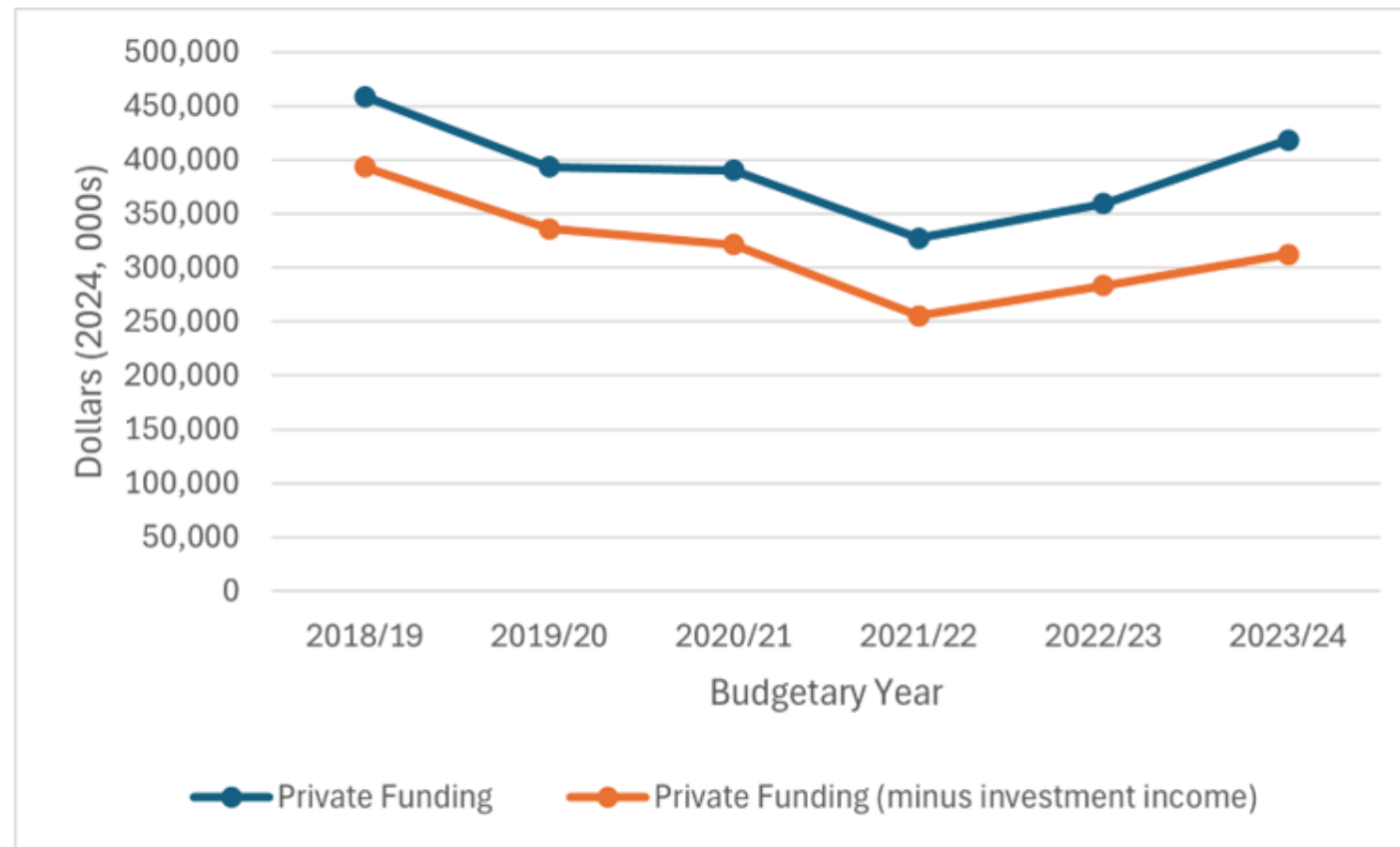


Fig.3. Real Alberta Health Funding to UCalgary, 2018/19 to 2023/24⁸⁶



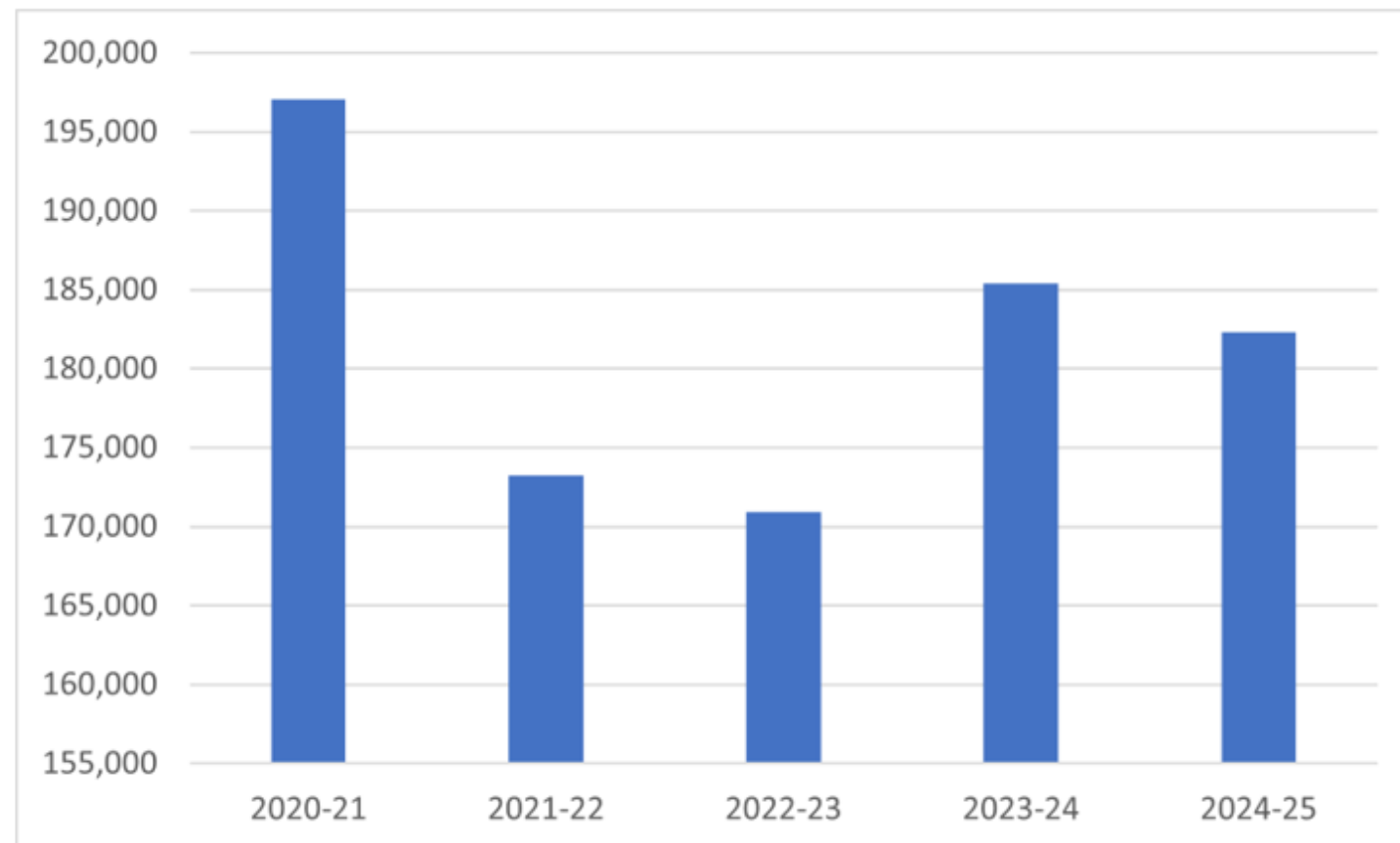
Private External Funding

Fig.4. Real UCalgary Private External Funding, 2018/19 to 2023/24⁹⁰



Alberta also has few scholarship opportunities, and non-repayable needs-based grants have declined

Fig.6. Projected Government Expenditures on Non-Repayable Student Aid, 2020/21 to 2024/25 (2024 CPI, in thousands)^{122,123,124,125}



Only tuition and federal research funding have increased since 2019 (and federal research only goes to a select few)

Fig.9. Master's Student Tri-Council Quotas in 2024/25 and Total Domestic Enrollment, 2022/23^{149,150}

Granting Agency	Master's Quotas	Total Students	% of Maximum Successful Applicants
SSHRC	1,365	86,889	1.6
NSERC	840 ¹⁵¹	29,741	2.8
CIHR	795	54,936	1.4
<i>Total</i>	3,000	171,566	1.7

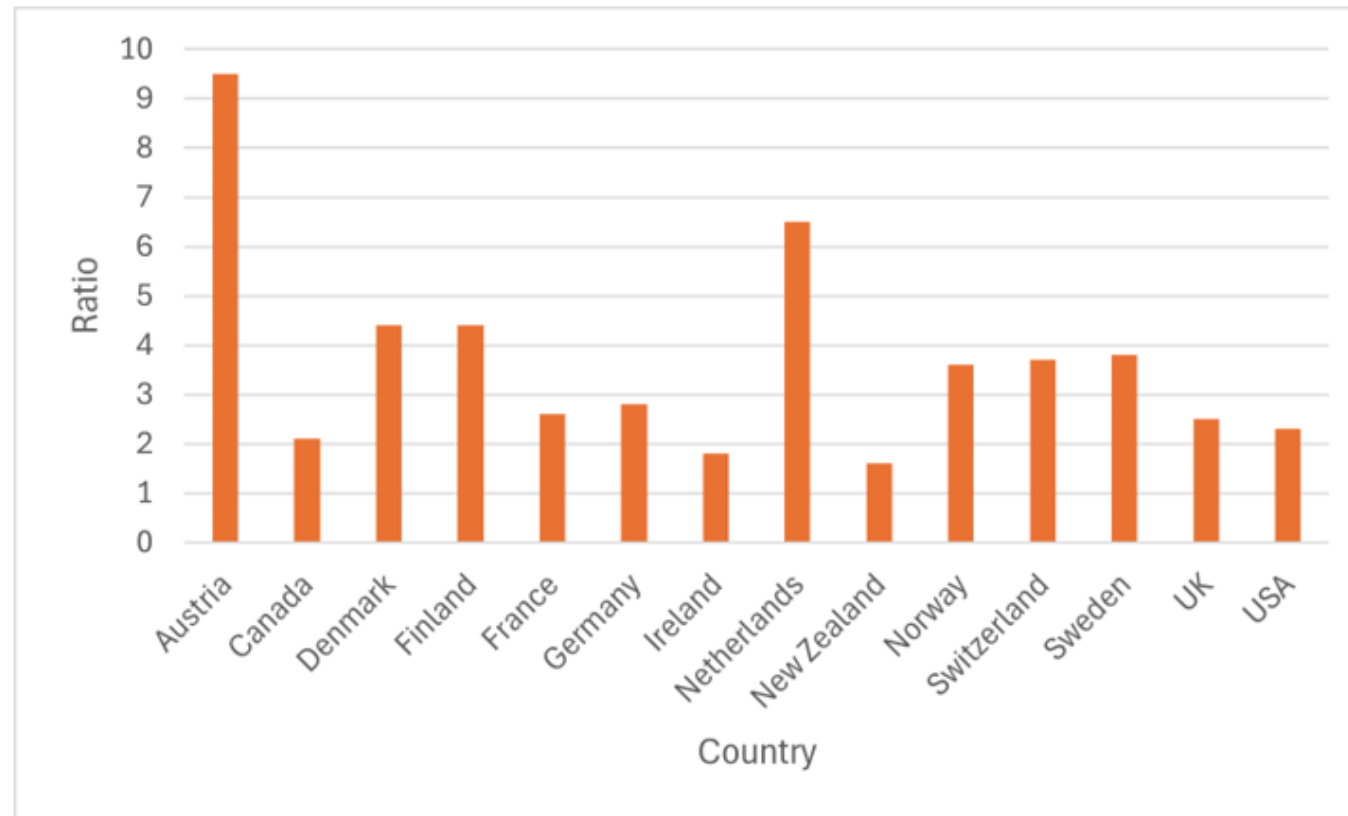
Fig.10. PhD Students Tri-Council Quotas in 2024/25 and Total Domestic Enrollment, 2022/23^{152,153,154,155}

Granting Agency	PhD Quotas	Total Students	% of Maximum Successful Applicants
SSHRC	1,817	18,567	9.8
NSERC	1,655	14,571	11.4
CIHR	930	4,353	21.4
<i>Total</i>	4,402	37,491	11.7

Part Three: Graduate Student Funding in a Comparative Perspective

The Average Canadian Stipend is substantially lower than other countries, including when adjusted for cost-of-living

Fig.12. Stipend/Cost of Living Ratio of 14 Countries, 2022 (USD)¹⁷¹

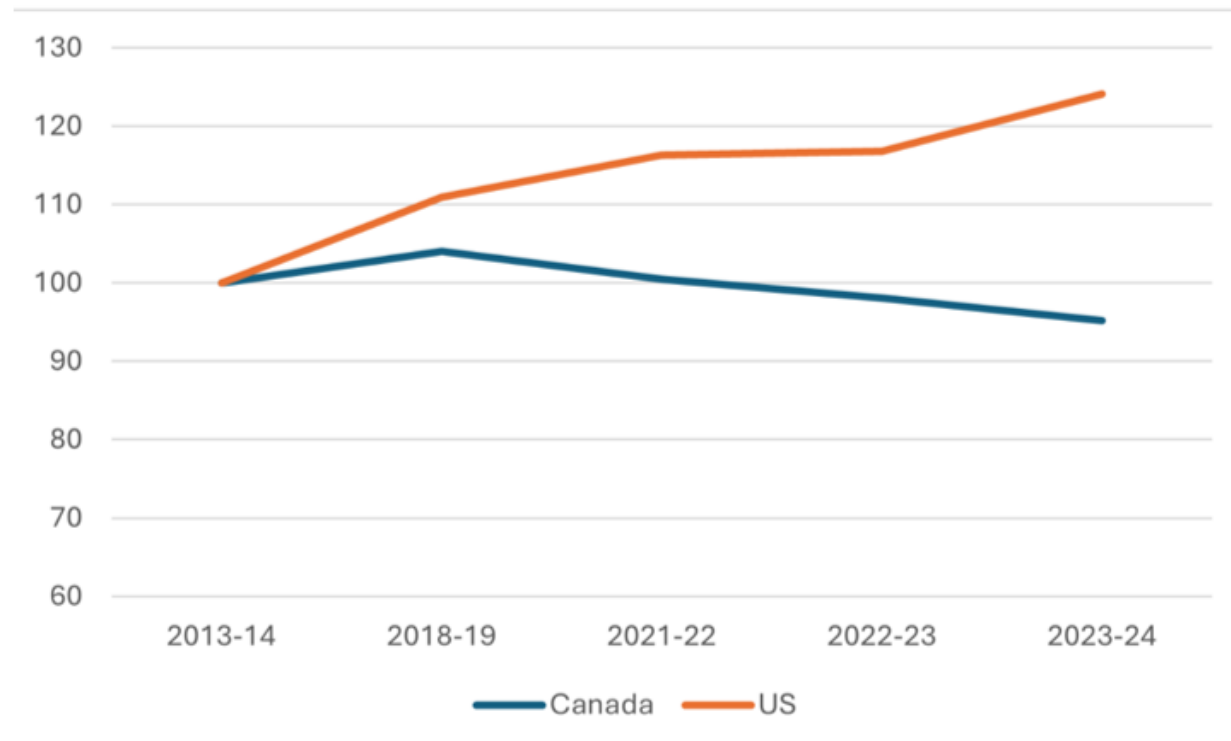


Canada vs the World

- This is likely going to get worse, as other jurisdictions have plans to rapidly increase support for post-secondaries (graduate students included) in order to jumpstart their economies.
 - Ex: The European Union's "Draghi Report"
- The United States *was* poised to do this too (the *CHIPs Act* earmarked \$13 billion for graduate student scholarships, professional development, and so on).
 - *CHIPs Act* in political limbo, but state governments have also increased support to post-secondaries far above what Canadian provinces have

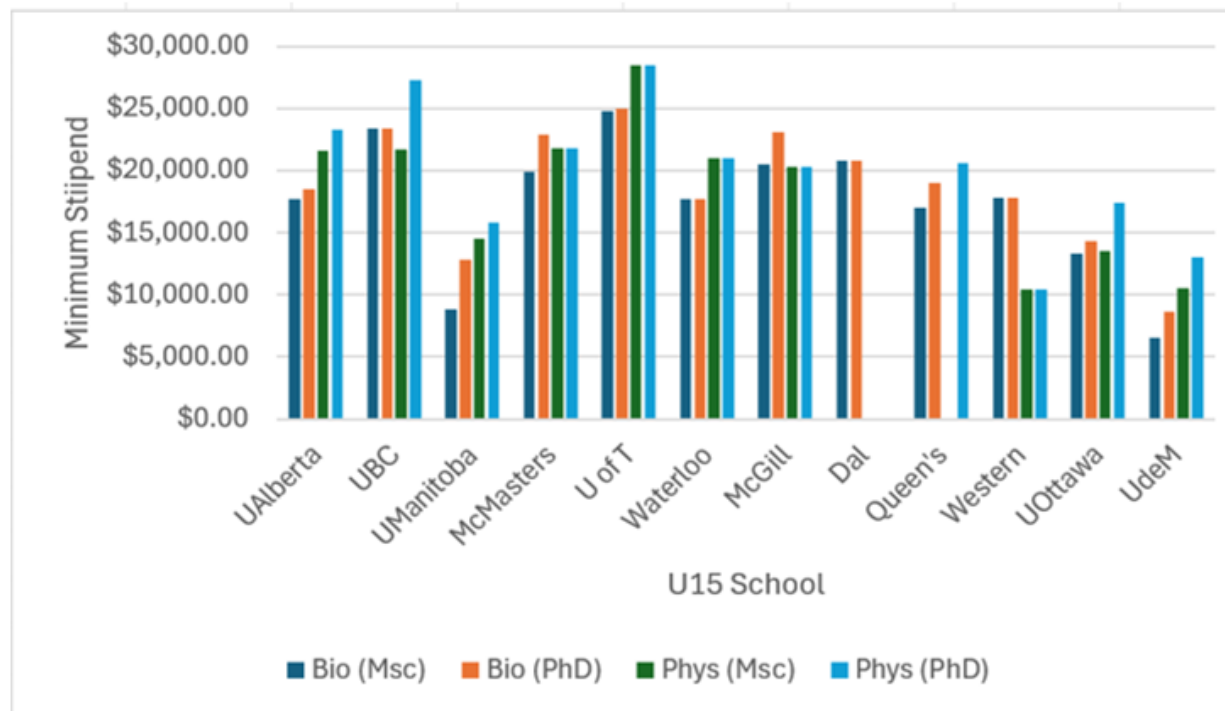
Provinces vs States

Fig.14. Change in Real State/Provincial Expenditures on PSE, Canada vs US, 2013/14 to 2023/24 (taken from HESA)¹⁸⁹



Funding package data is hard to find, but preliminary results suggest Albertan stipends are mostly below national average

Fig.16. Bailey et. al.'s Minimum Net Stipends for Bio and Physics Msc and Phd Students, U15¹⁹⁵



Alberta *does* have a leaky pipeline, though, further suggesting funding challenges exist at the graduate level

Fig.17. Percentage of Bachelor's and Graduate Degrees amongst working age population (25-64) in Alberta and Comparative Provinces, 2021.²⁰³

Jurisdiction	Bachelor's	Masters	PhDs
Newfoundland	13.4%	5.2%	0.7%
PEI	18.5%	6.0%	0.8%
Nova Scotia	19.7%	6.6%	0.9%
New Brunswick	16.3%	4.5%	0.6%
Quebec	18.1%	6.8%	1.1%
Ontario	23.7%	8.7%	1.2%
Manitoba	20.4%	4.8%	0.7%
Saskatchewan	18.3%	4.7%	0.8%
<i>Alberta</i>	21.7%	6.1%	0.9%
British Columbia	22.7%	7.9%	1.1%
<i>Canadian Average</i>	21.3%	7.4%	1.1%
<i>OECD Average</i>	18.9%	13.9%	1.3%

Part Four: Our Model

Assumptions

- Using 2022/23 headcount
- 50/50 split between course-based and thesis-based master's students
- 10% annual enrollment growth until 2030
- Administrative costs of scholarship equal to 25% of scholarship's value
- ROI of \$4.80
 - But ROI *only* on direct costs (not administrative costs)
 - Alt measure: \$1 spent on education generates \$7.46 in savings for government

Structure

- 3 tiers of scholarships:
 - Tier 1: Top 25% of students
 - Tier 2: Top 5% of students
 - Tier 3: Top 1% of students
- Based off Tri-Council model
 - One stream for social science, humanities, business, and education
 - One stream for natural sciences and engineering
 - One stream for medical researchers

Structure

Tier	Value	Number Awarded	Percentage of Successful Applicants
Master's			
1	\$7,000	2,102	Top 25%
2	\$13,000	420	Top 5%
3	\$17,500	84	Top 1%
Doctoral			
1	\$9,500	1,532	Top 25%
2	\$18,000	306	Top 5%
3	\$24,000	61	Top 1%

Cost

Tier 1

Eligible <u>Master's</u> Students	Value of Award	Direct Cost
2,102	\$7,000	\$14,714,000

Eligible Doctoral Students	Value of Award	Direct Cost
1,532	\$9,500	\$14,319,000

Tier 2

Eligible <u>Master's</u> Students	Value of Award	Direct Cost
420	\$13,000	\$5,460,000

Eligible Doctoral Students	Value of Award	Direct Cost
306	\$18,000	\$5,508,000

Tier 3

Eligible <u>Master's</u> Students	Value of Award	Direct Cost
84	\$17,500	\$1,470,000

Eligible Doctoral Students	Value of Award	Direct Cost
61	\$24,000	\$1,464,000

Cost

- Total 1-year direct cost: **\$42,935,000.00**
- Total 1-year indirect cost: **\$10,733,750.00**
- *Total 1-year cost: **\$53,668,750.00***

Long-Term Cost

	2025-26	2026-27	2027-28	2028-29	2029-30
<i>Master's</i>	\$21,644,000	\$23,808,400	\$26,189,240	\$28,808,164	\$31,688,980
<i>Doctoral</i>	\$21,291,000	\$23,420,100	\$25,762,110	\$28,338,321	\$31,172,153
<i>Indirect Cost</i>	\$10,753,750	\$11,807,125	\$12,897,838	\$14,286,621	\$15,715,283
<i>Total</i>	\$53,668,750	\$59,035,625	\$64,939,188	\$71,433,106	\$78,576,416

Path to Revenue Neutrality: Conservative Estimate

- Assume all new economic activity is taxed at 10% rate.
- If the scholarships generate \$4.80 of economic activity for every \$1 spent on direct costs, 2026/27 would then see the scholarships generate **\$22.7 million** in taxes against a cost of **\$59 million**.
- \$36.3 million deficit can be made up by combination of diverting existing merit-based scholarship funding (ex: AGES), reduced student aid demand, and reduced welfare rolls from graduate students.
- Additional funding could be made up by private donors, as these scholarships should crowd in additional private funding
- **Note:** administrative costs could also be reduced by partnering with Mitacs, using their expertise to administer program at low cost.

Path to Revenue Neutrality: Fully-Costed Estimate

- Federal Reserve study estimated education generates \$7.46 in savings for government through reduced welfare spending, reduced crime, higher future incomes, and economic growth.
 - Savings rate for states is \$3.10
- Assume \$3.00 in savings (except in first year due to growing pains)
 - No sales tax in Alberta = lower increased tax revenue than US average, so rounding down
- Even with a lower first-year savings rate, and factoring in the 25% administrative costs, the government still generates more savings than expenses with this program.

Conservative and Fully-Costed Estimate

Fig.19. Conservative and Fully-Costed Savings Minus Costs of Scholarship Program (in thousands)²²²

Year	Total Cost (Direct + Indirect)	Conservative Revenue Generated	<u>Fully-Costed</u> Savings Rate	<u>Fully-Costed</u> Savings	Difference (Conservative Estimate)	Difference (<u>Fully-Costed</u> Estimate)
2025/26	\$53,669	\$10,304	\$1.50/\$1.00	\$64,403	-\$43,365	+\$10,734
2026/27	\$59,036	\$22,699	\$3.00/\$1.00	\$141,867	-\$36,337	+\$82,831
2027/28	\$64,939	\$24,937	\$3.00/\$1.00	\$155,853	-\$40,002	+\$90,914
2028/29	\$71,433	\$27,430	\$3.00/\$1.00	\$171,438	-\$44,003	+\$100,005
2029/30	\$78,576	\$30,173	\$3.00/\$1.00	\$188,583	-\$48,403	+\$110,007

Merit Criteria

- Merit Criteria should be crafted by an independent, expert panel, and should take equity, diversity, inclusion, and accessibility considerations into account based.
- Otherwise, UCGSA's specific recommendations involve incentivizing interdisciplinary research and community/industry connections

Incentivizing Interdisciplinary Research

- “Wicked problems”: highly complex problems that are difficult to solve.
- Require cross-disciplinary thinking.
- To get the most from these scholarships, ensure that merit-criteria rewards projects that transcend disciplinary boundaries.
- Also ensure that efficiency of three-track model (ala the Tri-Council agencies) doesn't cause good research to fall through the cracks, simply because it doesn't fit neatly into a research silo.

Community/Industry Connections

- Research suggests that graduate students naturally form linkages with external organizations, especially private industry.
- Merit-criteria that encourages/rewards students for undertaking commercialization activities (ex: have experience helping professors commercialize their work or have research projects with high commercialization potential) or community work (volunteer experience with not-for-profits or have research projects that help a not-for-profits mission) can help further encourage these connections.
- Studies on graduate students creating linkages for technology transfer can help inform best practices.
 - Ex: rewarding students who can explain their projects in a way easily accessible to non-experts.

Course-Based Students

- And admitted blindspot for this proposal.
- Suggest further consultation with course-based students to see how they can be incorporated into this model.
- Ex: reward capstone projects in a similar vein to how this model evaluates a master's thesis or doctoral dissertation.
- Ex II: reconfigure course-work to include more work-integrated learning for course-based students, apply financial awards for meritorious work in those classes.

Why Must the Government Fund This?

- Endogenous growth theory states that economic models apply to *all* aspects of the growth process, including determining where ideas and technological advances come from.
- Means that skills and knowledge are economic goods, but not pure private goods (i.e., are rivalrous and excludable).
- Skills and knowledge are likely club goods (excludable but non-rivalrous), which means the benefits of possessing these goods can't be fully internalized.
- Means businesses don't have an incentive to invest in skills or knowledge production at a socially optimal level.
- Governments, which can tolerate greater risk, must then step in.

Community/Industry Connections

Fig.20. Mechanism-informed Merit Criteria Recommendations²³⁵

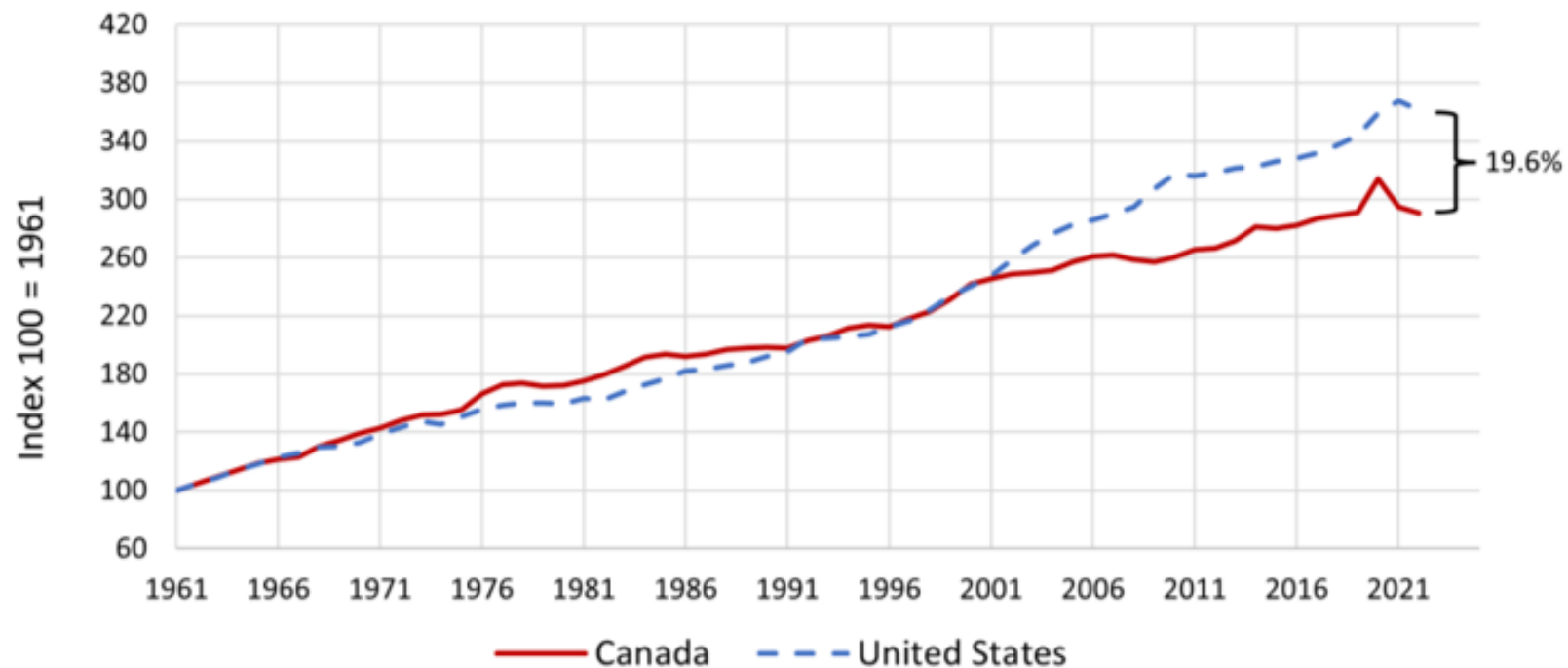
Study	Mechanism	Recommendation
<u>Ponomariov (2008); Boardman and Ponomariov (2009); Thune (2009); Thune (2010)</u>	Graduate students connect professors/university to private industry through work experience.	Increased funding support should naturally increase university-industry interactions, especially if it fosters positive student/supervisor or student/institution relations
Boardman and <u>Ponomariov (2009)</u>	Graduate students perform research that is easily <u>commercializable</u> by business.	Increased funding support should naturally increase university-industry interactions, especially if it allows graduates students to concentrate more on research.
<u>Ponomariov (2008); Boardman and Ponomariov (2009)</u>	Graduate students enhance research capacity because they are better able to trouble shoot research projects than professors or private industry	<i>Include criteria that rewards students for collaborating with professors to either aid their own <u>commercialization efforts</u> or their partnerships with not-for-profits.</i>
Slaughter et. al. (2002); Santos et. al. (2020)	Graduate students drive knowledge transfer between universities and industry.	<i>Include criteria that rewards students for explaining their projects in a way that's accessible to a non-expert audience.</i>

Part Five: The Future is a Foreign Land

Geopolitical Uncertainty and Canada's "Patent Productivity Paradox"

Canada's productivity crisis (and this was before the tariffs!)

Fig.21. Canadian and United States Business Productivity Growth, 1961-2022 (from Michael Willox)²⁷⁴



Alberta isn't immune

Fig.23. %Change in Labour Productivity from 2019 to 2023 and 2014 to 2023²⁸⁰



The Work of Graduate Students

- As already stated, graduate students are key contributors to the research and innovation ecosystem. We can help increase our productivity by generating more process and product innovation.
- Graduate student research also intersects with strategically important fields, like artificial intelligence, energy production, medicine, Arctic Security, the political economy of international trade, teaching, and so on.

Creating More Canadian-Owned IP

- Canada's "Patent Productivity Paradox":
 - Universities produce a ton of IP, but our productivity is stagnant. Why is that?
- Answer: a lot of university-created IP is sold to foreign-owned firms, rather than Canadian ones.
 - Why? Complicated answer, but universities have to maximize their budgets. They'll sell to the highest bidder, which is frequently foreign-owned firms.
- CIGI study: domestic firms have restricted freedom of operations in Canada due to foreign-owned firms eating all the university-created IP.

Canadian-owned IP Report Card

Fig.25. Hinton, Witzel, and Wajda's U15 Report Card for Canadian-owned University IP

University	% of IP owned by Canadians	Letter Grade	Pass/Fail
University of Manitoba	71%	B	Pass
Queen's University	64%	C	Pass
University of Alberta	63%	C	Pass
University of Ottawa	58%	C	Pass
University of Waterloo	53%	D	Pass
Dalhousie University	50%	D	Pass
Université de Montréal	49%	F	Fail
University of Saskatchewan	47%	F	Fail
Western University	46%	F	Fail
University of Calgary	40%	F	Fail
McGill University	40%	F	Fail
McMaster University	34%	F	Fail
University of Toronto	32%	F	Fail
University of British Columbia	30%	F	Fail
Université Laval	29%	F	Fail

These scholarships are a solution

- Protectionist measures—like restricting who universities can sell their IP to or requiring that they favour Canadian firms—create inefficiencies that Canada can't afford.
- However, leveraging graduate students as a way of increase IP transfers from Canadian universities to Canadian firms is much less disruptive.
- Suggest three possible ways that these scholarships can increase IP transfers between universities and domestic firms. We believe the last two are the least disruptive and most effective.

The Three Methods

Fig.26. Pros and Cons of Methods to Increase Canadian Ownership of IP via Graduate Students

Method	Pros	Cons
Require graduate students work with local firms	- Simplest <u>approach</u>; - Regulatory in nature—no additional funding needed from provincial government.	- Will create <u>labour</u> market distortions, which could impact human capital generation and market <u>adaptability</u>; - Restricts freedom of choice for graduate <u>students</u>; - May lead to funding problems for universities if lucrative contracts between staff (graduate students) and foreign firms are restricted.
Incentivize private firms to donate to scholarships by giving them immediate access to graduate student talent	- Increased private share of funding for scholarship <u>model</u>; - Increased competition for graduate student talent amongst Canadian <u>firms</u>; - Increased R&D funding for Canadian <u>firms</u>; <u>Labour</u> market distortions likely milder than previous method (attempts to stimulate competition rather than restrict it)	Increased private involvement could incentivize less risky research, if used as substitute for public funding.
Institute a “locally made” bonus to scholarship value	- Greater funding for graduate <u>students</u>; “Carrot” approach likely less disruptive to <u>labour</u> <u>markets</u>; - Easy hook for any marketing campaigns	Greater expense to government.

Entrepreneurial Training for Graduate Students

- In order to create a level playing field, graduate students should be given the opportunity to engage in commercialization activities.
- Creating internships in university Technology Transfer Offices (TTOs) would both expand the number of work opportunities available and give graduate students vital training to help them find commercialization opportunities.
- Also has downstream impact of making TTOs better staffed and more able to handle diverse research requirements.

See: Our Submission to the Mintz Panel

Fig.27. UCGSA's Recommendations on Technology Transfer Offices to the Mintz Panel

IP and Technology Transfer Offices (TTO)

- Technology transfer bottleneck
 - University guards IP closely due to funding cuts; makes technology transfer more difficult
- Staff support in TTO
 - Breadth of university research needs comprehensive staff expertise
 - **Recommendation:** Could utilize graduate student internships + leverage A.I to gain experience with commercialization
- Province-wide coordination
 - Most university-industry partnerships aren't local
 - Fragmented IP policies add transaction costs to partnerships
 - **Recommendation:** SPP paper recommended creation of an independent, province-wide science and research development office



Part Six: Limitations

(everyone has them)

Limitations

- Further work needed to include course-based students.
- Does not replace operating grant cuts.
 - Especially since administrative supports like Graduate Program Administrators (GPAs) need operating funding.
- Is not a substitute for needs-based funding to improve accessibility and persistence.
- Can increase inequality amongst future scholars.
 - Recent working paper showed “Matthew Effect” in research funding is driven by early award winners being encouraged to apply for many more awards, while unsuccessful applicants are discouraged from applying for future awards.

Recommendations

1. Create a three-tiered, merit-based, scholarship program that rewards domestic and international thesis-based graduate students for research excellence:
 - a. A first tier, that rewards the top 25% of master's and doctoral students with a scholarship valued at \$7,000 and \$9,500, respectively;
 - b. A second tier, that rewards the top 5% of master's and doctoral students with a scholarship valued at \$13,000 and \$18,000, respectively;
 - c. A third tier, that rewards the top 1% of master's and doctoral students with a scholarship valued at \$17,500 and \$24,000, respectively.
2. Structure the administration of these scholarships in a similar manner to that of the federal Tri-Council granting agencies:
 - a. One stream, administered by neutral experts, for the social sciences and humanities;
 - b. One stream, administered by neutral experts, for the natural sciences and engineering;
 - c. One stream, administered by neutral experts, for the medical sciences.
3. In the creation of merit criteria, ensure that, among other criteria recommended by subject-matter experts:
 - a. Students are rewarded for research projects that align with research demand from the private sector;
 - b. Students are rewarded for research projects that help not-for-profits fulfill their mandates;
 - c. The above does not mean the merit of research projects are tied to labour market outcomes or undermine the entrepreneurial potential of universities.
4. In order to save administrative costs and create best practices for commercializing research, draw from Mitacs as either consultants to the scholarship program or by connecting the scholarship program to the Mitacs network;
5. In the creation of merit criteria, ensure that students are rewarded for interdisciplinary research.
6. In the creation of merit criteria, ensure that equity-seeking groups are adequately consulted, to maximize accessibility and the diversity of voices within the innovation ecosystem.
7. Collaborate with course-based students to effectively integrate their programs into the research scholarship program, or to reform the evaluation of coursework to reward excellence in non-thesis based programs;
8. Ensure that graduate students sit on the ultimate decision-making bodies of each granting stream, in order to preserve the graduate student perspective on any governance questions, and:
 - a. That rules are in place to mitigate any conflicts of interest that may arise from graduate students sitting on these bodies, so that graduate students do not have to make a choice between serving their profession and having access to external funding.
9. Ensure these scholarships result in an increase in research commercialization by:
 - a. Incentivizing private businesses to invest in the model on the condition that they receive priority access to graduate student research talent and human capital;
 - b. Provide a "locally made" bonus to graduate students whose work with local businesses as part of the industry engagement section of the scholarship merit-criteria.



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