# A literature review on financial student aid

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by:

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## **Executive summary**

## Impact of student grants on enrollment

- There is broad evidence that direct grants, in pretty much any form (need-based, meritbased, etc.) increase enrollment in subsidized establishments. The impact matches predictions, although quantitatively being relatively small. A good rule of thumb would be an increase of 3.5 to 5 percentage points by an additional \$1,000.
- When the Higher Education system is heterogeneous, there are mixed results on the impact of grants on the aggregate increase in enrollment. Some studies find strong evidence for substitution between institutions, meaning that grants could only displace enrollment from one institution to another, while others find overall increases.
- The impact of grants on enrollment should be put in perspective. It is fairly small compared to other policy approaches. In comparison, personalized text messages sent as a reminder in the summer prior to enrollment increase enrollment in both Higher Education and Student aid programs by 14 percentage points. In one experiment, the authors state that the average cost of a text message is \$7. This suggests that per dollars spent, text messages are roughly four hundred times more efficient than grants.
- There is evidence that when students are given a choice, grants are chiefly used to substitute the amount of loans (rather than increase disposable income). There is however some evidence of reduction in hours worked.
- There is evidence that need-based programs increase enrollment from potential students with low income backgrounds.
- There is a need for cause to effect research of grants on Canadian minorities. Most cause to effect studies are American and the analysis on minorities is often a by-product of the research.
- There is a need of research for better design of efficient policy reforms. Theoretical studies
  on the efficient design of need based student grants are shown to significantly increase
  long- and short-term efficiency (enrollment, graduation) and equity (intra- and
  intergenerational mobility) in the society. There is however no practical study linking theory
  to existing programs.

## Impact of student loans on enrollment

- There is evidence that need-based loans increase enrollment. The impact matches predictions and is much smaller than the impact of grants. A good rule of thumb would be an increase of less than one tenth of a percentage point (0.075) for an additional \$1,000 in loans.
- Assuming a 4 percent interest rate, this means that, par dollar spent, the impact of student loans is 25% less impactful than grants. The higher interest rates are, the less impactful loans are.
- There is evidence that need-based programs increase enrollment comes from potential students with low income backgrounds.

When the Higher Education system is heterogeneous, there are mixed results on the impact of loans regarding the aggregate increase in enrollment. Some studies find strong evidence for substitution between institutions, meaning that loans could displace enrollment, while others find overall increases.

## Impact of student grants on graduation and completion

- There is supporting evidence that grants increase persistence, as measured either by graduation rates, credit completion or next-year continuation. Most studies use the latter definition. A good average estimate would be an increase by 4.2 percentage points in yearly persistence for every additional \$1,000.
- There is evidence that providing grants leads to substitution from two year programs to four year programs. A good point estimate would be 0.96 percentage point per additional \$1,000. The causal mechanism seems to vary, as it is sometimes argued that it is the willingness to apply to more selective institutions, sometimes the fact that grants studied are offered for five years.
- There is clear evidence that grants affect the program (and degree) choice, although there
  is much variability in the resulting choices. Some studies show that converting loans to
  grants increases student participation in programs with lower wages. Other studies find
  that students shift from programs that are not related to science, technology and
  mathematics (STEM) to related ones. One way to interpret these results is that students
  have an increased freedom in choosing career paths.
- There is contradictory evidence that grants affect the time to completion. Some studies find a positive impact (an increase in time to completion) while others find a negative impact. Some other studies find no effect. There are two distinctive features of the cases were time to completion increased: either grants were offered on a longer period of time or they induced changes in enrollment in programs that were estimated harder to complete.
- There is convincing evidence that additional grants reduce students' work hours while in school. However, reduction amounts to much less than a dollar per dollar of grant. The crux of the evidence of the previous section suggests that grants are chiefly used to reduce loans.
- There is some evidence, with nuanced results, that hours worked while in school reduce the grade point average. Some papers find a negative effect while others find no effect. The key difference between the two findings is the hours of work performed. A good point estimate would be that an additional hour worked decreases the grade-point average by 0.62 units.

## Impact of student loans on graduation and completion

- There is contradictory evidence that student loans influence completion and graduation. There are some results that find a positive impact, with a point estimate by 0.09 percentage points by \$1,000. Other studies find a decrease in persistence ranging between 0.55 percentage points to 0.57 percentage points by dollar of loans. In both cases, the magnitude of the causal effect is fairly small.
- Some papers reviewed in the section analyzing the impact of grants on completion and graduation rates study programs that convert loans in grants. As such, the result they find can also be interpreted as the opposite of converting grants to loans. This then suggests that substituting grants for loans reduces time to completion and coerces students into program that provides higher wages (rather than what they prefer).
- There is negative evidence that loans increase persistence in the years after the first one. Some studies find a negative effect (decrease in persistence by 13 percentage points) and other studies find no effect.
- Additional research on the impact of loans would be welcome. There is no clear-cut experimental design in the impact of loans on persistence. This could be easily done through a pilot project, a randomized control trial, giving additional loans to already eligible students. This could be performed by the CSLP, provided the appropriate regulatory maneuver.

## Is the 1960 structure still appropriate? Are people left behind?

- Asking about who is left behind and if the 1960 structure is still relevant amounts to questions about resources, program goals and consequently, program design. For instance, one can increase enrollment (e.g. leave less people behind) by spending more on grants. It can also be done by reducing resources spent inefficiently and redirect the money where it makes a difference.
- Globally, the 1960 program goals are still relevant today. The normative grounds for student aid are rooted in the reduction of liquidity constraints, the increase in human capital and the reduction in inequalities of opportunities. These criterions remain relevant today.
- Since 1960, much knowledge has however been developed about what works and how best serve these criterions. In particular, a lot of knowledge about human behaviour and responses to policies has been developed. When programs are not designed to account for behavioural effects, some potential students can be left behind. Important biases that occur simultaneously at the time of enrollment decisions push potential students to exit the educational system. In particular, individuals underweight the future, yield to current temptation, are biased towards the default option, are deterred by complexity and make important mistakes when situations occur once or twice in a lifetime. The student aid program designs should correct for these biases.

- In particular, there is significant evidence that influencing the default option for enrollment decisions will leave less people behind and increase enrollment. For instance, automatic student aid and higher education registration (with no obligation to commit) has been shown to increase participation in the double digits at a much cheaper cost than extra loans or grants.
- There is also significant evidence that less people will be left behind with a simplification of the registration processes, increasing participation and access. Some analyses done on Canadian student aid programs suggest that both the front- and back ends may be complicated, thereby hindering access.
- In terms of reform to the 1960 structure, some empirical and most theoretical literature agrees on the added value of an Income Contingent Loan system or its "public" equivalent, a graduate tax. Such a repayment scheme (on top of existing subsidies) could leave less risk-averse students behind. What an "Income contingent Ioan" means varies with stakeholders' perspectives. We refine the notion in the main text. Here, suffice it to say that we do not see it as a substitute to traditional aid, nor as a scapegoat to increase tuition fees, but as a loan repayment policy that would neutralize the risk of undertaking Higher Education.
- The theoretical literature on student aid suggests that more potential students could be brought in with a joint design of the tax scheme and the student aid programs. Additional studies could reveal gaps in terms of incentives for access and completion. A key lesson is that student aid should seek to fill those gaps to avoid neglecting subgroups of the population left behind by the interaction of both financial incentives. These subgroups are not identified by specific characteristics (e.g., age, sex), but rather by the characteristics of the gaps in the student aid and tax scheme landscape. By extension, the same could be said of the interaction between employment insurance and student aid programs.
- Mature students are comprised of two subgroups: students who are older and students with dependents. Human capital theory suggests that less subsidies should be given to older students. From a reduction of inequalities standpoint, transitory poverty reduction goals are better served through other programs such as unemployment insurance. However, a need assessment approach recognizes that additional funds should be provided to potential students with dependents or older students with more expenses.
- The optimal taxation literature suggests that there is little to no theoretical support for a tuition tax credit, or for Retirement Education Savings Plans. If true, it would mean that these expenses leave students behind and could be used to better target them. However, additional work ranking these policies in an environment with real world (inefficient) tax schemes should be done before stating a definite conclusion.
- Little to no structural work informs the design of efficient student grants and loans policy and how to depart (if needed) from the actual ones. This could be useful in bringing step reforms to already existing programs and answer more appropriately if the 1960 structure of aid is still relevant.
- Regulatory maneuver to perform pilot projects, as seen in laws managed by other divisions of ESDC, could significantly improve the research abilities of the branch on student aid programs.

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## List of acronyms

CESG:	Canada Education Savings Grant
CLB:	Canada Learning Bond
CSLP:	Canada Student Loan Program
CSG:	Canada Student Grant
DD:	Difference in difference
FTE:	Full-time enrollment
GT:	Graduate tax
ICL:	Income contingent loan
NSERC:	National Science and Engineering Research Council
RAP:	Repayment Assistance plan
RCT:	Randomized control trial
RDD:	Regression discontinuity design
RESP:	Registered educational savings plan.
SSHRC:	Social Sciences and Humanities Research Council
STEM:	Science technology, engineering and mathematics
TTC:	Tuition tax credit

## About the author



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## Introduction

Summary points

- Enrollment in Higher Education is one of the most important decision an individual can make.
- 833 papers on student aid were scanned with 250 reviewed.
- Excluded papers where not relevant to topics in the statement of work (e.g.: program design, international comparisons, default rates)
- A layout of the basic economic theory of student aid is provided in appendix.
- A policy landscape is also provided in appendix.

What is the impact of student aid on access and completion? How can a program be designed to leave no one behind? If those first two questions are related to the positive analysis of student aid policies, the last one is intrinsically tied to a normative analysis. Should Higher Education be subsidized? If so, how? These answers depend vastly on how analysts, pundits and policymakers weight various criteria, such as efficiency (improving enrollment and completion), equity (who has access and what are the impacts) and the belief as to which individuals behave rationally. Some empirical papers providing an analysis of the first two questions may come with vastly different policy recommendations, partly because they perform a positive analysis with difference normative criterions. Understanding the importance of these factors helps in understanding the validity of proposed policies.

Answering those questions properly matters. As stated in Frenette (2014):

Education is likely one of the most important investments made in one's lifetime...The earnings premium associated with completing a bachelor's degree (compared to high school completion) between the ages of 35 and 54 ranges from \$728,000 for men to \$442,000 for women. For a college certificate, the premium compared to high school completion over the same period is \$248,000 for men and \$180,000 for women, on average.

Literature reviews are useful for that reason, and specifically serve three purposes. First, they present a sense of what is known: what works, what does not, and in what context. Second, they help in understanding the converse, what is not yet known. Third, they help map knowledge into practical policies and map the lack of knowledge into research agendas. In short, they help us move forward.

This literature review makes no exceptions. It provides the state of the knowledge regarding student financial aid or, more generally, its intended outcomes—higher education enrollment, completion and fairness. This review starts with some papers previously known to the author and searches in scholarly databases. Searches were performed only in French and English, naturally limiting the review's scope. From this "seed" of papers, additional papers were added by the "snowballing" method: cited references in papers were added to the pool until it was exhausted.

In total, more than 833 papers were found. The number of papers was then reduced by eliminating those not relevant to the questions in the statement of work and those with no relevant identification strategy from their abstract description. For instance, descriptive papers on the structure of programs in other countries, or studies focusing on the impact of loans programs on default rates, were left out. All in all, 250 papers remained as relevant for this description. As a comparison, the review in Herbaut and Geven (2019) has 75 papers, the one in Havranek et al. (2018) has 43 papers and Nguyen et al. (2019) covers 42 papers. When relevant, those analyzed in those reviews are presented here as well.

We have organized the work around the questions in the requested statement of work. We first tackle the impact of student loans and grants on postsecondary access. Second, we examine the literature on the impact of student aid regarding completion. Third, we explore whether the Canada Student Loan Program or the Canada Student Grant program are leaving people behind? If so, how can these programs be improved?

Each section outlines more specific aspects of the literature, as well as explores subthemes. On one hand, the empirical literature helps in understanding whether policies and theories work and, if they do, their practical magnitudes. The empirical literature, however, may not always explain the transmission mechanisms. So we also provide a review of the theoretical literature on student aid and related topics. Theory clearly indicates how policies interact with behaviours, generating conceptual insights. Theories may not always be observed in practice, nor they can always provide a complete characterization of the world. Thus, an understanding of both theory and practice (hopefully) helps.

Where helpful, we also provide in the appendix a textbook economic analysis of a Higher Education market and discuss concepts such as enrollment, subsidies, magnitude and fairness. We also provide an overview of the policy landscape regarding subsidies in Higher Education. Such an appendix may give the reader a framework for the review, as any material presented without understanding its prior knowledge is bound to be misinterpreted.

## What impact do student loans and grants have on access to post-secondary education?

## **Section Introduction**

Summary points

- The literature linking student aid is categorized in three strands:
  - The international literature on short-term (3-4 years) factors linked to access.
  - The Canadian literature on short-term factors linked to access.
  - Estimates of various origins based on long-term (10 years or more) factors.
- A short literature review on the impact of tuition fees is also presented.
- The statistical methodologies employed to infer cause to effect relationships is crucial in empirical studies. Some should not be used for policy evaluation. Most are explained (and somewhat ranked) in footnotes of this section.

The literature linking student aid to access can be divided into three categories: short-term estimates based on identification strategies that are performed outside Canada, short-term estimates based on long-term analysis. By short-term, one should understand a timespan ranging from one to six years while long-term analysis should be understood as the impact of family decisions while potential students are still pupils in primary school or high school.<sup>1</sup> This division reflects the difference in results found and (partly) on the underlying (theoretical) mechanisms that explain these differences. The last category groups authors that find or argue that student aid has no impact on access chiefly because of family related factors. These are seen as more important in "building up" the importance of post-secondary education and, thus, explaining the decision to enroll. A leading example can be found in Carneiro and Heckmann (2002). Some Canadian authors (Frenette, 2017; Finnie et al., 2015) also argue the absence of findings based on these factors.

While there is undeniable evidence that long-term factors have an impact in building abilities and interest for post-secondary education, the first two categories of the literature focus, rather, on short-term aspects of post-secondary decisions and seeks evidence that policies, chiefly loans and grants awards, can influence decisions. Here, the distinction between the Canadian literature and the literature from the rest of the world is in finding evidence of policy impact. Almost all studies reviewed outside Canada find that student aid influences participation up to a point that it is sometimes stated as a "known fact" by leading authors (Dynarski and Scott-Clayton, 2013). In contrast, the Canadian literature, although scarce, provides more of a mixed message: some studies find an impact while others do not. This is already known to the CSLP analysists (ESDC,

<sup>&</sup>lt;sup>1</sup> Age may vary along papers, but it should be understood as an early age rather than the years before actual enrollment to post-secondary education.

2015b) and conjectured as coming from differences in sticker prices.<sup>2</sup> While this remains to be established, the "Canadian puzzle" can also be explained by methodological factors linked to identification strategies and perhaps a less heterogeneous post-secondary system. It should also be pointed out that some Canadian authors find results in line with the rest of the world (e.g., Ford et al., 2014; Neill, 2009; Frenette, 2005).

The rest of this section follows these categories. We begin with a review of the literature outside Canada. In this section, we follow the statement of work and divide the research whether it is done primarily on loans, grants and tuition fees. This sometimes leads to redundancy and partial analysis of papers in the devoted sections, as some research study combinations of subsidies, or combined topics discussed in another section. We then move on to the literature looking at the impact of student aid in Canada. As most studies linking long-term factors to post-secondary enrollment decisions also discuss in great length the differences in outcomes by groups, they are discussed in the same section. We finally conclude the section with a summary of the findings, where we answer to the question titling this section. Throughout, we include several footnotes explaining what the relevant empirical strategies for identifying cause to effect relationships are, and why they matter.

The most recent literature review on student aid was performed by Herbaut and Geven (2019). They reviewed 75 studies analyzing experiments or quasi experiments on enrollment and graduation (with their relevant references also discussed in the appropriate section of this review). Regarding enrollment, they conclude that "need-based grants do not systematically raise enrolment rates but only lead to improvements when they provide enough money to cover unmet need and/or include an early commitment during high school". Based on this review, we will argue results that are more nuanced, meaning that grants may have an impact even when not fully covering needs. Perhaps a more inclusive way to interpret most findings is that larger grant amounts seem to have more impact on enrollment.

## International Literature on Student Grants

Summary points:

- There is broad evidence that direct grants, in pretty much any form (need-based, meritbased, etc.) increase enrollment in subsidized establishments. The impact matches theoretical predictions, although quantitatively being relatively small. A good rule of thumb would be an increase of 3.5 to 5 percentage points for every additional \$1,000.
- When the Higher Education system is heterogeneous, there are mixed results on the impact of grants on the aggregate increase in enrollment. Some studies find strong

<sup>&</sup>lt;sup>2</sup> Specifically, the authors state that "One possible explanation for the smaller increase in PSE participation in Europe and in Canada compared to the U.S. might be related to the higher price of education in the U.S." (ESDC, 2015b, p. 29). Although stronger effects are found in places where prices are higher, we would however argue that the difference in methodologies amounts to much more for the difference in findings than the region of study.

evidence for substitution between institutions, meaning that grants could only displace enrollment from one institution to another, while others find overall increases.

- The impact of grants on enrollment should be put in perspective. It is fairly small compared to other policy approaches. In comparison, personalized text messages sent as a reminder in the summer prior to enrollment increase enrollment in both Higher Education and Student aid programs by 14 percentage points. In one experiment, the authors state that the average cost of a text message is \$7. This suggests that per dollars spent, text messages are roughly four hundred times more efficient than grants.
- There is evidence that when students are given a choice, grants are chiefly used to substitute the amount of loans (rather than increase disposable income). There is however some evidence of reduction in hours worked.
- There is evidence that need-based programs increase enrollment from potential students with low income backgrounds.

## Randomized Control Trials

A randomized control trial (RCT) studying the impact of merit-based grant on enrollment is performed by Angrist et al. (2016).<sup>3</sup> They examine how scholarships awarded to potential students affect enrollment and graduation rates. They find that an average increase in grants of \$6,200 increases enrollment by 13 percentage points and is likely to increase graduation rates. They cannot yet conclude the definite impact on graduation rates, as it is still too early (relative to the year of the experiment) to observe all outcomes.

## Difference in Differences

Dynarski (2000) finds that the HOPE program (a merit-based grant in Georgia) increases participation. She uses a difference in difference (DD).<sup>4</sup> She finds that an increase of \$1,000 in aid increases participation within middle- to high-income students by 4%. Using the same program and an instrumental variable approach, she also finds that a \$1,000 increase in aid increases participation of 3.2% amongst children with deceased fathers (which is a low-income class of students).<sup>5</sup> Those results are nuanced, however, by Carruthers and Umut (2016), who find no

<sup>&</sup>lt;sup>3</sup> Randomized control trials (RCTs) are the gold standard identification strategy for policy analysis. Its implementation relies on creating two random samples, where only one is subject to a policy shift (say, more grants). By comparing the difference in outcomes of both groups (say, enrollment), one can infer the average causal impact of the policy. Because the groups are randomly assigned, the difference of other factors between groups should be statistically indiscernible from zero. Thus, the sole difference in outcomes can be attributable to the difference in treatment (the policy shift). RCTs provide the most robust approach for identifying the impact of policies.

<sup>&</sup>lt;sup>4</sup> Difference in differences split a sample in two groups. As opposed to an RCT, those groups cannot be chosen randomly (e.g., provinces). As such, there can be specific differences in levels between them. Thus, the approach compares the *growth* in the outcome variable before and after a policy shift rather than levels. It is easier to implement, but it is also less convincing than an RCT. If there is another (omitted) variable other than the policy shift that is changing differently in either of the two groups, it can then explain the difference in growth of the outcome variable.

<sup>&</sup>lt;sup>5</sup> An identification strategy that isolates possible reverse causations employs another variable that is correlated with the policy lever of interest (e.g., grants), but is not correlated with the underlying variable that could confuse results (e.g., ability). Such a variable is called an "instrument." It allows isolating the

effect when the converse happens, that is when students lose their HOPE scholarship. In their analysis, 29 percent of students in their sample loses their HOPE scholarship after two semesters. This may be evidence of students evaluating their sunk costs, path dependence, or simply a change of perception about education once enrolled.

Dynarski (2008) also studied the impact of the Arkansas merit-based tuition reduction program. She finds that a tuition decrease by USD 1,500 to USD 2,500 increased participation by 1.6 percentage points to 2.98 percentage points. She also finds that the impact is more important on women than on men, especially amongst Hispanics and African-Americans. These results were questioned, however, by Sjoquist and Winters (2012) based on a lack of proper clustering of the subgroups being treated. Sjoquist and Winters did test the difference using the (claimed) appropriate approach and found larger margins of error. Thus, the same policy change yielded effects indiscernible from no effect at all. The second paper is convincing, as it can fully reproduce the results of the original paper, suggesting that the original finding may be overstated.

Arendt (2013) uses a grant reform in Denmark to study the impact of a 57% increase in grants. He finds that it increased enrollment and lowered dropout rates, although having no effect on graduation rates. He also found stronger results for students from lower socioeconomic backgrounds. Three years later, he reestimated the impact of the policy shift and found stronger results: hours worked diminished within treated students, graduation rates increased, and the dropout rate results stayed as estimated the first time. Increasing the timespan in a DD setup, however, is known to increase the likelihood of positive results by spurious correlations (Bertrand et al., 2009). This should be kept in mind when interpreting the longer-year findings.

Derden (2014) estimates the impact of the "maintenance grant", a need-based grant, in the United Kingdom in 2004. She finds that an increase in £1,000 translates into a 3.95 percentage point increase in participation.

Liu (2018) studies the impact of the Year-Round Program within the Federal student aid program of the United States. The program offers additional grants to students in the summer of their second year if they register for classes and have completed enough credits in the first year. She finds that an additional \$1,000 increases enrollment in the second year by 27 percentage points and increases degree completion by 2.7 percentage points.

## **Regression Discontinuity Design**

Kane (2003) uses a regression discontinuity design (RDD) to estimate the impact of the Californian need- and merit-based grant program.<sup>6</sup> He finds that an additional increase in \$1,000

impact of interest from the reversed causation. Instrumental variable techniques are convincing for isolating the direction of causality. However, they fail to eliminate other omitted interactions.

<sup>&</sup>lt;sup>6</sup> Regression discontinuity designs (RDD) exploit sharp changes induced by administrative rules to create random assignments above or below the threshold induced by the rule. A good example would be the administrative rule regarding the age to begin school: in Québec, one must be six years old on September 30th. Thus, those born one day later must wait 364 additional days compared to those born one day before. The administration rule creates a sharp difference (a discontinuity) in the treatment of the two types of

in grants increases participation by an average of 4% for first year enrollment. The long-term findings on graduation and income are also discussed in the section on these issues. This result was however revisited later by Bettinger et al. (2019) and found, with a larger sample, no substantive results.

Fack et al. (2015) study the impact of grants on enrollment and completion in France. They find that a  $\leq 1,500$  increase in grants increase enrollment by 5 to 7 percentage points. They also argue that it increases persistence (although they find no statistically significant impact).

Van Der Klaaw (2002) used an RDD to study the impact of increased financial aid in a College in the United States. The package of aid is comprised, on average, of 88% of grants. They find an elasticity of 0.86 between enrollment and dollars of aid package. However, they find that the effect is smaller for those who had already applied to another financial aid program.

Zhang et al. (2016) study the impact of merit-based grants on enrollment using an RDD around the merit eligibility threshold. The grant covers three-quarters of the tuition costs if the students have a Scholastic Aptitude Test (SAT) score above 970 or an American College Testing (ACT) score above 20. They find some evidence of increased enrollment to eligible institutions, enrollment increasing between 2 and 6 percentage points. They further find strong evidence of substitution between two-year programs for four-year programs, with estimates ranging from 6 percentage points to 12 percentage points. The range in results is mostly explained by the different bandwidth and functional form choices around the discontinuity.

## International Literature on Tuition Fees

Abraham and Clark (2006) use a DD to estimate the impact of a sharp tuition decline in the District of Columbia. Comparing neighbouring states, they find that student enrollment was more likely to increase, although they suggest that the effect may be because students simply substituted towards subsidized colleges from out of district institutions.

Garibaldi et al. (2012) study the impact of an increase of continuation tuition, that is, tuition fees once a student has been enrolled in a program after a given period (e.g., a year). They argue that if continuation tuition increases, student should face financial incentives to graduate faster. They use an RDD around the tuition reduction threshold and find that a  $\leq$ 1,000 increase in tuition decreases graduation time by 5.2%. They find no impact on graduation or on the grade point average.

young persons. If the assignation of individuals on one side or another of the discontinuity is random (as birthdays can be), one can then exploit the discontinuity as randomly assigned treatment (as in an RCT). To be implemented, an RDD requires an administrative rule that changes the treatment of individuals sharply. Of course, the treatment must be of interest to the question at hand (which can sometimes be hard to find).

Langelett et al. (2015) study the impact of tuition fees on enrollment decisions at South Dakota State University. They have no identification strategy.<sup>7</sup> As they use a conditional logit model, the student response is negative everywhere along the price axis by methodological design.<sup>8</sup> They focus on the most significant range of magnitude and find that student demand becomes elastic when tuition passes the \$9,000 threshold. Here, "elastic" means an elasticity greater than one (in absolute value). In other terms, they qualify the student demand as elastic when a 1% increase in tuition translates into a decrease of enrollment that is higher than 1%.

Papers by Leslie and Brinkman (1987) and Heller (1997) provide international reviews on the impact of tuition fees. Both report small, but negative, effects of tuition on enrollment. Recent literature reviews can be found in Pollard et al. (2019), Havranek et al. (2018) and Wilkins et al. (2013). Havranek et al. (2018) reports an analysis of 43 studies and is extremely useful as a survey of the work prior to year 2000. However, they make no distinction of studies by methodology, pooling simple regressions with more sophisticated identification strategies. Because of both the period of study and the methodological pooling, doubts can be cast on the review's validity. Pollard et al. (2019) and Wilkins et al. focus only on the recent (and truly significant) tuition increase in England, emphasizing peripheral concerns to price increases (information, etc.).

## International Literature on Student Loans

Summary points

- There is evidence that need-based loans increase enrollment. The impact matches predictions and is much smaller than the impact of grants. A good rule of thumb would be an increase of less than one tenth of a percentage point (0.075) for an additional \$1,000 in loans.
- Assuming a 4 percent interest rate, this means that, par dollar spent, the impact of student loans is 25% less impactful than grants. The higher interest rates are, the less impactful loans are.
- There is evidence that need-based programs increase enrollment comes from potential students with low income backgrounds.

<sup>&</sup>lt;sup>7</sup> Plain regressions are not an identification strategy. It is only when an author can convincingly argue that other variables left out of the regression have no effect on the question at hand that the identified correlations can be claimed as accurate. Moreover, is only when the direction of the correlation is clear that a causal effect can be claimed. As any imaginative person can find an omitted variable, or argue some form of reverse causation, they remain unconvincing.

<sup>&</sup>lt;sup>8</sup> A logit model imposes a structural form to the response of a variable, that is the logistic cumulative distribution. As such, if the average response is negative, the structural assumption imposes a negative response everywhere. This is an example of a methodological choice that affects results in one direction and perhaps a good explanation as to why the authors focus on the difference in magnitude along the price axis.

## **Regression Discontinuity Design**

Sano (2019), using Japanese data, studies the impact of increasing the eligibility threshold induced by reducing the expected family income. Reducing the expected family income increases the number of students eligible for loans. However, the impact in terms of accrued loans is not quantified in the paper. She finds evidence that the student loans increase induced by the reform increases enrollment by 0.5 to 0.7 percentage points.

Solis (2012) and Aguirre (2019) also explored the impact of loans on access, using a RDD, and found that having access to the state student loan program increase in enrollment varying between 2.2 and 7.2 percentage points. Loans provided represent roughly 90% of the tuition costs (roughly 18.9 million Chilean pesos, or roughly CAD 33,000). These figures translate in an enrollment elasticity with respect to loans of -0.024 to -0.08. The tuition amount explains the higher impact. In Chile, access to the post-secondary education is financially difficult as most alternative loans require a high family income. They also find evidence of a decline in graduation rates, which is why their work is detailed in greater length in the next section of this review.

## Difference in Difference

Johnson (2013) performs a structural estimation of the decisions to enroll and graduate in relation to various factors, including tuition, and available grants and loans.<sup>9</sup> He finds that credit constraints have a moderately small impact: if all credit constrained students were given more loans, the increase in enrollment would be 2.4%. He further investigates which type of subsidy has the highest impact. He finds that the most effective policies are tuition subsidies (grants) given to students with middle to high abilities to succeed. His results suggest that this is what increases graduation rates the most.

## General Equilibrium Study Comparing the Effect of Grants and Loans

#### Summary points

- Intergenerational effects are important when accounting for Higher Education policies: the immediate impact of aid is small, but the generational effects are bigger. The intuition is that the education of parents is a key driver of enrollment and student aid can be thought as educating future parents.
- Need based aid and an income contingent loan system perform better than merit grants or uniform tuition in the long run. They reduce intergenerational inequalities more and increase GDP more as well.

<sup>&</sup>lt;sup>9</sup> Structural estimation amounts to estimating jointly the relevant parameters of a theoretical behaviour combined with a policy. For instance, one could estimate the aversion parameter of a utility function and use this as a model of student behaviour. As such, the sole source of identification is the validity of the underlying theory. Changing the equations governing the behaviour of individuals studied usually changes the findings.

• When the Higher Education system is heterogenous in quality, need-based aid can be shown to worsen the outcomes of low-income students if the substitution effects (switching colleges) are important.

General equilibrium study abandons the classic micro econometric framework of policy evaluation and looks at the long-term effect of policies when accounting for the general response of the economy. These bear no identification strategy in an econometric sense, but rather estimate models that aim to reproduce those responses. The advantage is that one can examine more complex interactions, like intergenerational mobility, between policies and several statistics of interest.

Hanushek et al. (2014) study how various higher education subsidies affect both efficiency (enrollment, graduation) and equity (inter- and intra-generational mobility) in a dynamic general and intergenerational equilibrium setup.<sup>10</sup> As they show, the general equilibrium effect attenuates the effects found in partial equilibrium models. For instance, lowering tuition is shown to have a positive impact of enrollment, which then boosts the market of highly skilled workers, lowering the equilibrium wage. Lower wages, in turn, diminishes student demand. Intergenerational effects are also important as they show the long-term effects of higher education policies. A key driver of higher educated parents allows for an analysis of the indirect effects. This perspective is often neglected when policies are analysed in the short-run. For instance, grants may have a moderate immediate impact on enrollment, but greater indirect impacts through the creation of new educated parents.

Four policies are studied in their paper: uniform tuition subsidies, merit-based aid, an income contingent loan program (ICL) and need-based subsidies. For all accounts, their simulation shows that an ICL or a need-based aid perform better than uniform tuition or merit-based aid. Efficiency (enrollment, graduation), equity (equality within a generation) and intergenerational mobility (inequalities across generations) increase with either of these two policies. In both cases, the key driver is the impact on credit constrained students. These results are consistent with those of Stancheva (2017) when tax rates are not set efficiently.<sup>11 12</sup>

<sup>&</sup>lt;sup>10</sup> A similar study was also done by Bouchard St-Amant (2008) in Canada.

<sup>&</sup>lt;sup>11</sup> Efficient taxes relates to the economic theory of income taxation. An income tax system is said to be efficient when it maximizes income redistribution, given that it must provide incentives for workers to choose a labour supply at the highest of their ability (efficiency constraint). As a general characteristic, efficient taxes are redistributive and highly non-linear at the bottom of the income distribution. When taxes are approximated as linear (e.g. Hanushek, 2014), other policies, such as student aid, can be used to compensate the inefficiencies they generate. For instance, when taxes distort the future income too much, accrued student aid subsidies targeted at everyone can increase welfare by correcting the disincentive to acquire higher wages (i.e. Higher Education enrollment). Further explanations on optimal taxation are provided in footnotes 37 and 38.

<sup>&</sup>lt;sup>12</sup> Intergenerational effects in Canada have also been studied empirically by Parent (2014) and Parent and McKinnon (2007). As they study the impact of the creation of a university system (as Frenette (2007b)), they are out of the scope of this review.

Although the setup and policy comparison is appealing, there are two important drawbacks of their analysis. First, several policies are oversimplified to ease the analysis of an already complicated model. Need-based aid is either linear or constant, the ICL offers only one loan amount and merit-based aid is a direct function of ability. These characteristics are oversimplifying. Second, some important student response to policies are neglected. For instance, changes in the student aid program can change the behaviour of parents. In the need-based aid case, the analysis in their paper neglects the response of other members of the households at transferring private aid (e.g. cash transfers from parents). If private aid is accounted in the expected family contribution of student aid, as it is the case in most need-based programs, parents may very much reduce transfers. Those types of responses have been neglected, weakening the results found.

Azuero and Zarruk Valencia (2018) study the general equilibrium effects on student loan programs when higher education institutions vary in quality and acceptance rates. They find that in such circumstances, individuals from low-income backgrounds are less well off than when they do not receive loans. Their argument is that the demand for high-quality institutions increases unambiguously, thereby increasing admission standards. As they model average ability as a complement to quality and graduation success (i.e., peer effects), they show that the average quality and graduation rates decrease in low-quality institutions, where most low-income individuals can be attracted. These results relate to the findings of Aguirre (2019, detailed in the next section) Cohodes and Goodman (2014, also in the next section) where substitution effects between institutions are argued to be important. They also relate to Epple et al. (2006), who studies the impact of general equilibrium sorting effects in college quality.

Substitution effects between institutions are also found in Tennessee, where a merit-based program was studied through an RDD to assess its impact. Bruce et al. (2014) analyze the impact of the grants on student enrollment patterns. For students around the discontinuity, they find a significant substitution effect from two-year colleges to four-year colleges, but no other type of substitution across types of higher education institutions (e.g., private versus public, out of state versus in state, etc.). Similar substitution effects from two to four year are found in Dynarski (2003).

## Canadian Literature on linking Student Loans and Grants on enrollment

Canadian literature on the impact of loans on enrollment

Summary points

- Based on structural analysis, liquidity constraints seem understated in the empirical research. This is however heavily reliant on the mathematical hypothesis used.
- There seems to be a decline in enrollment from married/common-law individuals.

Belzil et al. (2017) uses an RCT tested by the (former) Millennium Scholarship Foundation to estimate the prevalence of credit constraints. Using structural estimates, they argue that these comprise an important segment of students. They argue that the estimated willingness to pay for a \$1,000 loan translates into a 6.6 percentage points markup above the market rate.<sup>13</sup> They also discuss how this willingness to pay is heterogeneous and particularly important amongst low-income students. They further show important risk-aversion coefficients, which can be a deterrent for enrollment.<sup>14</sup> If accurate, these results imply that there are more credit constraints students than what is argued in other papers on the topic (e.g., Finnie et al, 2015). They also imply that some risk averse students are left behind. Structural estimates on individual behaviours are useful for translating welfare measures in dollar values (or in this case, interest rates markup). However, they remain true only if the underlying mathematical formulation modeling the behaviour is accurate.

Employment and Social Development Canada (2015a, 2015b) has developed regression models linking loan access to post-secondary participation. They have no identification strategy and, as such, their result should not be used to conclude any cause to effect impact. They use the 2008 policy reform (2015b) to compare loan volumes and loan access to the CSLP. In short, the 2008 federal budget consolidated the multiple grants program into the CSGP and offered various increments to the CSLP, most notably 74 additional millions for the Repayment Assistance Plan (RAP). The reform included a lowering of the expected family contribution and increases in grants awarded through the CSGP. They find that the 2008 policy reform increased loan access by an average of 32 part-time borrowers (table A1)<sup>15</sup> and 78 part-time married (or common-law) students (table B1). They also find evidence that the average loan awarded declined. This second result is typical of expansive policy reforms, where the marginal applicant is usually eligible for fewer loans (see Bouchard St-Amant, 2020, for an analysis). It can also be explained by the fact that the combined policy reforms sometimes substitute loans for grants. They also find evidence that the reform leads to substitution of enrollment between university programs, as found in more robust studies (e.g., Rothstein and Rouse, 2011, detailed in the next section).

An interesting issue that arises from their work is the apparent decline in married or common-law students after 2008. It may be worthwhile exploring the reasons for this decline. The lack of identification strategy in their work also suggests the need for regulatory changes to implement and test pilot projects as is allowed, for instance, in programs of other ESDC branches (Government of Canada, 2018c).

<sup>&</sup>lt;sup>13</sup> Willingness to pay means that students are willing to pay an interest rate that is 6.6 percentage points higher than the market rate in order to obtain \$1,000.

<sup>&</sup>lt;sup>14</sup> See the Income Contingent Loan section for a detailed analysis.

<sup>&</sup>lt;sup>15</sup> In another table, this is estimated, puzzlingly, as a 1% increase of all part-time post-secondary students.

## Canadian literature on the impact of grants on enrollment

#### Summary points

• The Canadian literature on the impact of grants is much less conclusive than the international literature.

Finnie and Childs (2012) study the impact of grants using a regression discontinuity design (RDD). The students in the sample were potentially eligible to the Canada Access Grants a loan reduction policy that pays for half of tuition fees, up to \$3,000. The average grant figure is not reported in the paper. They use the eligibility threshold to receive grants and exploit this difference to check if additional grants have an impact on persistence and enrollment. They find an effect varying between 29 and 45 percentage points at decreasing the leaving rate (the inverse of persistence). They qualify this result as implausible due to the magnitude (which is indeed high, compared with other studies). They argue the implausibility because results are driven by both outliers in the dataset and the fact that the effect is in parts induced by some students leaving school on the untreated side of the discontinuity. The results without the outliers are not presented.

Note that the key identification hypothesis of an RDD is that treated students would behave as untreated students in the absence of grants. As such, it is surprising to see the authors argue that the decrease in participation rates at the left side of the cutoff cannot be a plausible explanation for higher percentage rates. In accordance with the experimental design, the treated students would have left at the same rate, absent of treatment.

Ford et al. (2012, 2014) have studied the impact of various policy interventions related to aid and post-secondary access. Two treatments were designed: one targeted at providing information to grade 9 students for a period of three years, the other providing \$8,000 in grants to be disbursed during their year in college. The first treatment increased enrollment by 13 percentage points, very much in line with the related results in the behavioural section. For the second treatment, the \$8,000 in grants increased post-secondary participation by 6.7 percentage points overall, with the most important impact amongst low-income students (10.66 percentage points), Francophones (13.29 percentage points) and parents with a high school diploma or less (14.58 percentage points). This study is sometimes cited as evidence that the combination of the Registered Education Savings' Plans (RESP) and the Canada Education Savings Grant (CESG) may be efficient ways to promote post-secondary enrollment (Frenette and Ford, 2012), although there are significant differences between the treatment and RESPs, most notably the shorter time difference between the subsidy award and its use, the absence of parental savings requirements and the fact that the last \$2,000 are given to students while they are enrolled. Based on the program design, we argue that this has more of a need based standard student aid structure (either loans or grants, depending on the jurisdiction), with the notable exception that the relationship between school completion and the buildup in awarded aid is more salient. As shown in the third section, some other studies find that "cash for grades" programs, where the connection between grants and grades is salient, may be an important factor for effectiveness.

Frenette (2014) used an RDD to study the impact of the CSG in Canada. Using family income as a threshold for eligibility, he found no effect. Frenette presents a variety of reasons as to why, most notably the lack of information about the program and the substitution between public grants and private loans being possible reasons. Both arguments are rooted in the literature and may be plausible explanations. However, additional reasons related to the experimental design could also explain the results. First, the RDD is designed around the family income cutoff. If the rest of the household of a given student does not provide substitute income for a lack of grant, such a cutoff could indeed indicate liquidity constraints. However, it may be possible that households provide a substitute source of income when that occurs (after all, the program accounts for family income partly for that reason). If this is the case, the randomized experiment around the cutoff becomes about the substitution of parental income and grants. It may be that students perceive no difference between either, thereby leading to a lack of effect. Second, the grant calculation increases at the cutoff (rather than being a binary change). This can also weaken the experiment result as the treatment is no longer discontinuous. Third, it may be more fruitful to use a dataset that identifies students who took a grant rather than those eligible. This would rule out the possibility that the lack of results stems from program poor targeting rather than the absence of impact of grants.<sup>16</sup>

#### **Tuition Fees**

• Increase in tuition fees decrease or substitute enrollment. The impact is of the same magnitude as changes in grants.

In Canada, six key studies on tuition fees have been made by Kwong et al. (2002), Heller and Swail (2004), Frenette (2005), Vierstraete (2007), Neill (2009) and Doray et al. (2015). Based on descriptive statistics of policy shifts, Heller and Swail (2004) argue that tuition has no impact on demand.

Frenette (2005) studies the Ontario deregulation and uses a DD as an estimation strategy. He finds no changes in total enrollment, but finds composition effects. The background of enrolled student shifted according to wealth, race and regional origin. All of the results found fit with a somewhat intuitive narrative: individual who are wealthier, white and/or living in urban areas where more likely to be enrolled that those who were not. Similar results were found by Kwong et al. (2002), although with a focus of the Ontarian policy shift on medical students.

If Frenette finds no aggregate effect, we recall that the deregulation occurred at the same time as the double cohort induced by the abolition of one year of high school in Ontario (Winton and Jones, 2004). Thus, the period of study comprises two important policy changes that affect enrollment in opposite ways, which may explain the null effect in aggregate. In another paper, Frenette argues that his composition findings imply that tuition has an impact on student enrollment (Frenette, 2015).

<sup>&</sup>lt;sup>16</sup> The author argues that focusing on the treated does not imply an intent to treat analysis. In other words, grants may have an impact, but what is more important for a program design is if *offering* grants has an impact. The distinction between both is that grants may not be taken by those receiving it.

In Québec, Vierstraete (2007) performs regressions analysis and argues that enrollment declines with tuition. Doray et al. performs a similar analysis and arrives at similar conclusions. Both have no identification strategies.

Perhaps the most convincing Canadian study on tuition comes from Neill (2009), who uses an instrumental variable approach to isolate unexpected changes in tuition policies induced by changes of political parties. She finds a negative but small effect on aggregate enrollment, a finding consistent with other international studies.

## How outcomes differ by group type?<sup>17</sup>

#### Summary points

- Tuition increase have a stronger impact on low-income individuals and minorities.
- Income is a factor that explains the difference in Higher Education and participation.
- Women are shown to be more responsive to student aid and mentorships.
- Most of the literature on this topic is American. It may not be applicable in Canada.
- There is no causal analysis performed on student aid by census region.
- Some Canadian analysis on the evolution of reading scores by quantiles would be welcome. Reading scores are a key long-term driver of enrollment. They have been shown to be (roughly) equal by income quantiles in the United States, ruling them out as an explanatory factor for differences in enrollment. Can the same be said in Canada?

## Outcomes differ by race and regional origin

Kane (1995) found that tuition decreases are most likely to have an impact on participation for African-American students. This is in accordance with Frenette (2005) and Kwong et al. (2002) who noticed changes in the composition of student demand with the 1990's tuition hike in Ontario. Their findings suggest that the tuition increase changed the composition of student demand by decreasing enrollment for students from lower socioeconomic backgrounds, from nonmetropolitan areas and from non-whites.

Heller (2000) has performed a review of the tuition policies in the United States. He uses paneldata regressions with fixed effects. He finds that student participation varied significantly between disadvantaged groups, namely Hispanics and African-Americans. He also found that college students are more responsive to tuition than university students, tuition responsivity varies by race with Asians being the most responsive, followed by Hispanic, African-American and white persons. Finally, he finds that minority groups seem more responsive to tuition increases than non-minorities. These results are consistent with the Canadian analysis (Frenette, 2005 and Kwong et al., 2002).

<sup>&</sup>lt;sup>17</sup> For example, as in the statement of work, gender, age, parental income, family status (e.g., married, parent), recent immigrant status, disability status, region or Census metropolitan area.

## Outcomes differ by Wealth and Parental Income

In Canada, most of the analysis by groups is tied to the work of Frenette (2005, 2007, 2017). His analysis is by quartile of family income rather than by individual characteristics. His 2005 paper is described in the previous section on tuition and his 2017 paper is described below. In Frenette's 2007 paper, he performs an Oaxaca decomposition of university participation.<sup>18</sup> He finds that 96% of the difference in the participation rate is attributable to observable factors. Such decomposition reveals that 12% of the difference in university participation is attributable to financial constraints, contrasting with 84% tied to family related factors, in particular, reading scores in high school (20%), parental education and expectations (41%) and overall grades of the pupil (14%). In relation to this review section, Frenette's decomposition also reports the impact of regional factors (2.4%), high school quality (5.8%), sex (-1.7%), peer influences (1.7%), perceptions on returns to schooling (0.4%), self-esteem (-0.01%) and parental presence (0.01%).<sup>19</sup> These factors are small in magnitude, compared to others. In the spirit of Carneiro and Heckman (2002), Frenette argues that long-term family factors should then be the focus to influence the difference in trends.

His analysis warrants four comments. First, the fact that 96% of the difference in the participation rate is explained might be misleading. The R-square of the underlying regressions varies between 40% and 45%. This implies that between 55% and 60% of the outcome variable (university participation) remains unexplained by the regressions. In other words, there is plenty of space in the "variance-covariance" spectrum of university participation to be influenced by an omitted variable. This is crucial to understand, as a 96% R-square would leave little room for omitted variable biases. Consequently, the share of the results found could vary in magnitude (or sign) in a setup with an identification strategy. In other words, completely different results could be found with a proper cause to effect methodological design. Second, one implicit omitted variable is the issue of self-selection. As it is the case with most long-term studies, observations of university students are those who have self-selected to attend university. In other words, the difference in observations that account for Oaxaca results are the outcome of decisions generating the results rather than results *inducing* the decisions. There is no way to disentangle the reverse causality (i.e. being in a university implies having good reading skills) from the causality of interest (good reading skills causes university enrollment). Third, some of the factors mentioned can hardly be used as policy levers. Changing parental expectations might be nearly impossible. So although it is important, it may not be in the realm of things that can be changed. Fourth, forward intergenerational effects, are neglected. It is thoroughly established that parental education and

<sup>&</sup>lt;sup>18</sup> An Oaxaca-Binder decomposition is a derivative of ordinary least square regressions. They are used to decompose the difference of mean value of an outcome (say university participation) in the mean value of observable characteristics (say financial hardship). The approach is thus useful in explaining why differences in outcomes may occur and the relative magnitude of explanatory factors. As they are a derivative of plain regressions, they are subject to the standard criticisms, most notably the omitted variable problem and the lack of cause to effect relationship. Any omitted variable may change the regression coefficients and thus, the share of explanatory power of the explaining variables.

<sup>&</sup>lt;sup>19</sup> The impact of sex (here being a men) at explaining the participation gap is negative in all quartiles. Men enroll in Higher Education less. However, the participation gap is more negative in the 4<sup>th</sup> quartile than in the first. This difference of 1.7 percentage points. A similar analysis can be done for self-esteem. It increases participation rates in the 4<sup>th</sup> quartile but decreases the participation rate in the 1<sup>st</sup> one. The difference between both is however small (-0.01%).

income (the latter being missing by design in Frenette) explains university participation. So one policy question would be how to increase the education of future parents. Any short-term impact that current policy may have on younger-soon-to-be-parents will have much larger effects over time.

Following Kane (2006), Bailey and Dynarski (2012) also provide some descriptive work on enrollment and completion rates of different generations in the United States. As in Frenette (2017), they find persistent differences between individuals coming from low-income backgrounds and those from a high-income background. The American difference is stunning: if enrollment rates of low-income individuals increased by 4 percent between 1960 and 1980, the enrollment rates increased by 18 percent over the same period for high-income individuals. A similar pattern is found in graduation rates. In Canada, similar descriptive studies have been done by Corak et al. (2011) and Frenette (2017). Frenette (2017) finds no widening in overall quintile gaps in Canada, but finds important heterogeneity in provinces. For example, he finds an important widening of attendance rate between the high- and low-income quintiles in Ontario, a high tuition province, compared to Québec, a low tuition province, in which the difference remains constant over the period studied (2001–2014). As those differences are not based on any identification strategy, they should not be interpreted as an indication of the relative policy effectiveness (Angrist and Pischke, 2008; Dynarski and Deming, 2009).

#### Outcomes vary by sex

There is mixed evidence that the impact of student aid on grades and hours worked may be more important for women than for men. If Stinebrickner and Stinebrickner (2000) finds an overall effect for both men and women, Scott-Clayton (2011) uses a DD and finds an effect solely for women. Sten-Gahmberg (2019), detailed in the following section of this review, also finds that women reduce hours worked more than man when they are given grants.

#### Missing and related pieces

We finish this sub-section with two remarks. First, there is little analysis done on the impact of student aid by census region. For the first three categories of students, it may be because performing identification strategies on the basis of age, immigration or marital status can be seen as discriminatory. For the latter case, it is perhaps too specific to be a question of interest. There are some studies looking at regional impacts (e.g.: Frenette, 2005), but none looking at census regions specifically. Second, some papers in other sections of this review may also be of interest to the difference in outcomes. In particular, Weiss et al. (2019), a paper reviewed in the next section, also finds that grants increases participation from low-income students and Hispanics. It is also worth reading the section reviewing the impact of student aid on the difference in circumstances of the following section.

## **Section Conclusion**

Summary points

- There is evidence that when students are given a choice, grants are chiefly used to substitute the amount of loans (rather than increase disposable income). There is however some evidence of reduction in hours worked.
- There is evidence that need-based programs increase enrollment from potential students with low income backgrounds.
- There is a need for cause to effect research of grants on Canadian minorities. Most cause to effect studies are American and the analysis on minorities is often a by-product of the research.
- There is a need of research for better design of efficient policy reforms. Theoretical studies
  on the efficient design of need based student grants are shown to significantly increase
  long- and short-term efficiency (enrollment, graduation) and equity (intra- and
  intergenerational mobility) in the society. There is however no practical study linking theory
  to existing programs.

We describe below what the literature answers, what it does not and what are the upcoming challenges. In terms of policy impact, we can be confident about the size and direction of the cause to effect relationship. We describe below the average local impact of loans and the average local impact of grants is what would economic theory predict: on average, an increase in subsidies increases both supply and demand, that is an increase in enrollment. By local, we mean at the institution level. The literature also provides a sense of the magnitude of these causal impacts. We show, in the third section of this review, that there exists other means that have more bang for the buck than traditional subsidies (whether its grants or loans). In particular, summer reminders prior to the first year, or automatic award letters seems promising avenues to better increase enrollment and completion.

What is much less clear, and needs to be refined by future research, is whether the local increase in enrollment is the outcome of substitution between institutions or a general increase in enrollment. Some studies find no aggregate effect, while other do not. Structural estimations of theoretical models (as well as basic theory) suggests increases in aggregate enrollment, although it is not always observed empirically. This is a methodological challenge, because identification strategies require a test group and a control group, which means by design that there is always room for substitution if the policy reforms are at the institution level or higher (e.g. provinces). In line with the questions of this review, there could be more research done, with proper identification strategies, on how targeted minorities respond to additional grants or additional loans.

We finally discuss what the literature does not answer. We argue below the need for some descriptive analysis as well as more refined cause to effect estimates. In a broader sense, there is also a need for structural estimates, where the interaction between existing policies and estimated behaviours is modeled. This last part is however discussed in the third part of this review.

#### What does the literature answer well?

#### Do student grants improve access?

Student grants certainly increase *local* enrollment, that is enrollment in a college or university that offers more grants compared to other institutions. There is broad evidence that grants, in pretty much any form (need-based, merit-based, etc.), increase enrollment in subsidized establishments. The impact matches theoretical predictions, although the magnitude is relatively small. A good rule of thumb would be an increase of 3.5 to 5 percentage points by an additional \$1,000.

When it comes to grants alone, the causal mechanism seems to be more about debt aversion than credit constraints. When students are given a choice, there is clear evidence that aid in the form of grants is chiefly used to reduce the amount of loans, in other words substituting sources of income rather than use it as an increase of disposable income (see Chapman, 2016, reviewed in the next section, for details). Such a substitution effect is not one for one, as there is also evidence suggesting a reduction in hours of work while in school (see Stinebrickner and Stinebrickner, 2003; Arendt, 2013; Sten-Gahmberg, 2019; Nguyen; 2019; reviewed in the next section, for details).

#### Do student loans improve access?

There is evidence that student loans increase overall participation, although with much less magnitude. The most convincing analysis comes from Solis (2017) and a good rule of thumb would be that an increase by \$1,000 increases enrollment by less than one tenth of a percent (precisely 0.075%). The study was performed in Chile, where tuition fees are on average much higher than in Canada (~ \$36,000), which goes to suggest that the impact of loans, in Canada, is probably weaker. So if there is an established cause to effect relationship, one could wonder if such magnitude is of any use.

#### Need-based grants and need-based loans improve access for low income populations

There is also evidence that need-based grants or need-based loans increase enrollment amongst potential students from low-income backgrounds. This is perhaps the biggest difference between merit-based and need-based programs: the former are more efficient at increasing graduation rates (targeted at ability), but less redistributive towards low-income backgrounds (targeted at the disadvantaged).

#### Women are more sensitive to subsidies than men

The subtitle says it all. This is evidence based on the current review, but also based on other strands of the economic literature (e.g. tax design literature). There is evidence that women respond more to subsidies (most often, grants) or counseling than man. The empirical literature does not say why.

#### Magnitude matters: there are more efficient approaches to increase enrollment

Knowing that student grants and loans have an impact on enrollment is not surprising in itself. To help understand the summarized results found in the literature, some perspective is useful. There may be more cost-effective ways to increase enrollment decisions than increases in the current grants or loans already offered. The third section of this review presents solid evidence that preenrollment reminders before the first year are effective. Personalized text messages sent as a reminder in the summer prior to enrollment were shown to increase participation in both Higher Education and student aid programs. These text messages are shown to increase enrollment by 14 percentage points. In one experiment, the authors state that the average cost of a text message is \$7, suggesting a high cost-benefit value.

#### What does the literature answer partly?

#### Substitution effects: local enrollment does not imply aggregate enrollment

It is not clear if an increase in local enrollment translates into aggregate enrollment. As some articles in the sections following suggest, there are mixed results regarding overall increases when the Higher Education system is heterogeneous. Some studies find strong evidence of substitution from unsubsidized institutions to subsidized ones, while others find an overall increase of enrollment. When the quality of higher education institutions is heterogeneous as well, the substitution effect can even lead to a decline in graduation rates.

#### Impact on minorities: most of the literature is American

Most causal studies look at the average effect across a targeted group (the treatment group). By design, most studies focus on a predetermined group induced by either a natural experiment (difference in difference methodology) or a cutoff in a policy design (regression discontinuity design). Rarely the treatment group is designed to study a specific minority, which means that the gender, racial or regional impact is often a by-product of the central analysis, that is the impact on the treated group.

Does student aid increases participation amongst racial or regional minorities? It seems to be the case for American minorities. Most American studies find a causal impact that is stronger within Hispanics and Afro American. Before generalizing across borders, one could however wonder whether American minorities have the same behaviour regarding student aid as the minorities in Canada. A safe answer is two assume differences. In such case, there is not much causal evidence that racial or regional minorities respond in a particular way (or magnitude) to subsidies in Canada. Additional causal studies on the subject could be relevant in a Canadian context.

#### What is not answered by the literature?

#### What are efficient policy reforms?

Related to the third section of this paper, there is evidence suggesting that a student aid program should be designed and adapted according to the existing tax scheme. The amount of aid awarded to a student of a given household should account for the impact of tax changes to the same household. Otherwise, this could generate unwanted differentiated treatments. In a context where a tax scheme does not reproduce an idealized (theoretical) design, need-based student grants significantly increase long- and short-term efficiency (enrollment, graduation) and equity (intra- and intergenerational mobility) in the society. The open question is how this should be achieved? This question can be nested in a broader one, which is how a student aid program should be efficiently designed? Is lowering the expected family income more efficient than increasing the grant (or loan) ceiling? This type of question is best served through structural estimation of theories. We discuss this further in the third section of the review.

#### Some descriptive statistics are missing

In terms of descriptive analysis, three types of studies seem to be missing from the Canadian landscape. First, a Canadian reproduction of Kane's (2005) research in the United States would be welcome. Kane performs an analysis of reading scores and math scores by race, sex and income. The most striking result is that the average scores have narrowed over time and, most impressively, became indiscernible between men and women. Could the same be said in Canada? This question matters, as reading scores and overall grades can be argued to be long-term factors favouring enrollment (Frenette, 2007; Murdoch et al., 2011). It can also be argued that if test scores are the same by groups, they can no longer be explanatory factors for the difference in enrollment and graduation rates. The second missing descriptive piece is the distribution of student aid by socioeconomic factors. This analysis may reveal gaps in the aid distribution. Third, related to gaps is a structural analysis of the interaction of student aid programs and tax schemes. Such an analysis may also reveal incongruences with respect to the total aid awarded as a function of family income, thereby prompting easy to implement adjustments in the program designs.

## What impact do student loans and grants have on completing post-secondary education?

## **Section Introduction**

Section summary:

- The literature studies two broad questions:
  - o How do loans or grants affect year to year persistence or graduation rates?
  - How do loans or grants lead students to change institutions or programs?

The literature on completion rates is one of two stories. The first story is a rather classical analysis, where authors attempt to estimate the (causal) impact of grants or loans on pursuing an additional year of school or graduating after a certain amount of time. Most of these studies use regression discontinuity designs on merit-based grants. As we shall see, these studies suggest a positive relationship between grants and graduation. The second story is more complicated and studies substitution effects between programs and even institutions. Analysis in those papers focuses on program shifts (STEM to non-STEM seems currently in vogue) and, sometimes, the impact of substitution shifts on graduation rates. As shifts in institutions and programs may entail a shift in program quality, the impact of grants can then have backfiring effects, lowering graduation rates.

Accordingly, these two strands of the literature are reported in two separate subsections, each section discussing separately the impact of grants from the impact of loans. As requested in the statement of work, an additional section on the difference in outcomes by group is also reported.

Separating the literature based on the impact of either enrollment or completion is bound to a (somewhat) artificial separation of some papers that cover both. Consequently, some papers already cited in the previous section are presented again, this time focusing on the completion or graduation aspects of their analysis. However, neither the description of the methodological setup of those papers, nor the strengths and weaknesses of various identification strategies, is repeated here.

## Graduation and completion rates

Summary points

- There is supporting evidence that grants increase persistence, as measured either by graduation rates, credit completion or next-year continuation. Most studies use the latter definition. A good average estimate would be an increase by 4.2 percentage points in yearly persistence for every additional \$1,000.
- There is evidence that providing grants leads to substitution from two year programs to four year programs. A good point estimate would be 0.96 percentage point per additional \$1,000. The causal mechanism seems to vary, as it is sometimes argued that it is the willingness to apply to more selective institutions, sometimes the fact that grants studied are offered for five years.
- There is contradictory evidence that grants affect the time to completion. Some studies find a positive impact (an increase in time to completion) while others find a negative impact. Some other studies find no effect. There are two distinctive features of the cases were time to completion increased: either grants were offered on a longer period of time or they induced changes in enrollment in programs that were judged harder to complete.

#### Caused by grants

As outlined in the previous section, Arendt (2013) studies the impact of a 57% increase in grants in Denmark. He uses a DD. He finds that the increase has no effect on graduation rates. However,
three years later, he reestimated the impact of the policy shift and found stronger results: hours worked diminished within treated students, graduation rates increased, and the dropout rate results remained as estimated the first time. Increasing the timespan in a DD setup is known, however to increase the likelihood of positive results by spurious correlations (Bertrand et al., 2009). This should be kept in mind when weighting the longer-year findings.

The experiment performed by Ford et al. (2012, 2014) also had an impact on graduation rates (see previous section for the experiment description). They found that the additional \$8,000 in aid provided increased graduation rates by 6 percentage points overall. In contrast, the treatment arm that gave information to grade 9 students had no impact on graduation rates.

Castleman and Long (2016) use an RDD to study the impact in Florida of need-based grants on enrollment and completion. The average grant is \$1,300. They find a modest increase in enrollment and a 22% increase in credit completion after six years.

Barrow et al. (2014) studied a merit-based type of subsidy in a community college in the United States. The program was implemented through an RCT; and eligible students had to maintain two conditions throughout: first, maintain more than a half-time enrollment, and second, maintain an average of C or higher. Over the two years of the study, students in the treatment arm of the program had 40% more credits completed than did the other group. Barrow et al. find no effect on hours of study, but do find an important increase in presence on campus in the second year.

Bettinger and al. (2019) use an RDD to explore the impact of the CAL grant in California. The grant is both merit-based and income based. As such the authors explore the impact of both eligibility cut-offs. At the income eligibility cut-off, the grant averages \$8,115, a substantive amount, while it averages \$4,311 at the grade-point average cutoff. The authors find substantive effects in terms of completion. At the income cutoff the graduation rate increases by 3 percentage points. At the GPA cutoff, the graduation rate increases by 3.1 to 4.6 percentage points, depending on the underlying estimated ability of the students. For low income students, this means that the grants increases graduation rates of 0.37 percentage points by extra \$1,000, while it is 1.1 percentage point at the GPA cutoff.

Carruthers and Fox (2016) study the impact of grants awarded uniformly to all students in a county in Tennessee. The grant is a "top dollar" award, completing the difference between federal pell grants and assessed needs. The average grant was \$971 and by design, awarded to students already receiving grants. Using a DD by comparing enrollment rates in other counties, they find an increase in graduation rates of 4.6 percentage points and an increase in enrollment rates by 4.0 percentage points. They also perform their analysis with propensity score matching and find similar results.

Coria and Hoffman (2016) study the relationship between student aid and academic performance in California. They perform multi-equation regressions and have no causal identification. They find a negative relationship between aid awarded and student outcomes (grades and completion). Low-income backgrounds are usually correlated with having more difficulties in school. As student aid programs are targeted at low-income students, the lack of identification strategy may reflect self-selection issues.

Denning (2019) studies the impact of a sudden change in financial aid rules on degree completion. He uses the discontinuity rule induced by the student status of financial independence (i.e. RDD). In Texas, where the study takes place, being financially independent (as opposed to being dependent from parents) changes the basis for the expected family contribution. The parental income is excluded (as in Québec), which increases mechanically both grants and loans awarded. The main effect is to increase grants to already eligible students, although the total amount is unspecified. He finds no impact on the academic average, but finds that treated students complete their credits on average one year earlier and with a small increase in degree completion (1.8 percentage points).

Dynarski (2008) also studied the impact of the Arkansas merit aid program from a graduation perspective (see the previous section for a discussion of the paper). She finds that the \$1,500 to \$2,500 reduction in tuition increased persistence (conditional on entry) by 2.7 to 5.2 percentage points. As discussed in the previous section, these results are questioned, however, by Sjoquist and Winters (2012) based on Dynarski's methodology. Using a proper clustering effect for both the control and test group, they perform the estimation again and find no effect.

Facchini et al. (2019) use matching to estimate the impact of grants on the probability of dropping out in an environment that they call "high withdrawal…and delayed graduates".<sup>20</sup> They find evidence that the average grant of  $\in$ 3,330 reduce the dropout rate by approximately 7 percentage points and increase the probability of timely graduation by 10 percentage points.

Graziosi (2014) studies the impact of both need-based and merit-based grants on dropout and graduation rates. Using a matching technique, she finds that need-based grants ranging from  $\in$ 1,700 to  $\in$ 4,500 increases persistence in the second year by 14 percentage points, but has no effect on graduation rates. She however finds that merit based grants of  $\in$ 5,200 euros increase the probability of completing in time by 21 percentage points.

Kwon (2019) did an RDD on Pell grants and found that grants diminish the probability of finishing the second year of study, but increases persistence in the first year by 13 percentage point. The average grant awarded is of \$3,700.

Nguyen et al. (2018) review the literature on enrollment and persistence. They review 42 studies with quasi-experiments, most of them being reviewed in this article as well. Based on their review

<sup>&</sup>lt;sup>20</sup> Matching is a statistical technique that attempts to find similar observations based on a propensity score (Austin, 2011). The matching is done by associating an observation from the treated group to a "similar" one in the nontreated group. These groups are not selected randomly. The identification hypothesis assumes then that matched observations would behave similarly if they were placed in the other group. The treatment effect is the average of differences between matched observations. Matching suffers from two problems. First, nothing prevents one observation from being matched multiple times to one in another group (thus creating a somewhat inflated statistical power). Second, if the group assignment is also correlated with matching characteristics, then the estimate of the treatment effect will be biased.

they argue that grant aid increases persistence and degree completion by 2 to 3 percentage points. They further relate that a grant increase of \$1,000 increases year to year persistence by 1.2 percentage points.

Weiss et al. (2019) study the impact of a multiprong intervention program through a randomized experiment. The program was a combination of grants waiving tuition fees, common classes and curriculum for the selected students, support messages, and counselling. The total cost per student averaged \$4,300. All the messages and counselling meetings were oriented towards completing in time. They saw a 10% increase in graduation rates after 3 years by 18 percentage points and an increase of 10 percentage points after 6 years. The magnitude of the increase should not go unnoticed. However, it should not be attributed solely to the impact of grants, but rather to being the impact of a (rather effective) cocktail of measures.

## Caused by loans

## Summary points

- There is contradictory evidence that student loans influence completion and graduation rates. There are some results that find a positive impact, with a point estimate by 0.09 percentage points by \$1,000. Other studies find a decrease in persistence ranging between 0.55 percentage points to 0.57 percentage points by dollar of loans. In both cases, the magnitude of the causal effect is fairly small.
- Some papers reviewed in the section analyzing the impact of grants on completion and graduation rates study programs that convert loans in grants. As such, the result they find can also be interpreted as the opposite of converting grants to loans. This then suggests that substituting grants for loans reduces time to completion and coerces students into program that provides higher wages (rather than what they prefer).
- There is negative evidence that loans increase persistence in the years after the first one. Some studies find a negative effect (decrease in persistence by 13 percentage points) and other studies find no effect.

Alon (2011) uses an RDD and finds that the marginal effect of an additional \$100 in loans increases first-year completion by 0.009 percentage points. He finds results of a similar magnitude (and significance) for enrollment and graduation. He argues for reducing merit-based aid and increasing need-based aid, therefore (with little reference to the literature on merit-based effects).

Grunnes et al. (2013) study the impact of loan forgiveness on completion rates.<sup>21</sup> They use a DD and find that a \$3,000 reduction in loans reduces the completion time by 1.5 semesters over a period of two years. They argue that the number of years is important to determine the magnitude of the impact. With only a year of bandwidth analysis, they find an effect of 0.8 semesters. These increased effects with time should be nuanced by the usual caveats of the DD technique over longer periods (see the discussion above on the paper by Arendt, 2013, for details).

<sup>&</sup>lt;sup>21</sup> Loan forgiveness should be understood here as a reduction in debt if students graduate within the program's prescribed time range.

Lozano-Rojas (2018) used an RDD to study the impact of Colombian subsidies embedded in the national loan program, a grant of roughly \$275. He finds a significant effect on persistence, with a 6.6 percentage point reduction in drop-out rates around the discontinuity. His results are sensitive, however, to the bandwidth used, and the effect becomes insignificant with close bandwidths.<sup>22</sup>

Herzog (2018) studied the impact of subsidized loans on persistence, using a matching technique based on propensity score. He classifies the impact of subsidized loans in terms of expected family contribution. This means that he classifies impacts by maximum amount of loans awarded, ranging from up to \$3,500 to up to \$5,200. He finds a significant negative effect on persistence, ranging from -2.0 to -2.9 percentage points, for students from low-income backgrounds and those borrowing high amounts of loans.

McKinnon and Burridge (2015) study the impact of increased loans with propensity score matching. They find evidence that additional loans increase persistence in the first year, but decrease participation and completion in the following years.

## Substitution effects

## Caused by grants

## Summary points

- There is clear evidence that grants affect the program (and degree) choice, although there is much variability in the resulting choices. Some studies show that converting loans to grants increases student participation in programs with lower wages. Other studies find that students shift from programs that are not related to science, technology and mathematics (STEM) to related ones. One way to interpret these results is that students have an increased freedom in choosing career paths.
- There is convincing evidence that additional grants reduce students' work hours while in school. However, reduction amounts to much less than a dollar per dollar of grant. The crux of the evidence of the previous section suggests that grants are chiefly used to reduce loans.
- There is some evidence, with nuanced results, that hours worked while in school reduce the grade point average. Some papers find a negative effect while others find no effect. The key difference between the two findings is the hours of work performed. A good point estimate would be that an additional hour worked decreases the grade-point average by 0.62 units.

The RDD study by Angrist et al. (2016) described in the first section of this report also finds that the \$6,200 grants increase causes substitution of enrollment from two-year colleges to four-year

<sup>&</sup>lt;sup>22</sup> He also finds a decrease in default rates, although that is out of scope for this review.

colleges. Six percent of enrolled students in two year colleges in the test group when went to a four year colleges. Most of the four year colleges chosen were more selective. They also found that enrollment shifts are higher for nonwhite applicants, first-generation students and students with the lowest grades. The grants also increased the average time to completion: completion rate after four years was 6 percentage points lower in the test group than in the control group. The authors argue that this is due to the fact that grants were awarded for a five year period, reducing the financial pressure to complete on time.

Anderson et al. (2018) uses an RCT to study the impact of grants on persistence three years or more after the award. The grant is of \$3,500 for university students and \$1,800 for college students. They find no effect on enrollment, persistence nor on time to completion. They however find a 6 percentage point substitution of graduation rates from non-STEM fields to STEM fields. This result persisted over time the four years the study was conducted.

Bettinger and al. (2019) also find substitution effects induced by the CAL grant. Their most important finding is that at the income discontinuity the increase in enrollment in private institutions that is induced by the grant is entirely offset by a decrease in enrollment in public institutions (both universities and two year colleges). However, they do not find such shift in enrollment at the GPA cutoff. This is perhaps an important difference between merit-based aid and need-based aid.

Castleman et al. (2019) study a substitution effects induced by need-based grants. The grant was of \$1,300 on average and complemented the federal aid provided to already eligible students. They specifically look at enrollment and credit completion in STEM related programs. They use an RDD and find an increase between 20 and 35 percentage points of credit completion in STEM related programs. They also find that the RDD could increase degree attainment without ruling out the null effect (i.e., positive, but not statistically significant).

Brown et al. (2012) used an RCT to study the impact of need-based grants on the substitution effect between STEM related programs and others. They find that low-income students increased their enrollment in STEM programs by 7.87 percentage points. This study also relates to the work of Rothstein and Rouse (2011), who find that students receiving more grants were less likely to choose profitable career paths, but rather chose career paths that they found more rewarding (notably the public sector). Substitution effects in career paths are also studied in Chapman (2016). Using an RDD on a merit aid program, she finds a substitution effect in income (e.g., grants replace loans), few changes in patterns while in college, and significant effects in career paths. Sullivan (2018) also finds similar results using a DD on students at the University of Virginia. He finds that additional loans redirect enrollment towards business and "high paying industries". He finds no evidence of the impact of loans on either enrollment or grade point average. These results are understandable, as when financial hardship after college is reduced, students become free to choose what they would prefer to do.

Desjardins et al. (2013) studied the impact of the Gates Millennium Scholars program on a variety of outcomes after graduation. They use an RDD around the academic average eligibility cutoff

(3.3/4) and show that eligible students reduce their loans rather than increasing their disposable income, do not change their enrollment patterns, increase their grade point average and increase their aspiration to receive a PhD. It is not clear if the grade point increase is induced by the eligibility cut-off or by the grant itself.

Goodman (2008) studies the impact of merit-based aid in the state of Massachusetts. The grant is of \$740 for community college students, \$960 for state college students and \$1,575 for students attending the public university. These grants were provided to students who had high school grades above the 75th percentile with the condition that they would remain within Massachusetts and go to public institutions. He applies an RDD technique to students above and below the percentile threshold and finds a six percent substitution effect from colleges not eligible for funds towards eligible (public) colleges. Cohodes and Goodman (2014) later study the same program with the same methodology. They find the same participation results as in Goodman (2008) but find additionally that graduation rates of those who benefited from the grants were lower by 17 percentage points. Using a proxy for the quality of institutions, they show that the difference in the quality, when compared to institutions chosen by those below the cutoff, could be the main driver for the lower graduation rates. Their proxy for quality, based in part on tuition levels and peer effects, seems compromised by endogenous factors. As such, the causal explanation may need to be revisited.

The substitution effect between subsidized and unsubsidized colleges was also studied by Long (2004). Using a propensity score matching technique, she finds that if the subsidy given to colleges to lower tuition were given as student aid instead, enrollment would increase 29% in (currently) unsubsidized colleges. This is also evidence that students enrollment follow subsidies locally. However, as it only shift enrollment, one cannot conclude it would have an overall increase in enrollment.

Lepine (2019) uses propensity score matching to study the impact of grants on performance. She finds that, all other things being equal, students with more grants perform better. She also finds evidence that for those who benefitted from a full scholarship (100% reduction in tuition), there is a 4 to 7% reduction in hours worked. However, she finds no significant effect for partial grants. There is also similar, but indirect, evidence in Park and Scott-Clayton (2018) that aid decreases labour participation.

Schröter (2010) uses a DD and structural equations to study the impact of student aid reforms. He finds that a uniform increase in student aid increases time spent in school. He also studies specific reforms and finds that increasing grants towards those who work less could increase graduation rates up to 5%. What is different in Schröter, perhaps, is the reverse mechanism that other papers often studied: directing aid does not change hours worked (often theorized to improve grades), but directing aid at those who work less has more impact on grades. The direction of the causality may not be that important if what matters is graduation rates alone, but may be relevant if one seeks to reduce the completion time.

## Caused by loans

#### Summary points

• Loans seems to have little impact in terms of substitution.

Solis (2012) and Aguirre (2019) have studied the impact of eligibility threshold in the context of the Chilean student aid program (see the previous section for details on the policy studied). Chile is a noteworthy country for analysis, as tuition fees are extremely high, up to a point where very few can access university without subsidies (id., 2020; Solis, 2012). Aguirre finds that the being awarded loans substitutes participation away from technical institutions in favour of "more academically demanding" institutions. In the same experiment, Aguirre finds that such a substitution effect has lowered graduation rates for those students. He argues that the monetary incentives provide access to universities that may be attractive, but are too demanding for the marginal student with loans. He however change his results one year later (id., 2020) and finds that student loan access increases enrollment between 2.2 and 7.2 percentage points, depending on the university studied. The change is sharpest for technical universities. Of those who enrolled, he finds that student loans increase the full-time enrollment by 3.2 percentage points, but have no impact on graduation rates. Although done earlier, Solis (2012) found similar results. Altogether, these results suggest little substitution effect by loans.

## Do graduation outcomes differ by group type of students?

## Caused by grants

#### Summary points

- Grants seems to have a greater impact on minorities than on non-minorities.
- Most of the literature is American: it is not clear if the results can be transferred to Canadian minorities can be questioned.

Dynarski (2000, 2003) studied the impact of merit-based aid on completion in the United States with a DD.<sup>23</sup> This is the \$1,000 scholarship discussed in the previous section. She compares the outcomes in graduation rates of students in neighbouring states. She finds that aid has a greater impact amongst lower-income and socially disadvantaged individuals. In the United States, disadvantaged individuals are mostly Hispanics and African-American students.

Leppel (2002) studies the difference in college persistence between men and women. She has no identification strategy. She finds that having children impacts persistence negatively for men and being African-American increases persistence for women.

<sup>&</sup>lt;sup>23</sup> Dynarski (2000) is also a good review of studies made prior to 2000. Heller (1997) also reviews literature on the impact of tuition from 1987 to 1997. Leslie and Brinkman review the studies prior to 1987.

Some studies detailed in the third section of this review offer insights on the difference in outcomes by group. Angrist et al. (2009) and Levitt et al. (2016) use an RCT to study the impact of instant gratifying cash rewards ("cash for grades") and counseling. They show that the combination of subsidies and counseling has a causal effect on performance and persistence, but solely on women. Angrist and Levy (2009) find similar results in another "cash for grades" experiment. Evans and Nguyen (2019, detailed in the next section), who employ an RDD to study the impact of grants on hours worked, also find a stronger impact on women than men. Arendt (2013, detailed in the previous section) also finds that student aid increases have a more important impact on enrollment rates of low-income students.

The Herbaut and Geven review (2019, detailed in the previous section) concludes "need-based grants quite consistently appear to improve completion rates of disadvantaged students. In contrast, the evidence indicate that merit-based grants only rarely improve outcomes of disadvantaged students." Again, their review is based solely on studies with RCTs or quasinatural experiments, the most reliable methodologies to infer cause to effect relationships.

Kramer and Ortagus (2017) study the impact of the Machen Florida Opportunity Scholars Program. Similar in principle to the multipronged program studied by Weiss et al. (2019), the program offers grants, counseling and peer cohorts to favour enrollment and graduation. However, the authors' analysis focuses on the difference in participation of various low-income groups. Using an RDD, they find that the program increases participation of Hispanic students. They also find suggestive (nonsignificant) evidence that it positively affects African-American students. They further find significant increases in participation rates at the master's level for the same group of students (39.5% and 8.4% increases, respectively). They also find that the program increased PhD enrollment by 11.8% for Asian students. Comparing STEM and non-STEM students, they find significant effects of non-STEM enrollment at the master's level.

## Caused by loans

#### Summary points

• In terms of graduation time and hours worked, man seem to be more responsive than women to loan remission programs.

Although less related to a difference in graduation outcomes than outcomes themselves, the study by Sten-Gahmberg (2019) is stimulating from a heterogeneity in impact perspective. She uses a DD to estimate the impact of a more generous loan remission program in Norway. She finds evidence that males reduced their graduation time significantly, although there was no impact on females. She also finds that males respond more by reducing hours worked than do females, who quit the workforce altogether. These results showing that female labour supply is more responsive to financial incentives echoes known results on the impact of taxes on labour supply (Meghir and Philipps, 2008).

## Does student aid reduces labour supply?<sup>24</sup>

## Impact of grants

Summary points

- Grants reduce hours at work. A good point estimate is that an addition \$1,000 in grant reduces hours of weekly work by 1.4 hours.
- When there is "too much" time spent on work, a reduction in hours worked increase the grade point average. One hour less per week implies an average increase 0.62 units in grade average point.

Evans and Nguyen (2019) employ an RDD to study the impact of student grants on hours of work while in school. They find that an increase in grants by \$1,100 translates into a decrease of 1.5-2 hours of work every week. The effect on hours worked is more important for women. They find little to no impact of the subsidy on graduate point average.

Bouchard St-Amant and Morin (2020) performs a structural analysis of the impact of two possible policy reforms on hours worked in terms of the Québec student financial aid program.<sup>25</sup> This affects both the amount of grants and loans provided. They look at how reducing the clawback rate in the student contribution compares with increasing the income protection amount.<sup>26</sup> Both policies reduce earned income (work), although the first policy reform has less impact. This is so because reducing the clawback rate increases incentives to work, thereby reducing the overall effect of providing more grants. Their analysis is robust to parameters changes in elasticities. Such a study suggests that student aid programs, in particular their design, can alter the patterns of hours worked during studies.

Following Keane and Wolpin (2005), Glocker (2011) use structural estimates to study the relationship between hours worked, graduation rates and student aid.<sup>27</sup> She has no identification strategy. She finds that student aid reduces the time to completion, compared to the time to an equivalent amount in parental transfers. Increases in student aid beyond a given need threshold do not affect the graduation time, but increase the graduation rate. The mechanism for the latter is simply the reduction of hours worked, which provides additional time to study.

Stinebrickner and Stinebrickner (2003) study the impact of hours worked on academic performance and finds that the indirect impact of the grant program they study reduces academic

<sup>&</sup>lt;sup>24</sup> The question in the statement of work is too long for a title. The question is: "how do individual circumstances differ between program recipients and nonrecipients in terms of having to work while in school and having enough study time?"

<sup>&</sup>lt;sup>25</sup> Structural analysis is midway between theoretical and empirical studies. It uses estimated responses found in other studies to analyse the counterfactual impact of changing the structure of an existing program.
<sup>26</sup> The protected income is the fiscal equivalent of a refundable tax credit. Increasing its value increases the amount of grants to eligible students as it uniformly lowers the expected student contribution.

<sup>&</sup>lt;sup>27</sup> Keane and Wolpin (2005) used American data, while Glocker used German data. However, the modeling approach and the conclusions are similar.

achievement. Such a private grant program requires student to work additional hours for the purpose of grant eligibility. Using an instrumental variable technique, they find that an increase in weekly hours reduces the grade point average by 0.62 units. Stinebrickner and Stinebrickner conclude that additional hours of work could reduce performance in school.

## Impact of loans

• There are no convincing results linking the impact of loans on hours worked.

Avdic and Gartell (2015) study a Swedish reform to analyse the impact of loans on future earnings and credits completed. They use a DD with groups who have been exposed differently to the reform and uses it for comparative purpose. Compared to students who did not benefit from the reform, they find a significant increase in earnings and credits completed from low-income students. The identification strategy they use is plagued, however, with endogeneity problems. It is possible that the policy shift was designed such that some socioeconomic groups used as a control group were less exposed. In such a case, there may be a reverse causality at work. Certainly, their results contrast with Welch (2014), who studies the impact of the HOPE scholarship on current and future earnings of graduates. Using a DD, he finds no impact.

## Section conclusion

We follow the same structure as in the previous section, sometimes linking results to other sections.

## What does the literature answer well?

#### Do student grants increase completion and completion rates?

There is supporting evidence that grants increase graduation rates If most studies look at the impact of merit-based aid, some authors look at the impact of need-based aid with a similar message. A good average estimate would be an increase year to year persistence by 4.2 percentage points for every additional \$1,000. These results are also consistent with studies on time to completion, where grants that lasts longer than the program duration are shown to delay graduation rates. Thus, grants with a duration limited to the program time may improve both persistence and completion time.

In terms of time to completion, there is meager evidence that grants lower the completion time. Some studies find the opposite, and some find no impact. As already discussed, this may be very well connected to the duration of grants awarded compared to the duration of the program.

However, there is clear evidence that grants lead to substitution effects. The program and institution choice are altered by the introduction of subsidies, although there is much variability in the resulting choices. At the program level, one way to interpret these results is that students have an increased freedom in choosing career paths.

At the institution level, there is evidence that subsidies may shift enrollment from unsubsidized institutions to subsidized ones. This affects enrollment patterns on a *local* level, as discussed in the previous section, but may not mean accrued enrollment in the aggregate. Moreover, if institutions are heterogeneous in quality, additional aid may backfire if the substitution occurs from high-quality to low-quality institutions. In the context of a nationwide program, the complementary grants given by institutions should be evaluated carefully. Avoiding substitution effects suggests that grants from other sources should be completely accounted in the student income definition, so as to neutralize incentives to move from one institution to another. This could however introduce shirking from institutions, displacing the financial burden to the federal government. It could furthermore provide incentives for institutions to give aid in other forms.

#### Do student loans increase completion and completion rates?

Evidence is contradictory as to whether loans influence completion or graduation rates. Some studies find a positive impact, while others do not. A consistent finding, in this section or the previous one, is that the magnitude effect of loans is fairly small on enrollment or on completion rates (whether is negative or positive).

Studies discussed in this review also find contradictory effects regarding year to year persistence. Most studies find a positive impact of loans on enrollment, but the effect found on completion in the following years is blurried by opposite results. Some studies find a negative impact in the second and third year, meaning that more loans reduces persistence. This should be combined results found linking more loans to shorter graduation times.

#### Do grants reduce the labour supply?

With respect to substitution effect on labour supply, there is evidence that additional grants reduce the hours of work while in school, although in less than a dollar for dollar fashion. A good point estimate would be a reduction of 1.4 hours per additional \$1,000 in grants. This result should be connected with the (nuanced) evidence that hours worked while in school reduce the grade point average. A reduction of one hour on work translates into an increase of 0.62 grade-average point. Some papers find a negative effect on grades while others find no effect. The key difference between both categories is the magnitude of hours worked. As such, a policy design that avoids "too much" work may help academic results.

#### Women respond more to grants.

As in the previous section, the evidence found in this section suggest that women are more responsive to grants, but this time in terms of completion and reduction of hours worked. This result echoes well know results in the taxation literature, where women are also found to be more responsive to changes in tax rates.

## What does the literature does not answer well?

Summary points

- Additional research on the impact of loans would be welcome. There is no clear-cut experimental design in the impact of loans on persistence. This could be easily done through a pilot project, a randomized control trial, giving additional loans to already eligible students. This could be performed by the CSLP, provided the appropriate regulatory maneuver.
- Some Canadian literature linking outcomes to minorities would be welcome.

#### Do loans reduce the labour supply?

There is weak evidence that loan remission programs reduce hours worked for males. The study finding these results rely on a difference in difference where there may be a reverse causality at work: the group used as a treatment is more likely to be less cash constrained than the control group, biasing the results upwards.

Such finding could be easily clarified with a pilot project providing additional loans to already eligible students. This could be done with the proper regulatory changes to allow for pilot projects, as it is possible in other divisions of ESDC.

#### Variation in outcomes by groups: most of the literature is American (again)

The impact of student aid, whether its grants or loans, seems to have a similar qualitative impacts on completion time and graduation rates for most groups studied, including minorities. Some studies linking graduation rates to grants even find stronger effects on minorities coming from lower-income backgrounds (e.g. Dynarski, 2003). However, most of these studies are American and, as in the previous section, one could be led to ask if the impact on Canadian minorities would be the same.

#### What does the literature does not answer?

Summary points

• The student aid mix (grants vs loans) seems to impact the graduation time. In particular, the grant duration seems to affect negatively graduation rates. Additional research with structural estimates on the proper design could inform how to increase graduation rates.

One key feature that is not answered by the literature is the efficient design of loans versus grants. As found in some papers discussed in this section, grants increase persistence, but they also increase time to completion. A coherent causal mechanism is that if grants are high enough and awarded for a long enough period, they become a sustainable income that does not encourage graduation. As such, an efficient design of a phasing out period, combined perhaps with a substitution in loan may be an idea worthwhile pursuing. But the problem, at this stage, it that this is not an idea that has been thoroughly researched. How should the mix of student grants and

student loan be organized to favour enrollment, persistence and completion? Questions involving a "student aid mix" and some phasing out are best served by estimated structural models.

# CSLP: Are we leaving people behind?<sup>28</sup>

## **Section Introduction**

Summary points:

- Those questions implicitly ask about program resources, program goals and consequently, program design.
- Globally, the 1960 program goals are still relevant today. The normative grounds for student aid are rooted in the reduction of liquidity constraints, the increase in human capital and the reduction in inequalities of opportunities.
- Since 1960, much knowledge has however been developed about what works and how best serve these criterions. In particular, a lot of knowledge about human behaviour and responses to policies has been developed.

Are the 1960 criteria behind CSLP's design still relevant in today's society? Yes, but they can be further refined. In terms of policy goals, there are two broad sets of motives for assessing student aid subsidies. First, there are motives related to low-income individuals, which can be tied either to a poverty reduction goal (e.g., Stiglitz and Rosengard, 1998) or a willingness to remove credit constraints (e.g., Kane, 1995); and second, there are efficiency motives, related to credit constraints and human capital productivity (e.g., Hanushek et al., 2014). These policy goals remain the key normative roots behind student subsidies design.<sup>29</sup> Any theoretical study uses these criteria (perhaps differently) when considering efficient policy design.

In terms of refinements, much has been learned since 1960 and, of course, the population has changed. Thus, some refinements can be discussed to improve both the CSLP and the CSG. The student aid programs can be refined on the basis of increased evidence-based research. Asking who is left behind is an implicit policy question about program generosity, but it is also about the efficient use of current funds (e.g., program design). Below, we provide suggestions as to how additional subsidies could have impacts on targeted populations, but also on how some elements of the CSLP and CSG could be improved to leave fewer individuals behind.

In the following parts of this section, we discuss first about two broad notions defining implicitly who could be left behind. The first notion relates to findings in the behavioural economics literature and the second notion relates to mature students. We then move on to a prominent idea in the literature that pertains to program design, that is an income contingent loan. We follow with a conclusion for both this section and the review as a whole.

<sup>&</sup>lt;sup>28</sup> The statement of work questions are too long to form a title. They are "Are we leaving people behind? Is the program criteria, which is routed in 1960 social, economic reality, still relevant in today's society? (learners not limited to 18-24 years olds). Both of those questions are covered in the review.

<sup>&</sup>lt;sup>29</sup> *A contrario,* their absence is often used as an indication of an inappropriate program design (Cameron, 1998; Carneiro and Heckmann, 2003). According to Finnie et al. (2015), perceived credit constraints account for less than 5% of reasons not to enroll in Canada (Finnie et al., 2015). Frenette (2007a) also argues that credit constraints are a minor factor.

## Novel results from behavioural economics

Summary points:

- There are important biases that occur simultaneously at the time of enrollment decisions that push potential students to exit the educational system. In particular, individuals underweight the future, yield to current temptation, are biased towards the default option, are deterred by complexity and make important mistakes when situations occur once or twice in a lifetime. The student aid program designs should factor these biases in.
- There is significant evidence that less people will be left behind with a simplification of the registration processes, increasing participation and access. Some analyses done on Canadian student aid programs suggest that both the front- and back ends may be complicated, thereby hindering access.

Regarding Higher Education decisions, four key elements of the behavioural economics literature suggest that some people are left behind.

First, perhaps the most important aspect relates to the evaluation of future benefits (e.g. earned income). It has been shown empirically that individuals do not properly account for future benefits in life (Laibson, 1997; Hazel and Munro, 2003; Maskin and Dasgupta, 2004). Such a phenomenon has also been shown to be more important in the presence of poverty, scarcity or more enjoyable alternatives (Gul and Pessendorfer, 2001; Spears, 2011; Shah et al., 2012; Haushofer and Fehr, 2014). In the context of Higher Education, this may mean that future benefits associated with a degree may be incorrectly accounted for when individuals decide if they enroll.

Second, individuals are deterred by complexity. Bettinger et al. (2012) have used a randomized control trial to estimate the impact of simplifying American student-aid forms. They used two test groups, one receiving both information and help in filling student aid forms, while the second only received information on student aid. Compared with the control group, they found significant increases in take up rates and college enrollment. Thus, simplifying application forms and renewals could significantly improve take up rates (Dynarski and Wiederspan, 2012). This was identified as a priority in the Strategic Investment Fund review (ESDC, 2015c, hereafter SIF review). McLaren's (2014) analysis, showing the complexity of the formulaic calculations for determining aid, suggests that student aid programs may need to be examined through the lens of simplification. As it is rightly discussed in the SIF review, simplification can sometimes imply a trade-off between targeted aid and simple measures. However, one functional approach that helps reducing complexity from the student perspective is targeting on the basis of questions that can be deduced from other government services (e.g. family income and structure). This can help target aid appropriately without added complexity.

A key factor that could improve student aid is predictability. For instance, a guarantee that the same amounts would occur yearly over the normal period of study, provided income remains within a given range of the initial calculation. This could be done, for instance, by using stepwise changes in the expected family calculations or by introducing regulations specifying that only an

important income changes triggers a new calculation.<sup>30</sup> Such idea is discussed in the SIF review (ESDC, 2015c, p. 38). This would have the effect of keeping aid identical within income variations. As such, student aid would not vary over years for small changes in income. Evidence suggests that students do not understand the mechanics of aid calculation (McLaren, 2014; Government Accounting Office, 2009; Dynarski and Scott-Clayton, 2006, 2013). Thus, they cannot plan appropriately.

Third, individuals choose the default option more often than the most intelligent option (Thaler and Sunstein, 2008). An incredible experiment performed in San Marcos showed the power of changing the default option (*id*.). A high school director added a college and student aid application as a graduation requirement. As a result, the enrollment rate increased by thirty-three percent in a neighboring college. As a comparison, a student aid increase by USD 1,000 is likely to increase enrollment by three to five percentage points (Dynarski, 2003). On the student access policy scale, the San Marcos experiment is an earthquake. Such results warrant testing the approach in other (perhaps Canadian) contexts, which is a different setup than what was experimented by Employment and Social Development Canada (ESDC) (2013).

Fourth, it has also been shown that individuals tend to correct for mistakes as they repeat decisions over time (Gul, 2010). As mistakes in decisions are corrected over time, they have less negative impact on individual welfare. However, decisions that happen just once or twice in a lifetime – pension choices, home purchase decisions, or... education decisions – leave little room for learning from mistakes. Thus, the design of policies that help in making those decisions may be crucial.

This literature review begins with Lavecchia et al. (2016) and Herbaut and Geven (2019) who provide a survey of field experiments related to behavioural economics and Higher Education.<sup>31</sup> Herbaut and Geven (2019) reviewed more than seventy papers on the link between behavioural economics and student financial aid. They find that "outreach policies are broadly effective in raising access of disadvantaged students when they include active counselling or simplify the university application process." We present the relevant papers in these two reviews as well as some additional papers.

Angrist et al. (2009) use an RCT to study three policy levers. The first treated group received counselling and academic advice, while the second received cash rewards for good grades. A third group received both (while a fourth one acted as a control). They find that the combination of both cash rewards and counselling has the most impact. It increased grades for women (but had no effect on men). The effect persisted in the second year of enrollment, although the treatment was only in the first year. The study suggests that the combination of both financial and behavioural effects (counselling, instant gratification) can be a powerful combination.

<sup>&</sup>lt;sup>30</sup> In the Québec program, the "protected income" defined in the student expected calculation has this flavour, although it is not at all understood, nor it is clear that it is efficient from an incentives perspective.
<sup>31</sup> Such a review has some literature on other levers for improving access, such as identity nudges. While it could be of interest for local administrators, it is outside this statement of work.

Castleman and Page (2014, 2015, 2016) perform an RCT on students during the summer prior to enrollment, when "summer melts" can occur – when potential students abandon school before even enrolling. They have done several treatment arms in their RCT. The first comprises personalized reminders and invitations to connect to a counselor through text messages. That treatment increased enrollment by 4.5 percentage points. The impact seems to be uniform across students who had less definite college plans. Their second treatment arm is the sending of text messages reminding students to register for financial student aid. They find increases in take up rates of 14 percentage points, which is a large increase. In another RCT, Castleman et al. (2012) explored the impact that in-person counselling had during the same summer period. Counselling increased enrollment by 14 percentage points (also a large effect).

Although not related to the "summer melt", a study by Liu et al. (2011) also provides some evidence of early commitment to financial aid. They perform an RCT on high school students in China, offering early information and commitment for student aid amounts. They find that early information offers of ¥5,000 increases pupils' decisions to go to colleges with higher tuition ("defense related colleges") by 4 percent. The ¥2,500 offer letter did not have a significant impact, nor the letter mentioning the existence of student aid. They also find that the letters had no impact on enrollment decisions, nor on academic performance. The authors hypothesized that the letters were not sent early enough (four months before final tests) to influence grades.

Hoxby and Turner (2013) also examine early commitment in the year prior to enrollment. They test the impact of college advising and college application fee waivers with an RCT. They send an advice letter combined with the application fee waiver to potential students. As a result, the students in the treatment arm increased enrollment by 5 percentage points more than in the control arm.

These experiments suggest that interventions in the year prior to enrollment may have an impact. Increases in enrollment from 14 to 20 percentage points are much larger than the impact of accrued student grants. On top of existing aid, they may provide an interesting direction for new interventions.

Also related to early commitment, but over longer periods, Dinkleman and Martinez (2014) perform an RCT that provides information about higher education to eight-year-old pupils. They divide the treatment into two groups, one of which also provides information to parents. They find a significant difference in school grades, school attendance and high school choice, all of them pointing towards better preparedness for Higher Education attendance. Jensen (2010) performs a similar RCT with older pupils in the Dominican Republic and finds an enrollment increase of 20 to 30 percentage points in the next four years. The magnitude of the increase should not go unnoticed.

Nguyen (2008) also analyzes the impact of providing early information by varying its delivery format. He performed an RCT in Madagascar and compared the impact of having "role models" versus simple provision of information. He finds that basic statistics on the impact of Higher Education increase enrollment by 3.5 percentage points and increased test scores by 0.2

standard deviations. In a similar spirit, Oreopoulos and Dunn (2013) also perform an RCT about the provision of information on the economic costs and benefits of Higher Education. In particular they focus on its returns and the availability of aid. McGuigan et al. (2016) performed a similar RCT. However, both only reported perceptions and intents to enroll. They found an increase in intents. This is worth outlining in the context of a similar Canadian experiment that was performed by the Social Research Demonstration Corporation (ESDC, 2013), since they find no impact on enrollment decisions. However, they do find evidence of increased enrollment in the student aid program. It would have been interesting to analyze the enrollment pattern shifts, as some other papers did.

Information packages were also studied by Marx and Turner (2019). They perform an RCT to study the impact of loan offers on the grade point average and on completion. By "loan offers", it should be understood that the college where the experiment happened offered letters about aid that could already be requested by students. As such, the experiment is about testing the impact of letters with an amount of loan listed rather than the impact of the loans itself. Unsurprisingly, they find that the amount of loans taken increase by 40% in the treatment group, with an average increase by \$4,000 per additional student borrowing. The impact on outcomes is more interesting: they find that both the grade point average and credits completed increased by 30% in the treatment group. Finally, they find an 11% increase of substitution from two year to four year colleges. The paper is a good experimental confirmation of anchoring, that is the phenomenon by which individuals

Aside from the null result in Canada, all point in the same direction as Cameron (1994), Stinebrickner and Stinebrickner (2005), and Cameron and Heckmann (2013) who argue that long-term social factors, in this case awareness, are more important in building up human capital than short-term subsidies. However, Kerr et al. (2014) perform a similar RCT assessing the impact of information about post college earning and find no effect.

Some studies also focused on providing personal assistance, which can be understood from the perspectives both of reducing complexity and of changing the default option. The "FASFA experiment" (Bettinger et al., 2012) is the most cited study as evidence that reduced complexity increases applications (e.g., Dynarski, 2012). They did an RCT where help was provided to students by dedicated H&R Block counsellors (tax experts) in filling out the student aid forms. They find a significant increase in participation in the Pell program.

Avery (2013) performs an RCT where students are provided with counselling on college applications. They find that students who receive such counselling are more likely to apply to fouryear colleges by 30 percentage points, to apply to a more selective institution by 15 percentage points, and were overall more likely to enroll in a four-year college by 15 percentage points. Carell and Sacerdote (2013) also perform an RCT helping students register for financial aid. They experimented with two treatment arms: the first provides information about the financial aid amount they can receive, while the second provides information and counselling. They find that students treated in any of the two groups are more likely to be in college in their second year. Those results are consistent with Castleman, Arnold and Wartman (2012) and Castleman, Page and Schooley (2014) who also perform RCTs on counselling, with increases in enrollment by 3.7 to 15 percentage points.

It is sometimes argued that only the net cost of studies (tuition fees net of grants, loans, and tax credits) is what matters for policy purpose (Usher and Duncan, 2008).<sup>32</sup> However, the combined results of the previous studies can be used to argue that complex deferred payments over time may be less effective than immediate aid. First, the introduction of a payment delay may increase financial hardship for credit constrained students (Neil, 2008). Second, deferred payments can be underweighted by potential students thinking about Higher Education, which may lower the subsidy effectiveness. Third, deferred payments may not be known at the time of registration, also hindering their effect. Fourth, access to deferred payments such as tax credits can be complex, which also suggests that the take up rate of the subsidy may be lower because of complexity. Combined, these arguments suggest that immediate payments are more effective than deferred (and complex ones).

## Should there be student aid subsidies for mature students?

Summary points

- Mature students are comprised of two subgroups: students who are older and students with dependents.
- Human capital theory suggests that less subsidies should be given to older students.
- From a reduction of inequalities standpoint, transitory poverty reduction goals are better served through other programs such as unemployment insurance.
- However, a need assessment approach recognizes that additional funds should be provided to potential students with dependents or older students with more expenses.

The answer depends very much on how the relationship between student aid and the definition of mature student is framed. There are three definitions in the literature (ESDC 2015c). The first definition of "mature student" relates to age: mature students are older students: someone looking to re-train after losing a job, or retired individual looking for an intellectual challenge. The second definition relates to potential students with dependents, chiefly single parents. The third definition relates to students who took a break in their school curriculum: students that delayed entry in postsecondary education by a year or two. So the first and third definition relates to age, or delayed entry, although with a significant difference between both. The second definition is rather one of family structure: single parents are not the same from an household composition perspective than others.

As discussed in the introduction of this section, student aid programs are rooted in three broad policy goals: human capital acquisition, poverty reduction goals and the relief of credit constraints. How should age be viewed on the basis of these criterions? Human capital theory (Becker, 1967; Stantcheva, 2017) suggest that human capital subsidies should diminish with age. In such theory,

<sup>&</sup>lt;sup>32</sup> Others argue that tax credits may not effectively target low-income students (or their households) (Berger, 2008; Neil, 2008).

Higher Education is viewed, from a social standpoint, as an investment. The longer the investment lasts, the higher is the payoff. Conversely, shorter durations, as older individuals will experience, warrants less returns and thus less investments. So from this angle, mature students should be subsidized less. This can either mean loans instead of grants, or unsubsidized interest rates.

If there is little support for *additional* subsidies in human capital theory, the case supporting subsidies for more mature students could be made if it is rooted in poverty reduction policies. However, it raises the question as to why poverty reduction should be achieved through student aid programs, or why it is chosen as the preferred delivery mechanism (as opposed to welfare programs or unemployment insurance programs). Moreover, a policy rationale would also need to be elaborated as to why mature students only should be targeted instead of mature individuals in general.

However, the support towards mature student can be analyzed through a standard need assessment analysis and the policy goal of liquidity constraints. First, it is pretty clear that the needs of potential students with dependents differ from those who have none (ESDC, 2015c). Second some older students may face different costs of living than younger ones (e.g. mortgage payments). These could be understood as financial barriers that could deter participation in Higher Education.

There is one topic that is closely related to this question and that is indirectly assessed, but seems missing from the literature: the interaction between student aid policies and unemployment insurance programs. In particular, the impact of the most recent "Skills boost" (ESDC, 2020) measures with the unemployment insurance program should be researched and evaluated.

# Risk-averse students are left behind: the case for an Income Contingent Loan (ICL) scheme

Summary points

- Most theoretical literature agrees on the added value of an Income Contingent Loan system or its "public" equivalent, a graduate tax. Such a repayment scheme (on top of existing subsidies) could leave less risk-averse students behind.
- The theoretical literature on student aid suggests that more potential students could be brought in with a joint design of the tax scheme and the student aid programs. These students are not identified by specific characteristics (e.g., age, sex), but rather by the characteristics of the gaps in the student aid and tax scheme landscape.
- By extension, the same could be said of the interaction between employment insurance and student aid programs.

Clearly indicated by the literature is the added value of an Income Contingent Loan (ICL) repayment scheme (Garca-Pealosa, 2000; Barbaro, 2004; Kapicka, 2006; Bohacek and Kapicka, 2008; Barr, 2009; Del Rey and Racionero, 2010; Jacobs and Bovenberg, 2011; Chatterjee and Ionescu, 2012; Jacobs, 2013; Guo and Krause, 2013; Krueger and Ludwig; 2014; Dessy et al.,

2014; Gary-Bobo and Trannoy 2015; Lochner and Monge-Naranjo, 2012, 2015; Stantcheva, 2017; Koeniger and Prat, 2018).<sup>33</sup> A consequence of its absence is that some apt but potentially risk averse students can decide to forego Higher Education (Finnie, 2005). An ICL is also connected to priority 1b in the SIF review (ESDC, 2015c).

An ICL repayment scheme can be understood as a policy by which loans are repaid proportionate to earned income. It is thus redistributive amongst students ex post, as successful graduates (high incomes) pay more loans than unsuccessful ones (low incomes). It limits, however, the scope of redistribution to graduates (as opposed to general taxes). Australia, the United Kingdom, the United States and New Zealand provide good examples of nationwide ICL systems (Britton et al., 2019), although some authors disagree that the United States has a proper one (Barr et al., 2019).

Four key elements determine the scope of an ICL. The first is the scope and immutability of debt mutualization.<sup>34</sup> The second, and closely related, is the interest rate schedule as a function of income. The third is the period after which the debt is automatically written off.<sup>35</sup> And the fourth is the institutional setup in a broad sense, with perhaps the central question being who the lender is (state versus private).

In Canada, the Repayment Assistance Plan (RAP) and its provincial equivalents comes the closest to an ICL (Lochner and Monge-Naranjo, 2016; Usher, 2014). Based on income thresholds, loan reimbursements can be delayed or reduced for block periods of six months. The scheme is, however, not universal, mandatory, or self-financed (Government of Canada, 2020). In Canada, a complete ICL scheme was studied a few times (Fluet, Marceau and Vaillancourt, 1999; Fisher et al., 2005; Carricato, 2007). An international review of existing programs also exists in Chapman (2006), Chapman and Lounkaew (2010), and Chapman and Mathias (2010).

The chief goal of an ICL is to neutralize ex ante risks tied to Higher Education outcomes (Gary-Bobo and Trannoy, 2015; Lochner and Monge-Naranjo 2015; Stantcheva 2017). If risk averse individuals can know ex ante that eventual debts are repaid proportionate to their labour outcomes, it can increase participation. It is nothing else than an insurance policy on labour outcomes. This is the theoretical driver supporting the policy, as opposed to subsidy reductions and a mechanism for tuition increases. From an empirical perspective, Avery and Turner (2012) also discuss this, in sum:

<sup>&</sup>lt;sup>33</sup> In some papers, there is a perfect equivalence between a graduate tax and an ICL program. A Graduate Tax is such that the government absorbs the cost of liquidities given to students through accrued public debt, which is then repaid through an additional income tax. In most jurisdictions, the most practical outcome of a graduate tax is the abolition (or the reduction) of the tuition tax credit to finance additional subsidies.

<sup>&</sup>lt;sup>34</sup> The pure version of a system will, for instance, forbid high income graduates from buying back their debt. The ability to buy back debts defines implicitly the ease at which higher income graduates can evade the scheme. If so, the base for repayment becomes smaller and, thus, the equilibrium interest rate increases. It implies a higher cost and an ex ante inefficiency for low-income students.

<sup>&</sup>lt;sup>35</sup> Combined with default rates, these first three key elements define the actuarial environment that determines the equilibrium rate schedule, or the residual costs to finance the program (if any).

[f]rom a financial perspective, enrolling in college is equivalent to signing up for a lottery with large expected gains—indeed, the figures presented here suggest that college is, on average, a better investment today than it was a generation ago—but it is also a lottery with significant probabilities of both larger positive, and smaller or even negative, returns.

Gary-Bobo and Trannoy (2015) evaluate the structure of an efficient student loan policy. They characterize the efficient loan scheme as one that equalizes benefits for each individual after they are in school, but before they enter the workforce. The intuitive notion is that the loan scheme provides the same ex ante benefits to students, given that they do not know how they will perform in the labor market. Lochner and Monge-Naranjo (2012, 2016) have also written in great detail on the design of efficient student loan contracts. They analyse how student loan policies should be designed when students differ in wealth and abilities. They use a mechanism design paradigm, where student loans must satisfy participation constraints for both lenders and borrowers. The analysis focuses solely on resolving credit constraints. They show that an efficient loan program design should have components of an ICL.<sup>36</sup>

Several authors have concluded likewise in the context of a joint analysis with a general income tax scheme.<sup>37</sup> Such studies were undertaken by Kapicka (2006); Bohacek and Kapicka (2008); Grochulski and Piskorski (2010); Jacobs and Bovenberg (2011); Turner (2012); Jacobs (2013); Guo and Krause (2013); Krueger and Ludwig (2014); Stantcheva (2017); and Koeniger and Prat (2018). Two key policy lessons stem from this literature. The first, as already stated, is the role of an ICL to neutralize ex ante risk. The second is that when the tax scheme is not determined efficiently, student grants significantly improve outcomes for both efficiency (access, completion) and equity (lowering inequalities).

Three policy lessons should be drawn from these authors. First, an efficient loan policy neutralizes the risk associated with higher education outcomes. Those who benefit from higher education pay for those who attempted to graduate but did not. Second, redistributive concerns are important issues for an efficient student aid policy (although sometimes being embedded in the tax scheme). In most theoretical studies, a form of redistribution within the current population is achieved through the student aid program (long-term redistribution, dealing with higher incomes of successful students, is managed through the tax scheme). In the simplest cases, an ICL redistributes wealth from successful students to unsuccessful ones. In research where the study of student aid is joint with the tax scheme, student aid also becomes a tool to guarantee sufficient income to low-income individuals. Third, higher education achievements – and indirectly, student

<sup>&</sup>lt;sup>36</sup> Its practical application depends on the degree to which moral hazard, market incompleteness and ex post verification of income is severe. When important, a student loan contract departs from an ICL and becomes second best (but remains more efficient than laissez-faire).

<sup>&</sup>lt;sup>37</sup> Optimal taxation studies look at the efficient design of a tax scheme and takes its roots in the now celebrated theory developed by Mirlees (1971). At first focused on income taxation, the theory has now spread to other fields, most notably the design of human capital subsidies. In this environment, student aid policies are seen as a student-specific tax scheme. The policy objective is to redistribute income as much as possible, given that the scheme must still provide incentives to work.

aid schemes – are important for the planning of a tax scheme. Higher Education outcomes determine (partly) work productivity, a chief ingredient for optimal taxes.<sup>38</sup>

## Section conclusion

Summary points (not stated in other sections)

- Additional research should be done:
  - $\circ$  on the interaction between the tax scheme and student aid programs.
  - o on the interaction between unemployment insurance and student aid programs.
  - on theoretical interactions between identified human biases and student aid programs.
  - o on structural studies of student aid policy reforms.
- ESDC could greatly improve its research capacity with regulatory maneuver for pilot projects.

## Who is left behind?

In short, risk averse students, miscalculating students, and perhaps those in the blind spots induced by the joint claw back effect of student aid programs and the income tax schedule can be left behind.

Individuals underweight the future, yield to current temptation, prefer the default option, are deterred by complexity, and make important mistakes on decisions occurring once or twice in one's lifetime. Higher Education decisions imply all of these dimensions, suggesting that behavioral factors can be important for evaluating student aid policies. There is significant evidence that changing the default option for enrollment decisions would increase enrollment participation. For instance, automatic student aid and higher education registration (with no obligation to commit) has been shown to increase participation. This is a promising avenue for program development that could increase enrolment significantly.

There is considerable evidence that simplifying registration processes increases participation and access. A pilot project where high school students would be automatically registered to both their nearest university (or CÉGEP) and the student aid program could dramatically increase participation rates. This would require substantial thinking in terms of operations and admission mechanics, but would be certainly worth trying as an experiment. Evidence shows that such a program could work. On a simpler scale, some analysis to reduce the front-end complexity (forms, renewals, continuity of aid) could improve access. Such a pilot project could require regulatory (or legislative) changes, very much in the spirit of the recent reforms to the Canada Labour Code (Government of Canada, 2018c, art. 263).

<sup>&</sup>lt;sup>38</sup> In the public economics literature, "optimal taxes" are usually understood as being income taxes and all transfers to individuals. Thus, the optimal taxation literature jointly studies income taxes, student aid, social welfare, and employment insurance programs. Transfers to individuals are seen as negative taxes to subgroups of the population. An applicable example can be found in Stantcheva (2017).

A clear signal from the theoretical literature is the added value of an ICL system or its "public" equivalent, a graduate tax. Such a repayment scheme (on top of existing subsidies) could improve enrollment for debt averse students. The impact of introducing this loan repayment policy would be to neutralize the risk of undertaking Higher Education. As such, the participation of risk averse individuals could be improved. If such a program may be evaluated as politically dangerous (Usher, 2014), a second best would be to improve the Repayment Assistance Plan, especially its up-front promotion and the length of forgiveness periods.

## Missing pieces

As stated in this section's introduction, asking who is left behind is an implicit question about the generosity and the design of the program. Accrued subsidies can help reach groups denied access to Higher Education because of a lack of proper subsidies. But even with fixed resources, making the most of existing subsidies to increase access also requires examining how current funds are spent.

As stated in the first section conclusion, the theoretical literature on student aid suggests that more potential students could be helped with a joint design of the tax scheme and the student aid programs. Studies could reveal gaps in terms of incentives for access and completion. A key lesson is that student aid programs should adapt their formulaic calculations to cover blind spots induced by separate designs. This would avoid neglecting subgroups of the population that are not identified by specific characteristics (e.g., age, sex), but rather by the characteristics of the gaps in the student aid and tax scheme landscape. In relationship with the analysis on mature students, similar work on the interaction between unemployment insurance and student aid programs could also reveal gaps.

As an example, there is no structural research comparing the effectiveness of Registered Savings Account (RESPs), student related tax credits, and other types of student aid policies. This matters for the design of student loans (and grants) programs, as their inclusion or not in the definition of student income implicitly acknowledges whether this income has an impact on the claw back rate (Essaji and Neill, 2012), and thus whether aid is targeted appropriately.<sup>39</sup> Some work done in Canada suggest they could be eliminated (SRDC, 2013; ESDC, 2015c). Some additional structural work, in the nature of Hanushek et al. (2014), would be welcome for providing definitive conclusions as whether or not they should be included in the calculation of expected student income definition.

<sup>&</sup>lt;sup>39</sup> To our knowledge, only Morris did a complete analysis on these subsidies, in an unpublished paper (Morris, 2003), concluding that RESPs are ineffective, then concluded the opposite in a book chapter (Morris, 2010). The results in Koeniger and Prat (2018) are perhap the closest (published) work addressing such analysis. Some empirical work has also been done in Canada (Milligan, 2002, 2004) and in the United States (Dynarski, 2004, Government Accountability Office, 2005). Both suggest that RESPs are poor mechanisms to favour access to lower income students, although Milligan's conclusion is to recommend a subsidy equivalent to the Canada Learning Bond (CLB).

Second, little theoretical work has been done at the intersection of student aid programs and behavioural economics. It could be useful to investigate further the impact of behavioural mistakes on the design of policies, as in the optimal taxation literature (e.g., Bouchard St-Amant and Perrault, 2019). Some contradicting results may arise. For instance, underweighting the future may mean that potential students may improperly account for future income, but it may also mean that they will improperly account for future debts. As loans are much less costly than grants, one could make the case that loans could be more efficient in promoting access. Ghandi (2007) makes such an argument (although contradictory with empirical evidence). He assumes that the deferred costs of loans are underweighted by students, meaning that a total amount of appropriations can reach more individuals with loans while having less impact than predicted by debt aversion theory. Ghandi, however, has nothing more than intuition to support the direction of the assumed effect.

Third, there is some need for structural analysis that is closer to existing policies. Midway through theory and empirical studies, structural analysis estimates empirically the joint response of students and policies when some policy parameters are changed. Those analyses can be helpful in two ways. First, estimation of current models can be used to perform counterfactual experiments of existing policy reforms and identify efficiency and equity improving approaches. Examples of this type are in Bouchard St-Amant and Morin (2020), and a broader discussion on their usefulness for policy evaluation can be found in Chetty (2009). Second, a complete characterization of student aid programs in a federal system remains to be analyzed. In the spirit of fiscal federalism literature (Boadway and Shah, 2009) or the tuition analysis of Kemnitz (2004), how can a central government design a student aid policy when provinces can adapt theirs to extract more subsidies? These questions remain to be answered.

Finally, the state of the empirical research performed by ESDC could be greatly improved if they had the regulatory maneuver to perform experiments through pilot projects. As it is explained in the first section of this review, researchers need some experimental design to infer cause to effect relationships that goes beyond statistical tools (such as regression). Such regulatory maneuver exists in other legislations managed in other branches of ESDC (Government of Canada, 2018c, art. 263). This could help researchers within the branch to develop a better portrait of what works and what does not. Some experiments can be focused on aspects of the program that do not yet exists, but could also be used to test existing approaches. Two popular approaches are useful when thinking of pilot projects. One approach simply phases in a new program at different times in two different jurisdiction (say a year). This difference can be used to perform a difference in difference methodology with the all the operational data of the department. Another one simply award more funds to students randomly chosen in a sub-population of the program (say one or two selected universities that would participate in the project). This also helps identify the impact of funds on outcomes such as persistence and enrollment.

# Where to look?

Summary points:

- Relevant empirical reviews: Lavechavia et al. (2019), Herbaut and Geven (2019), and Havranek et al. (2018).
- Relevant theoretical paper: Koeniger and Prat (2018).
- The most relevant journal to follow is the Economics of Education Review.
- Every five year, the new edition of the Handbook of Economics of Education should be bought.

Before concluding this review, we perform a constrained selection exercise: if a new employee (or PhD student) interested in the literature on student aid had to read four articles, which ones should be picked? Three of them are literature reviews: Lavechavia et al. (2019), Herbaut and Geven (2019), and Havranek et al. (2018). In the latter review, one should pay close attention to the distinction between studies with an identification strategy and studies that do not. On the theory side, Koeniger and Prat (2018) contains the most complete environment characterizing the efficient design of a student aid program. It may be difficult to read without a proper background in mathematics, however.

If the same person had to choose at most one journal to subscribe to in order to follow recent empirical trends on the impact of student aid, which one should be picked? The safest bet would be the *Economics of Education Review*, which focuses on empirical studies with clear identification strategies. Every five years, there is also a new version of the *Handbooks on Economics of Education*. These handbooks would also be worth buying each time they are published.<sup>40</sup>

All in all, these articles and journals provide the most substance for the purpose of evaluation.

<sup>&</sup>lt;sup>40</sup> On the theory side, the *Journal of Public Economic Theory* publishes some education related articles, although infrequently.

# Conclusion

Summary points:

- Grants increase enrollment and graduation rates, although with substitution effects.
- There are promising avenues to increase enrollment in automatic registration policies.
- The questions in this statement of work are too limited in scope. Cruelly missing are questions about program design.
- Higher Education is costly, but ignorance is costlier. We hope this review helped decide who should pay.

Many of the conclusions that can be drawn from the literature have already been stated in the conclusion of each section. For the sake of completion, we repeat the three most important findings of the literature. First, there is clear evidence that increasing grants increases enrollment, although such increase is small. A good rule of thumb is a 3.5 to 5 percent increase in enrollment for a uniform increase of \$1,000 in aid. Second, there is evidence that grants influence graduation, although most programs studied in this context relate to merit-based aid. Third, there seem to be promising new directions in terms of ways to increase enrollment. Policies providing easy enrollment and registration for high school students could have more impact than giving more grants through the current scheme.

We also outline that if the questions of access and graduation are quite important for policy evaluation, they are also limited in scope. Broader questions, such as the efficient design of a student aid scheme, or measures aimed at improving access through the tax scheme, are equally important. For instance, should it be more targeted or more uniform? Those are typical questions that can be best addressed through theory, or structural estimations. Moreover, neglecting their analysis for improvement may also leave potential students behind.

One thing that was understood since the creation of European universities and has endured up to now is the notion that was elegantly quipped by Voltaire in the 16th century: education may not be cheap, but the costlier alternative is ignorance. The sole forgotten aspect of his famous phrase is an answer as to who should pay. Four centuries later, a proper answer still needs to be figured out. Hopefully, this review provides a partial one.

# Appendix

## Basic economic theory applied to student aid

Economists separate the world into two categories of agents: producers and consumers. Each group, when analyzed as a whole, forms what is known as "supply and demand". In relation with prices, the supply side will tend to produce more goods as prices increases, *all other things being equal*. Conversely, the demand side will buy fewer goods if the price increases, *all other things being equal*. The interaction of supply and demand, if left on its own, then leads to a price equilibrium where supply equals demand, generating a pair of observed quantities and a price.

In Canada, the Higher Education markets are heavily regulated and subsidized: provinces legislate which institutions can grant degrees (Bouchard St-Amant et al., 2020), subsidize the supply through transfers, subsidize the demand through transfers as well, and regulate tuition to some extent. The usual economic framework thus requires several adaptations for a complete practical analysis. Nonetheless, it can help in understanding basic predictions about student aid policies.

Higher Education generates four key "products" and services: graduates, research, certification and public services (Bouchard St-Amant, 2013). Most of the literature related to student aid focuses on the first product, where quantities are either enrollment or graduates and prices are either tuition or the cost of attendance. Thus, the *demand* comprises potential students and *supply* comprises higher education institutions. However, it should be kept in mind that institutions are also highly active in the production of the three other products. Student aid policies can thus have impacts outside the production of graduates.

Student financial aid is, at its core, a subsidy given to the demand side. The subsidy's effect is to lower the price paid by students, thereby leading to a new equilibrium. It is such that the price net of subsidy is lower than the original equilibrium price and the price with the added subsidy is higher. All other things being equal, enrollment and graduation are predicted to increase.

## Efficiency, equity and magnitude

Efficiency is a state of an economy where there can be no improvement in someone's welfare without sacrificing the welfare of someone else. Efficiency improvements are thus a search for "value creation" where each person is at least as good as before. To complicate matters, value creation may imply a displacement of resources, so a different state of the economy that is more efficient may imply less resources of some good (e.g., taxable income).

Are subsidies to Higher Education efficient? Some certainly are, such as subsidies to research, a product usually seen as a public good (Stiglitz, 1999), which would not be produced in sufficient quantities without subsidies. Four economic concepts also support subsidies to student demand. The first is what is called *market incompleteness*. In most countries, as in Canada, servitude is constitutionally illegal. As such, lenders cannot ask for a collateral in exchange for student loans.

If student ability to succeed cannot be observed, lenders may decide not to lend enough loans. leading to inefficient levels of enrollment. Thus, student loans should be guaranteed by the government to avoid such inefficiency. Friedman (1955) himself made that argument. The second concept relates to credit constraints, as developed by Becker (1962), which include all cases under which individuals could be denied loans for the pursuit of studies. The third is related to external effects, which are valuable by-products of decisions to pursue higher education, but are not accounted for at the moment of deciding to pursue higher education (Hindricks and Myles, 2013). For instance, individuals with more education are more likely to vote (Tenn, 2007), which is hardly a general factor in why one decides to pursue higher education. Another type of external effect is if the likely student does not weight properly the cost and the benefits of higher education (Chetty, 2015). In such cases, the behaviour of the individual is what generates the external effect. The fourth one may be called (for lack of a better name) a *government induced* external effect. For instance, higher education is associated with higher income, which generates higher tax revenues, often called a "fiscal externality" in the literature (e.g., Lawson, 2017). The key difference between both types of external effects is that in a counterfactual world without government, the second type would not exist. If one seeks to analyze the soundness of public intervention, the distinction matters, as relying on (perhaps) an inefficient intervention to justify another one would logically collapse its raison d'être.

## Efficiency

Efficiency grounds for subsidies are generally rooted in a disconnection between the social value of graduates and the number of graduates produced by a decentralized market. When the social value is higher than the market value, the subsidy corrects the market outcome so as to reach an efficient level of graduates.

## Equity

Do student aid programs reduce inequalities? It depends very much on how long you measure inequalities. If one uses a snapshot of the current population as the basis of measure, then student aid programs such as the CSLP and the CSG are reducing inequalities: they are mainly targeted at low-income students.

However, such a snapshot of the population neglects the temporal effects of Higher Education: most graduates earn more later in life, thereby increasing the portion of the population with a high income. The impact on inequalities then depends on whether Higher Education has more impact in lifting low-income individuals than at lifting the wage of high-income individuals (see Di Fraja and lossa, 2002; Bouchard St-Amant, Garon and Marceau, 2020; and Devillier and Gert, 2007 for further explanations). If this is the case, long-term inequalities are reduced. If not, they can increase.

The two previous paragraphs suggest that a joint analysis of inequalities (across time and individuals) should be preferable to a single dimension analysis. It is, however, more easily said than done. Some theories perform just that (Hanushek et al., 2014; Krueger and Ludwig, 2013) and are described in the appropriate section.

## Magnitude

Do subsidies to Higher Education change outcomes? If one acknowledges efficiency or equity grounds (i.e., some basis for public intervention), a key factor of analysis is the magnitude of the change they induce in outcomes. If the supply and demand curves are steep, then the same subsidy would barely change enrollment or graduation decisions. Conversely, if the supply and demand curves are flat, the same small subsidy could have an important impact on production.

A small market response to subsidies does not imply an inefficient use of the subsidy. At best, it could be argued that other policy tools available could be better to improve the targeted outcome. Provided with solid efficiency grounds (if the social value is greater than the private value) and a lack of other tools, a small response would only imply that the magnitude of the subsidy should be increased.

## Policy conceptual landscape

There is some variety in the policy tools through which the government can subsidize demand in Higher Education. Some exist in Canada while others do not. We provide below a brief conceptual overview of these policy tools. These concepts may help in understanding various articles and analysis.

## Need-based aid programs

Probably the most well-known types of program to subsidize demand are those for need-based aid. They reduce the cost of Higher Education to lower-income students by providing grants and loans. In Canada and in the United States, most need-based programs are constructed on a common core architecture, which is the difference between needs and resources:

[Aid awarded] = [estimated needs] - [estimated resources].

In the United States, the Federal Stafford Loan Program, the Pell Grant program and some state programs are based on this architecture (Castleman et al., 2018; Cohodes and Goodman, 2014). In Canada, most provincial programs, the CSLP and the CSG programs are also based on this architecture (Finnie et al., 2004; Frenette and Reuben, 2012; McLaren, 2014; Bouchard St-Amant et al., 2020).

Four key questions help refine the structure of need-based aid. First, what is the income threshold to be qualified as low income? Second, what is the definition of the student household? This question is closely related to the definition of income that should be used for the assessment of the low income status. Third, how are estimated resources assessed? Most definitions use a step function progressive with income and decreasing with the household size. Fourth, how are needs estimated? The answers to these questions differentiate several existing programs.

## Merit aid

Merit aid is grants provided to students who perform well relative to a given competition result. Most often, the result is the academic average. But as is the case in graduate studies, competitions can be applications for research grants (such as NSERC or SSHRC grants). Their design can be understood as an auction (see Bergin, 2005). Students submit "bids" that are indicative of their ability. The highest bids then win the competition, up to a cutoff point implicitly defined by available funds.

## **Tuition policies**

Tuition policies reflect the degree of autonomy that universities face in charging prices to students. Tuition fee policies generally have three characteristics. First, the degree of control (or autonomy) that a university has in increasing existing tuition levels. Second, the degree of uniformity imposed on fees across programs. Third, the degree to which universities can charge additional ancillary and mandatory fees besides tuition. For instance, the province of Québec has relatively low tuition and uniform fees across (subsidized) programs, while Ontario has higher and heterogenous tuition.

## RESPs and associated subsidies

Registered Education Savings Plans (RESPs) are registered savings accounts dedicated to financing Higher Education. Interests accrued are tax free and are most often not counted as student income in student aid programs. They thereby leave grant awards unaffected for students with higher income backgrounds (Essaji and Neill, 2012). The Government of Canada (and some provinces such as Québec) provide additional subsidies for initial savings deposited in RESPs (Government of Canada, 2018a). For instance, the Canada Education Savings Grant (CESG) is a subsidy designed to match private deposits in an RESP up to a yearly limit. As a complement, the Canada Learning Bond (CLB) provides initial subsidies up to \$2,000 without matching contributions. Depositors must qualify as low income to benefit from the CLB.

## Tax credits and fiscal expenditures

Tax credits and other fiscal expenditures are tax reductions. Some of them, like the tuition tax credit or the credit on interest paid on student loans, are aimed at reducing the tax burden of those attending, those who have attended, or relatives of those who attend Higher Education. Other fiscal expenditures may take the form of excluded sources of revenues in the tax base (e.g., RESPs). In 2020, more than \$4.6 billion is estimated to be spent by the Federal Government on education related fiscal expenditures (Department of Finances, 2018).

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