The Long-Term Effects of Career Guidance in High School: Evidence from a Randomized Experiment

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Abstract

This paper studies the effects of a randomized control trail in which Canadian high school students were randomly invited to participate in an extensive career guidance program. By matching the experimental data with administrative records, I am able to examine the effects of the intervention on college enrollment, graduation, and income up to age 29. I find that the intervention significantly increased treated students' four-year college enrollment and graduation rates, as well as their average labor income in adulthood. In contrast, a student financial aid intervention, also tested within the experiment, had limited effects on students' long-term outcomes.

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1 Introduction

Traditional models of human capital investment predict that students will enroll in college if the expected benefits from enrolling outweigh the costs of doing so (Becker (1964)). However, evidence from behavioral economics tells us that students are not always able to make optimal college enrollment decisions, given the large number of options, the complexity of the application process, and the immaturity of the decision-makers (Lavecchia, Liu, and Oreopoulos (2016)). In particular, these informational and behavioral frictions have been advanced as a potential explanation for the low college enrollment rate of disadvantaged students (French and Oreopoulos (2017); Dynarski et al. (2023)).

Economists have thus recently asked whether interventions providing guidance to high school students on college decisions and application steps can improve their outcomes. These programs have, in most cases, been found to increase the college enrollment rates of disadvantaged students (Dynarski et al. (2023)). However, while these programs may appear to be effective in the short run, it is unclear how the short-run effects will translate in the long run. The long-run effects of these programs ultimately depend on the returns to college attendance of the marginal students, and returns to college attendance have been shown to vary greatly in the population (Carneiro, Heckman, and Vytlacil (2011); Oreopoulos and Petronijevic (2013); Barrow and Malamud 2015).

In this paper, I study the effects of a hands-on career guidance program in high school on students' long-term outcomes. The program was tested within the *Future to Discover Project*, a randomized control trial conducted between 2004 and 2008 on two cohorts of high school students in New Brunswick (Canada) by the Social Research and Demonstration Corporation (SRDC).[1] It consisted of twenty workshops, conducted from Grades 10 to 12, designed to help students develop post-high-school plans and strategies to achieve their goals.

I match the experimental data gathered by the SRDC to post-secondary institution records and income tax files, allowing me to study the effects of the interventions using a longer time period than previously available.[2] Specifically, I am able to study the effects of the intervention on students' college enrollment, graduation, and earnings, from the end of high school through age 29.

In addition, I am able to directly compare the effects of the career guidance intervention with the effects of financial aid, which has traditionally been used to boost the college

1. The experiment was conducted in collaboration with Statistics Canada and received financial support from the Canada Millennium Foundation.

2. See, Hui and Ford (2018) and Ford, Hui, and Kwakye (2019) for recent reports on the experiment.

enrollment rate of disadvantaged students (Dynarski, Page, and Scott-Clayton (2022)). In fact, a financial aid intervention, providing students who enrolled in college with $9,600 of grant aid over two years (2020 Canadian dollars), was also tested within the randomized control trial.

What are the potential effects of the career guidance program? In theory, the program can improve students' decision-making regarding post-secondary education by tackling several informational and behavioral frictions students may face (Lavecchia, Liu, and Oreopoulos (2016), French and Oreopoulos (2017)). First, by helping students look for information on the costs and benefits of each post-secondary option, the program is expected to reduce misinformation. Second, by pushing students (and parents) to think about their options and to understand the long-lasting effects of their choices, it can minimize students' lack of attention, present bias, and over-reliance on default options. An improvement in decision-making should lead to better outcomes in the long run, although the effect on college enrollment may vary depending on the direction of the initial mistakes made by students (i.e., underestimation or overestimation of the returns). The program may also have unintended consequences if the information provided is not tailored to individual cases. For example, it could induce students with a high risk of dropping out to enroll in college. Ultimately, assessing the direction and magnitude of the effects of the program is an empirical question that requires looking at outcomes beyond college enrollment.

I find that the career guidance intervention increased the share of students who enrolled in four-year college. Those effects are purely driven by low-income students who were 10 percentage points more likely to enroll because of the intervention, which corresponds to a 50 percent increase over baseline. I also find that the intervention *decreased* the enrollment rate of high-income students by 3 percentage points, although the estimate is insignificant. Those two opposite effects imply a sharp diminution in the income gradient in four-year college enrollment: I estimate that the intervention led to 83 percent reduction in the four-year college enrollment gap between equally-achieving high- and low-income students, from 15 percentage points to 2 percentage points.

What happens to these students in the long run? Firstly, I find that the intervention significantly increased the share of low-income students who earned a four-year college degree, but also the share of college dropouts. It suggests that some of the students who were induced to enroll in a four-year college by the intervention were successful in graduating, but some were not. Secondly, I find that the small decrease in the high-income students' four-year college enrollment rate did not translate into a decline in graduation: instead, I observe that the intervention significantly decreased the fraction of high-income students who enrolled

and dropped out from college by 3 percentage points. It suggests that the program induced some high-income students with a high risk of dropping out not to enroll. Finally, turning to earnings data, I find that the career guidance intervention increased individuals' labor income significantly and meaningfully: I estimate that, between ages 27 and 29, students assigned to the career guidance intervention earned, on average, 7 percent more in labor income because of the intervention – with a 90 percent confidence interval ranging from 2 to 12 percent.

In comparison, I find that the student grant increased low-income students four-year and community college enrollment rates. However, these increases only translated into an increase in community college graduation. In addition, point estimates indicate no effect of the grant on earnings in adulthood, although confidence intervals are quite large.

My study adds to a growing body of studies that investigate the effects of interventions targeting informational and behavioral frictions in educational decisions (see the excellent reviews by French and Oreopoulos (2017), Damgaard and Nielsen (2018), and Dynarski et al. (2023)). More specifically, it adds to our understanding of the effects of career guidance programs in high school. Previous research has shown the effectiveness of these programs in increasing the college enrollment rate of disadvantaged students (e.g., Avery (2013); Bettinger et al. (2012); Stephan and Rosenbaum (2013); Carrell and Sacerdote (2017); Castleman and Goodman (2018); Cunha, Miller, and Weisburst (2018); Bettinger and Evans (2019); Oreopoulos and Ford (2019); Joshi and Barnes (2021)). My study is, however, the first to look at the effects of such a program on college completion and income. I show that guidance programs can, not only boost college attendance of disadvantaged students, but also have meaningful benefits in the long run. Moreover, I find suggestive evidence that these programs can also benefit some students through a reduction in educational attainment.

This paper also adds to the literature on the long-term effects of student grant aid. Systematic reviews of existing causal evidence from the U.S. find that student grant aid increases college enrollment by 3 to 4 percentage points and completion by 1.5 to 2 percentage points per $1,000 of grant aid eligibility, which is consistent with the effects found in this paper (Dynarski (2003); Deming and Dynarski (2010); Nguyen, Kramer, and Evans (2019)). Only a handful number of studies have looked at the effects of grant aid on earnings (Bettinger et al. (2019); Denning, Marx, and Turner (2019); Eng and Matsudaira (2021); Gurantz (2022)). No consensus emerges from these studies: estimates range from no effect of grant aid on earnings to an increase in annual earnings of 6 percent for marginally eligible students. My findings, which indicate that student grant aid can increase college enrollment but have no subsequent effects on earnings, are consistent with the results in Eng and Matsudaira

(2021) and Gurantz (2022).

More generally, my findings have implications for how individuals make decisions. The positive effects of the career guidance program on students' long-term outcomes suggest the existence of informational and behavioral frictions that prevent students from making optimal decisions regarding post-secondary education. My findings also reveal that these behavioral biases are strongly correlated with socio-economic status and can shape socio-economic inequalities. It adds to a growing body of studies that highlights the importance of behavioral biases in domains such as education, health, and poverty (see the review by Diamond and Vartiainen (2012)). In contrast, the findings from the financial aid program suggest the absence of binding financial constraints in the context studied (see for a review Lochner and Monge-Naranjo (2012)).

2 The Future to Discover Experiment

2.1 Context

The Future to Discover experiment was conducted in the province of New Brunswick, Canada. High school in New Brunswick, like in the U.S., runs from Grades 9 to 12, after which students can decide whether to enroll in post-secondary education or not. Students are typically 14 years old at the beginning of high school and graduate at age 18. Three main options are available to students who want to enroll in post-secondary education in Canada: (1) four-year colleges (also called universities) offering programs that lead to a bachelor's degree; (2) community colleges (also called colleges of applied arts and technology or institutes of technology or science) which typically grant diplomas for technical studies of two years; and (3) private career colleges that offer career-oriented programs of one year or less.

Tuition fees in New Brunswick for one year of undergraduate schooling at a four-year college were roughly equal to $6,600 at the time when most students from the sample enrolled in post-secondary education (2020 Canadian dollars).[3] This is higher than in Western European countries but lower than in the U.S. (OECD (2020)). Although tuition fees are smaller in Canada compared to the U.S., financial aid policies are also less generous. In fact, comparing tuition fees net of grant aid, real costs of college attendance are lower in the U.S. than in Canada for lower-income students (Belley, Frenette, and Lochner (2014)).

3. Tuition fees from the four main four-year colleges were retrieved from Statistics Canada: *Table 37-10-0045-01 Canadian and international tuition fees by level of study.*

In Canada, 33 percent of adults have a four-year college degree, which is comparable to other developed countries (Statistics Canada (2020)). However, unlike other countries, Canada is characterized by a very high enrollment rate in community and private career colleges: 26 percent of Canadian adults have a short-cycle tertiary diploma compared to 7 percent of adults in other OECD countries (Statistics Canada (2020)).

The population in New Brunswick is slightly less educated than the rest of the Canadian population: 24 percent of adults in New Brunswick have a four-year college degree (Statistics Canada (2020)). The lower level of education is also reflected in lower income levels in New Brunswick compared to the rest of Canada.[4]

2.2 The Interventions

With the objective of finding out what works best to increase college enrollment, three interventions targeting high school students were tested within the *Future to Discover Project* experiment: a career guidance intervention, a financial aid intervention, and a mixed intervention combining the career guidance and the financial aid interventions.

Career Guidance Intervention

Students assigned to the career guidance intervention were invited to participate in twenty workshops given over three years and designed to help students develop post-high-school plans and strategies to achieve their goals. Specifically, the workshops were split into the following four series:

1. *Career Focusing*: The first workshop series was conducted in Grade 10. It included six workshops that were designed to guide students in the exploration of career options. Besides being taught how to research information on post-secondary education and labor market trends, students were encouraged to explore their post-secondary options through different activities and exercises.

2. *Lasting Gifts*: The second workshop series, which took place in Grade 11, was tailored toward the parents. The four workshops of the series aimed to encourage and assist parents in getting involved in their children's career guidance. Together with their children, parents were exposed to various career-guidance approaches and were instructed to test these approaches through interactive activities and reflective exercises.

3. *Future in Focus*: The third workshop series was designed to help Grade 12 students

4. Statistics were retrieved from Statistics Canada: *Table 11-10-0190-01 Market income, government transfers, total income, income tax and after-tax income by economic family type.*

build resilience to overcome unexpected life challenges. The workshops focused on the specific skills and attitudes needed to work through obstacles and on the importance of developing a support network.

4. *Post-secondary Ambassadors*: Six meetings with post-secondary education students from various institutions were organized over Grades 10 to 12. The invited students were asked to share their experiences and advice, providing high school students with peer mentors and role models.

The workshops took place on each school property and were scheduled right after school hours.[5] From the randomization, 30 to 35 students were typically invited to the workshops in each school, allowing the meetings to be held in a classroom and facilitating interactions. Importantly, the workshops were optional. Students were actively reminded about the date and location of the workshops through text messages, mails, and announcements in each school. They were also encouraged to attend through prizes and snacks.

In addition to the workshops, students were given access to post-secondary and career information via a website and a bi-annual magazine. The two media shared the same content: a description of post-secondary options, a guide to the financial aid system, labor market trends, and links to other career guidance resources. The same content was offered across the two media in order to reach more students and parents with different habits and access to the internet.

Nearly all students assigned to the intervention were exposed to the program if we consider all forms of exposure: 85 percent attended at least one workshop, 73 percent read parts of the magazine, and 22 percent visited the website.

Financial Aid Intervention

Students assigned to the financial aid intervention were eligible for a student grant worth up to $9,600 (2020 Canadian dollars) upon college enrollment. Specifically, they could claim $2,400 each academic term that they enrolled in a post-secondary institution, for a maximum of four terms.[6] They were informed about their eligibility to the grant at the time of recruitment in Grade 9 and reminded about it at the end of Grade 12 and one year after high school.

5. The second workshop series took place in the evening to facilitate the participation of the parents

6. To receive the grant, students had to register in a post-secondary program recognized by the Canada Student Loans Program. It includes most four-year and vocational programs as long as they lead to a certificate, diploma, or degree. Students were eligible to receive the payments for three years after high school graduation.

The grant was substantial compared to tuition fees at the time of the experiment. According to my calculations, the grant was equivalent to a decrease in the total student cost of living by 25–35% for two years.

Mixed Intervention

Some students were assigned to a mixed intervention, in which case they were both invited to participate in the career guidance program and made eligible for the $9,600 student grant.

2.3 Experimental Design

Figure 1 provides an overview of the experimental design.

The Future to Discover project was implemented in 30 high schools in New Brunswick. The schools were selected to participate in the experiment based on a priority index computed from the size of the school, the number of low-income families in the school, and the number of other schools in the district.

Invitations to participate in the experiment were sent to a random sample of Grade 9 students within these schools in both springs 2004 and 2005. Upon invitation, students along with their parents, were required to give their written consent and answer a baseline survey in order to take part in the experiment. These requirements were fulfilled by about 78 percent of the students invited to participate. Students were then classified as either high- or low-income. The classification was done according to the family income, which was collected during the interview, and an income threshold equal to the provincial median.[7]

The randomization was conducted at the student level within each school. Low-income students were randomly assigned to a control group and three treatment arms (career guidance, financial aid, career guidance + financial aid). High-income students were not eligible for financial aid and were accordingly only randomized between the career guidance and control groups. Due to budgetary concerns, the assignment ratios were adjusted for the second cohort of students, and this differently across schools. I take into account these unequal assignment ratios across schools and income status in the estimation strategy described below.

7. Parents were asked to show the household annual income stated in their income tax return during the baseline interview limiting reporting errors. The income threshold varied with family size. Six thresholds were defined, ranging from $40,000 for a single-parent family with one child to $60,000 for a family with two parents and three children or more.

3 Empirical Framework

3.1 Data

I use data from three main sources. First, I use data collected by the SRDC on students' baseline characteristics (demographics, family composition, socioeconomic status, and aspirations), test scores in high school, participation in the workshops, and claims for the financial aid.

Second, I match the experimental data obtained from the SRDC to the Canadian Post-Secondary Information System, which provides yearly information on enrollment and graduation from the universe of public post-secondary institutions in Canada. At the time this paper is written, the last available year of data from the Post-Secondary Information System is the 2018–19 academic year, which means that I observe enrollment and graduation until 10 years after high school graduation for both cohorts of students. Note that I do not observe, from the Post-Secondary Information System, enrollment and graduation from private institutions. This is likely a small limitation since most four-year and community colleges are public in Canada (Jones and Li (2015)). I mostly lack information on enrollment and graduation from private career colleges, which offer short and career-oriented programs of one year or less. I identify enrollment in these private career colleges, using the survey conducted two and a half years after high school graduation. The survey is, however, conducted too soon to provide a reliable view of graduation.

Finally, I match the experimental data with earnings data from the Statistics Canada confidential tax filer database that provides annual information on earnings (labor income, capital gains, social benefits,...) from the universe of tax filers. When earnings information is missing for a given individual in a given year – 5–8% of records every year – I impute the value of zero.[8] At the same this paper is written, the data allow me to study the effect of the interventions on annual earnings until 29 years old.

3.2 Estimation

First, I estimate the effects of being invited to the career guidance program relatively to the control group on the pooled sample of high- and low-income students. For this purpose, I restrict the sample to students who were either assigned to the career guidance only intervention or to the control group, and I estimate the following model by Ordinary Least

8. The tax filing rate is very high in Canada since individuals need to file a tax return, not only when they owe taxes, but also to qualify for refunds and credits.

Squares:

$$Y_i = \beta_0 + \beta_1 T_i^G + \boldsymbol{\beta_2 S_i} + \epsilon_i^1 \tag{1}$$

where Y_i is the outcome of interest for student i and T^G is a binary indicator equal to one if student i was assigned to the career guidance only group. To take into account the stratified design of the experiment in the variance calculations, I include a full vector of school-cohort-income dummies, $\boldsymbol{S_i}$. Observations are reweighted in order to equalize the assignment ratios across cohorts and income groups. β_1 captures the causal effects of being invited to the career guidance program relatively to the control group, i.e., the intent-to-treat effect of the intervention. I also estimate the equation separately for low-income and high-income students.

Second, I estimate the effects of being eligible for the student grant on low-income students. I restrict the sample to low-income students who were either assigned to the financial aid only intervention or to the control group, and I estimate the following model by Ordinary Least Squares:

$$Y_i = \gamma_0 + \gamma_1 T_i^F + \boldsymbol{\gamma_2 S_i} + \epsilon_i^2 \tag{2}$$

where T^F is a binary indicator equal to one if student i was assigned to the financial aid only group. Similarly to equation 1, I include a full vector of school-cohort-income dummies, $\boldsymbol{S_i}$ and I reweight the observations in order to equalize the assignment ratios. γ_1 captures the causal effects of being eligible for the student grant on low-income students, compared to no intervention.

Finally, I estimate the effects of being invited to the career guidance program and being eligible for the student grant (mixed intervention) on low-income students. I restrict the sample to low-income students who were either assigned to the mixed intervention or to the control group, and I estimate the following model by Ordinary Least Squares:

$$Y_i = \delta_0 + \delta_1 T_i^M + \boldsymbol{\delta_2 S_i} + \epsilon_i^3 \tag{3}$$

where T^M is a binary indicator equal to one if student i was assigned to the mixed intervention group. δ_1 captures the causal effects of being both invited to the career guidance program and eligible for the student grant on low-income students, compared to no intervention.

I report in all tables Huber-White robust standard errors and standard sampling-based significance levels.

3.3 Identification

Because students were randomly assigned to the interventions, the estimation of equations 1, 2, 3, by Ordinary Least Squares provides unbiased estimates of the parameters of interest under (1) successful randomization, (2) the absence of selective attrition, and (3) the absence of spillovers.

Successful randomization Appendix tables A1, A2, andA3 report differences in baseline characteristics between the control group and the treatment groups. Given the randomization we would expect to see only minor differences across groups. The tables show a balance on almost all baseline characteristics: overall, I find 5 significant differences out of 90 tests, a number that could have been obtained by chance alone. I also test for whether the baseline characteristics jointly predict treatment status, and find no evidence that it is the case. Finally, I explore, in Appendix Table A4, the sensitivity of the results to the inclusion of covariates in equations 1, 2, and, 3. The main results are robust to including these controls.

Selective attrition Since I rely on the administrative data described above, I do not have sample attrition for the main outcomes of interest. I however restrict my sample when looking at specific secondary outcomes for which data is not available for all students (aspire to pursue a four-year college degree, enrollment in private institutions). I test and discuss potential threats to causal identification arising from selective attrition when presenting the results on these outcomes. Moreover, to enable the comparison of the treatment effects measured on the restricted samples with the ones measured from the full sample, I adjust the treatment effects on these outcomes using inverse probability weighting (IPW) (Seaman and White (2013)).[9]

Spillovers Since the intervention is randomized at the individual level in each school, I cannot rule out treatment spillovers. Treatment spillovers might have occurred in two ways. First, students from the career guidance group might have shared information from the workshops, website, and magazine with the control group students. Second, by changing the students' enrollment behavior, the program might have influenced students in the control group through peer effects. I cannot estimate the magnitude of the spillovers. However, I hypothesize that the treatment spillovers would impact students in the same direction as the

9. This method puts more weight on observations that have, according to observed baseline characteristics, a high probability to be missing for the outcome of interest but are not. In practice, I construct the weights from Probit regressions of the missingness indicators on treatment dummies, baseline characteristics, and cohort and school dummies.

direct effects. Under this assumption, the effects I estimate are ultimately lower bounds for the true effects.

4 Results: Career guidance

College Enrollment

I start by exploring the treatment effects of the career guidance program on college enrollment. The effects are reported in Table 1.

I find that the intervention increased the fraction of students who enrolled in four-year colleges by 4.1 percentage points. The increase in driven by low-income students who were 10 percentage points more likely to enroll in a four-year college because of the interventions, which corresponds to a 50 percent increase from the control mean and is significant at the 1 percent level. In contrast, I find that the intervention decreased the fraction of high-income students who first enrolled in a four-year college by 3 percentage points, an effect that is not significant (p-value= 0.25), but meaningful in magnitude.

I also explore whether enrollment in community colleges and major choice were affected by the program but find no significant effects on these dimensions of enrollment. Similarly, I find no effect on private career college enrollment (Appendix Table A5[10]).

Are these effects driven by a change in the probability to apply to a four-year college or by a change in the probability to be selected into a four-year college? To answer this question, I estimate the impact of the career guidance program on the fraction of students who aspire to pursue a four-year college degree when asked during the survey conducted at the beginning of Grade 12. Results are presented in Appendix Table A5. I find effects that are very similar to the ones in Table 1, which suggests that the observed changes in four-year college enrollment are mostly driven by changes in "aspirations" and application decisions.[11]

To understand the contrasted effects observed between individuals from low- and high-income families, I further explore the relationship between four-year college enrollment and academic preparation for the two types of students in both the control and treatment groups. I use test scores prior to treatment as a proxy for academic preparatiom, and re-estimate equation 1 allowing for the treatment effect to vary by parental income and test scores in a

10. There is a significantly lower fraction of high-income students in the career guidance group who answered the survey in Grade 12 compared to the control group. This means that the effects derived from the survey for these students need to be interpreted cautiously. No selective attrition is, however, to be noted for the low-income students.

11. The same cautionary remark made for private career college enrollment applies.

quadratic form.[12] Figure 2 presents the results (see Appendix Table A6 for the underlying estimated regression).

We see from this Figure that low-income students are less likely than similarly achieving high-income students to enroll in four-year college, and that this is true at all levels of academic preparation.[13] By substantially boosting the enrollment rate of low-income students and by slightly decreasing the enrollment rate of high-income students the intervention led to a substantial decrease in the gap in four-year college enrollment between the two types of students. Specifically, I estimate that the gap between similarly-achieving students decreased by 83% as a result of the intervention (95% confidence interval = [52%,115%]). Another interesting pattern emerges from the Figure: it shows that the increase in enrollment was stronger for higher-achieving low-income students, and inversely, that the decrease in enrollment was stronger for lower-achieving high-income students (p-value for the test of homogeneous treatment effects across test scores is 0.02). Together these findings indicates that the intervention, first, reinforced the importance of test scores and, second, reduced the influence of socio-economic background in students' college enrollment decisions.

College Completion

I then explore in Table 2 the effects of the intervention on college completion.

First, I find that the intervention increased the share of low-income students who graduated from a four-year college degree by 4.7 percentage points and the share of low-income students dropping out from college by 4.5 percentage points. Assuming these increases are solely driven by the students who were induced to enroll in a four-year college by the program, it implies that some, but not all, of these marginal students were successful in completing their degree.

Second, the small (insignificant) decline in four-year college enrollment observed for students from high-income families did not convert into a decline in graduation. Rather, the fraction of students who dropped-out from college significantly decreased because of the intervention. It suggests that the program induced some high-income students with a high risk of dropping out not to enroll, which is consistent with the fact that the program induced mostly lower-achieving students not to enroll.

Given the large returns to having a college degree and possible negative effects of attend-

12. Since the mapping between test scores and ability can vary across schools, I scale the test scores within each school using the enrollment rate of high-income students.

13. This pattern has recently been discussed in the literature on academic matching (Dillon and Smith (2017); Campbell et al. (2022)).

ing college without completion (Oreopoulos and Petronijevic (2013)), the results suggest that the program was beneficial to some low- and high-income students. They also indicate that some low-income students might have been hurt by the program. It is however important to note that, although enrolling was possibly harmful to these students *ex-post*, it might have been optimal *ex-ante* in order to obtain new information on the probability of success and the returns to college attendance (Oreopoulos and Petronijevic (2013)).

Labor Market Outcomes

Finally, I investigate the effects of the program on labor market outcomes. Figure 3 presents the effects on individuals' average total labor income from 18 to 29 years old. Labor income is measured for everyone in the sample, not only workers, such that the effects can reflect changes in both work intensity and hourly wage.

The career guidance intervention initially decreased students' labor income between the ages of 19 and 21, which is consistent with the increase in college attendance induced by the intervention. However, starting from age 23, the intervention increased students' labor income. Specifically, I estimate that the intervention increased, on average, treated students' labor income by $2,300 annually between 27 and 29 years old, which is significant at the 5 percent confidence level (2020 Canadian dollars). It is substantial since it represents a 7 percent increase from the control mean of $33,500, with a 90 percent confidence interval that ranges from 2 to 12 percent.

Assuming the rise in income is solely driven by the 0.19-year increase in the length of post-secondary education observed in Table 2, it can be inferred that the returns to an additional year of schooling for the marginal students are roughly 36 percent, which is much higher than the returns to schooling observed in the literature (Oreopoulos and Petronijevic (2013)). This suggests that the increase in income is not solely driven by an increase in the length of schooling but that other mechanisms are also at play, such as the decrease in the dropout rate of high-income students or changes in major and occupational choices that are not captured by the increase in the length of schooling.

The increase in labor income might be driven by an increase in hours worked or by an increase in hourly wages. I cannot observe in the tax data the number of hours worked, however, I can observe whether an individual has worked in a given year and, in that case, what is the industry of employment. I report the effects on those outcomes in Appendix Table A7. I find that the program did not affect the share of individuals working at age 29, and that the intervention significantly increased the share of individuals working in public administration. Together, these results suggest that the increase in earnings is mostly driven

by an increase in wages rather than in hours worked.

I also explore differences in treatment effects by parental income (Panels (B) and (C)). Individuals from both low- and high-income families seem to have benefited from the program: the intervention increased low-income background individuals' labor income by 10 percent and high-income background individuals' labor income by 5 percent. However, confidence intervals are quite large.

Summary

To sum-up, I find that the career guidance program led to substantial increase in the four-year college enrollment rate of low-income students, and to small decline in the four-year college enrollment rate of high-income students. Going further, I find positive effects of the program on students post-secondary trajectories and income in adulthood.

The results suggest that the program improved students' decision-making regarding college enrollment. First, it reinforced the importance of test scores and reduced the influence of socio-economic background in students' college decisions, and second, it had positive benefits in the long-run – both of which are consistent with a decrease in informational and behavioral frictions.

5 Results: Financial Aid

In the same ways as for the career guidance program, I explore the treatment effects of the financial aid on college enrollment, completion, and labor income. Results are presented, in Table 3, Table 4, and Figure 4, respectively.

College Enrollment

I find that the aid increased the fraction of students enrolling in college by roughly 7 percentage points, which is mainly driven by an increase in four-year college enrollment.

Do the students induced to enroll in a four-year college by the financial aid intervention have the same characteristics as the students induced to enroll by the career guidance program? Appendix Table A8 presents an estimation of the baseline characteristics of the students induced to enroll in four-year college by each intervention.[14] The table suggests

14. I use the methodology initially developed by Imbens and Rubin (1997) and recently used in Dynarski et al. (2021). The method assumes the absence of defiers, that is, the absence of students induced not to enroll. Under the assumption, the mean of a characteristic for the compliers, μ_C, is equal to: $(\mu_P - p_A\mu_A - p_N\mu_N)/p_C$, with p_A, p_N, p_C, the shares of always-takers, never-takers, and compliers, respectively. μ_P is the

that students induced to enroll by the financial aid intervention have, on average, different characteristics than students induced to enroll by the career guidance group. Notably, they are more likely to be female, less likely to have a parent with a college education, and have lower test scores than the compliers from the career guidance intervention.

College Completion

Turning to graduation data, I find that the increase in four-year college enrollment did not translate into an increase in four-year college graduation. It suggests that the students who were induced to enroll in a four-year college by the intervention were not successful in completing their degree. This is in contrast with the career guidance program that increased four-year college graduation, and is consistent with the fact that students who were induced to enroll by the two types of interventions have, on average, different characteristics.

Although the aid did not increase the fraction of students earning a four-year college degree, it increased the fraction of students earning a community college degree by 5 percentage points, which is explained by an increase in both community college enrollment and graduation conditional on enrollment.

Labor Market Outcomes

Going further, I find that the intervention initially decreased students' labor income between the ages of 19 and 21, which is consistent with the fact that, similarly to the career guidance program, it increased college attendance. However, in contrast with the career guidance intervention, I find that the aid had no significant effect on individuals' labor income at ages 27–29. Specifically, the point estimate indicates that the aid decreased individuals' average labor income between the age of 27 and 29 by \$228 annually, with a 90 percent confidence interval ranging from -\$2,633 to +\$2,177. Although the estimate is imprecise, it is significantly lower than the effect of the career guidance program (p-value=0.05).

The lack of effect on income suggests that the aid induced some students with low returns from college to enroll. This is consistent with the predictions of classical models of human capital investment in the absence of credit constraints (e.g., Becker (1964); Cameron and Taber (2004)). These models predict that student grants, by decreasing the direct cost of post-secondary education, induce students at the margin of enrolling to enroll – students

mean of the characteristic in the full population, μ_A is the mean of the characteristic for students from the control group who enrolled (the always-takers), and μ_N is the mean of the characteristic for students from the treated group who did not enroll (the never-takers). See Marbach and Hangartner (2020) and Dynarski et al. (2021) for more details on the methodology.

who, by definition, derive little benefits from enrollment.

Nonetheless, it is important to note that the grant did increase the share of low-income students earning a community college degree, which might have private and social non-pecuniary benefits that are not captured by my analysis (Oreopoulos and Salvanes (2011), Dynarski et al. (2023)).

Mixed Intervention

I finally explore the effects of the mixed intervention on students' outcomes in Appendix Table A9. I find that the mixed intervention impacted students' college enrollment, college graduation, and labor income, in the same way as the career guidance intervention. In line, I find that the students induced to enroll in college by the mixed intervention share the same characteristics as the students induced to enroll in college by the career guidance intervention (Appendix Table A8).

These results indicate a lack of complementary between career guidance and financial aid: the career guidance intervention alone seems to be enough to produce the observed effects, and financial aid provision has no additional benefits.

6 Discussion & Conclusion

This paper investigates the effects of a career guidance program in high school, a student grant aid, and the combination of the two, on students' college enrollment, graduation, and income in adulthood, in Canada.

I find that the career guidance program had, on average, substantial private benefits: it increased the share of low-income students who enrolled in and graduated from four-year college, decreased the share of high-income students who dropped out from college, and increased individuals' labor income in adulthood.

The per-student cost of the program was roughly equal to $3,600 (2020 Canadian dollars) (Ford et al. 2012). Appendix Table A10 indicates that the program increased, on average, the amount of federal taxes collected from each individual by $310 annually from 27 to 29 years old.[15] Assuming that these tax gains will persist until retirement, it implies that the discounted lifetime tax gains from the intervention are roughly equal to $5,100 per student,

15. The program did not affect the fraction of individuals receiving employment insurance or social assistance benefits.

suggesting that the intervention was at worse budgetary neutral.[16] ù

The program was intensive and included a wide range of ingredients. An important question remains about which features of the program were the more effective at improving students outcomes. The design of the experiment does not allow to disentangle the effects of the different features. However, previous studies suggest that in-person college-going guidance and support programs are more effective at increasing college enrollment than light-touch programs that only provide information (Carrell and Sacerdote (2017); French and Oreopoulos (2017); Dynarski et al. (2023))). According to French and Oreopoulos (2017), the most effective programs are the ones that "make the process to get to college easier and more salient". It suggests that an important component of the program was to help students develop concrete post-high school plans. More research should, however, be conducted to fully understand how the design of guidance programs influences their effectiveness in the long-run.

Although the program had overall large benefits, I also find evidence that the intervention induced some students to enroll who then drop out. Given possible negative effects of attending college without completion (Oreopoulos and Petronijevic (2013)), this suggests that the intervention might had adverse effects for some students. It would be interesting to see in the future whether providing students with additional support and guidance in college could offset these negative effects.

I also find in this paper that the student grant had limited long-term benefits, despite increasing college enrollment. The external validity of these results is dependent on the existing institutional environment, particularly in relation to the costs of education and existing financial aid policies. I would expect to see positive long-run effects of financial aid in countries where the net costs of college attendance are higher. It is also important to note that my findings do not inform us about the effects of the current financial aid policies in Canada, but rather about the expected impacts of increasing the generosity of the financial aid system.

My findings bring new insights into how students make college enrollment decisions. The positive effects of the career guidance program on students' long-term outcomes is likely explained by the existence of informational and behavioral frictions that prevent students from making optimal decisions regarding post-secondary education. These frictions do not seem to affect all students in the same way: they seem to induce some low-income students to

16. Assuming additional tax revenues of $310 annually from age 27 to retirement at age 65, an annual discounting rate of 3 percent, and computing the present value at age 15 when the program is first implemented. All values are expressed in 2020 Canadian dollars.

under-invest in education, and to a lesser extent, some high-income students to over-invest in education, explaining an important part of the gap in four-year college enrollment between the two types of students. In contrast, financial limitations do not seem to play an important role in students' decisions in the context studied.

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Tables and Figures

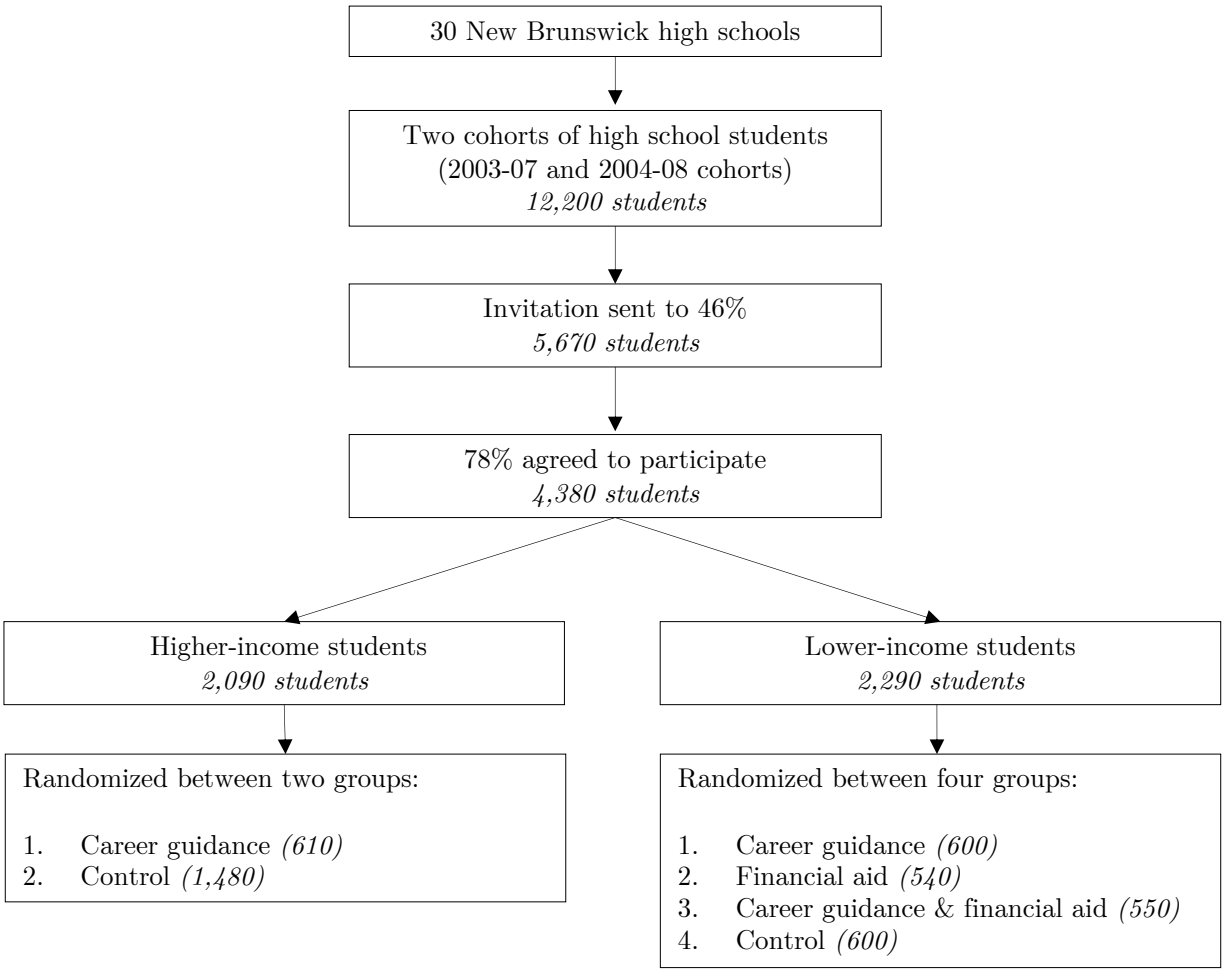


Figure 1: Experimental Design

Notes: The figure provides an overview of the experimental design with the number of students at each step of the randomization process. The numbers are derived from Currie et al. 2007.

Table 1: Treatment Effects of the Career Guidance Program on College Enrollment

	Sample		
Dependent variable	All students (1)	Low-income students (2)	High-income students (3)
First enrolled in a four-year college	0.041**	0.104***	-0.028
	(0.018)	(0.026)	(0.023)
	0.36	*0.21*	*0.53*
	[3,280]	[1,200]	[2,090]
First enrolled in a community college	-0.015	-0.029	-0.000
	(0.015)	(0.023)	(0.019)
	0.20	*0.21*	*0.19*
	[3,280]	[1,200]	[2,090]
Enrolled in STEM conditional on four-year college enrollment	0.004	-0.010	0.012
	(0.027)	(0.054)	(0.031)
	0.29	*0.27*	*0.31*
	[1,440]	[340]	[1,110]

Notes: The table reports the effects of being invited to the career guidance program for all students (column 1) and by parental income (columns 2 and 3). The samples are restricted to students who were assigned to the career guidance program intervention or to the control group. Each cell represents a separate OLS regression of the dependent variable on the treatment dummy and strata dummies. Huber-White robust standard errors are reported in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. The means of the dependent variables in the control group are reported in italics below the standard errors. Sample sizes are reported in square brackets and are rounded to the nearest 10 for data confidentiality concerns.

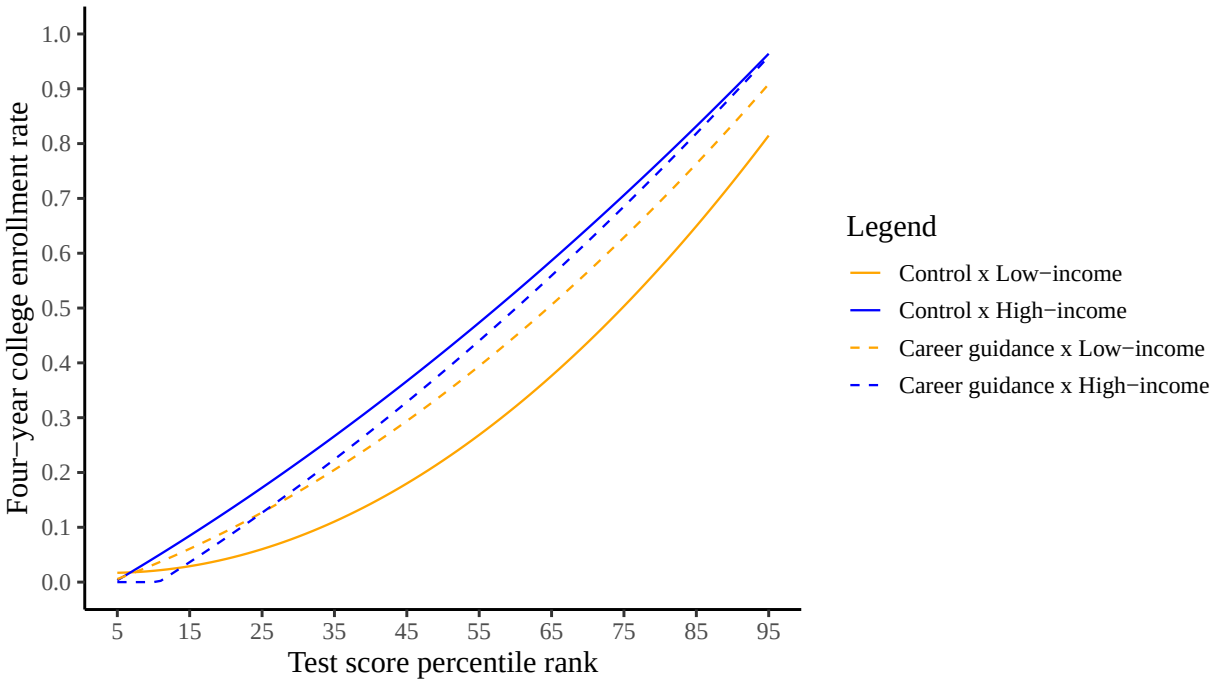


Figure 2: Four-year College Enrollment Across Test Scores, by Income and Treatment Groups

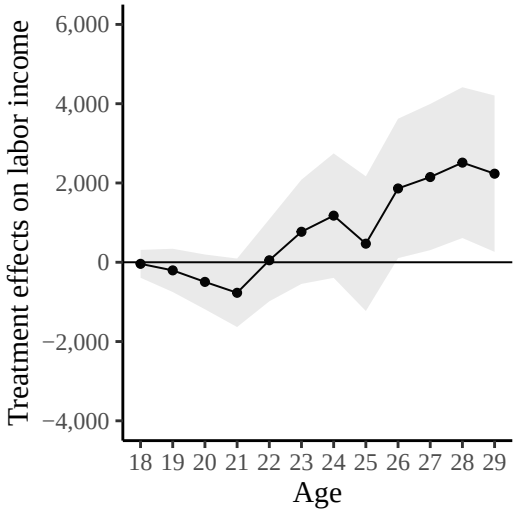
Notes: The figure plots the four-year college enrollment rate of students across test scores, by income status and treatment groups. Test scores are measured in Grade 9 before treatment and are expressed in percentile rank. Since the mapping between test scores and ability can vary across schools, I scale the test scores within each school using the enrollment rate of high-income students. The relationships between enrollment and test scores are estimated from a regression of enrollment on test score percentile rank and test score percentile rank squared, interacted with income status, treatment group, and income status $\times$ treatment group.

Table 2: Treatment Effects of the Career Guidance Program on College Completion

	Sample		
Dependent variable	All students (1)	Low-income students (2)	High-income students (3)
Ever graduated from a four-year college conditional on enrollment	0.023	-0.089	0.082***
	(0.027)	(0.058)	(0.029)
	0.64	*0.61*	*0.67*
	[1,440]	[340]	[1,110]
Ever graduated from a four-year college	0.031*	0.047**	0.013
	(0.016)	(0.022)	(0.023)
	0.24	*0.13*	*0.36*
	[3,280]	[1,200]	[2,090]
Ever graduated from a community college conditional on enrollment	-0.015	-0.058	0.021
	(0.036)	(0.064)	(0.040)
	0.71	*0.69*	*0.73*
	[900]	[300]	[600]
Ever graduated from a community college	-0.011	-0.012	-0.011
	(0.015)	(0.022)	(0.019)
	0.19	*0.17*	*0.21*
	[3,280]	[1,200]	[2,090]
Dropped out from college	-0.007	0.045**	-0.034**
	(0.014)	(0.022)	(0.017)
	0.14	*0.13*	*0.16*
	[3,280]	[1,200]	[2,090]
Years of post-secondary schooling	0.193*	0.377***	-0.007
	(0.100)	(0.143)	(0.138)
	2.27	*1.48*	*3.14*
	[3,280]	[1,200]	[2,090]

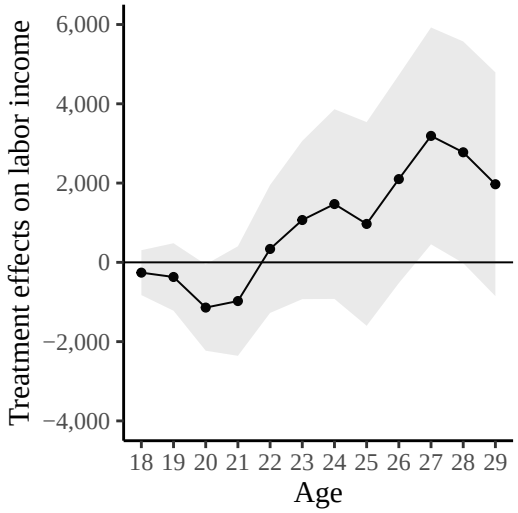
Notes: The table reports the effects of being invited to the career guidance program for all students (column 1) and by parental income (columns 2 and 3). The samples are restricted to students who were assigned to the career guidance program intervention or to the control group. Each cell represents a separate OLS regression of the dependent variable on the treatment dummy and strata dummies. Huber-White robust standard errors are reported in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. The means of the dependent variables in the control group are reported in italics below the standard errors. Sample sizes are reported in square brackets and are rounded to the nearest 10 for data confidentiality concerns.

(A) – All individuals



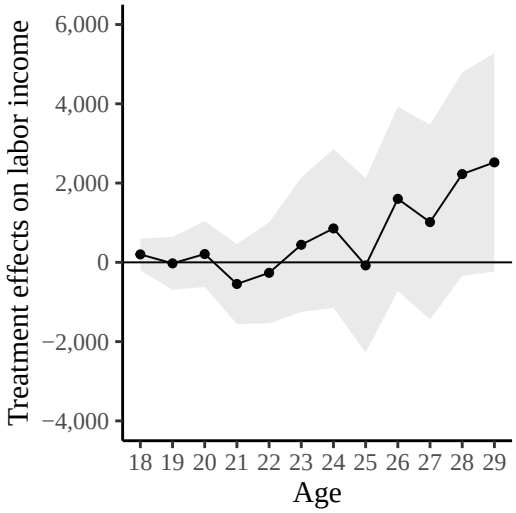
Average TE ages 27–29: 2,299** (1,075)

(B) – Low-income students



Average TE ages 27–29: 2,645* (1,574)

(C) – High-income students



Average TE ages 27–29: 1,921 (1,460)

Figure 3: Treatment Effects of the Career Guidance Program on Labor Income

Notes: The figure plots the effects of being invited to the career guidance program for all students (panel A) and by parental income (panels B and C). Point estimates together with the associated 90 percent confidence intervals are reported. Each point is estimated from a separate OLS regression of the dependent variable on the treatment dummy and strata dummies, restricting the sample to students who were assigned to the career guidance intervention and to the control group. Huber-White robust standard errors are used to compute the confidence intervals. Earnings are expressed in 2020 Canadian dollars. Sample size is 3,280 for all individuals, 2,090 for the high-income sample, and 1,200 for the low-income sample.

Table 3: Treatment Effects of the Financial Aid on College Enrollment, Low-income Students

Dependent variable	Control mean (1)	Treatment effect (2)	Sample size (3)
First enrolled in a four-year college	0.21	0.054**	1,150
		(0.026)	
First enrolled in a community college	0.21	0.020	1,150
		(0.025)	
Enrolled in STEM conditional on four-year college enrollment	0.27	-0.051	280
		(0.054)	

Notes: The table reports the effects of being eligible for the financial aid on low-income students. The sample is restricted to low-income students who were assigned to the financial intervention or to the control group. Each row represents a separate OLS regression of the dependent variable on the treatment dummy and strata dummies. Huber-White robust standard errors are reported in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. The means of the dependent variables in the control group are reported in column (1). Sample sizes are reported in column (3) and are rounded to the nearest 10 for data confidentiality concerns.

Table 4: Treatment Effects of the Financial Aid on College Completion, Low-income Students

Dependent variable	Control mean (1)	Treatment effect (2)	Sample size (3)
Ever graduated from a four-year college conditional on enrollment	0.61	-0.085 (0.066)	280
Ever graduated from a four-year college	0.13	0.009 (0.021)	1,150
Ever graduated from a community college conditional on enrollment	0.69	0.051 (0.055)	300
Ever graduated from a community college	0.17	0.050** (0.023)	1,150
Dropped out from college	0.13	0.013 (0.021)	1,150
Years of post-secondary schooling	1.48	0.145 (0.136)	1,150

Notes: The table reports the effects of being eligible for the financial aid on low-income students. The sample is restricted to low-income students who were assigned to the financial intervention or to the control group. Each row represents a separate OLS regression of the dependent variable on the treatment dummy and strata dummies. Huber-White robust standard errors are reported in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. The means of the dependent variables in the control group are reported in column (1). Sample sizes are reported in column (3) and are rounded to the nearest 10 for data confidentiality concerns.

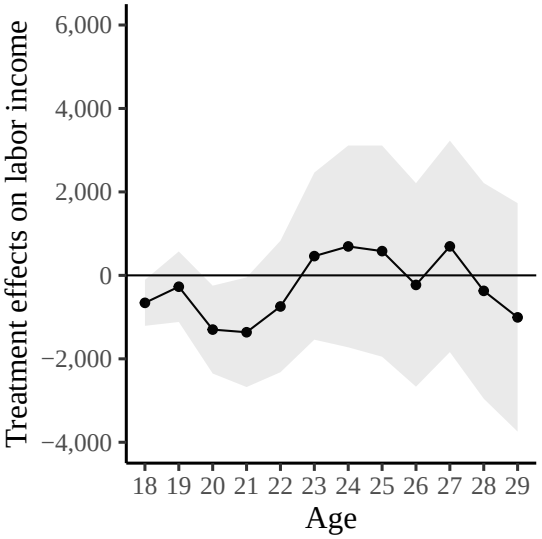


Figure 4: Treatment Effects of Financial Aid on Labor Income

Notes: The figure plots the effects of being eligible for the financial aid on low-income students. Point estimates together with the associated 90 percent confidence intervals are reported. Each point is estimated from a separate OLS regression of the dependent variable on the treatment dummy and strata dummies, restricting the sample to students who were assigned to the financial aid intervention and to the control group. Huber-White robust standard errors are used to compute the confidence intervals. Earnings are expressed in 2020 Canadian dollars. Sample size is 1,150.

Online Appendix

Table A1: Baseline Characteristics and Differences Between Treatment and Control Groups. Career Guidance Intervention.

	All students		Low-income students		High-income students	
	Control mean	Δ with control group	Control mean	Δ with control group	Control mean	Δ with control group
Female	0.52	0.010	0.54	-0.005	0.50	0.025
		(0.019)		(0.030)		(0.024)
English speaker	0.52	0.007	0.54	0.014	0.51	-0.000
		(0.009)		(0.013)		(0.012)
Single parent	0.20	0.004	0.34	0.023	0.08	-0.016
		(0.016)		(0.028)		(0.012)
Parent(s) not working	0.11	0.001	0.2	0.005	0.02	-0.004
		(0.012)		(0.023)		(0.006)
Age of signing parent	42.0	0.140	41.1	0.401	42.9	-0.144
		(0.197)		(0.321)		(0.221)
Number of dependents in household	1.92	-0.018	1.96	-0.008	1.88	-0.029
		(0.032)		(0.052)		(0.037)
Highest level of education of parents: four-year college degree	0.18	0.009	0.05	0.014	0.29	0.004
		(0.012)		(0.014)		(0.021)
Highest level of education of parents: two-year college degree	0.46	-0.001	0.41	0.012	0.51	-0.015
		(0.019)		(0.029)		(0.024)
Highest level of education of parents: high school	0.24	0.001	0.32	-0.013	0.16	0.016
		(0.016)		(0.027)		(0.018)
Highest level of education of parents: less than high school	0.13	-0.009	0.22	-0.013	0.04	-0.005
		(0.013)		(0.024)		(0.009)
One parent born outside Canada	0.26	0.001	0.38	0.012	0.15	-0.011
		(0.017)		(0.028)		(0.017)
Grade 9 average test score: 90%–100%	0.13	0.012	0.07	0.014	0.18	0.009
		(0.012)		(0.016)		(0.018)
Grade 9 average test score: 80%–89%	0.31	0.033*	0.25	0.063**	0.36	0.000
		(0.017)		(0.026)		(0.023)
Grade 9 average test score: 70%–79%	0.28	-0.021	0.31	-0.021	0.26	-0.022
		(0.017)		(0.027)		(0.021)
Grade 9 average test score: 60%–69%	0.17	-0.018	0.22	-0.048**	0.12	0.013
		(0.014)		(0.023)		(0.016)
Grade 9 average test score: Below 60%	0.08	-0.003	0.11	-0.003	0.06	-0.003
		(0.011)		(0.018)		(0.011)
Grade 9 average test score: Missing	0.03	-0.002	0.04	-0.006	0.02	0.001
		(0.007)		(0.011)		(0.007)
Has ever repeated a grade	0.12	0.001	0.17	0.012	0.07	-0.011
		(0.013)		(0.022)		(0.012)
P-value F-test of joint significance		0.92		0.37		0.94
Sample size		3,280		1,200		2,090

Notes: Differences are based on OLS regressions of each characteristic on treatment and strata dummies. Joint test p-values are computed using a F-test of joint significance from a regression of the treatment dummy on all listed characteristics and strata dummies. Huber-White robust standard errors ar reported in parentheses. *** p<0.01 ** p<0.05 * p<0.1.

Table A2: Baseline Characteristics and Differences Between Treatment and Control Groups. Financial Aid Intervention.

	Low-income students	
	Control mean	Δ with control group
Female	0.54	0.009
		(0.030)
English speaker	0.54	-0.006
		(0.013)
Single parent	0.34	-0.007
		(0.028)
Parent(s) not working	0.20	-0.026
		(0.023)
Age of signing parent	41.1	-0.303
		(0.323)
Number of dependents in household	1.96	0.016
		(0.054)
Highest level of education of parents: four-year college degree	0.05	0.007
		(0.014)
Highest level of education of parents: two-year college degree	0.41	0.049*
		(0.029)
Highest level of education of parents: high school	0.32	-0.015
		(0.027)
Highest level of education of parents: less than high school	0.22	-0.041*
		(0.024)
One parent born outside Canada	0.38	-0.007
		(0.029)
Grade 9 average test score: 90%–100%	0.07	0.008
		(0.016)
Grade 9 average test score: 80%–89%	0.25	0.041
		(0.027)
Grade 9 average test score: 70%–79%	0.31	-0.012
		(0.027)
Grade 9 average test score: 60%–69%	0.22	-0.029
		(0.024)
Grade 9 average test score: Below 60%	0.11	0.001
		(0.018)
Grade 9 average test score: Missing	0.04	-0.009
		(0.010)
Has ever repeated a grade	0.17	-0.015
		(0.021)
P-value *F*-test of joint significance		0.92
Sample size		1,150

Notes: Differences are based on OLS regressions of each characteristic on treatment and strata dummies. Joint test *p*-values are computed using a *F*-test of joint significance from a regression of the treatment dummy on all listed characteristics and strata dummies. Huber-White robust standard errors ar reported in parentheses. *** p<0.01 ** p<0.05 * p<0.1.

Table A3: Baseline Characteristics and Differences Between Treatment and Control Groups. Mixed Intervention.

	Low-income students	
	Control mean	Δ with control group
Female	0.54	-0.039
		(0.030)
English speaker	0.54	-0.011
		(0.013)
Single parent	0.34	0.015
		(0.028)
Parent(s) not working	0.2	-0.016
		(0.023)
Age of signing parent	41.1	0.247
		(0.340)
Number of dependents in household	1.96	-0.030
		(0.049)
Highest level of education of parents: four-year college degree	0.05	-0.001
		(0.013)
Highest level of education of parents: two-year college degree	0.41	0.033
		(0.029)
Highest level of education of parents: high school	0.32	-0.020
		(0.027)
Highest level of education of parents: less than high school	0.22	-0.012
		(0.024)
One parent born outside Canada	0.38	0.032
		(0.029)
Grade 9 average test score: 90%–100%	0.07	-0.004
		(0.015)
Grade 9 average test score: 80%–89%	0.25	0.035
		(0.026)
Grade 9 average test score: 70%–79%	0.31	-0.028
		(0.027)
Grade 9 average test score: 60%–69%	0.22	-0.011
		(0.025)
Grade 9 average test score: Below 60%	0.11	0.017
		(0.019)
Grade 9 average test score: Missing	0.04	-0.008
		(0.010)
Has ever repeated a grade	0.17	0.010
		(0.022)
P-value *F*-test of joint significance		0.74
Sample size		1,150

Notes: Differences are based on OLS regressions of each characteristic on treatment and strata dummies. Joint test *p*-values are computed using a *F*-test of joint significance from a regression of the treatment dummy on all listed characteristics and strata dummies. Huber-White robust standard errors ar reported in parentheses. *** p<0.01 ** p<0.05 * p<0.1.

Table A4: Treatment Effects of the Career Guidance Program on College Enrollment, Controlling for Baseline Student Characteristics

	Career Guidance			Financial Aid
Dependent variable	All students (1)	Low-income students (2)	High-income students (3)	Low-income students (4)
First enrolled in a four-year college	0.020	0.072***	-0.036*	0.031
	(0.015)	(0.022)	(0.019)	(0.022)
First enrolled in a community college	-0.009	-0.022	0.005	0.022
	(0.015)	(0.023)	(0.018)	(0.024)
Enrolled in STEM conditional on four-year college enrollment	0.004	-0.016	0.022	-0.051
	(0.025)	(0.050)	(0.030)	(0.054)
Ever graduated from a four-year college conditional on enrollment	0.018	-0.080	0.075***	-0.079
	(0.026)	(0.058)	(0.029)	(0.066)
Ever graduated from a four-year college	0.014	0.026	0.006	-0.006
	(0.013)	(0.019)	(0.019)	(0.019)
Ever graduated from a community college conditional on enrollment	-0.006	-0.035	0.025	0.054
	(0.036)	(0.066)	(0.040)	(0.055)
Ever graduated from a community college	-0.009	-0.011	-0.007	0.048**
	(0.014)	(0.021)	(0.019)	(0.023)
Dropped out from college	0.007	0.037*	-0.033**	0.007
	(0.014)	(0.021)	(0.017)	(0.021)
Years of post-secondary schooling	0.089	0.228*	-0.038	0.022
	(0.084)	(0.123)	(0.115)	(0.117)
Average annual labor income ages 27–29	1,890*	1,793	2,087	-802
	(1,008)	(1,481)	(1,379)	(1,374)

Notes: The table reports the effects of being invited to the career guidance program in Columns (1) to (3), and of being eligible for the financial aid in Column (4). The samples are restricted to students who were assigned to the career guidance program intervention or to the control group in Columns (1) to (3), and to students who were assigned to the financial aid intervention or to the control group in Column (4). Each cell represents a separate OLS regression of the dependent variable on the treatment dummy, strata dummies, and baseline characteristics. Huber-White robust standard errors are reported in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%.

Table A5: Treatment Effects of the Career Guidance Program on Additional Outcomes Derived from the Follow-up Surveys

Dependent variables	Share who answered (1)	P-value H_0: no selective missingness (2)	Treatment effect (3)	Treatment effect (IPW) (4)
Panel A: Low-income students				
Enrolled in a private career college	0.74	0.83	-0.009	-0.005
			(0.030)	(0.030)
Aspire to pursue a four-year college degree	0.73	0.92	0.130***	0.122***
			(0.034)	(0.034)
Panel B: High-income students				
Enrolled in a private career college	0.65	0.05	0.010	0.010
			(0.021)	(0.021)
Aspire to pursue a four-year college degree	0.61	0.00	-0.030	-0.028
			(0.028)	(0.028)

Notes: The table reports the treatment effects of eligibility for the career planning program on additional outcomes derived from the follow-up surveys conducted by the SRDC. Column (1) reports the fraction of students who answered the questions. I test for selective missingness by regressing the indicator of missingness on the treatment dummies and strata dummies, and report the p-value associated with the test in Column (2). Column (3) reports the treatment effects obtained from unweighted OLS regressions of the dependent variables on the treatment dummy and strata dummies. Column (4) reports the treatment effects obtained from the same regressions adjusted with inverse probability weights (IPW). These weights are constructed from a probit regression of an indicator of missingness on treatment dummies, baseline characteristics, cohort and school dummies. Huber-White robust standard errors are reported in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. The samples are restricted to students who were assigned to the career guidance program intervention or to the control group.

Table A6: Four-year College Enrollment Across Test Scores, by Income Status and Treatment Group

Variables	Ever enrolled in a four-year college	
Career guidance	0.012	-0.036
	(0.028)	(0.034)
High-income	0.010	-0.053
	(0.027)	(0.039)
Career guidance × High-income	-0.071	-0.015
	(0.045)	(0.058)
Test score pct.	0.008***	-0.001
	(0.001)	(0.002)
Career guidance × Test score pct.	0.002**	0.005**
	(0.001)	(0.002)
Higher-income × Test score pct.	0.003***	0.008***
	(0.001)	(0.002)
Career guidance × High-income × Test score pct.	-0.001	-0.005
	(0.001)	(0.004)
Test score pct.^{2}		9.58e-05***
		(1.88e-05)
Career guidance × Test score pct.^{2}		-3.93e-05
		(2.69e-05)
Higher-income × Test score pct.^{2}		-6.40e-05***
		(2.31e-05)
Career guidance × High-income × Test score pct.^{2}		4.34e-05
		(3.54e-05)
Constant	-0.113***	0.018
	(0.017)	(0.022)
Observations	3,280	3,280
Avg. gap in control group	0.148	0.145
	(0.021)	(0.020)
Avg. gap in career guidance group	0.023	0.024
	(0.024)	(0.023)
% change in gap	-84.3%	-83.4%
	(16.2)	(15.9)

Notes: The table reports the estimates from an OLS regression of four-year college enrollment on test score percentile rank interacted with a high-income dummy, a treatment dummy, and a high-income-treatment dummy. The sample is restricted to students who were assigned to the career guidance program intervention or to the control group. Huber-White robust standard errors are reported in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. Sample sizes are rounded to the nearest 10. The average gaps are computed by taking the average, across test scores, of the predicted difference in enrollment between high- and low-income students ($E_{TS}[\Delta E(Y|T^G, TS]$).

Table A7: Treatment Effects of the Career Guidance Program and Financial Aid on Additional Labor Market Outcomes

	Career Guidance			Financial Aid
Dependent variable	All students (1)	Low-income students (2)	High-income students (3)	Low-income students (4)
Reported some income during during year of 29 birthday	-0.000	-0.002	0.002	-0.018
	(0.015)	(0.024)	(0.017)	(0.024)
Industry (NAIC) of main job				
Agriculture, forestry, fishing and hunting	-0.004	-0.011	0.004	0.003
	(0.008)	(0.013)	(0.009)	(0.014)
Mining, extraction, utilities, and construction	0.017	0.017	0.016	-0.001
	(0.013)	(0.022)	(0.016)	(0.021)
Manufacturing	-0.016	-0.023	-0.009	0.025
	(0.011)	(0.018)	(0.013)	(0.021)
Trade	-0.007	-0.010	-0.005	-0.002
	(0.016)	(0.025)	(0.019)	(0.026)
Administrative and professional services	-0.018	-0.028	-0.008	-0.028
	(0.015)	(0.024)	(0.019)	(0.024)
Education, healthcare, and social assistance	-0.006	0.002	-0.014	0.000
	(0.015)	(0.024)	(0.018)	(0.024)
Entertainment, accommodation, and food services	0.010	0.013	0.007	0.008
	(0.011)	(0.018)	(0.012)	(0.017)
Other services	-0.008	-0.017	0.000	-0.020
	(0.008)	(0.012)	(0.010)	(0.012)
Public administration	0.032*	0.056**	0.008	0.014
	(0.017)	(0.027)	(0.023)	(0.026)

Notes: The table reports the effects of being invited to the career guidance program in columns (1) to (3), and of being eligible for the financial aid in column (4). Each cell represents a separate OLS regression of the dependent variable on the treatment dummy and strata dummies. The samples are restricted to students who were assigned to the career guidance program intervention or to the control group in columns (1) to (3), and to students who were assigned to the financial aid intervention or to the control group in column (4) (N = 3,280, 1,200, 2,090, and 1,150). Samples are further restricted for the industry outcomes to individuals for whom the industry is known (N=2,670, 920, 1,750, and 870, respectively). Huber-White robust standard errors are reported in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%.

Table A8: Characteristics of Students who Were Induced to Enroll in a Four-Year College Because of Each Intervention

	Compliers		
Characteristic	Career guidance (1)	Financial aid (2)	Mixed intervention (3)
Female	0.48	0.80	0.61
English speaker	0.49	0.30	0.53
Single parent	0.23	0.29	0.11
Parent(s) not working	0.10	0.22	0.12
Age of signing parent	39.6	40.3	41.7
Number of dependents in household	2.2	2.5	2.3
One parent with a college diploma/degree	0.47	-0.13	0.30
One parent born outside Canada	0.28	0.38	0.16
Test score percentile rank	45	34	55
Has ever repeated a grade	-0.04	0.16	0.00
Share of students in the population	*10%*	*5%*	*9%*

Notes: The table reports the descriptive statistics of students who always enroll in four-year college (the always-takers, column 1) and of students who are induced to enroll in four-year college following the career guidance program (column 2), following the financial aid intervention (column 3), and following the mixed intervention (column 4). Means for the always-takers are obtained from the students who enrolled in four-year college in the control group. Means for the compliers are not directly observed and are calculated from the means of the always-takers, never-takers, and full sample. The method assumes the absence of defiers, that is, the absence of students induced not to enroll by the interventions. Under the assumption, the mean of a characteristic for the compliers, μ_C, is equal to: $(\mu_P - p_A\mu_A - p_N\mu_N)/p_C$, with p_A, p_N, p_C, the shares of always-takers, never-takers, and compliers, respectively. μ_P is the mean of the characteristic in the full population, μ_A is the mean of the characteristic for students from the control group who enrolled (the always-takers), and μ_N is the mean of the characteristic for students from the treated group who did not enroll (the never-takers). See Marbach and Hangartner (2020) and Dynarski et al. (2021) for more details on the methodology.

Table A9: Treatment Effects of the Mixed Intervention

Dependent variable	Control mean (1)	Treatment effect (2)	Sample size (3)
First enrolled in a four-year college	0.21	0.089***	1,150
		(0.026)	
First enrolled in a community college	0.21	-0.036	1,150
		(0.024)	
Enrolled in STEM conditional on four-year college enrollment	0.27	-0.002	310
		(0.059)	
Ever graduated from a four-year college conditional on enrollment	0.61	-0.081	310
		(0.064)	
Ever graduated from a four-year college	0.13	0.025	1,150
		(0.021)	
Ever graduated from a community college conditional on enrollment	0.69	0.051	280
		(0.060)	
Ever graduated from a community college	0.17	0.011	1,150
		(0.023)	
Dropped out from college	0.13	0.019	1,150
		(0.021)	
Years of post-secondary schooling	1.48	0.297**	1,150
		(0.143)	
Average annual labor income ages 27–29	27,700	1,555	1,150
		(1,526)	

Notes: The table reports the effects of being both invited to the career guidance program and eligible for the financial aid (mixed intervention). The samples are restricted to students who were assigned to the mixed intervention or to the control group. Each row represents a separate OLS regression of the dependent variable on the treatment dummy and strata dummies. Huber-White robust standard errors are reported in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. The means of the dependent variables in the control group are reported in column (1). Sample sizes are reported in column (3) and are rounded to the nearest 10 for data confidentiality concerns.

Table A10: Treatment Effects of the Career Guidance Program and Financial Aid on Taxes and Transfers

	Career Guidance			Financial Aid
Dependent variable	All students (1)	Low-income students (2)	High-income students (3)	Low-income students (4)
Avg. annual federal taxes paid ages 27–29	310*	359	257	-3
	(173)	(242)	(248)	(217)
	3,500	*2,700*	*4,400*	*2,700*
Ever received social assistance during year of 29 birthday	0.003	0.007	-0.000	0.017
	(0.008)	(0.014)	(0.007)	(0.015)
	0.04	*0.06*	*0.02*	*0.06*
Ever received EI benefits during year of 29 birthday	0.004	-0.003	0.012	-0.022
	(0.017)	(0.027)	(0.020)	(0.027)
	0.28	*0.32*	*0.23*	*0.32*
Sample size	3,280	1,200	2,090	1,150

Notes: The table reports the effects of being invited to the career guidance program in Columns (1) to (3), and of being eligible for the financial aid in Column (4). The samples are restricted to students who were assigned to the career guidance program intervention or to the control group in Columns (1) to (3), and to students who were assigned to the financial aid intervention or to the control group in Column (4). Each cell represents a separate OLS regression of the dependent variable on the treatment dummy and strata dummies. Huber-White robust standard errors are reported in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%.