The Long-Term Effects of Career Guidance in High School and Student Financial Aid: Evidence from a Randomized Experiment*

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Abstract

This paper studies the effects of a randomized control trial in which Canadian high school students were randomly invited to participate in a career guidance program during high school and/or made eligible for extra financial aid conditional on college enrollment. I use administrative records to examine the effects of the interventions on college enrollment, graduation, and income up to age 29. The guidance intervention increased students four-year college enrollment and graduation rates and had positive effects on individuals' income in adulthood. In contrast, the financial aid intervention had no effect on income in adulthood despite increasing college enrollment.

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1 Introduction

Parental income is, across many countries, a strong predictor of post-secondary education enrollment.[1] This stems in part from differences in academic preparation between students from high- and low-income families, but large differences remain even after controlling for academic achievement, raising concerns that students from low-income families might make sub-optimal educational choices due to financial, informational, or behavioral barriers (Lochner and Monge-Naranjo (2012); French and Oreopoulos (2017)).

In response to these concerns, two types of interventions have been used by policymakers: (1) informational and behavioral programs aimed at improving students' decision-making regarding post-secondary education, such as meetings with career counselors, career planning workshops, or information provision; and (2) financial aid programs designed to help students cover the costs of post-secondary education such as governmental grants and loans (Page and Scott-Clayton (2016); Herbaut and Geven (2020)).

While the two types of programs appear to be effective in the short run (see for a review Dynarski, Page, and Scott-Clayton 2022 and Dynarski et al. 2023), empirical evidence on their long-term effects is limited. Yet, 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; Zimmerman 2014; Barrow and Malamud 2015). In addition, we lack evidence on the relative effectiveness of the two types of interventions, which are often tested in very different contexts.

In this paper, I ask whether these "college-going" interventions are effective in improving students' outcomes – and specifically disadvantaged students' outcomes – in the long run, and what type of intervention is the most successful

1. See, for example, Bailey and Dynarski (2011) and Chetty et al. (2014) for the US, Frenette (2017) for Canada, and Blossfeld and Shavit (1993) for twelve other countries. See Kinsler and Pavan (2011) and Hoxby and Avery (2013) for the income gradient in enrollment in selective colleges.

in doing so. I answer the question by reevaluating, using new administrative data, a randomized control trial that tested the two types of interventions on a sample of high school students in Canada.

Specifically, I study the Future to Discover Project, which was conducted by the Social Research and Demonstration Corporation (SRDC) in the late 2000s. The experiment involved over 4,000 Canadian high school students from the province of New Brunswick. Students from lower-income families were randomly assigned to one of three treatment groups or to a control group. Students in the first treatment group were invited to participate in several after-school career guidance workshops from Grades 10 to 12 (hereafter, guidance intervention). The workshops were designed to help students understand the importance of career planning, explore educational and career options, and transition from high school to college. Students in the second treatment group were made eligible for a student grant that they would receive if they enrolled in college (hereafter, financial aid intervention). Specifically, students could receive up to CA$9,600 of aid over two years.[2] Students in the third treatment group received both interventions (hereafter, mixed intervention). Students from higher-income families were only randomized between the guidance intervention group and the control group.

Several excellent reports have been written by SRDC on the effects of the three interventions (e.g., Ford et al. 2012; Hui and Ford 2018; Ford, Hui, and Kwakye 2019). I build on these reports in several ways. First and foremost, I use new administrative data derived from tax returns to estimate the effects of the interventions on income in early adulthood (27–29 years old). Second, I use new post-secondary institution records to estimate the effects of the program on college enrollment and completion more accurately than what was possible before.[3] Finally, I expand on the analysis conducted by the SRDC by studying how the career guidance intervention affected students from high-

2. All dollar values presented in the paper are expressed in 2019 Canadian dollars. 1 Canadian dollar was approximately equivalent to 0.70 to 1 US dollar over the period of the study.

3. See Appendix F for more details on how the treatment effects reported in this paper compare with SRDC's previously-reported results.

income families and the income gradient in educational attainment.

I start by studying the effects on low-income students, on whom all three interventions were tested. I find that the career guidance intervention increased low-income students' four-year college enrollment rate by 10 percentage points, a 50 percent increase over baseline, while having no significant effect on community college enrollment. In the long run, I find that the intervention significantly increased the probability that low-income students graduated from a four-year college and their average labor income in adulthood as measured between ages 27 and 29. In contrast, the student financial aid intervention increased both low-income students four-year and community college enrollment rates – by 5 percentage points each. However, these increases only translated into an increase in the share of students graduating from a community college, and I find no effect of the intervention on individuals' average income in adulthood.

The findings discussed above apply to students from lower-income families. The guidance intervention was also tested on students from high-income families. In contrast with low-income students, I find no significant effect of the guidance intervention on the four-year college enrollment rate of high-income students. This implies a strong alignment of college enrollment rates across parental income. In particular, I estimate that the intervention led to a 70 percent reduction in the four-year college enrollment gap between equally-achieving high- and low-income students.

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 intensive 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; Stephan and Rosenbaum 2013; Carrell and Sacerdote 2017; Castleman and Goodman 2018; Cunha, Miller, and Weisburst 2018; Oreopoulos and Ford 2019; Castleman, Deutschlander, and Lohner 2020). My paper

goes beyond college enrollment and shows that guidance programs can also have meaningful benefits in the long run.

This paper also adds to the literature on the 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).

I also contribute to both strands of literature by comparing the effects of the two types of interventions on the same sample of students, as well as by studying the interaction between the two. This is important to inform the policy debate that often requires choosing between alternative programs.

2 The Future to Discover Experiment

This section heavily draws on the two implementation reports to summarize the main features of the experiment (Social Research and Demonstration Corporation 2007; Social Research and Demonstration Corporation 2009). More details can be found in the two reports.

2.1 Interventions

The Future to Discover experiment was developed and conducted by the SRDC and project partners, with the objective of finding out what works best to in-

crease college enrollment.[4] Three interventions targeting high school students were tested for this purpose: a career guidance intervention, a financial aid intervention, and a mixed intervention which combined both interventions.

The career guidance intervention consisted of a series of workshops designed to help students understand the importance of educational and career planning, explore educational and career options, and transition from high school to college. The workshops were two hours long, took place on each school property right after school hours, and were led by a team of "Facilitators" hired and trained by the project partners to deliver the workshops. In total, twenty workshops were given from Grades 10 to 12. Appendix B provides some details on the timing and content of the workshops. In addition to the workshops, students were given access to post-secondary and career information via a website and a bi-annual magazine. The intensity and content of the intervention make it similar to the U.S. College Possible, College Forward, and Bottom Line programs (Avery 2013; Castleman and Goodman 2018; Castleman, Deutschlander, and Lohner 2020), although it does not provide, like these programs, direct individual counseling or tutoring.

The workshops were optional, and it was not compulsory for students to browse the website or read the magazine. However, 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 engaged with the website.[5]

The financial aid intervention consisted of a grant worth up to CA$9,600 that students could receive upon college enrollment. Specifically, students could claim CA$2,400 each academic term that they enrolled as full-time students in a post-secondary institution, for a maximum of four terms.[6] The

4. The Future to Discover experiment received expert and financial support from the Canada Millennium Scholarship Foundation, the New Brunswick Department of Education, and Statistics Canada.

5. Appendix B provides details on attendance at the workshops.

6. To receive the grant, a student had to register as a full-time student 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.

grant was substantial compared to tuition and 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 percent for two years. Students were informed about their eligibility for the grant at the time of recruitment at the end of Grade 9, and were actively reminded about it after that (during and after high school) through mails and phone calls. Receiving the grant was relatively straightforward: students had to send a short application package to the program office and would receive a check a few months after their enrollment status was confirmed. Over 85 percent of the students who enrolled in college received a payment. Compared to existing financial aid programs, the intervention offered an early guarantee of aid with a simple application process, two features that have been shown to increase application rates (Bettinger et al. (2012); Dynarski et al. (2021)).

Finally, 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 CA$9,600 student grant.

2.2 Experimental Design

The Future to Discover project was implemented in 30 high schools in New Brunswick.[7] 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 of 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

7. I provide in Appendix B details about the educational system in New Brunswick.

the provincial median.[8]

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, and mixed intervention). 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 was done in different ways across schools. I take into account these unequal assignment ratios across schools and income status in the estimation strategy described below.

Figure B.2 provides an overview of the experimental design as well as the number of students at each step of the randomization process.

3 Empirical Framework

3.1 Data

I use SRDC experimental data linked to new post-secondary institutions' administrative records and tax returns – both of which were made available by Statistics Canada (Statistics Canada and Social Research and Demonstration Corporation 2022; Statistics Canada 2022a; Statistics Canada 2022d;Statistics Canada 2022c). The post-secondary institutions' records cover most four-year and community colleges in Canada. From these data, I identify whether a student ever enrolled in a four-year or community college and ever graduated from these institutions within ten years of high school graduation. The data do not cover private career colleges, which typically offer short and career-oriented programs of one year or less. I identify enrollment in these private career colleges using the follow-up survey conducted by the SRDC. Annual tax returns

8. 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 CA$40,000 for a single-parent family with one child to CA$60,000 for a family with two parents and three children or more.

from the universe of tax returns in Canada were also matched to individuals. They provide information on individuals' annual income from ages 18 to 29. See Appendix A for additional information on data coverage, data processing, and outcomes definitions.

Since I rely on administrative data, I do not have sample attrition for the main outcomes of interest and I perform the analysis using the 4,370 students who were initially randomized. Table 1 presents baseline characteristics for the control group students, and reports the differences in these characteristics between the control 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: I find 4 significant differences out of 72 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.

3.2 Estimation Strategy

I estimate the effects of three interventions by estimating the following model by OLS:

$$Y_i = \beta_0 + \beta_1 G_i + \beta_2 G_i \times H_i + \beta_3 A_i + \beta_4 M_i + \beta_5 H_i + \boldsymbol{\gamma_i^s} + \epsilon_i \qquad (1)$$

where Y_i is the outcome of interest for student i. G_i, A_i, and M_i are binary indicators equal to one if student i was assigned to the guidance, financial aid, or mixed interventions, respectively. H_i is a binary indicator equal to 1 if student i is from a high-income family, and zero otherwise.

The model captures the intent-to-treat effects of the interventions, i.e., the effect of being invited to the career guidance program only, being eligible for the financial aid only, and being both invited to the career guidance program and being eligible for the financial aid. The causal effect of the guidance intervention is captured by β_1 for the low-income students and by $\beta_1 + \beta_2$ for the high-income students. The effect of the financial aid intervention is captured by β_3, and the effect of the mixed intervention by β_4. They are

only estimated for the low-income students and cannot be estimated for the high-income students who were not eligible for the aid.

Observations are reweighted in order to equalize the assignment ratios across cohorts.[9] Moreover, to take into account the stratified design of the experiment in the variance calculations, I include a full vector of school-cohort dummies, $\boldsymbol{\gamma}_i^s$, in the regression. I discuss in Section 4.3 the robustness of the results to alternative specifications.

4 Treatment Effects

4.1 College Enrollment

I first present the treatment effects of the three interventions on college enrollment in Table 2.[10] I first report the effects of the three interventions on the sample of students from low-income families (Panel A). The guidance intervention increased the fraction of low-income students who enrolled in college by 7.0 percentage points. This is exclusively driven by an increase in four-year college enrollment, which increased by almost 50 percent over baseline. The financial aid increased college enrollment by a slightly large magnitude (+10.4 percentage points), which is driven both by an increase in the fraction of students enrolling in four-year colleges and by an increase in the fraction of students enrolling in community colleges. This is significantly different from the career guidance intervention which did not increase community college enrollment and only increased four-year college enrollment. The mixed in-

9. In the absence of reweighting, the treatment effect β_1 estimated from equation 1 is not consistent for the average treatment effect in the population (Rubin and Imbens 2015). It is instead a weighted average of the within-stratum average effects, with the weights being influenced not only by the fraction of observations in each stratum (which we would ideally want), but also by the probabilities of receiving and not receiving the treatment in each stratum. The reweighting procedure ensures that the weights are only proportional to the fraction of observations in each stratum and that β_1 is thus consistent for the population average treatment effect.

10. I report in Appendix Table E.11 the effects on private career college enrollment using the survey conducted in Grade 12. None of the interventions seem to strongly affect this outcome.

tervention increased low-income students four-year college enrollment by 8.0 percentage points while having no effect on community college enrollment, which is similar in magnitude, direction, and significance to the effects of the guidance-alone intervention.

I explore the heterogeneity of these effects in Appendix Table E.12 along several dimensions (gender, language, parental education, test scores, and aspiration for higher education at baseline). The large standard errors make the analysis generally inconclusive. However, the results suggest that the effects of the guidance and mixed interventions are mostly driven by higher-achieving students, while the financial aid intervention affected both lower- and higher-achieving students.

Are these effects driven by a change in the probability of applying to college or by a change in the probability of being admitted? To answer this question, I estimate the impact of the interventions 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 E.11. The effects are very similar to the ones on actual enrollment presented in Table 2, which suggests that the effects are mostly driven by changes in "aspirations" and application decisions, rather than admission likelihood.

The design of the experiment also allows to test the effect of the guidance intervention on students from high-income families. The effects are reported in Panel B of the Table 2. In contrast with the effect on low-income students, the guidance intervention decreased the fraction of high-income students who enrolled in college by 3 percentage points, an effect that is not significant at conventional significance levels (p-value$= 0.13$), but meaningful in magnitude.

The contrasted effects of the intervention on low- and high-income students imply a substantial decrease in the four-year college enrollment gap between the two types of students, which I explore further in Table 3. Specifically, I report and decompose the gaps in four-year college enrollment between high- and low-income students in both the control and career guidance groups. The gaps are decomposed into a part that can be explained by students' academic preparation as measured by students' average test scores in Grade 9 and high

school fixed effects, and a part that cannot. See Appendix C for more details on the methodology and some robustness checks. The table displays two major findings. First, it indicates that, in the absence of the interventions, the gap in four-year college enrollment between high- and low-income students is substantial – 30 percentage points wide – and that roughly 50 percent of it *cannot* be explained by differences in academic preparation between the two types of students. Second, it shows that the career guidance intervention was able to narrow the unexplained gap by 70 percent – from 14 to 4 percentage points – such that, in the career guidance group, most of the difference in four-year college enrollment between high- and low-income students is explained by differences in academic preparation.[11]

4.2 Long-term Outcomes

What happens to these students in the long run? To answer this question, I present in Table 4 the treatment effects of the three interventions on college completion and on labor income in early adulthood (27–29 years old). Additional results on labor market outcomes are also presented in Appendix E.[12]

First, I find that the guidance intervention increased the share of low-income students who graduated from a four-year college by 4.8 percentage points and the share of low-income students who dropped out from college by 3.6 percentage points. It suggests that some, but not all, of the students induced to enroll in a four-year college by the intervention were successful in completing college.

I also investigate the effects of the program on individuals' annual labor income in adulthood. I estimate that the intervention increased, on average, low-income students' labor income by CA$2,700 annually between 27 and 29 years old, which is significant at the 10 percent confidence level, and represents

11. I find similar results when decomposing the gap between very high-income and very low-income families in Appendix Table C.7.

12. I present the effects of the interventions on the probability of being employed, and on income and industry conditional on working in Table E.13. I present the evolution of the treatment effects on income over time from age 18 to 29 in Figure E.3.

a 10 percent increase from the control mean. If the increase in income is exclusively coming from the 0.43-year increase in the duration of post-secondary education, it implies that the returns to one additional year of schooling are approximately 23 percent – a rate significantly higher than those documented in the literature (Oreopoulos and Petronijevic 2013). This suggests that the increase in income is not only driven by an increase in the time spent in post-secondary education but that other mechanisms are also at play, such as changes in major and occupational choices, conditional on educational attainment, that are not captured by my analysis.[13]

Second, I find that the financial aid intervention significantly increased the share of low-income students who graduated from a community college (+7.6 percentage points), but had no effect on the share of students who graduated from a four-year college. This is significantly different from the effects of the guidance intervention, which increased four-year college graduation. Furthermore, I find that, in contrast with the career guidance intervention, 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 ages of 27 and 29 by CA$380 annually. Although the estimate is imprecise, it is significantly lower than the effect of the career guidance intervention.

Third, the effects of the mixed intervention on college graduation and income follow a similar pattern as the effects of the guidance-alone intervention. In particular, the mixed intervention increased individuals' four-year college graduation rate by 2.5 percentage points and individuals average labor income at ages 27–29 by CA$1,530, both of which are not statistically different from the effects of the guidance intervention, albeit slightly smaller.

Finally, I also report the effects of the guidance intervention on the long-

13. While I do observe majors and industries, I choose not to report the effects on these outcomes conditional on educational attainment because they are hard to interpret without making strong assumptions on the similarity between marginal (students whose education attainment is affected by the intervention) and inframarginal students (students whose education attainment is not affected by the intervention, but whose major and occupational choices might be).

run outcomes of high-income students. The small decline in college enrollment observed for high-income students did not convert into a decline in graduation. Rather, the fraction of students who enrolled in college and dropped out significantly decreased because of the intervention by 3 percentage points. This suggests that the intervention might have induced some high-income students with a high risk of dropping out not to enroll. I also find suggestive evidence that high-income students might have experienced an increase in income following the intervention, but the effect is insignificant at conventional significance levels.

4.3 Robustness Checks and Limitations

Appendix Table D.8 to Table D.10 present the treatment effects using alternative specifications and sample groups, namely, the inclusion of controls for baseline characteristics, the omission of observation weighting, and the restriction of the sample to students who were randomly chosen to answer the follow-up surveys as previously used by the SRDC. While the estimated treatment effects exhibit slight variations across these specifications, they generally fall within one standard error range, above or below, the estimates presented in Tables 2 and 4. Importantly, the p-values for the tests assessing the equality of treatment effects across treatments and income groups remain remarkably stable across the various specifications.

The analysis above assumes the absence of spillovers. However, since the interventions are randomized at the individual level in each school, I cannot rule out treatment spillovers between students in the same school.[14] Unfortunately, I cannot estimate the magnitude of the spillovers with the data I have. However, under the assumption that the treatment spillovers impact students in the same direction as the direct effects, the effects I estimate are ultimately lower bounds for the true effects.

14. 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 students from the other groups. Second, by changing students' enrollment behavior, each intervention might have influenced students in the other groups through peer effects.

5 Cost-Benefit Analysis

In order to assess the economic viability and societal impact of the interventions, I now present a cost-benefit analysis of each intervention in Table 5. Each element is categorized as a cost or benefit for the individual, the government (or any publicly-funded institution), and society (the sum of the two). All amounts are reported in 2019 Canadian dollars and are discounted back to the end of high school using a 3 percent discount rate as in Angrist, Autor, and Pallais (2022). They are expressed per student assigned to each intervention. Note that I only present the results for the low-income students for which all three interventions were tested.

First, the three interventions implied some direct operating costs, which include, in the case of the guidance intervention, designing and delivering the workshops, website, and magazine, and in the case of financial intervention, managing and delivering the student grant. According to Ford et al. (2012), the costs of running the guidance intervention were roughly equal to CA$4,500 per student, the costs of running the financial intervention CA$700 per student, and the costs of running the mixed intervention the sum of the two. In addition to the operating costs, students in the financial aid group received, on average, CA$4,800 in student grants from the Future to Discover Project. That amount was roughly similar for students assigned to the mixed intervention.

Second, the three interventions induced an increase in college attendance, which implies some additional tuition and fees paid by the individuals and additional student grants paid by the government.[15] Using data on enrollment and financial assistance, I estimate the total amount of tuition and fees paid by each individual as well as the total amount of student grants received and estimate the impact of the interventions on these outcomes using equation 1. I provide details on the construction of the outcomes and the estimated regressions in Appendix G. The guidance intervention increased, on average, the total tuition and fees paid by individuals by CA$2,450 and the total amount

15. I omit the potential effects of increased enrollment on provincial and governmental funding distributed to institutions.

of student grants received by CA$350. The financial aid increased the average tuition and fees paid by a smaller amount, which is consistent with the smaller increase in the time spent in post-secondary education. The financial intervention also led to a small decline in the amount of grant aid received, which can be explained by some crowding out from the Future to Discover grant received.

Finally, the three interventions are expected to induce some changes in individuals' lifetime income. Since I do not fully observe individuals' income over their lifetime, I forecast it using the income observed at age 29 and the typical income growth rate observed in the population. I then estimate the effects of the interventions on this estimated variable using equation 1. See Appendix G for more details on the calculation of lifetime income as well as on the regression estimated. I find that the guidance intervention increased individuals' lifetime income by roughly CA$56,000, which is in the same ballpark as the effects of the mixed intervention. Part of these increases in income is captured by the government through taxes: using after-tax income, I estimate that roughly 29 percent of it is transferred to the government. Moreover, in line with the effects reported in Table 4, I find virtually no effect of the financial aid intervention on lifetime income.

Taken together, these estimated amounts indicate that the guidance intervention had large benefits for the individuals through an increase in lifetime income. They also indicate that intervention can pay for itself through taxes.[16] Overall, I estimate that the intervention led to roughly CA$50,000 of net benefits for society. In contrast, I estimate that the benefits of the financial intervention for society are limited: it had only small benefits to the individuals – mostly coming from the additional financial assistance received during college – and was costly to the government. The mixed intervention implies some somewhat similar benefits to society than the guidance-alone intervention while inducing larger transfers from the government to the individuals.

16. This implies an infinite marginal value of public funds. See Hendren and Sprung-Keyser 2020 for a comparison of marginal values of public funds across different policies.

6 Discussion

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, college graduation, and income in adulthood, in Canada.

I find that the career guidance program had, on average, substantial benefits: it increased the share of low-income students who enrolled in four-year college, reduced the enrollment gap between high- and low-income students, and increased individuals' labor income significantly. I also estimate that the fiscal gains generated by the program will exceed its initial costs.

The career guidance program 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 for disentangling 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 large benefits overall, I also find evidence that the intervention induced some students to enroll, who then dropped out. Given the possible negative effects of attending college without completion (Oreopoulos and Petronijevic 2013), this suggests that the intervention might have adverse effects on 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.

In addition, I find that the financial aid intervention had limited effects

on individuals' income in adulthood, despite increasing college enrollment. It suggests that the aid induced some students with low monetary 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 who, by definition, derive little benefits from enrollment. Nonetheless, the increase in enrollment and graduation might have had non-pecuniary benefits that are not captured by my analysis (Oreopoulos and Salvanes 2011).

It is important to note that the findings from the financial aid intervention inform us about the expected impacts of increasing the generosity of the financial aid system rather than about the effects of existing financial aid policies. The effects are likely highly dependent on the institutional environment, particularly in relation to the costs of education and existing financial aid policies.

More generally, my findings shed new light on how individuals make decisions and what factors explain the link between parental income and students' educational 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 in the absence of intervention. My findings also reveal that these frictions are strongly correlated with socioeconomic status and can shape socioeconomic inequalities. In contrast, the findings from the financial aid program suggest the absence of large and binding short-run financial constraints in the context studied. It adds to a growing body of studies that highlights the importance of informational and behavioral frictions (e.g., Hoxby and Avery 2013; Campbell et al. 2022; Dynarski et al. 2021; Ainsworth et al. 2023) and the smaller role of short-run financial constraints (e.g. Keane and Wolpin 2001; Cameron and Taber 2004; Lochner and Monge-Naranjo 2012) in explaining educational inequalities.

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7 Tables

Table 1: Baseline Characteristics in Treatment and Control Groups

	Low-income students				High-income students	
	Control group mean	Difference guidance vs. control	Difference fin. aid vs. control	Difference mixed vs. control	Control group mean	Difference guidance vs. control
Student's characteristics						
Female	0.54	-0.005	0.009	-0.039	0.50	0.025
		(0.030)	(0.030)	(0.030)		(0.024)
English speaker	0.52	0.014	-0.006	-0.011	0.51	-0.000
		(0.013)	(0.013)	(0.013)		(0.012)
Has ever repeated a grade	0.17	0.012	-0.015	0.010	0.07	-0.011
		(0.022)	(0.021)	(0.022)		(0.012)
Grade 9 average test score						
Between 90%–100%	0.07	0.014	0.008	-0.004	0.18	0.009
		(0.016)	(0.016)	(0.015)		(0.018)
Between 80%–89%	0.25	0.063	0.041	0.035	0.36	0.000
		(0.026)	(0.027)	(0.026)		(0.023)
Between 70%–79%	0.31	-0.021	-0.012	-0.028	0.26	-0.022
		(0.027)	(0.027)	(0.027)		(0.021)
Between 60%–69%	0.23	-0.048	-0.029	-0.011	0.12	0.013
		(0.023)	(0.024)	(0.025)		(0.016)
Below 60%	0.11	-0.003	0.001	0.017	0.06	-0.003
		(0.018)	(0.018)	(0.019)		(0.011)
Missing	0.04	-0.006	-0.009	-0.008	0.02	0.001
		(0.011)	(0.010)	(0.010)		(0.007)
Household and parental characteristics						
Single parent	0.35	0.023	-0.007	0.015	0.08	-0.016
		(0.028)	(0.028)	(0.028)		(0.012)
Age of signing parent	41.1	0.401	-0.303	0.247	42.9	-0.144
		(0.321)	(0.323)	(0.340)		(0.221)
Number of dependents in household	1.96	-0.008	0.016	-0.030	1.88	-0.029
		(0.052)	(0.054)	(0.049)		(0.037)
One parent born outside Canada	0.38	0.012	-0.007	0.032	0.15	-0.011
		(0.028)	(0.029)	(0.029)		(0.017)
No parent working	0.21	0.005	-0.026	-0.016	0.02	-0.004
		(0.023)	(0.023)	(0.023)		(0.006)
Highest level of education of parents						
Four-year college degree	0.05	0.014	0.007	-0.001	0.29	0.004
		(0.014)	(0.014)	(0.013)		(0.021)
Community college diploma	0.40	0.012	0.049	0.033	0.51	-0.015
		(0.029)	(0.029)	(0.029)		(0.024)
High school diploma	0.32	-0.013	-0.015	-0.020	0.16	0.016
		(0.027)	(0.027)	(0.027)		(0.018)
Less than high school	0.23	-0.013	-0.041	-0.012	0.04	-0.005
		(0.024)	(0.024)	(0.024)		(0.009)
Sample size	600	1,200	1,140	1,150	610	2,090
P-value F-test of joint significance		0.37	0.92	0.74		0.94

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 are reported in parentheses.

Table 2: Treatment Effects on College Enrollment

		First enrollment	
	Ever enrolled	Four-year college	Community college
Panel A: TE on low-income students			
Guidance intervention	0.070	0.097	-0.027
	(0.029)	(0.026)	(0.026)
Financial aid intervention	0.104	0.046	0.058
	(0.029)	(0.025)	(0.027)
Mixed intervention	0.071	0.080	-0.009
	(0.029)	(0.025)	(0.026)
Panel B: TE on high-income students			
Guidance intervention	-0.031	-0.020	-0.011
	(0.021)	(0.023)	(0.021)
Sample size	4,370	4,370	4,370
Control mean low-income	0.49	0.20	0.29
Control mean high-income	0.76	0.51	0.25
P-values equality tests of TE			
TE on low-income students			
Guidance = aid	0.238	0.062	0.002
Mixed = guidance + aid	0.012	0.089	0.296
Mixed = guidance	0.969	0.536	0.493
Mixed = aid	0.258	0.209	0.016
TE of guidance			
Low-income = high-income	0.004	0.001	0.631

Notes: The table reports the effects of three interventions on college enrollment. Enrollment is measured from public institutions within 10 years of high school graduation. Each column represents a OLS regression of the dependent variable on treatment dummies, a parental income dummy, and strata dummies (equation 1). Huber-White robust standard errors are reported in parentheses. Sample sizes are rounded to the nearest 10 for data confidentiality concerns.

Table 3: Gap in Four-year College Enrollment
between High- and Low-income Students

	Control group	Guidance group	Treatment effect	% change
Gap between high- and low-income students	0.305 (0.021)	0.185 (0.028)	-0.121 (0.035)	-40%
Explained by average test scores and high school FE	0.161 (0.015)	0.141 (0.019)	-0.020 (0.024)	-12%
Unexplained by average test scores and high school FE	0.145 (0.021)	0.044 (0.024)	-0.101 (0.032)	-70%

Notes: The table reports the gap in four-year college enrollment between high- and low-income students in both the control and career guidance groups. Each gap is decomposed into a part that can be explained by students' academic preparation as measured by students' average test scores in Grade 9 and high school fixed effects, and a part that cannot. The decomposition is performed using a traditional Kitagawa-Oaxaca-Blinder decomposition using, as the reference coefficients, the coefficients from a pooled regression.

Table 4: Treatment Effects on Long-Term Outcomes

	College completion				Annual
	Four-year college	Community college	Dropped out	Years of PSE	labor income ages 27–29
Panel A: TE on low-income students					
Guidance intervention	0.048	-0.016	0.036	0.430	2,703
	(0.022)	(0.025)	(0.021)	(0.138)	(1,585)
Financial aid intervention	0.007	0.076	0.011	0.220	-381
	(0.021)	(0.026)	(0.020)	(0.131)	(1,453)
Mixed intervention	0.025	0.030	0.006	0.278	1,531
	(0.021)	(0.026)	(0.020)	(0.138)	(1,520)
Panel B: TE on high-income students					
Guidance intervention	0.013	-0.007	-0.028	-0.016	1,930
	(0.023)	(0.021)	(0.016)	(0.132)	(1,462)
Sample size	4,370	4,370	4,370	4,370	4,370
Control mean low-income	0.14	0.24	0.12	1.56	27,700
Control mean high-income	0.36	0.28	0.14	3.14	39,600
P-values equality tests of TE					
TE on low-income students					
Guidance = aid	0.066	0.000	0.249	0.119	0.060
Mixed = guidance + aid	0.335	0.430	0.162	0.054	0.723
Mixed = guidance	0.315	0.070	0.158	0.282	0.490
Mixed = aid	0.405	0.096	0.811	0.668	0.224
TE of guidance					
Low-income = high-income	0.269	0.780	0.014	0.019	0.720

Notes: The table reports the effects of three interventions on college completion, the number of years students spent in post-secondary education (PSE), and labor income in adulthood. Completion and years of PSE are measured from public institutions within 10 years of high school graduation. The income variable corresponds to the average annual income from paid employments that individuals received between ages 27 and 29. Each column represents a OLS regression of the dependent variable on treatment dummies, a parental income dummy, and strata dummies (equation 1). Huber-White robust standard errors are reported in parentheses. Sample sizes are rounded to the nearest 10 for data confidentiality concerns.

Table 5: Costs and Benefits

	Individual	Government	Society
Panel A: Guidance intervention			
Operating costs	.	-4,537	-4,537
Student grant from FTD	.	.	.
Extra tuition & fees	-2,452	.	-2,452
Extra student grant excl. FTD	356	-356	.
Additional lifetime income after-tax	40,031	.	40,031
Additional lifetime taxes collected	.	16,430	16,430
Benefits minus costs	37,935	11,538	49,472
Panel B: Financial aid intervention			
Operating costs	.	-715	-715
Student grant from FTD	4,794	-4,794	.
Extra tuition & fees	-932	.	–932
Extra student grant excl. FTD	-261	261	.
Additional lifetime income after-tax	953	.	953
Additional lifetime taxes collected	.	-1,051	-1,051
Benefits minus costs	4,554	-6,298	-1,744
Panel C: Mixed intervention			
Operating costs	.	-5,252	-5,252
Student grant from FTD	4,552	-4,552	.
Extra tuition & fees	-1,618	.	-1,618
Extra student grant excl. FTD	-36	36	.
Additional lifetime income after-tax	29,188	.	29,188
Additional lifetime taxes collected	.	14,336	14,336
Benefits minus costs	32,086	4,568	36,654

Notes: The table reports estimated costs and benefits for each of the three interventions on low-income students. All figures are reported in 2019 Canadian dollars and have been discounted to the end of high school using a 3% discount rate. Each element is categorized as a cost (negative values) or benefit (positive values) for the individual, the government, and the society. These values are expressed per student assigned to each intervention. Operating costs are derived from Ford et al. (2012). All other elements are obtained by estimating the effects of the interventions on monetary outcomes constructed from the data and using equation 1.

Supplementary Material for Online Publication

A Data Appendix

A.1 Baseline Survey

Baseline socio-demographic characteristics of the students and their parents were collected during the baseline survey in Grade 9 by the SRDC (Statistics Canada and Social Research and Demonstration Corporation 2022). I use this information to conduct balance tests, to control for baseline characteristics in some specifications, and to conduct some heterogeneity analyses.

A.2 High School Records

Students' test scores and courses taken in high school were collected by the SRDC from the provincial education department in New Brunswick (Statistics Canada and Social Research and Demonstration Corporation 2022). From these data, I use the variable "average test score in Grade 9" as a proxy for students' academic preparation. It is the average of all grades obtained by an individual during 9th grade, with one grade received per course/subject, and is expressed from 0 to 100.[17] The variable is not a perfect measure of academic preparation. First, the tests taken are not standardized across schools such that the measure can reflect differences in difficulty and grading practices across schools/teachers. Second, although students in Grade 9 in New Brunswick all take the same core courses (Mathematics, English/French, Sciences, Social studies), there are some variations for other courses (Arts, Second Language, Technology, Physical Education, Personal Development). The variable can thus also reflect some slight differences in courses taken across students.

A.3 Post-secondary Institutions Records

Post-secondary institutions records come from Statistics Canada Post-Secondary Information System (PSIS) (Statistics Canada 2022c). Linkage keys between the PSIS and SRDC experimental data were derived by Statistics Canada using students' Social Insurance Numbers, dates of birth, sex, and names that were collected during the baseline survey (Statistics Canada 2022a).

The PSIS provides student-level information on enrollment and graduation from most publicly-funded 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.

The PSIS has two limitations. First, the PSIS does not cover private institutions. Private institutions in Canada are for the vast majority private career colleges, which offer short and career-oriented programs of one year or less (Jones and Li 2015; Usher and Balfour 2023).[18] Enrollment in

17. Each course-level grade is a combination of test results and other assessments given at the class-level, and is expressed from 0 to 100.

18. Other private post-secondary institutions are non-standard universities (mostly religious), language and theo-

these private career colleges is non-negligible: it represents 11 percent of the student body according to Usher and Balfour (2023). 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. Second, although the PSIS aims to cover the universe of publicly-funded post-secondary institutions, only 80 to 95 percent of these institutions are indeed covered.[19] In particular, the PSIS records do not cover the New Brunswick community colleges before 2010. To address this important limitation, I supplement the PSIS records until 2010 with data on enrollment and graduation gathered by the SRDC from the New Brunswick Department of Post-secondary Education, Training, and Labour.

From these data, I construct the following outcomes of interest:

- "Ever enrolled in college" is a binary variable that takes the value of one if a student ever enrolled in a public college in a program leading to a certificate, diploma, or degree, and zero otherwise. Enrollment is measured within 10 years of the theoretical end of high school.
- "First enrolled in a four-year college" is a binary variable that takes the value of one if the student's first enrollment in college is in a four-year college (also called university), and zero otherwise.
- "First enrolled in a community college" is a binary variable that takes the value of one if the student's first enrollment in college is in a community college, and zero otherwise.
- "Ever completed four-year college" is a binary variable that takes the value of one if the student ever obtained a certificate, diploma, or degree from a four-year college, within 10 years of the theoretical end of high school.
- "Ever completed community college" is a binary variable that takes the value of one if the student ever obtained a certificate, diploma, or degree from a community college, within 10 years of the theoretical end of high school.
- "Dropped out from college" is a binary variable that takes the value of one if a student ever enrolled in a public college and never graduated from a public college as per the definitions above, and zero otherwise. The variable takes the value of zero for students still enrolled in college 10 years after the theoretical end of high school.
- "Years of post-secondary schooling" is the number of years a student was enrolled in a public college within 10 years of the theoretical end of high school.
- "Ever enrolled in a private career college" is a binary variable that takes the value of one if a student ever enrolled in a private career college in a program leading to a certificate, diploma, or degree, and zero otherwise. Enrollment is measured within 3 years of the theoretical end of high school.

logical schools, and offshore institutions. They all attract a small number of students (Jones and Li 2015; Usher and Balfour 2023).

19. Percentages retrieved from Statistics Canada website: https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=1324896 and https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=57878.

A.4 Tax Returns

Tax returns from the universe of tax returns in Canada from 2007 to 2019 were linked to SRDC experimental data (Statistics Canada 2022d). Linkage keys between the tax returns database and SRDC experimental data were derived by Statistics Canada using students' Social Insurance Numbers, dates of birth, sex, and names that were collected during the baseline survey (Statistics Canada 2022a).

If a tax return is not found for an individual in a particular year, which arises if the individual did not fill a return for that year, I impute the value of zero to the income variables.[20] At the time this paper is written, the returns provide information on individual annual income until 29 years old for both cohorts. From these data, I construct the following outcomes of interest:

- "Annual labor income at ages 27–29": is the average annual income that the individual received from paid employments between ages 27 and 29, before any deductions. It excludes self-employment income, tips, and gratuities (i.e., it only includes income reported in T4 slips). It is expressed in 2019 Canadian dollars.
- "Ever employed during the year of 29th birthday": is a binary variable that takes the value of one if the individual received any employment income during the year of her 29th birthday.
- "Annual income conditional on being employed during the year of 29th birthday" is the annual income that an individual received from paid employments during the year of her 29th birthday. It is only expressed for the subsample of individuals who received any employment income during the year.
- "Works in high-paying industry during the year of 29th birthday" is a binary variable that takes the value of one if the individual main employment during the year of her 29th birthday is in a high-paying industry. Industries are classified using 2-digit NAIC codes. High-paying industries are industries that pay, on average, above the median, according to Statistics Canada Longitudinal Administrative Databank (Statistics Canada 2022b). It is only expressed for the subsample of individuals who received any employment income during the year.

20. 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 a number of refunds and credits. Tax returns were not found for only 5 to 8 percent of individuals each year.

B Details on the Future to Discover Experiment

B.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 and fees in New Brunswick for one year of undergraduate schooling at a four-year college were roughly equal to CA$6,600 at the time when most students from the sample enrolled in post-secondary education (2019 Canadian dollars).[21] This is higher than in Western European countries but lower than in the U.S. (OECD 2020). Although tuition and fees are smaller in Canada compared to the U.S., financial aid policies are also less generous. In fact, comparing tuition and 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).

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.[22]

B.2 Career Guidance Workshops

The workshops were designed in collaboration with Jobmatics, Canadian Career Development Foundation, Educational Policy Institute, Allegro 168 Communications + Design, DMHS Group Inc. They were split into the following four series:

21. Tuition and 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.*

22. 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.*

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 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.

Social Research and Demonstration Corporation (2009) provides additional information on the content and delivery of the workshops.

B.3 Workshops Attendance

Figure B.1 reports the distribution of the number of workshops attended per student. On average, students attended 8 workshops out of 20, 15 percent of students never attended a workshop, and 22 percent attended most of the workshops (i.e., more than 75 percent of the workshops). Attendance declined over time: while the attendance rate at each workshop was roughly equal to 60 percent during the first year (Grade 10), it dropped to 30 percent in Grades 11 and 12. Parents were also invited to some of the workshops: 71 percent of the parents attended the orientation session and 46 percent attended at least one *Lasting Gifts* session. The numbers are derived from Social Research and Demonstration Corporation (2009), which also provides additional details.

B.4 Experimental Design

Figure B.2 provides an overview of the experimental design as well as the number of students at each step of the randomization process.

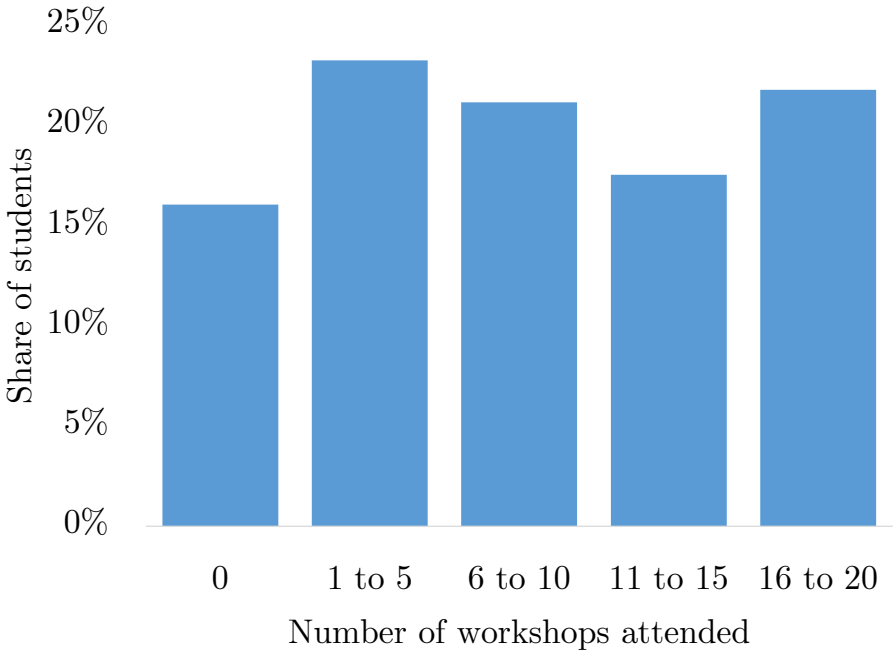


Figure B.1: Workshops Attendance

Notes: The figure reports the distribution of the number of workshops attended by each student, out of 20 workshops. The numbers are derived from Social Research and Demonstration Corporation (2009). The sample size is 1,750 students.

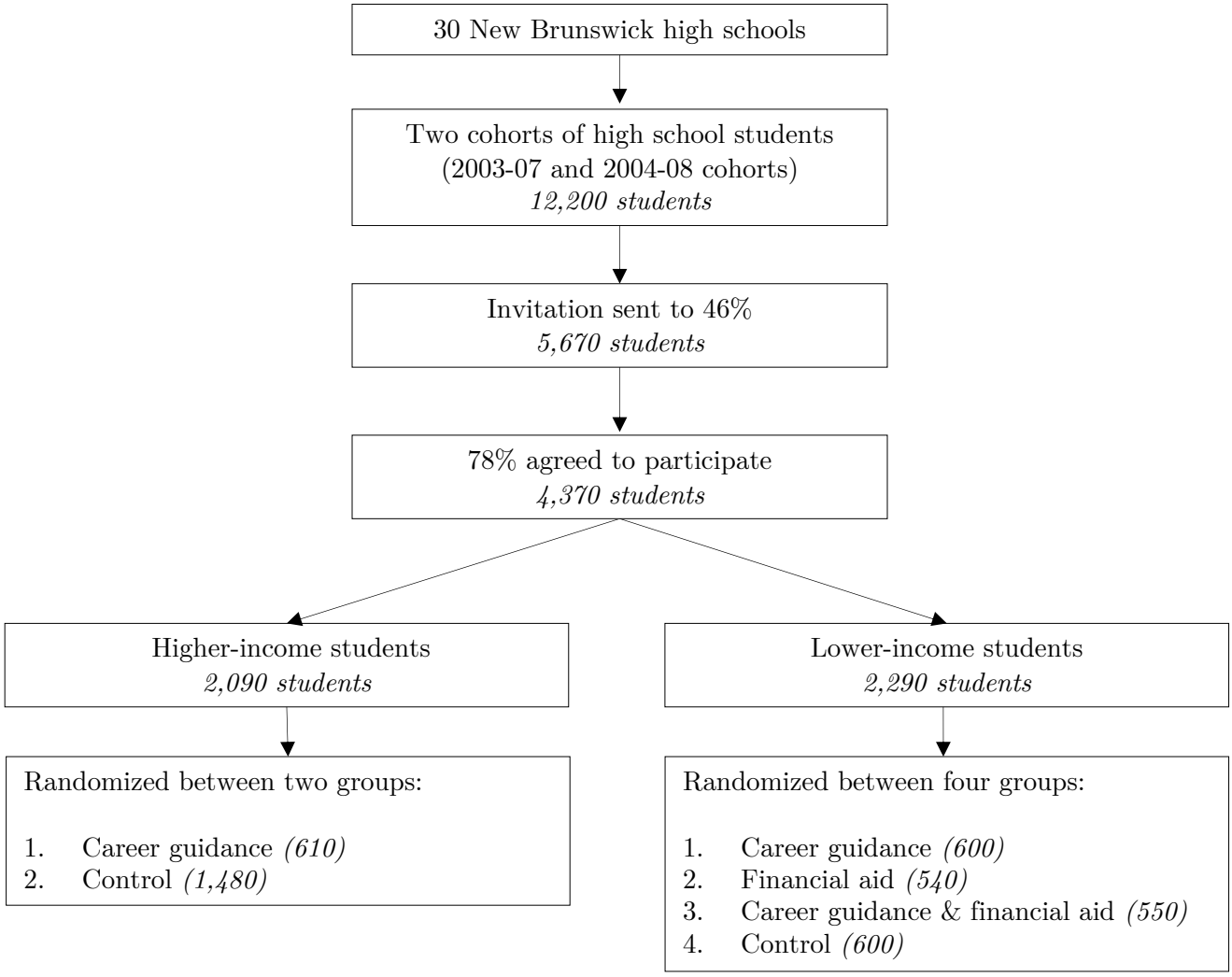


Figure B.2: Experimental Design

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 both Social Research and Demonstration Corporation 2007 and the author's calculations.

C Decomposition of the Gap in Four-Year College Enrollment by Parental Income

I decompose the gap in four-year college enrollment between high- and low-income students into a part that can be explained by students academic preparation as measured by students average test scores in Grade 9 and high school fixed effects, and a part that cannot.

Students are defined as high- and low-income students following the initial classification of students made by the SRDC for randomization purposes. The classification was done according to the family income, which was collected during the interview, and an income threshold equal to the provincial median. Appendix Table C.7 presents the decomposition of the gap between students from very high-income and very low-income families.[23]

I follow a traditional Kitagawa-Oaxaca-Blinder decomposition (Kitagawa 1955, Blinder 1973, Oaxaca 1973).[24] Specifically, consider the following linear probability model:

$$Y_{gi} = \mathbf{X}'_{gi}\beta_g + \epsilon_{gi}, \tag{2}$$

where Y_{gi} is a binary variable equals to one if student i enrolled in a four-year college, and zero otherwise. g can take the value h if student i come from a high-income family and l if student i come from a low-income family. $\mathbf{X}$ is a vector of variables capturing academic preparation, namely students average test scores in Grade 9 and high school fixed effects, and a constant. ϵ_{gi} is the error term, with $E[\epsilon_{gi}] = 0$. I include high school fixed effects in order to account for differences in test difficulty, grading practices, and courses offered across schools. The test score measure is missing for 22 students (less than 2% of the sample). I assign the mean value to these students and add an indicator of missingness into the decomposition to account for these missing values while keeping the full sample of students.

The gap in four-year college enrollment between high- and low-income students is given by:

$$E(Y_h) - E(Y_l) = E[\mathbf{X}_h]'\beta_h - E[\mathbf{X}_l]'\beta_l, \tag{3}$$

which can be rewritten as follows:

$$E(Y_h) - E(Y_l) = (E[\mathbf{X}_h] - E[\mathbf{X}_l])'\beta^* + E[\mathbf{X}_h]'(\beta_h - \beta^*) + E[\mathbf{X}_l]'(\beta^* - \beta_h), \tag{4}$$

where β^* are some reference coefficients chosen by the econometrician. In equation 4, $(E[\mathbf{X}_h] - E[\mathbf{X}_l])'\beta^*$ is the explained part of the gap, and $E[\mathbf{X}_h]'(\beta_h - \beta^*) + E[\mathbf{X}_l]'(\beta^* - \beta_h)$ is the unexplained

23. Very high-income students are students whose parents' annual income is 80k or more at the time of the baseline survey (top income category). Very low-income students are students whose parents' annual income is less than 20k at the time of the baseline survey (bottom income category).

24. In practice, the results were produced using the Stata package `oaxaca`, which follows the methodology described below (Jann 2008).

part of the gap.

In the main text, I report the decomposition using, as the reference coefficients β^*, the coefficients obtained from estimating equation 1 on the pooled sample of students.[25] Appendix Table C.6 presents the decomposition using, as the reference coefficients β^*, the low-income and high-income students' coefficients.

25. The regression includes as an additional regressor an indicator variable for parental income group.

Table C.6: Alternative Methods to Decompose the Gap in Four-year College Enrollment between High- and Low-income Students

	Control group	Guidance group	Treatment effect	% change
Panel A: Using low-income coefficients as the reference coefficients				
Explained by average test scores and high school FE	0.125	0.110	-0.015	-12%
	(0.016)	(0.018)	(0.024)	
Unexplained by average test scores and high school FE	0.180	0.074	-0.106	-59%
	(0.025)	(0.027)	(0.037)	
Panel B: Using high-income coefficients as the reference coefficients				
Explained by average test scores and high school FE	0.188	0.165	-0.023	-12%
	(0.019)	(0.023)	(0.030)	
Unexplained by average test scores and high school FE	0.117	0.020	-0.097	-83%
	(0.022)	(0.026)	(0.034)	

Notes: The table reports the gap in four-year college enrollment between high- and low-income students in both the control and career guidance groups. Each gap is decomposed into a part that can be explained by students' academic preparation as measured by students' average test scores in Grade 9 and high school fixed effects, and a part that cannot. The decomposition is performed using a traditional Kitagawa-Oaxaca-Blinder decomposition using, as the reference coefficients, the coefficients from the low-income sample in Panel A, and from the high-income sample in Panel B.

Table C.7: Gap in Four-year College Enrollment between Very High- and Very Low-income Students

	Control group	Guidance group	Treatment effect	% change
Gap between very high- and very low-income students	0.515 (0.032)	0.352 (0.044)	-0.163 (0.055)	-32%
Explained by average test scores and high school FE	0.274 (0.032)	0.270 (0.038)	-0.004 (0.050)	-1%
Unexplained by average test scores and high school FE	0.241 (0.039)	0.082 (0.044)	-0.159 (0.059)	-66%

Notes: The table reports the gap in four-year college enrollment between very high- and very low-income students in both the control and career guidance groups. Very high-income students are students whose parents' annual income is 80k or more at the time of the baseline survey (top income category). Very low-income students are students whose parents' annual income is less than 20k at the time of the baseline survey (bottom income category). Each gap is decomposed into a part that can be explained by students' academic preparation as measured by students' average test scores in Grade 9 and high school fixed effects, and a part that cannot. The decomposition is performed using a traditional Kitagawa-Oaxaca-Blinder decomposition using, as the reference coefficients, the coefficients, the coefficients from a pooled regression.

D Robustness Checks

Table D.8: Treatment Effects, Specification with Controls for Baseline Characteristics

		First enrollment		College completion				
	Ever enrolled	Four-year college	Community college	Four-year college	Community college	Dropped out	Years of PSE	Annual labor income
Panel A: TE on low-income students								
Guidance intervention	0.046	0.062	-0.016	0.020	-0.013	0.035	0.259	1,655
	(0.026)	(0.022)	(0.026)	(0.019)	(0.024)	(0.021)	(0.116)	(1,491)
Financial aid intervention	0.082	0.020	0.062	-0.013	0.074	0.009	0.085	-1,012
	(0.026)	(0.021)	(0.027)	(0.019)	(0.026)	(0.020)	(0.111)	(1,372))
Mixed intervention	0.067	0.075	-0.007	0.020	0.030	0.007	0.249	1,023
	(0.026)	(0.021)	(0.026)	(0.018)	(0.026)	(0.020)	(0.114)	(1,434)
Panel B: TE on high-income students								
Guidance intervention	-0.035	-0.027	-0.008	0.007	-0.006	-0.027	-0.050	2,116
	(0.019)	(0.019)	(0.019)	(0.019)	(0.021)	(0.016)	(0.108)	(1,378)
Sample size	4,370	4,370	4,370	4,370	4,370	4,370	4,370	4,370
P-values equality tests of TE								
TE on low-income students								
Guidance = aid	0.168	0.063	0.003	0.102	0.001	0.233	0.130	0.086
Mixed = guidance + aid	0.096	0.807	0.152	0.634	0.391	0.196	0.555	0.856
Mixed = guidance	0.417	0.586	0.734	0.991	0.094	0.179	0.929	0.693
Mixed = aid	0.573	0.013	0.010	0.080	0.104	0.900	0.146	0.170
TE of guidance								
Low-income = high-income	0.010	0.002	0.807	0.612	0.828	0.016	0.052	0.821

Notes: The table reports the effects of three interventions on the main outcomes of interest. Each column represents a OLS regression of the dependent variable on treatment dummies, a parental income dummy, and strata dummies (equation 1). Unlike the specification used in Tables 2 and 3, the specification includes controls for the baseline characteristics listed in Table 1. Huber-White robust standard errors are reported in parentheses. Sample sizes are rounded to the nearest 10 for data confidentiality concerns.

Table D.9: Treatment Effects, Specification without Weights

		First enrollment		College completion				
	Ever enrolled	Four-year college	Community college	Four-year college	Community college	Dropped out	Years of PSE	Annual labor income
Panel A: TE on low-income students								
Guidance intervention	0.064	0.091	-0.027	0.046	-0.013	0.027	0.417	2,157
	(0.028)	(0.025)	(0.026)	(0.022)	(0.025)	(0.020)	(0.137)	(1,549)
Financial aid intervention	0.100	0.042	0.058	0.007	0.079	0.004	0.229	-335
	(0.029)	(0.025)	(0.027)	(0.021)	(0.026)	(0.020)	(0.129)	(1,451)
Mixed intervention	0.071	0.081	-0.010	0.028	0.028	0.005	0.285	1,579
	(0.029)	(0.025)	(0.026)	(0.021)	(0.025)	(0.020)	(0.135)	(1,526)
Panel B: TE on high-income students								
Guidance	-0.031	-0.020	-0.011	0.012	-0.004	-0.029	-0.014	2,040
	(0.021)	(0.024)	(0.021)	(0.023)	(0.021)	(0.016)	(0.132)	(1,483)
Sample size	4,370	4,370	4,370	4,370	4,370	4,370	4,370	4,370
P-values equality tests of TE								
TE on low-income students								
Guidance = aid	0.214	0.064	0.002	0.081	0.000	0.270	0.163	0.121
Mixed = guidance + aid	0.023	0.155	0.275	0.413	0.293	0.361	0.060	0.912
Mixed = guidance	0.817	0.704	0.516	0.435	0.113	0.283	0.349	0.728
Mixed = aid	0.322	0.141	0.013	0.335	0.059	0.957	0.677	0.224
TE of guidance								
Low-income = high-income	0.007	0.001	0.624	0.276	0.801	0.028	0.024	0.953

Notes: The table reports the effects of three interventions on the main outcomes of interest. Each column represents a OLS regression of the dependent variable on treatment dummies, a parental income dummy, and strata dummies (equation 1). Unlike the specification used in Tables 2 and 3, the specification does not include weights. Huber-White robust standard errors are reported in parentheses. Sample sizes are rounded to the nearest 10 for data confidentiality concerns.

Table D.10: Treatment Effects, Specification Restricted to Follow-up Students

		First enrollment		College completion				
	Ever enrolled	Four-year college	Community college	Four-year college	Community college	Dropped out	Years of PSE	Annual labor income
Panel A: TE on low-income students								
Guidance intervention	0.084	0.110	-0.026	0.067	-0.028	0.052	0.544	3,961
	(0.031)	(0.028)	(0.028)	(0.024)	(0.027)	(0.023)	(0.151)	(1,778)
Financial aid intervention	0.104	0.046	0.058	0.007	0.076	0.011	0.220	-400
	(0.029)	(0.025)	(0.028)	(0.021)	(0.026)	(0.020)	(0.132)	(1,458)
Mixed intervention	0.071	0.080	-0.009	0.025	0.030	0.006	0.278	1,534
	(0.029)	(0.025)	(0.026)	(0.021)	(0.026)	(0.020)	(0.138)	(1,522)
Panel B: TE on high-income students								
Guidance intervention	-0.031	-0.015	-0.016	-0.002	0.001	-0.019	-0.038	2,775
	(0.023)	(0.026)	(0.023)	(0.025)	(0.023)	(0.017)	(0.145)	(1,581)
Sample size	4,370	4,370	4,370	4,370	4,370	4,370	4,370	4,370
P-values equality tests of TE								
TE on low-income students								
Guidance = aid	0.515	0.030	0.004	0.014	0.000	0.082	0.030	0.017
Mixed = guidance + aid	0.006	0.052	0.301	0.134	0.638	0.069	0.017	0.394
Mixed = guidance	0.684	0.314	0.543	0.093	0.035	0.050	0.084	0.197
Mixed = aid	0.257	0.211	0.017	0.405	0.095	0.811	0.668	0.220
TE of guidance								
Low-income = high-income	0.003	0.001	0.766	0.048	0.408	0.013	0.005	0.618

Notes: The table reports the effects of three interventions on the main outcomes of interest. Each column represents a OLS regression of the dependent variable on treatment dummies, a parental income dummy, and strata dummies (equation 1). Unlike the sample used in Tables 2 and 3, the sample is restricted to the students who were randomly selected to answer the surveys. Huber-White robust standard errors are reported in parentheses. Sample sizes are rounded to the nearest 10 for data confidentiality concerns.

E Additional Results

Table E.11: Treatment Effects on Survey Outcomes

	Aspires to pursue a four-year college degree	Ever enrolled in a private career college
Panel A: TE on low-income students		
Guidance intervention	0.119	-0.009
	(0.033)	(0.023)
Financial aid intervention	0.053	-0.005
	(0.031)	(0.021)
Mixed intervention	0.091	0.018
	(0.031)	(0.022)
Panel B: TE on high-income students		
Guidance intervention	-0.032	0.013
	(0.028)	(0.016)
Sample size	3,220	3,150
% asked to answer the survey	82%	82%
Response rate	88%	90%

Notes: The table reports the effects of three interventions on selected outcomes derived from the follow-up surveys conducted by the SRDC. Each column represents a OLS regression of the dependent variable on treatment dummies, a parental income dummy, and strata dummies (equation 1). Each regression is adjusted with inverse probability weights to be comparable with the full sample of students. 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. Sample sizes are rounded to the nearest 10 for data confidentiality concerns.

Table E.12: Heterogeneity of Treatment Effects on College Enrollment
(Low-income Students Only)

	Enrolled in a four-year college			Enrolled in a community college		
	TE guidance	TE aid	TE mixed	TE guidance	TE aid	TE mixed
Panel A: by gender						
Male	0.103	0.016	0.097	-0.026	0.116	0.023
	(0.033)	(0.030)	(0.032)	(0.038)	(0.041)	(0.038)
Female	0.092	0.068	0.074	-0.028	0.010	-0.041
	(0.037)	(0.038)	(0.038)	(0.036)	(0.037)	(0.037)
P-value equality test	0.837	0.285	0.646	0.977	0.058	0.228
Panel B: by language spoken at home						
French speaker	0.099	0.076	0.087	-0.017	0.052	-0.013
	(0.038)	(0.039)	(0.038)	(0.041)	(0.043)	(0.042)
English speaker	0.095	0.019	0.073	-0.035	0.063	-0.006
	(0.035)	(0.033)	(0.034)	(0.033)	(0.035)	(0.033)
P-value equality test	0.947	0.262	0.795	0.732	0.838	0.886
Panel C: by parental education						
No parent with	0.062	0.053	0.075	0.013	0.064	0.017
higher education	(0.030)	(0.031)	(0.031)	(0.035)	(0.038)	(0.036)
At least one with	0.125	0.026	0.076	-0.073	0.045	-0.040
higher education	(0.041)	(0.039)	(0.041)	(0.038)	(0.040)	(0.039)
P-value equality test	0.217	0.599	0.990	0.098	0.737	0.290
Panel D: by average test score in Grade 9						
Below school median	0.034	0.018	0.029	-0.026	0.078	0.010
	(0.021)	(0.020)	(0.020)	(0.034)	(0.036)	(0.034)
Above school median	0.105	0.051	0.162	-0.021	0.032	-0.041
	(0.046)	(0.048)	(0.048)	(0.040)	(0.043)	(0.042)
P-value equality test	0.162	0.524	0.011	0.928	0.416	0.345
Panel E: by aspiration for higher education in Grade 9						
Does not want a four-	0.053	0.015	0.018	0.021	0.120	0.046
year college degree	(0.027)	(0.025)	(0.025)	(0.040)	(0.043)	(0.042)
Wants a four-year	0.136	0.074	0.113	-0.064	0.010	-0.047
college degree	(0.037)	(0.037)	(0.037)	(0.034)	(0.036)	(0.034)
P-value equality test	0.073	0.187	0.033	0.109	0.051	0.088

Notes: The table reports the effects of three interventions on college enrollment for several subgroups. Each outcome × panel represents a OLS regression of the dependent variable on treatment dummies, treatment dummies interacted with a group dummy, and parental income and strata dummies. Huber-White robust standard errors are reported in parentheses. Reported p-values are for the equality tests of treatment effects across the two subgroups. Only treatment effects on low-income students are reported.

Table E.13: Treatment Effects on Additional Labor Market Outcomes

	During year of 29th birthday		
	Ever employed	Annual income cond. on being employed	Works in a high-paying industry
Panel A: TE on low-income students			
Guidance intervention	-0.004	2,617	0.056
	(0.024)	(1,863)	(0.033)
Financial aid intervention	-0.019	-491	-0.002
	(0.025)	(1,793)	(0.033)
Mixed intervention	-0.028	3,408	0.055
	(0.025)	(1,865)	(0.034)
Panel B: TE on high-income students			
Guidance intervention	0.004	2,719	0.003
	(0.017)	(1,699)	(0.026)
Sample size	4,370	3,540	3,530
Control mean low-income	0.78	37,600	0.46
Control mean high-income	0.85	49,400	0.57
P-values equality tests of TE			
TE on low-income students			
Guidance = aid	0.543	0.118	0.090
Mixed = guidance + aid	0.897	0.633	0.994
Mixed = guidance	0.344	0.696	0.974
Mixed = aid	0.740	0.047	0.102
TE of guidance			
Low-income = high-income	0.791	0.968	0.155

Notes: The table reports the effects of three interventions on selected labor market outcomes measured during the year of the individual 29th birthday. Annual income corresponds to income from all paid employments received during the year. Ever employed equals one if the individual received some employment income during the year. Industries are classified using 2-digit NAIC codes. High-paying industries are industries that pay, on average, above the median. Each column represents a OLS regression of the dependent variable on treatment dummies, a parental income dummy, and strata dummies (equation 1). Huber-White robust standard errors are reported in parentheses. Sample sizes are rounded to the nearest 10 for data confidentiality concerns.

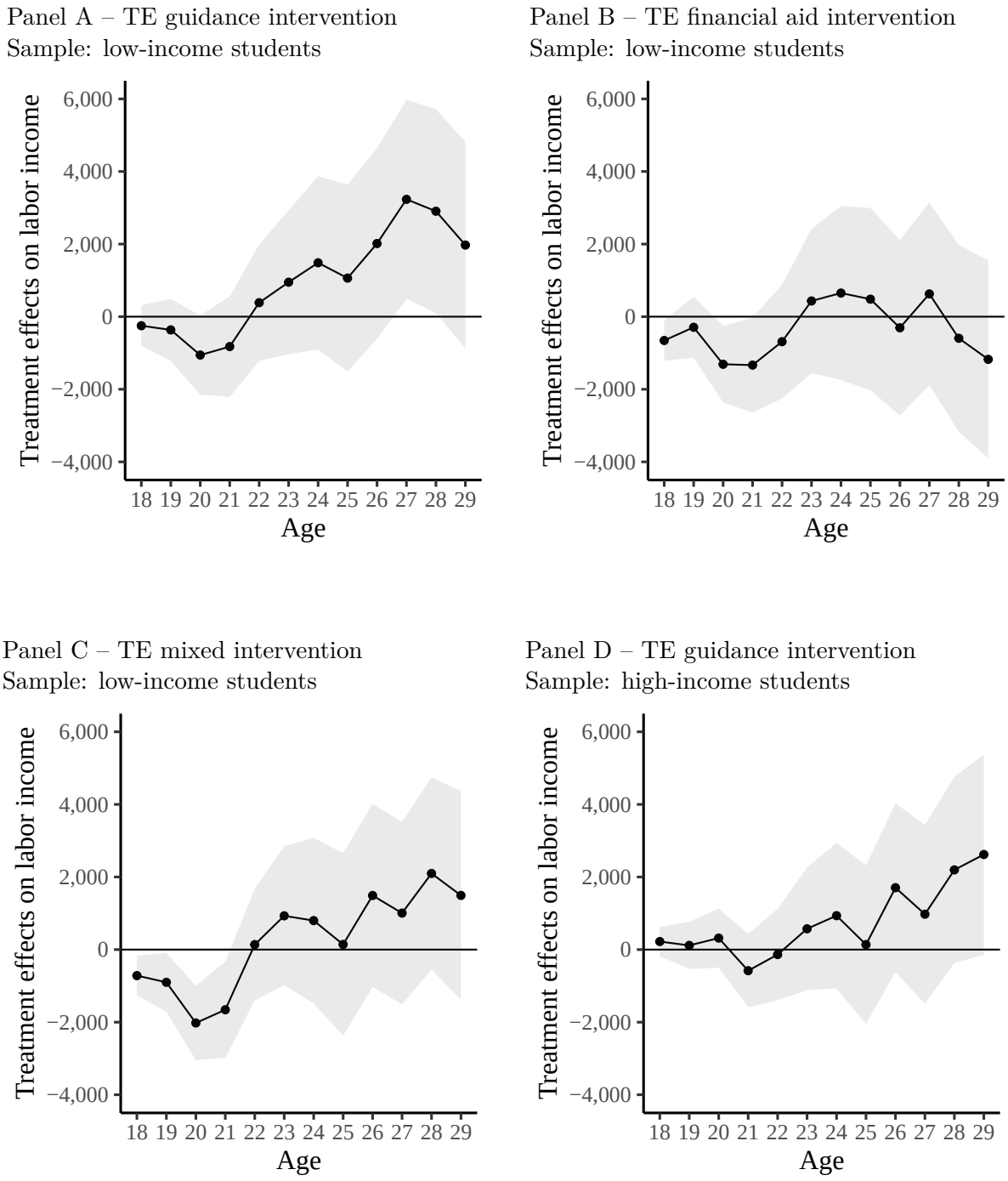


Figure E.3: Treatment Effects on Annual Labor Income over Time

Notes: The figure plots the effects of the three interventions on individuals' annual labor income over time. Point estimates together with the associated 90 percent confidence intervals are reported. Labor income correspond to income from all paid employments received during a year. Each point represents a OLS regression of the dependent variable on treatment dummies, a parental income dummy, and strata dummies (equation 1). Huber-White robust standard errors are used to compute the confidence intervals.

F Comparison with SRDC's Results

The treatment effects on college enrollment and completion for the low-income students were previously reported in a number of SRDC's reports (e.g., Ford et al. 2012; Hui and Ford 2018; Ford, Hui, and Kwakye 2019). For comparison, I present in Table F.14 the estimates reported above in Tables 2 and 4 together with SRDC's most recent estimates (as in Hui and Ford 2018). Note that the effects of the interventions on income in adulthood and on high-income students were not reported in the SRDC's reports and are thus not presented in Table F.14.

The results presented in this paper are generally consistent with the effects previously presented in Hui and Ford (2018): there is, on average, a 2.3 percentage points distance between the estimates reported in Hui and Ford (2018) and the estimates I report in Tables 2 and 4, which is equivalent to one standard error of the estimates.

The differences in the estimates reported could be explained by a difference in the construction of the outcomes as well as the specification used to estimate the effects. On the one hand, there are three main differences between the outcomes used in this paper and the outcomes used in Hui and Ford (2018). First, I use the Post-Secondary Information System, which allows, unlike the data collected by the SRDC, to capture enrollment and graduation from institutions outside the Maritimes Provinces. Second, the new data allow me to construct the outcomes using a longer time window than previously possible (within 10 years of high school graduation versus within 7 years). Finally, I report the effects on first enrollment, while Hui and Ford (2018) report the effects on enrollment at any time within 7 years of high school graduation. On the other hand, my understanding is that Hui and Ford (2018) use a regression with controls for baseline characteristics, without weights, and restrict the sample to students who were randomly chosen to answer the follow-up surveys, although the specification used is not clearly indicated. As I show in Tables D.8, D.9, and D.10, the estimated treatment effects vary slightly across alternative specifications, which might also explain some of the differences.

To understand how much of the difference between my estimates and the ones presented in Hui and Ford (2018) is explained by how the outcomes are constructed versus the specification used, I estimate the treatment effects estimated from equation (1) following similar definitions of the outcomes as in Hui and Ford (2018). The effects are reported in Column (2) of Table F.14. This exercise suggests that one-third of the observed difference between the estimates I report and the ones reported in Hui and Ford (2018) is explained by differences in the construction of the outcomes, and two-thirds of the observed difference is explained by differences in the specification used to estimate the effects.

Table F.14: Comparison with estimates in Hui and Ford (2018)

	Estimates reported in Tables 2 and 4 (1)	Estimates using the same definitions as in Hui and Ford (2018) (2)	Estimates reported in Hui and Ford (2018) (3)
Panel A: Enrollment in four-year college			
Guidance intervention	0.097	0.100	0.057
	(0.026)	(0.026)	(0.027)
Financial aid intervention	0.046	0.032	-0.004
	(0.025)	(0.025)	(0.025)
Mixed intervention	0.080	0.073	0.056
	(0.025)	(0.025)	(0.024)
Panel B: Enrollment in community college			
Guidance intervention	-0.027	-0.002	-0.015
	(0.026)	(0.026)	(0.028)
Financial aid intervention	0.058	0.083	0.074
	(0.027)	(0.027)	(0.025)
Mixed intervention	-0.009	0.021	0.018
	(0.026)	(0.026)	(0.027)
Panel C: Completed four-year college			
Guidance intervention	0.048	0.027	0.012
	(0.022)	(0.020)	(0.021)
Financial aid intervention	0.007	0.002	-0.016
	(0.021)	(0.019)	(0.018)
Mixed intervention	0.025	0.013	-0.003
	(0.021)	(0.019)	(0.018)
Panel D: Completed community college			
Guidance intervention	-0.016	-0.008	-0.012
	(0.025)	(0.023)	(0.022)
Financial aid intervention	0.076	0.089	0.082
	(0.026)	(0.025)	0.023)
Mixed intervention	0.030	0.036	0.042
	(0.026)	(0.024)	0.022)
Average distance			
Col. (1) and (3)		0.023	
Col. (2) and (3)		0.016	

Notes: The table reports in Column (1) the treatment effects reported in this paper (as in Tables 2 and 4), and in Column (3) the treatment effects reported by the SRDC (as in Hui and Ford (2018)). Column (2) also reports the treatment effects estimated from equation (1) following similar definitions of the outcomes as in Hui and Ford (2018). Standard errors are reported in parentheses.

G Details on Cost-Benefit Calculation

G.1 Tuition and Fees and Financial Assistance

I estimate the total amount of tuition and fees paid by each individual in the sample by imputing a value of 6,570 for each year of four-year college and 3,100 for each year of community college. These values are a rough estimation of tuition and fees paid by the individuals based on Statistics Canada *Table 37-10-0045-01 Canadian and international tuition fees by level of study* as well as on the tuition and fees indicated on the main institutions' websites (expressed in 2019 Canadian dollars). I estimate the total amount of student grants received from the government using data on financial assistance collected by the SRDC from New Brunswick institutions. I discount all flows back to the end of high school using a 3 percent discount rate.

G.2 Lifetime Income

To estimate each individual's lifetime income, I proceed in three steps. First, I use the 2021 Canadian Census (Statistics Canada 2023) to estimate the typical income growth rate in Canada over time. Specifically, I follow the same methodology as in Angrist, Autor, and Pallais (2022) and estimate the following Poisson regression model on a representative sample of individuals aged 25 to 65 from the Census:

$$\log E(Y_{it}) = \alpha + \beta f(exp_{it}) + \gamma S_i$$

where Y_{itg} is the individual i annual income expressed in 2019 Canadian dollars at age t, $f(exp_{it})$ is a polynomial of degree 4 of the individual imputed years of experience at age t, and S_i is a vector of dummies for the highest level of education obtained by the individual (bachelor degree or short-cycle diploma). The advantage of the Poisson regression model over traditional log models is that it allows the income variable to include zeroes. I impute years of experience with $t - 25$ for individuals with a bachelor's degree, $t - 22$ for individuals with a short-cycle diploma, and $t - 19$ for individuals with no higher education credential. I estimate the model by gender to take into account different income trajectories over time for women and men.

Second, going back to the experimental data, I project each individual's income observed at age 29 using the β coefficients and imputed years of experience, from age 30 to age 65. Specifically, individual i forecasted income at age t is:

$$\hat{Y}_{it} = Y_{i,29} \times \exp\left[\beta(f(exp_{it}) - f(exp_{i,29}))\right]$$

Finally, I compute the lifetime income of each individual by taking the discounted sum of actual

and forecasted income flows from 18 to 65 years old, as follows:

$$LI = \sum_{t=18}^{29} \frac{Y_{it}}{(1+r)^{(t-18)}} + \sum_{t=30}^{65} \frac{\hat{Y}_{it}}{(1+r)^{(t-18)}}$$

with r the discount rate equal to 3 percent as for the rest of the cost-benefit calculation.

G.3 Treatment Effects

I estimate the effects of the interventions on the monetary outcomes described above using equation 1. Results are presented in Table G.15.

Table G.15: Treatment Effects on Lifetime Monetary Outcomes

	Net present value of lifetime flows			
	Tuition and fees	Student grant from gvt.	Income before-tax	Income after-tax
Guidance intervention	2,452	356	56,461	40,031
	(784)	(220)	(41,889)	(30,767)
Guidance intervention	-2,470	-319	-1,103	242
× High-income	(1,111)	(258)	(60,730)	(43,668)
Financial aid intervention	932	-261	-97	953
	(749)	(207)	(40,979)	(30,253)
Mixed intervention	1,618	-36	43,524	29,188
	(781)	(208)	(44,489)	(32,852)
Sample size	4,370	4,370	4,370	4,370

Notes: The table reports the effects of three interventions on the net present value of lifetime monetary outcomes. Values are discounted back to the end of high school using a 3 percent discount rate and are expressed in 2019 Canadian dollars. Each column represents a OLS regression of the dependent variable on treatment dummies, a parental income dummy, and strata dummies (equation 1). Huber-White robust standard errors are reported in parentheses. Sample sizes are rounded to the nearest 10 for data confidentiality concerns.