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Working Paper

Long-Run Effects from Comprehensive Student Support: Evidence from Pathways to Education

IZA Discussion Papers, No. 12203

Provided in Cooperation with:

IZA – Institute of Labor Economics

Suggested Citation: Lavecchia, Adam M.; Oreopoulos, Philip; Brown, Robert S. (2019) : Long-Run Effects from Comprehensive Student Support: Evidence from Pathways to Education, IZA Discussion Papers, No. 12203, Institute of Labor Economics (IZA), Bonn

This Version is available at:

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MARCH 2019

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ISSN: 2365-9793

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ABSTRACT

Long-Run Effects from Comprehensive Student Support: Evidence from Pathways to Education*

We estimate long-run impacts to the Pathways to Education program, a comprehensive set of coaching, tutoring, group activities and financial incentives offered to disadvantaged students beginning in Grade 9. High school administrative records are matched to income tax records to follow individuals up to the age of 28, even when they leave the household or province. We find significant positive effects on persistence in postsecondary education institutions, earnings and employment. Program eligibility increased adult annual earnings by 19 percent, employment by 14 percent and reduced social assistance (welfare) receipt by more than a third.

JEL Classification: I2, I26, I28, J18

Keywords: comprehensive high school student coaching, tutoring, financial support, Pathways to Education, long run effects

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* We are grateful to Douwre Grekou and Beryl Li at Statistics Canada for help with accessing the data, Annik Beaudry, Barbara Bekooy, Chris Esposito and Joe Iacampo at Employment and Social Development Canada (ESDC) for many helpful conversations. We thank Statistics Canada and ESDC for financial support and to Abel Brodeur, Jason Garred, Steve Lehrer, Louis-Philippe Morin and Jeff Smith for comments and discussions. Any errors or omissions are those of the authors.

1. Introduction

Children that grow up surrounded by poverty often remain in poverty even into adulthood (Chetty et al., 2014). To try to break this cycle, governments and nonprofit institutions have developed a broad range of policies and interventions. These include: home visitations to disadvantaged parents with young children (Schweinhart et al., 2005; Heckman, Pinto and Savelyev, 2013; Conti, Heckman and Pinto, 2016; García et al., 2017; García, Heckman and Ziff, 2017), assistance to move to better neighborhoods (Katz, Liebman and Kling, 2001; Ludwig et al., 2013; Chetty, Hendren and Katz, 2016; Chetty and Hendren, 2017), reforms to school accountability and teacher pay (Goodman and Turner, 2013; Gilraine, 2018), lowering class sizes (Chetty et al., 2011), expanding effective charter schools (Abdulkadirogulu et al., 2011; Dobbie and Fryer, 2011, 2013; Fryer, 2014) and providing subsidies for higher education (Conger and Turner, 2017; Denning, Marx and Turner, 2018).

Recent evidence indicates particular promise from offering more structure and comprehensive education support programs to disadvantaged students. A randomized trial in Chicago, for example, tested a program that provided disadvantaged high school students regular social-cognitive skill training and mandatory daily tutoring during school and found dramatically improved math performance and school engagement (Cook et al., 2014; Heller et al., 2017). Another randomized trial testing a program that offered a wide array of social, community, and educational after-school services to disadvantaged high school students found large improvements to graduation rates and college enrollment (Rodríguez-Planas, 2012, 2017). At the college level, one of the most effective programs ever tested has been the Accelerated Study in Associate Program (ASAP), which requires that college students enroll full-time, attend mandatory tutoring,

regular counseling and career advising services, and receive free public transportation passes and funding for textbooks. ASAP doubled graduation rates at the City University of New York and had similarly large impacts on persistence from a replication attempt in Ohio (Scrivener et al., 2015; Sommo and Ratledge, 2016). The Carolina Covenant aid program is another college-based support system, where eligible students received financial aid (through a mix of grants and work study funding) and a variety of services including career exploration workshops, peer mentoring and support with navigating the university's wellness and academic programs. Clothfelter, Hemelt and Ladd (2018) find that eligibility increased credit accumulation through the first three years of college and suggestive evidence points to positive impacts on graduation rates.¹

The Pathways to Education program (often referred to simply as Pathways) resembles ASAP and Carolina Covenant but at the high school level, offering disadvantaged youth in Grades 9 through 12 free public transportation and postsecondary financial aid in exchange for commitments to regularly meet with an advisor, access tutoring assistance, and attend character-building group events. Pathways began in 2001 as a grassroots effort by social workers at the community health center in the Regent Park public housing project in Toronto. Regent Park is Canada's oldest and largest public housing project and is one of the poorest communities in Toronto. Eligibility is based solely on place of residence; for example, at its Regent Park site, only students living in the neighborhood's public housing units are eligible for the program. In previous work, we estimated that the introduction of Pathways increased high school graduation and college enrollment by about 10 to 20 percentage points (Oreopoulos, Brown, and Lavecchia, 2017).

¹ Page et al. (2017) estimate the impact of the Dell Scholars program on postsecondary completion. Using two identification strategies, they find evidence that eligibility for the program increases the likelihood of receiving a bachelor's degree for low-income students.

Programs like Pathways and ASAP appear effective at improving education attainment, but cost thousands of dollars per student. To justify these costs, it is necessary to consider long-term benefits. What policy makers are ultimately concerned with is return on investment in improving lifetime outcomes, such as earnings, in order to break the cycle of poverty. With the possibility that short-run impacts on academic outcomes may not easily translate to significant long-term impacts (Demming, 2009; Chetty et al., 2011), the ability for comprehensive programs to improve long-run outcomes is an open question.

This paper delivers encouraging evidence that comprehensive student support programs like Pathways, can indeed lead to meaningful, long-run labor market benefits, including higher employment rates and earnings and a reduced reliance on social assistance (welfare). We exploit the lottery nature of being assigned to a particular public housing project (which also determines Pathways eligibility) and unique administrative data that links school records, personal income tax files and information from employers. Our data allow us to follow those eligible for Pathways and a comparison group of students living in other public housing units from the year they begin high school, through college and early into early adulthood. Using a quasi-random-assignment and difference-in-differences research design, we find that eligibility for Pathways increases postsecondary education attainment and the earnings of young adults. Between the ages of 19 and 24, eligibility for Pathways increases annual tuition expenditures at 2-year colleges and 4-year universities by between \$229 and \$760 or 30 to 100 percent. Consistent with a delayed labor market entry due to staying in school longer, eligibility for Pathways leads to lower adult earnings from age 19 to 23, but higher earnings from age 26 to 28. We estimate that by age 28, eligibility for Pathways increases earnings by about \$3,100 per-year (2015 Canadian dollars) or 19 percent and the likelihood of being employed by 6-7 percentage points or 10-13 percent.

We find that Pathways has an impact on a variety of other monetary and non-monetary outcomes. Eligibility reduces social assistance receipts by \$300-\$500 (30-50 percent) and reduces the likelihood of having a child as a young adult by a third (32.3 versus 49.7 percent). These findings suggest that the large costs from offering an envelope of comprehensive services to disadvantaged youth at the high school level may nevertheless be worth it due to impressive long-run gains.

The remainder of the paper is structured as follows. Section 2 describes the main features of the Pathways to Education program. In Section 3, we describe the administrative datasets and empirical strategy. Sections 4 and 5 report the main results and various sensitivity checks. Section 6 provides some concluding comments.

2. Background on the Pathways Program

Pathways to Education is a non-profit organization that delivers a comprehensive program to support at-risk youth.² The program began in 2001 as a grass-roots effort by community workers in Regent Park, Toronto. In the City of Toronto, social housing is the responsibility of the Toronto Community Housing Corporation (TCH). The TCH operates high-rise apartment, single family and mixed housing units in 106 neighborhoods. TCH residents pay rent geared to income with payments are capped at 30 percent of gross income.

The Regent Park public housing project comprises more than 2,000 apartment units within a self-contained downtown community. The community has historically faced high levels of

² The discussion in this section borrows heavily from Section 2 of Oreopoulos, Brown and Lavecchia (2017).

poverty and crime. Around the time of the introduction of Pathways, fewer than 50 percent of Regent Park youth graduated high school and more than half of households had no earnings.

The Pathways program in Regent Park is available to all students living within the community's catchment area and attending high school. Eligibility for the program was phased in for successive cohorts, beginning with the entering Grade 9 cohort in September 2001. The fact that older Regent Park cohorts were never eligible for the Program – even Grade 9 students in September 2000 -- allows us to evaluate the impact of Pathways using a difference-in-differences design, described in Section 3. Over the past decade and a half, Pathways has expanded to 20 sites across 8 provinces Canada, including three additional sites in Toronto.³

Although Pathways is available to all high school students living in Regent Park, participation is voluntary and requires students and parents to agree each year in writing to the program's conditions and high expectations. Participation is nevertheless extremely high, often in excess of 85-90 percent (Oreopoulos, Brown and Lavecchia, 2017). Perhaps the community-based nature of the program contributes to this critical mass of interest and fosters near-complete buy-in from eligible families.

Pathways is defined by four pillars of support: counseling, financial, academic and social. Upon enrolling in the program, each student is assigned to a student-parent support worker (or SPSW) that is employed-full time by Pathways. Students meet with their SPSW at least twice a month, more if necessary, to discuss their participation in the program, attendance in school, academic performance, college applications, job search and any other issues that may arise. In later grades, SPSWs help with resume preparation, job interview practice and organizing visits with

³ An up to date list of all Pathways sites is available at: <https://www.pathwaystoeducation.ca/pathways-communities>.

postsecondary institutions and potential employers. SPSWs also act as the point of contact for parents and schools.

Financial support for Pathways students comes in two forms. Immediate assistance and incentives for attending school takes the form of free public transportation tickets and school supplies that are distributed during student-SPSW meetings. Long-term financial assistance is provided through a trust fund for each participant. For each year a student is registered, the program sets aside \$1,000 CAD, up to a maximum of \$4,000 (tax-free), that can be used towards tuition and other post-secondary expenses. This bursary covered approximately 15-20 percent (33 percent) of the tuition for one academic year at four-year universities (two-year colleges) in Ontario over the 2006-2014 period.

The third pillar of the Pathways program, academic support, is comprised of free tutoring. Tutoring sessions are conducted in small groups or on a one-on-one basis if necessary. Pathways tutors are volunteers that receive some training from the organization and teach about five hours per week. Tutoring support is available in core academic subjects up to four nights a week and is mandatory for students with a GPA below a threshold (usually 65 percent).

The fourth pillar of the Pathways program is social support. In grades 9 and 10, this support takes the form of group mentoring activities. Students select at least two activities per month from a list of daily options provided by the program. In recent years, these activities have included: attending sporting events, theater, participating in creative arts programs, cooking, community recycling projects and martial arts. The activities are designed to develop students' social and group work skills, as well as to foster friendships among program participants. The typical mentoring group activity features 15 students and three volunteer mentors. Pathways allows students to take a more active role in selecting mentoring activities as they progress through high

school. In grades 11 and 12, students are able to propose biweekly activities to their SPSW that better align with their interests and skills, including tutoring younger grades.

3. Data and Empirical Strategy

3.1 Data

We merged administrative data from Toronto Community Housing (TCH), the Toronto District School Board (TDSB), and Statistics Canada. In this section, we summarize this process and the construction of key variables. Online Appendix A contains additional details. TDSB administrative data are available for students who entered grade 9 beginning in September 2000, the year before Pathways was introduced. We also used data for a smaller cohort of students that enrolled in Grade 9 in September 1999 in the former City of Toronto before the city was amalgamated in 1998 to include the suburbs of East York, Etobicoke, North York, Scarborough and York. This additional year was used to check the sensitivity of our results to having one pre-Pathways cohort in our baseline sample. The TDSB data were matched to TCH data using uniquely identifiable postal codes from school enrollment forms. This allowed us to construct a dataset of all students enrolled in TDSB schools and living in one of the 70 public housing projects built by TCH that only house families paying subsidized rents.⁴

That the application process for TCH housing units was centralized and the demand for units far exceeded supply is important for our empirical strategy. Applying for a TCH unit required filling out a standardized form that assessed an applicant's income and need for housing, as well

⁴ We focus on the 70 TCH sites that exclusively house tenants paying rent geared to income; the remainder house a mix of families paying subsidized and market rent or seniors.

as broad geographic preferences. Because the number of applicants far exceeded the number of available units, offers were made based on a first-come, first-serve basis, with some preferential treatment for applicants that were survivors of domestic abuse and human trafficking, terminally ill applicants and over-housed tenants. Most applicants indicated they were interested in all TCH projects to reduce their waitlist time, which averaged around 5 years (Toronto Social Housing Connections, 1998). Consequently, where a TCH resident ended up was largely determined by the availability of units at the time they were at the top of the waiting list and, therefore, not only were the young adults in our sample very similar in terms of the circumstances that brought them to public housing as children, but assignment to Regent Park and eligibility for Pathways was similar to a lottery. It was unlikely that families would have known about the program and selected into Regent Park prior to the introduction of Pathways.

We matched the TDSB-TCH data to administrative data from Statistics Canada for the 2005-2015 years. These data offer rich information on Canadian tax filers' postsecondary enrollment and tuition expenditures, earnings, social assistance and UI receipt, as well as marital status and number of children. TDSB public housing students were matched to the administrative tax records using their first and last name and date of birth. Although individuals appear in the tax data as soon as they obtain a Social Insurance Number (SIN) and file a tax return, we restricted the analysis sample to those at least 19 years old in each calendar (tax) year. This leaves us with an unbalanced panel of 8,605 public housing students between 2005 and 2015 or 48,069 individual-year observations.

We estimated the causal effect of eligibility for Pathways on a variety of long-term outcomes, beginning with persistence in postsecondary education programs. The tax data contain information on the tuition payments made to recognized postsecondary institutions over a calendar

year (Canadian tax filers over the age of 16 may claim a nonrefundable tax credit for eligible tuition payments). We used these tuition payments to proxy for persistence in college or university. Our two primary labor market outcome variables were a dummy variable equal to one if an individual received positive employment earnings and zero otherwise and the total earnings over a calendar year.⁵ Earnings for those not working were coded as zero. The data also contain information on social assistance payments received, unemployment insurance (UI) benefit payments, marital status and the number of children (both under the age of 6 and under the age of 18).⁶ Background variables were constructed from both the TDSB and tax data and included gender, immigrant status, language spoken at home, age at the start of high school, and age in the current tax year.⁷ We deflated all dollar amounts are to 2015 dollars using the Bank of Canada's Consumer Price Index.

3.2 Empirical Strategy

Below we display estimates of the causal effect of eligibility for Pathways on long-term outcomes using a difference-in-differences approach, taking advantage of the program's gradual roll-out to successive Grade 9 students. Our research design compares the outcomes of individuals that were assigned to live in Regent Park during high school with students that were assigned to other Toronto public housing projects before and after Pathways was introduced. Since our data

⁵ For individuals work worked for multiple employers, earnings are equal to the sum of the wages paid at all firms. Our measure of earnings also includes self-employment income.

⁶ Unemployment insurance benefits in Canada are delivered through the Employment Insurance (EI) program.

⁷ Online Appendix Table A2 reports summary statistics for select dependent and independent variables for the 2015 calendar year.

follows young adults from the time they leave high school until their late 20s, we are able to estimate heterogeneous impacts of Pathways by age. Our main estimating equation is

$$y_{i(pc)a} = \sum_{a=20}^{29} \gamma^a 1[Age_{i(pc)a} = a] + \sum_{a=20}^{28} \beta^a T_{i(pc)} 1[Age_{i(pc)a} = a] + X'_{i(pc)} \delta + e_p + e_c + e_{i(pc)a} \quad (1)$$

where the subscript i denotes an individual, a denotes calendar age (in years), p denotes housing project and c denotes cohort (the year entered grade 9). The variable $1[Age_{i(pc)a} = a]$ is equal to one if individual i is age a in year t and zero otherwise (the omitted age dummy is for 19 year-olds). The individual time invariant characteristics mentioned earlier are encapsulated by the vector X'_{ipc} , and e_p and e_c are housing project and year fixed effects, respectively. $T_{i(pc)}$ is a dummy variable equal to one for those that lived in Regent Park and entered Grade 9 after September 2001 (eligible for Pathways) and equal to zero otherwise. Standard errors are clustered at the housing project level to allow for serial correlation and heterogeneity in the outcomes of students that resided in the same housing project (Cameron and Miller, 2015).⁸

The coefficient β^a is the average causal effect of being eligible for Pathways on outcome y at age a .⁹ If eligibility for Pathways increases postsecondary persistence and delays labor market entry, we expect that the β^a coefficients will be decreasing in age when postsecondary tuition

⁸ As a sensitivity test, we also implement the effective degrees of freedom correction for the clustered robust variance estimator suggested by Young (2016). The results are reported in Appendix Table A14 and discussed in Online Appendix B. In general, the estimated standard errors using this procedure are larger than those reported in the main results.

⁹ Since the registration rate for Pathways is extremely high (see Figure 1 in Oreopoulos, Brown and Lavecchia (2017)), the casual effects of participation in Pathways or treatment-on-the-treated (TOT) effects will be similar to the intent-to-treat (ITT) effects reported below.

expenditures is the dependent variable. We expect the opposite age pattern when earnings and labor supply variables are the dependent variables of interest. The identification of causal effects in our setting requires that the parallel trends assumption is satisfied: in the absence of the introduction Pathways, the average outcomes of young adults from Regent Park would have followed the same path as the other public housing (OPH) projects. We report a number of robustness checks in Section 4 and in the Online Appendix to assess the validity of this assumption.

Note that our estimate of the causal effect of eligibility for Pathways on earnings for young adults may understate the effect of the program on more mature workers. This is because a delayed labor market entry (due to increased schooling) will mean that Pathways-eligible individuals will have less labor market experience, on average, than their ineligible peers. Recent research suggests that the earnings-experience profile is steep for young workers in Canada (Mincer, 1974; Boudarbat, Lemieux and Riddell, 2010). This is important to keep in mind when interpreting the results in Section 4.

4. Results

4.1 Graphical Evidence

Figure 1 illustrates our identification strategy for the main dependent variables of interest. The figure plots average tuition expenditures (Figure 1a), earnings (Figure 1b) and employment (Figure 1c) by year entered Grade 9 for the 2015 tax year. Recall that there exists an inverse relationship with an individual's Grade 9 year of entry and their age in 2015. The dark circle markers are the unconditional means for young adults that lived in Regent Park during high school and the diamond markers are the unconditional means for those that lived in OPH.

Figure 1a plots the relationship between average tuition expenditures and year of Grade 9 entry and reveals two clear patterns. The first is that tuition expenditures are much higher for younger cohorts (those who entered Grade 9 in 2005 or later) in both Regent Park and OPH. The second is that the tuition expenditures of young adults from Regent Park closely track those from OPH, except during the years immediately after high school when individuals are in their early 20s. In particular, the average tuition expenditures of young adults from Regent Park that entered Grade 9 in 2000, the year before Pathways was introduced, is similar to that of young adults from OPH. The same is true for the 2001-2004 Regent Park cohorts who are age 25 to 28 in 2015. However, young adults in the 2006-2008 Regent Park cohorts (age 21 to 23 in 2015) have much higher tuition expenditures, on average, than those that lived in OPH. For example, young adults in the 2006 Regent Park cohort claimed an average of \$1,445 in tuition expenditures in 2015 compared with \$918 for young adults from OPH.

If the parallel trends assumption holds, then the difference between the postsecondary tuition expenditures of young adults from Regent Park and OPH can be interpreted as the causal average effect of eligibility for Pathways at a particular age. Under this assumption, the means in Figure 1a suggest that eligibility for Pathways increases expenditures until about age 25 before tapering off.

Figure 1b plots the relationship between 2015 earnings and year of Grade 9 entry. The figure shows that the 2000 OPH cohort earned \$18,000, on average, in 2015. Young adults in the same cohort that lived in Regent Park earned \$2,400 more (or \$20,400), an average, in 2015. The earnings gap between Regent Park and OPH young adults increases substantially in the subsequent cohorts, precisely when Pathways was introduced in Regent Park. The earnings difference between young adults that lived in Regent Park and the OPH sites ranges between \$3,200 and \$4,900 for

the 2001 to 2004 Grade 9 cohorts. For more recent cohorts, the earnings gap is small and sometimes negative. Overall, the raw data presented in Figures 1a and 1b suggest that eligibility for Pathways increases expenditures on tuition at postsecondary students for young adults under the age of 25 and increases earnings for those in their mid- to late 20s. This age pattern is consistent with a delayed labor market entry due to higher postsecondary education attainment.

Figure 1c shows that there is a similar age pattern for the employment status dummy as with earnings. The figure suggests that eligibility for Pathways increases the fraction of young adults in their mid- to late 20s that report positive earnings. Effects for more recent cohorts is mixed, perhaps because the employment rate for younger adults is more volatile, especially for the 2006-2008 cohorts.

4.2 Regression Analysis

The means in Figure 1 illustrate our empirical strategy but are based on 2015 data only. In the remainder of the analysis, we pool data from 2005-2015 and estimate equation (1) on the sample of young adults that lived in public housing and entered Grade 9 between 2000 and 2006.¹⁰ Table 1 reports estimated γ^a 's and β^a 's from equation (1) for our three main outcomes: tuition expenditures (column 1), earnings (column 2) and employment (column 3). The estimates in Table 1 confirm the graphical evidence in Figure 1. In particular, the estimate for β^{19} in column 1 suggests that eligibility for Pathways increases tuition expenditure by a statistically insignificant \$229 at age 19. Between the ages of 20 and 24, eligibility for Pathways is estimated to increase

¹⁰ We restrict the sample to those that entered Grade 9 no later than 2006 to avoid contaminating the OPH comparison group with the Pathways expansion sites of Rexdale and Lawrence Heights, where Pathways was introduced on 2007.

tuition expenditures by between \$360 and \$760 per year. Each of the $\beta^{20} - \beta^{24}$ coefficient estimates is statistically significant at the one percent level. To put these numbers in perspective, the average tuition expenditure at age 19 for the 2000 OPH cohort is \$730 (see online Appendix Table A3). Compared with this benchmark, eligibility for Pathways increases tuition expenditure claims by 49 to 104 percent between the ages of 19 and 24. Beginning at age 25, the estimated impact of Pathways on tuition expenditures falls dramatically.¹¹

In previous work, we found that eligibility for Pathways increased high school graduation rates and the fraction of youth admitted to a college or university (Oreopoulos, Brown and Lavecchia, 2017). However, enrollment in a postsecondary institution does not guarantee success or graduation, especially for students from disadvantaged families that face additional pressures, such as financial constraints, work requirements and family obligations (Oreopoulos and Petronijevic, 2013; Scrivener et al., 2015). Although our administrative data does not have a direct measure of postsecondary education attainment, postsecondary tuition expenditure claims allow us to infer the number of (calendar) years a student attends a postsecondary institution. The estimates in column 1 of Table 1 suggest that eligibility for Pathways leads to higher expenditures at colleges and universities during the period of the lifecycle when most young adults invest in postsecondary education.

The dependent variable in column 2 of Table 1 is earnings from all employment activities. The γ^a coefficient estimates follow the expected pattern: the earnings of young OPH adults increase by approximately \$1,000 to \$2,000 per year from age 19 to age 29. The β^a estimates are also generally increasing in age. Eligibility for Pathways lowers earnings for young adults age 19-

¹¹ The β^{28} coefficient estimate is suppressed because of data confidentiality concerns due to the fact that relatively few 28 year-olds in our sample are enrolled in college.

23 by between \$800 and \$1,700 per year. Beginning at age 24, the β^a coefficients increase steadily and by age 26, eligibility for Pathways is estimated to have a positive effect on earnings. The β^{28} coefficient estimate suggests that eligibility for Pathways increases earnings by \$3,100 or 19 percent at age 28.¹² This estimate is statistically significant at the one percent level and is comparable to recent estimates of the return to an additional year of high school or postsecondary education (Oreopoulos and Petronijevic, 2013; Heckman, Humphries and Veramendi, 2018).

Unconditional earnings can increase because of an increase in the likelihood of working (extensive margin), an increase in earnings conditional on working (intensive margin), or both. In column 3, we explore the extent to which the effect of Pathways on earnings is due to an extensive margin response. Eligibility for Pathways has a small and statistically insignificant effect on working at age 19-20. By age 21, eligibility for Pathways is estimated to increase the likelihood of having positive earnings by 4.3 percentage points. This effect increases to between 5 and 8 percentage points for those between the ages of 23 and 28. Our estimate for β^{28} suggests that eligibility for Pathways increases the likelihood of having positive earnings by 7.7 percentage points or 14 percent (0.077/0.550).

It is also possible that eligibility for Pathways increases earnings conditional on working. There are several possible channels through which this may occur. For example, the job search assistance provided by SPSWs may help match Pathways participants with better-paying firms. Another possibility is that Pathways increases human capital through more education, leading to higher earnings in adulthood. However, a naïve estimation of equation (1) on the sub-sample of individuals with positive earnings will lead to biased estimates of the β^a coefficients because of

¹² Average (unconditional) earnings at age 28 for the 2000 OPH cohort is \$16,390; \$3,100/\$16,900 = 0.189.

the significant extensive margin response. If young adults induced to work because of Pathways have a lower earnings potential, on average, than those that would have worked in the absence of the program, then conditioning on the sub-sample of those with positive earnings will result in estimates for β^a that are biased downwards. In Online Appendix B1, we show that the extensive margin effect explains a majority (between 50 and 79 percent) of the impact of eligibility for Pathways on unconditional earnings.

4.3 Robustness Checks

The validity of our difference-in-differences strategy requires that the counterfactual outcomes of youth that resided in Regent Park follow the same trend as those that resided in other TCH projects. With only one pre-Pathways cohort, we are unable to assess the plausibility of this assumption using our baseline sample of students that entered high school between September 2000 and 2006. In this subsection, we address this limitation in two ways. First, we report results from the estimation of equation (1) for subsamples of OPH sites that most closely resemble Regent Park in size and composition. Second, we use data for students that began high school in 1999 to assess whether the outcomes of pre-2001 Regent Park cohorts followed the same path as young adults from OPH. As mentioned earlier, this information is only available for students that lived in a select few public housing sites in the legacy Metro Toronto school board.¹³

¹³ To increase sample size, the legacy Metro Toronto sample includes both uniquely matched postal codes for public housing projects as well as close-by mixed residences. Estimated effects from the sample of postal codes that match uniquely to public housing addresses only are similar but noisier.

Table 2 reports the estimation results from this sensitivity analysis for postsecondary tuition expenditures (Panel A, top) and earnings (Panel B, bottom). The results for the employment status dummy are reported in Online Appendix Table A6. Column 1 reports our baseline estimates from Table 1 as a benchmark. In column 2, the comparison group is restricted to the 11 largest public housing sites in Toronto. These sites house several hundred residents and face poverty rates similar to Regent Park. The age pattern of the β^a coefficients is very similar to the baseline sample for both the postsecondary tuition and earnings outcomes. For example, the estimates for β^{20} - β^{23} in Panel A suggest that eligibility for Pathways increases postsecondary tuition expenditures by between \$370 and \$730 between the ages of 20 and 23. Furthermore, the estimates for β^{26} - β^{28} in Panel B suggest that eligibility for Pathways increases earnings by \$1,450 to \$3,850 for young adults in their late 20s. In column 3, the comparison group is restricted to youth that went to high school in one of Toronto’s so-called “priority neighbourhoods”, which are areas with concentrated levels of crime and poverty. The estimates for β^a in this sub-sample are also very similar to those in columns 1 and 2.

Column 4 of Table 2 reports the estimates from equation (1) when the comparison group is restricted to the aforementioned public housing sites in the legacy Metro Toronto school board. The pattern of β^a coefficients in Panel A are very similar in magnitude to the baseline specification in column 1. In particular, the estimates for β^{20} - β^{23} suggest that eligibility for Pathways increases postsecondary tuition expenditures by between \$240 and \$690 for young adults in their early twenties. Compared with the baseline sample, restricting the sample to young adults from the legacy Metro Toronto school board leads to estimates that are more imprecise; the standard errors in column 1 are generally at least twice as large as those in column 1 and not all β^a coefficients estimates are statistically significant at conventional levels. This is because the sample size from

including an earlier cohort of students from a smaller set of projects falls by almost two thirds from 48,069 in column 1 to 16,969 in column 4.

Figure 2 plots the average earnings by year entered Grade 9 for Regent Park and the Metro legacy Toronto public housing sites for the 2015 calendar (tax) year. There appears to be no discernable difference in the trends of the pre-2001 Regent Park and legacy Metro Toronto public housing cohorts, suggesting that the parallel trends assumption underlying our empirical strategy is plausible. Furthermore, the estimates of the effect of eligibility for Pathways on earnings in Table 2 follow the same age pattern as in the baseline sample. Our estimates suggest that by ages 26-28, eligibility for Pathways increases annual earnings by at least \$2,100-\$5,400 or 12-32 percent. Together, the evidence in Table 2 points to large long-term earnings gains from eligibility for Pathways in Regent Park.

5. Additional Long-Term Outcomes

In Table 3, we report estimates of the effect of Pathways on additional outcomes. These results corroborate our earnings estimates and suggest that Pathways positively impacts certain social outcomes as well as labor market outcomes. In column 1, the dependent variable is social assistance (welfare) receipts. At all ages, young adults eligible for Pathways receive less social assistance receipt than those ineligible for the program. Our estimates suggest that by age 25-28, eligibility for Pathways reduces welfare payments by \$300-500 per year or 30-54 percent. The estimated impacts on UI benefit receipt in column 2 is mixed. Eligibility for Pathways appears to increase UI receipts for older individuals in our sample. However, increased UI receipt may, in part, be due to increased eligibility for benefits because eligibility for UI in Canada depends on

satisfying a minimum hours of work requirement. Columns 3 and 4 of Table 2 show that eligibility for Pathways significantly reduces the likelihood of being married and having a child before age 28. In Online Appendix Tables A9 and A10, we show that eligibility for Pathways reduces the likelihood of having a child for women much more than for men. Finally, we estimate the impact of Pathways on job quality using the median earnings at the firm an individual works for as a proxy for firm quality.¹⁴ Column 5 of Table 2 shows that eligibility for Pathways leads to better employment opportunities using this measure.

6. Discussion

In this paper, we evaluate the impact of the Pathways to Education program on the long-term outcomes of disadvantaged youth. Using unique administrative data from Statistics Canada, the Toronto District School Board (TDSB) and Toronto Community Housing (TCH) we estimate the effect of Pathways on earnings, employment, persistence in postsecondary institutions, as well as a variety of other labor market and social outcomes. Our findings extend our previous work in Oreopoulos, Brown and Lavecchia (2017) and show that, at its Regent Park site, the positive impacts from Pathways extend significantly beyond adolescence and into early adulthood. We find that eligibility for Pathways increases annual earnings at age 28 by approximately \$3,100 or 19 percent. Eligibility for Pathways is also found to have a large positive impact on the fraction of disadvantaged youth that are employed as adults and postsecondary education attainment. The program also decreases the likelihood of receiving social assistance.

¹⁴ For those who work at multiple firms in a tax year, we use the highest median earnings across all establishments.

Our paper is the first to estimate the impacts of comprehensive support programs for high school students on earnings. Our results add to a growing body of evidence that interventions like Pathways, ASAP, Carolina Covenant and the Quantum Opportunity Program have the potential to improve labor market outcomes and reduce reliance on social assistance more than a decade after students participate in the program (Scrivener et al., 2015; Heller et al., 2017; Rodriguez-Planas, 2017; Clotfelter, Hemelt and Ladd, 2018). An important question remains around whether watered-down versions of these programs could generate similar effects for less cost.¹⁵ But equally interesting is the question of whether programs like Pathways at the high school and ASAP at the college level are substitutes or work even better when delivered together.

¹⁵ Online Appendix C reports the results of a benefit-cost calculation using the individual and public monetary gains to Pathways using the estimates reported in the paper.

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Figure 1A

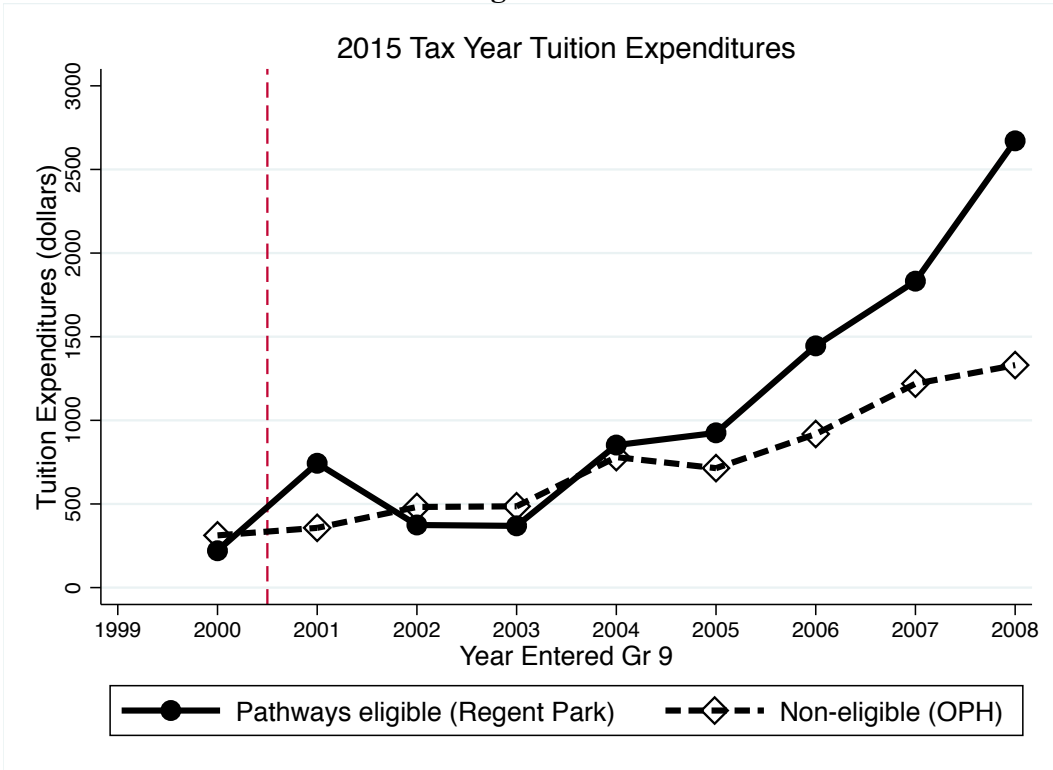


Figure 1B

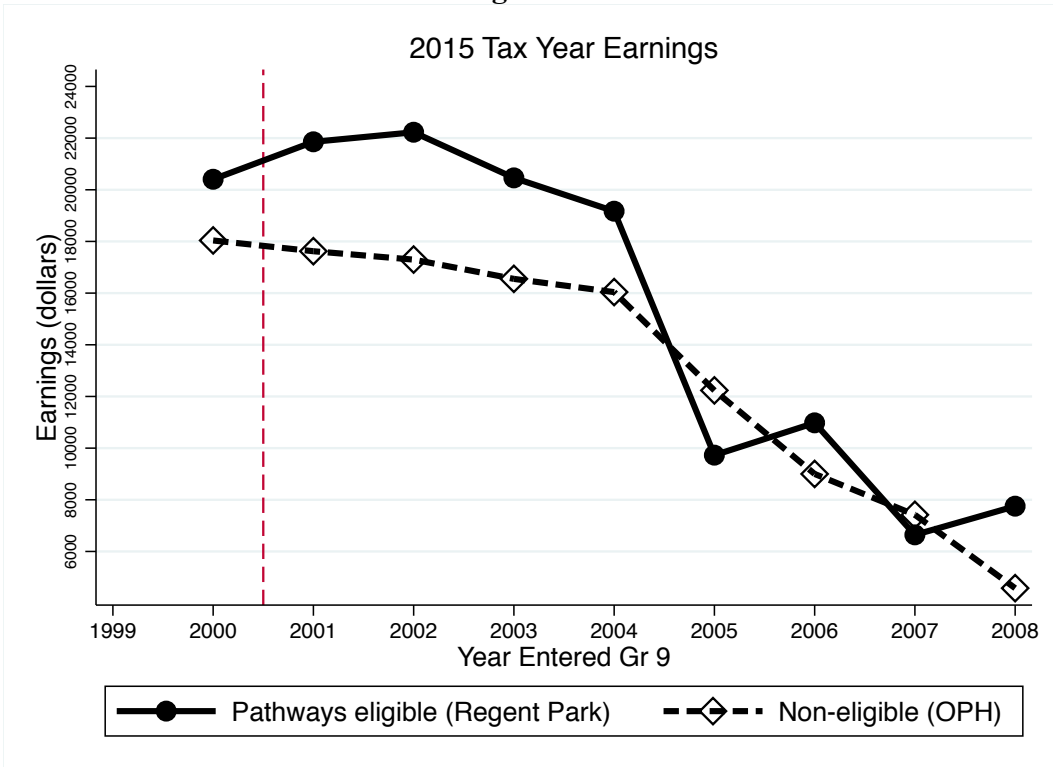
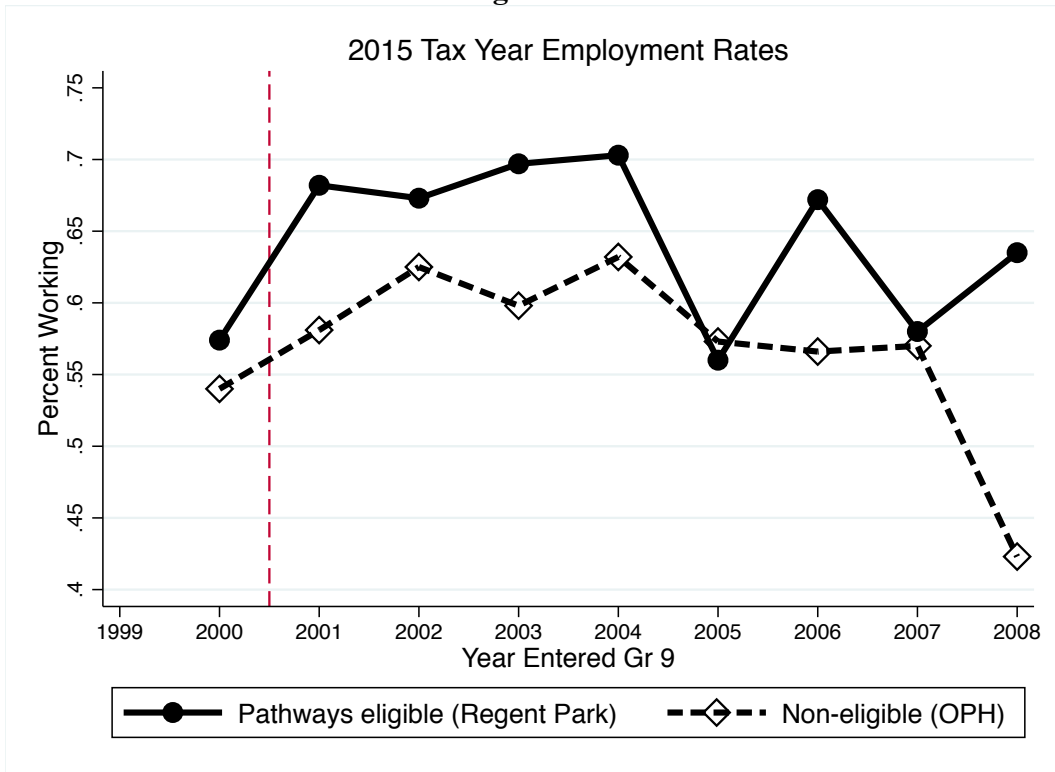
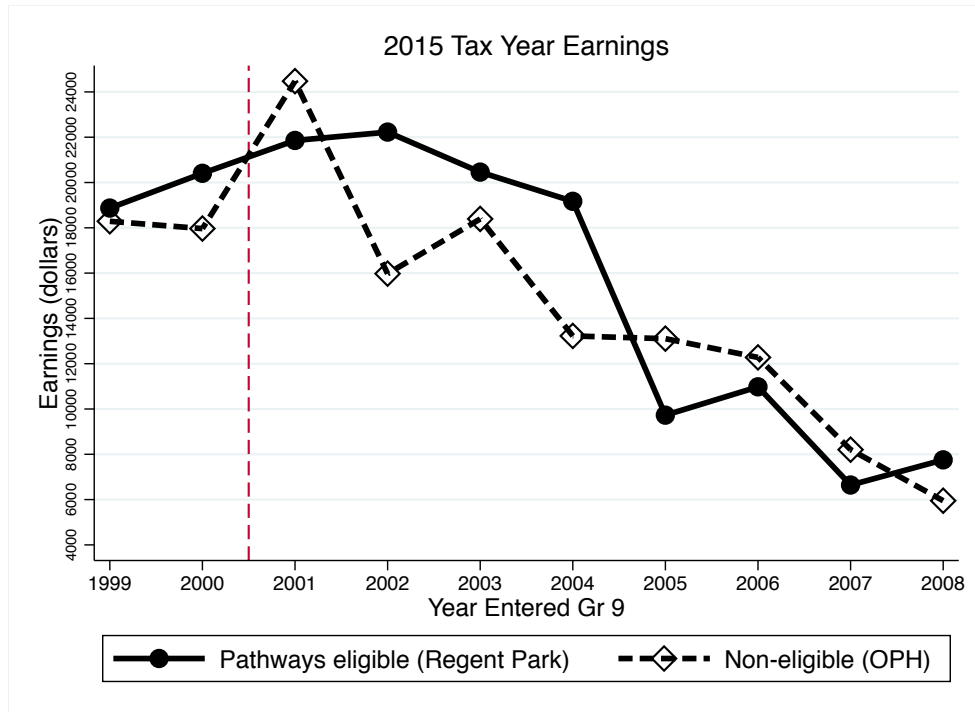


Figure 1C



Notes: Figure 1 plots average 2015 outcomes by year entered Grade 9 (cohort) for youth that lived in Regent Park in high school (solid) line and other Toronto public housing projects (OPH) (dashed line). In Figure 1A the outcome variable is expenditures on tuition at 2-year colleges and 4-year universities. In Figures 1B and 1C the outcome variable is labor market earnings (all sources) and employment status, respectively.

Figure 2
2015 Outcomes by Grade 9 Cohort: Legacy Toronto Projects Comparison Group



Notes: Figure 2 plots the average 2015 tax year earnings by year entered Grade 9 for the 1999-2008 TDSB cohorts. The means for young adults that lived in Regent Park are represented by the solid circle markers and the means for the legacy Metro Toronto public housing sites are represented by the open diamond markers.

Table 1
Intent to Treat (ITT) Estimated Effects of Pathways on Adult Outcomes by Age

	(1) Tuition Expenditures	(2) Earnings	(3) Working
Pathways*Age 19	229 [228]	-1,739 [463]***	0.017 [0.020]
Pathways*Age 20	634 [70]***	-788 [519]	0.028 [0.020]
Pathways*Age 21	760 [67]***	-1,236 [482]**	0.043 [0.017]**
Pathways*Age 22	727 [61]***	-1,458 [504]***	0.052 [0.017]***
Pathways*Age 23	459 [53]***	-1,314 [517]	0.052 [0.017]***
Pathways*Age 24	368 [50]***	138 [472]	0.054 [0.016]***
Pathways*Age 25	-174 [57]***	-6 [551]	0.133 [0.018]***
Pathways*Age 26	-8 [67]	2,148 [518]***	0.069 [0.017]***
Pathways*Age 27	-86 [95]	4,542 [772]***	0.061 [0.031]**
Pathways*Age 28	- -	3,136 [702]***	0.077 [0.023]***
Age 20	58 [181]	690 [195]***	0.008 [0.012]
Age 21	106 [200]	1,960 [146]***	0.019 [0.011]*
Age 22	-26 [197]	3,556 [175]***	0.021 [0.012]*
Age 23	-262 [211]	5,803 [275]***	0.024 [0.010]**
Age 24	-476 [214]**	7,359 [287]***	0.015 [0.013]
Age 25	-563 [216]**	9,217 [347]***	0.013 [0.012]
Age 26	-668	10,805	0.008

	[214]***	[372]***	[0.011]
Age 27	-650	11,642	0.029
	[212]***	[672]***	[0.027]
Age 28	-691	13,255	0.014
	[186]***	[501]***	[0.012]
Age 29	-750	14,532	0.020
	[177]***	[576]***	[0.012]*
Constant	6,091	31,209	1.210
	[698]***	[7,336]***	[0.293]***
Observations	48,069	48,069	48,069
R-squared	0.072	0.088	0.028

Notes: The sample is individuals (students) who entered a TDSB high school between 2000 and 2006, lived in a public housing project and are at least 19 years old between 2005 and 2015. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with $70-1 = 69$ degrees of freedom. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 2
ITT Estimated Effects for Pathways to Education Using Alternative Comparison Groups

	(1)	(2)	(3)	(4)
	Baseline	Large Density Projects	Priority Neighbourhoods	Legacy Toronto Projects
<i>A. Tuition Expenditures</i>				
Pathways*Age 19	229 [228]	-62 [465]	543 [81]***	663 [228]**
Pathways*Age 19	634 [70]***	551 [118]***	747 [97]***	242 [356]
Pathways*Age 21	760 [67]***	729 [107]***	889 [103]***	689 [242]**
Pathways*Age 22	727 [61]***	636 [96]***	828 [81]***	633 [280]*
Pathways*Age 23	459 [53]***	370 [61]***	473 [90]***	427 [188]*
Pathways*Age 24	368 [50]***	398 [57]***	509 [52]***	313 [191]
Pathways*Age 25	-174 [57]***	-215 [55]***	-159 [44]***	-126 [193]
Pathways*Age 26	-8 [67]	-156 [85]*	-45 [72]	130 [203]
Pathways*Age 27	-86 [95]	-150 [144]	-17 [80]	253 [176]
Pathways*Age 28	- -	- -	- -	- -

B. Earnings

Pathways*Age 19	-1,739 [463]***	-2,751 [717]***	-2,948 [639]***	-4,419 [1,580]**
Pathways*Age 20	-788 [519]	-1,462 [981]	-2,127 [579]***	-1,363 [1,620]
Pathways*Age 21	-1,236 [482]**	-2,002 [806]**	-2,598 [611]***	-1,736 [1,464]
Pathways*Age 22	-1,458 [504]***	-2,414 [865]**	-2,793 [689]***	-1,713 [1,719]
Pathways*Age 23	-1,314 [517]**	-2,360 [952]**	-2,582 [1,055]**	-1,085 [1,876]
Pathways**Age 24	138 [472]	-427 [695]	-403 [398]	628 [1,787]
Pathways*Age 25	-6 [551]	-431 [911]	-426 [455]	599 [1,843]
Pathways*Age 26	2,148 [518]***	1,468 [530]**	1,889 [562]***	2,767 [1,471]
Pathways*Age 27	4,542 [772]***	3,854 [799]***	4,552 [803]***	5,398 [1,829]**
Pathways*Age 28	3,136 [702]***	2,320 [1,279]*	3,090 [741]***	2,114 [2,562]
Observations	48,069	24,446	20,335	16,969

Notes: The baseline sample is the same as in Table 1. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. For column 2, the large density projects include: Alexandra Park, Bleecker Street, East Mall, Edgeley Village, Jane Finch, Firgrove Crescent, Flemingdon Park, Lawrence Heights, Malbern, Moss Park, Pelham Park, Regent Park, Rexdale (Thistletown) and Warden Woods. For column 3, the priority neighbourhoods are comprised of the following 11 housing projects: Duncanwoods Drive, Edgeley Village, Firgrove Crescent, Flemingdon Park, Lawrence Heights, McCowan Road, Pelham Park, Rexdale (Thistletown), Scarlettwoods, Yorkwoods Village, and 'Other' projects (several small projects grouped together to create a publicly available dataset). For column 4, the legacy Metro Toronto projects include: Alexandra Park, Blake Street, Bleecker Street, Don Mount Court, Edgewood Avenue, Greenwood Park, Pelham Park and Regent Park. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with G-1 degrees of freedom (G denotes number of housing projects). *** p<0.01, ** p<0.05, * p<0.1.

Table 3
Intent to Treat (ITT) Estimated Effects of Pathways on Additional Outcomes

	(1) Social Assistance Payments	(2) UI Benefit Payments	(3) Married or Common Law	(4) Has Child	(5) Employer Quality
Pathways*Age 19	-89 [100]	-1,587 [451]***	-0.036 [0.006]***	-0.055 [0.016]***	3,487 [958]***
Pathways*Age 20	-112 [91]	-785 [439]*	-0.031 [0.007]***	-0.071 [0.017]***	3,847 [919]***
Pathways*Age 21	-160 [89]*	-1,118 [434]**	-0.023 [0.007]***	-0.085 [0.014]***	3,385 [777]***
Pathways*Age 22	-142 [94]	-1,268 [467]***	-0.029 [0.007]***	-0.088 [0.015]***	2,898 [803]***
Pathways*Age 23	-215 [91]**	-1,160 [504]**	-0.021 [0.006]***	-0.079 [0.017]***	498 [1,294]
Pathways*Age 24	-362 [94]***	297 [421]	-0.007 [0.007]	-0.079 [0.014]***	2,178 [877]**
Pathways*Age 25	-551 [110]***	288 [520]	-0.020 [0.008]**	-0.146 [0.015]***	1,324 [926]
Pathways*Age 26	-343 [106]***	1,962 [533]***	0.040 [0.008]***	-0.094 [0.015]***	2,149 [1,204]*
Pathways*Age 27	-311 [149]**	4,328 [820]***	0.085 [0.011]***	-0.095 [0.029]***	2,374 [1,261]*
Pathways*Age 28	-486 [118]***	2,863 [645]***	0.088 [0.011]***	-0.161 [0.019]***	2,362 [1,224]*
Constant	-4,534 [1,797]***	29,939 [7,040]	-0.143 [0.102]	-0.503 [0.274]*	64,198 [21,321]***
Observations	48,069	48,069	48,069	47,115	26,842
R-squared	0.061	0.098	0.048	0.034	0.087

Notes: The sample is the same as in Table 1. Employer quality is the median earnings of the largest firm an individual works for. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with 70-1 = 69 degrees of freedom. *** p<0.01, ** p<0.05, * p<0.1.

Online Appendix A (Data)

This appendix provides additional details about the administrative datasets described in Section 3 and the construction of key variables. Appendix Table A1 summarizes the key variables used in our analysis.

A1. Toronto District School Board Data

The TDSB data contain information on the demographic characteristics and academic performance of students that entered Grade 9 in a TDSB school between September 2000 and September 2008. Importantly, the TDSB data also include information on students' first and last names, date of birth and address, including postal codes. This information allows us match the TDSB data to a list of public housing projects provided by Toronto Community Housing (TCH).

A2. Toronto Community Housing (TCH)

The Toronto Community Housing Corporation (TCH) is the public housing agency for the City of Toronto. The TCH is the second-largest public housing provider in North America (behind the New York City Housing Authority). As of 2017, TCH owns 2,100 buildings, including more than 350 high- and low-rise apartment buildings that house more than 110,000 residents in 60,000 low-income households.¹ TCH residents pay rent geared to income, with approximately 25 to 30 percent of a household's gross income being charged as rent. All

¹ For more details about TCH, refer to <https://www.torontohousing.ca/About>.

households wishing to obtain a unit in a TCH property must fill out a standardized application form. Since the demand for units is greater than the supply available in any given year, the TCH must ration spots in its properties. Since 1995 TCH has allocated units in chronological order, with special consideration given to newly arrived immigrants, the homeless and those facing domestic violence. Even those that qualify for special consideration, wait times were often substantial. For example, average wait times in 1998 were 5 to 7 years (Toronto Social Housing Connections, 1998).

Our data focuses on the 113 housing projects built before 1976. To create a publicly available dataset, some nearby and small projects are grouped together. This leaves us with 70 housing projects ranging in size across various neighborhoods in Toronto. The TCH data is matched with the TDSB data using the postal codes on school registration forms.

A3. Administrative Data from Statistics Canada

The long-term outcomes of used in this study are derived from six administrative datasets provided by Statistics Canada. These datasets are: the T1 Family File (T1FF), the T1, T2, T3 and Payroll Deduction (PD7) tax files, and the Longitudinal Immigration Database (IMDB). In this section, we briefly describe each of these datasets, how the data are matched to the TDSB-TCH data and the construction of key variables.

T1 Family File (T1FF): The T1FF is an administrative file that combines information from three tax files provided by the Canada Revenue Agency (CRA). The three files that comprise the T1FF are: the individual T1 file, the T4 file and the Canada Child Tax Benefit

(CCTB) file.² The individual T1 file is based on the information provided by tax filers on their individual returns. Variables of interest include earnings, deductions, taxable income, as well as limited demographic characteristics and family identifiers. The T4 file supplements the information provided in individual tax returns with information submitted by third parties (employers and financial institutions). These third-party reports include information on earnings from employment, public and private pension contributions, payroll tax deductions and interest income. The CCTB file includes information on non-filing children, including year of year of birth. We use this information to construct an indicator variable for whether a tax filer has any children, as well as the filer's number of dependents in each year.

T2, T3 and Payroll Deduction (PD7) files: The T2 administrative file contains information from corporate income tax returns beginning with the 2000 tax year. In particular, variables in the T2 file include firm sales, gross profits, taxes, business equity and assets. The T3 Trust Income Tax and Information Return file contains information on the sales and income of communal farming organizations. The PD7 administrative file is derived from payroll deduction forms remitted by employers to the Canada Revenue Agency. For each year, the file contains information on total gross payrolls, the total number of employees, as well as summary statistics about the earnings of employees of the firm. In particular, the PD7 file contains information on the mean and median wage paid to employees of the firm.

Longitudinal Immigration Database (IMDB): The IMDB file combines administrative immigration and tax files to provide data on the socio-economic outcomes of Canadian immigrants. The file contains information on labour market outcomes, country of origin,

² <http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=4105>

education, as well as knowledge of English or French.³ We use the IMDB file to confirm the immigrant status of individuals in our sample.

Online Appendix Table A2 reports summary statistics for select variables for 2015. The sample is all individuals that enrolled in a TDSB school between 2000 and 2008 and lived in a TCH public housing project. Column 1 reports means for Regent Park students. Columns 2 and 3 report means for students from the Rexdale and Lawrence Heights projects (where Pathways was introduced in 2007) and other public housing students (OPH), respectively. Across all sites, the fraction of individuals working ranges between 52 and 63 percent and (unconditional) average annual earnings range between \$10,700 and \$15,800. The low level of mean earnings partially reflects the age range of our sample in 2015 and partially reflects the fact that the employment rate is low. In particular, while students in the 2000 Grade 9 cohort are 29 years old in 2015, students in the 2008 cohort are only 21. Table A2 also shows that Regent Park students claim more tuition spending and are more likely to be immigrants than students from other public housing sites.

Online Appendix Table A3 reports the means of select outcome variables for 19 year-olds and 28 year-olds in the 2000 OPH cohort. The age patterns for earnings, the likelihood of being married and having a child and postsecondary tuition expenditures in the comparison group follow the expected pattern. For example, the average young adult in the 2000 OPH cohort earned \$4,301 at age 19 and \$16,390 at age 28.

³ <http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5057>

Online Appendix B (Additional Results and Robustness Checks)

B1. Decomposition of the Effect of Eligibility for Pathways on Unconditional Earnings

In Section 4.2 of the main text, we calculate how much of the effect of eligibility for Pathways on unconditional earnings is due to an increase in the likelihood of working (extensive margin). This section provides additional details regarding this decomposition using a simplified version of our estimating equation (1). For expositional reasons, we ignore covariates other than a young adult's age in calendar year t and collapse the housing project fixed effects and Grade 9 cohort fixed effects into two binary variables that indicate whether an individual lived in Regent Park and entered high school after September 2001. Let $RP_{i(p)} = 1$ if a young adult lived in Regent Park during high school and $RP_{i(p)} = 0$ otherwise. Similarly, let $Post_{i(c)} = 1$ for those that enrolled in Grade 9 in September 2001 or later and $Post_{i(c)} = 0$ otherwise. Furthermore, let Age_a be a binary variable equal to 1 if an individual is age a in calendar year t and zero otherwise. Using the above notation, our main estimating equation can be written as follows.

$$y_{i(pc)a} = \beta_1 RP_{i(p)} + \beta_2 Post_{i(c)} + \sum_{a=19}^{28} \beta_3^a (RP_{i(p)} \times Post_{i(c)} \times Age_a) + \sum_{a=19}^{28} \beta_3^a Age_a + e_{i(pc)a} \quad (B1)$$

All of the insights from the decomposition below follow through if equation (1) is used rather than equation (B1).

For each individual i , observed (unconditional) earnings at age a , $y_{i(pc)a}$, can be written as the product of a binary variable equal to 1 for those with positive earnings $v_{i(pc)a}$ and (the latent) conditional earnings variable $z_{i(pc)a}$. Thus, $y_{i(pc)a} = v_{i(pc)a} \times z_{i(pc)a}$. For individuals with positive earnings, observed earnings are equal to conditional earnings $y_{i(pc)a} = z_{i(pc)a}$. We

can now write the estimating equations for empirical models in which the dependent variable is the binary participation dummy and the conditional earnings variable, respectively

$$v_{i(pc)a} = \alpha_1 RP_{i(p)} + \alpha_2 Post_{i(c)} + \sum_{a=19}^{28} \alpha_3^a (RP_{i(p)} \times Post_{i(c)} \times Age_a) + \sum_{a=19}^{28} \alpha_4^a Age_a + u_{i(pc)a} \quad (B2)$$

$$z_{i(pc)a} = \pi_1 RP_{i(p)} + \pi_2 Post_{i(c)} + \sum_{a=19}^{28} \pi_3^a (RP_{i(p)} \times Post_{i(c)} \times Age_a) + \sum_{a=19}^{28} \pi_4^a Age_a + \epsilon_{i(pc)a} \quad (B3)$$

In the former equation, α_3^a is the estimate of the average causal effect of eligibility for Pathways on the likelihood of working at age a (i.e. the estimates reported in column 3 of Table 1). The parameter π_3^a is the estimate of the average causal effect of eligibility for Pathways on conditional earnings at age a (i.e. the intensive margin effect). Using equations (B1) to (B3), the mean unconditional observed earnings at age a for Regent Park and OPH youth that entered Grade 9 before September 2001 can be written as follows.

$$E[y_{i(pc)a} | RP_{i(p)} = 1, Post_{i(c)} = 0, Age_a = a] = \beta_1 + \beta_4^a = (\alpha_1 + \alpha_4^a) \times (\pi_1 + \pi_4^a) \quad (B4)$$

$$E[y_{i(pc)a} | RP_{i(p)} = 0, Post_{i(c)} = 0, Age_a = a] = \beta_4^a = \alpha_4^a \times \pi_4^a \quad (B5)$$

Similarly, the mean unconditional observed earnings at age a for Regent Park and OPH youth that entered Grade 9 after September 2001 can be written as follows.

$$\begin{aligned}
E[y_{i(pc)a} | RP_{i(p)} = 1, Post_{i(c)} = 1, Age_a = a] &= \beta_1 + \beta_2 + \beta_3^a + \beta_4^a \\
&= (\alpha_1 + \alpha_2 + \alpha_3^a + \alpha_4^a) \times (\pi_1 + \pi_2 + \pi_3^a + \pi_4^a) \quad (B6)
\end{aligned}$$

$$E[y_{i(pc)a} | RP_{i(p)} = 0, Post_{i(c)} = 1, Age_a = a] = \beta_2 + \beta_4^a = (\alpha_2 + \alpha_4^a) \times (\pi_2 + \pi_4^a) \quad (B7)$$

Subtracting (B5) from (B4) and (B7) from (B6) gives the Regent Park – OPH difference in the mean observed earnings before and after the introduction of Pathways.

$$\begin{aligned}
E[y_{i(pc)a} | RP_{i(p)} = 1, Post_{i(c)} = 0, Age_a = a] - E[y_{i(pc)a} | RP_{i(p)} = 0, Post_{i(c)} = 0, Age_a = a] &= \beta_1 \\
&= \alpha_1 \times (\pi_1 + \pi_4^a) + \alpha_4^a \times \pi_1 \quad (B8)
\end{aligned}$$

$$\begin{aligned}
E[y_{i(pc)a} | RP_{i(p)} = 1, Post_{i(c)} = 1, Age_a = a] - E[y_{i(pc)a} | RP_{i(p)} = 0, Post_{i(c)} = 1, Age_a = a] \\
&= \beta_1 + \beta_3^a \\
&= (\alpha_1 + \alpha_3^a) \times (\pi_1 + \pi_2 + \pi_3^a + \pi_4^a) + (\alpha_2 + \alpha_4^a) \times (\pi_1 + \pi_3^a) \quad (B9)
\end{aligned}$$

Finally, the difference-in-differences estimator of the average causal effect of eligibility for Pathways on earnings at age a is obtained by subtracting (B8) from (B9).

$$\begin{aligned}
\beta_3^a &= \alpha_3^a \times (\pi_1 + \pi_2 + \pi_3^a + \pi_4^a) + \pi_3^a (\alpha_1 + \alpha_2 + \alpha_3^a + \alpha_4^a) + \alpha_1 \times \pi_2 + \alpha_2 \times \pi_1 - \alpha_3^a \pi_3^a \\
&= \underbrace{\alpha_3^a \times E[y_{i(pc)a} | y_{i(pc)a} > 0, RP_{i(p)} = 1, Post_{i(c)} = 1, Age_a = a]}_{Extensive Margin Effect} \\
&\quad + \underbrace{\pi_3^a \times P[y_{i(pc)a} > 0 | RP_{i(p)} = 1, Post_{i(c)} = 1, Age_a = a]}_{Conditional Earnings Effect} \\
&\quad - \underbrace{(\alpha_3^a \pi_3^a - \alpha_1 \times \pi_2 - \alpha_2 \times \pi_1)}_{Compositional Effect} \quad (B10)
\end{aligned}$$

Equation (B10) shows that average causal effect of eligibility for Pathways on earnings at age a can be decomposed into three terms. Each term in equation (B10) represents is the contribution to the relative differences in the earnings growth between Regent Park and OPH young adults,

before and after the introduction of Pathways from three economic forces. The first term, which we refer to as the Extensive Margin Effect, is the product of (i) the average causal effect of eligibility for Pathways on employment and (ii) the average earnings of employed young adults from Regent Park that entered Grade 9 after 2001. Intuitively, part of the difference in earnings growth between Regent Park and OPH young adults is due to the change in the likelihood of working caused by the Pathways program. The second term in equation (10), which we refer to as the Conditional Earnings Effect, is the product of (i) the average causal effect of eligibility for Pathways on conditional earnings and (ii) the fraction of young adults from the post-2001 Regent Park cohorts that are working. Part of the difference in the earnings growth between Regent Park and the comparison housing projects is due to the change in conditional earnings caused by the program. The third part of equation (B10) shows that to obtain the estimator for the average causal effect of eligibility for Pathways on earnings, we must subtract from the Extensive Margin and Conditional Earnings Effects a term that captures the difference in the composition of the sub-sample of employed workers caused by the effect of Pathways on the fraction of young adults that are working.

Using the fact that average earnings conditional on working at age 28 for young adults from Regent Park is \$32,037 in 2015, the estimates from columns 2 and 3 of Table 1 suggest that the extensive margin response explains most of the unconditional earnings response ($\$32,047 * 0.077 / \$3,136 = 0.787$). We also performed a similar decomposition of the unconditional earnings response at ages 26 and 27. The results reinforced the importance of the extensive margin impact on Pathways, explaining 73.7 and 50.2 percent of the unconditional earnings responses, respectively.

B2. Sensitivity of the Main Results

This section summarizes the results from additional analyses. We first explore the sensitivity of the main results reported in Table 1 of the main text. Online Appendix Table A4 reports the coefficients and standard errors from the estimation of equation (1) on the subsample of young adults that entered Grade 9 between September 2000 and September 2003. The results using the baseline sample in the main text uses an unbalanced panel with 48,069 individual-year observations. By restricting the sample to the 2000-2003 TDSB cohorts, we focus on a group of young adults that we are able to follow from age 19 until their late 20s. The coefficient estimates in Appendix Table A4 are qualitatively and quantitatively similar to those reported in Table 1. In particular, the effect of eligibility for Pathways on postsecondary tuition expenditures (column 1) is generally decreasing in age from age 19 to age 27 (the age 28 coefficient is suppressed because of residual disclosure and privacy concerns). Furthermore, in column 2, the effects of eligibility for Pathways on earnings are generally increasing in age. By ages 26-28, eligibility for Pathways is estimated to increase annual earnings by between \$2,000 and \$4,500, nearly identical to the estimates in Table 1. The coefficient estimates in column 3 when employment status is the dependent variable are also very similar to those reported in Table 1.

Appendix Table A5 reports estimates of the causal effect of eligibility for Pathways on the employment status dummy using the alternative comparison groups considered in Table 2 of the main text. Although the estimates are generally less precisely estimated (several β^a estimates are not statistically significant at conventional levels), the results suggest that the baseline estimates in Table 1 (and repeated in column 1 of Table A5) are reasonably robust to alternative comparison groups. Online Appendix Figure A1 plots employment rates by Grade 9 cohort

separately for young adults from Regent Park and OPH in 2015. Reassuringly, there is no discernable difference in the employment trends of the Regent Park and OPH pre-2001 cohorts.

Young adults in the tax data are matched with the TDSB administrative records by matching on the first name, last name and date of birth of the former public housing students. Approximately 90 percent of public housing students in the TDSB data are matched with income tax records by Statistics Canada. Students that are not matched to the tax data likely either left Canada before age 19 or have never filed a tax return. We investigated whether eligibility for Pathways affects the likelihood of being matched and found (in unreported results) that the program increases the likelihood of being matched by 2-4 percent. In our baseline sample, we assigned the small fraction of unmatched students zero values for all of the dependent variables (including earnings).

Online Appendix Table A6 explores how dropping unmatched students from the sample affects the results reported in the main text. The dependent variable in column 1 is tuition expenditures. The estimates of the effect of eligibility for Pathways on tuition expenditures on the sub-sample of matched tax filers is nearly identical to the estimates using the baseline sample. For example, the estimates $\beta^{20} - \beta^{24}$ indicate that program eligibility increases tuition expenditures by \$395 and \$810 per year between the ages of 20 and 24 and near zero after 25.

The effects of eligibility for Pathways on earnings in column 2 have a similar age pattern as the estimates reported in Table 1 of the main text but are generally smaller in magnitude. Eligibility is estimated to have a negative effect on earnings for the youngest adults in our sample (ages 19-25); the $\beta^{19} - \beta^{24}$ estimates range between -\$2,000 and -\$1,000. However, by age 26, eligibility for Pathways is estimated to increase annual earnings by between \$1,000 and \$3,000 per year. These estimates are about 50 percent smaller in magnitude than the \$2,000 to

\$4,500 range for the baseline sample and indicates that the sub-sample of TDSB students that are ultimately matched with the tax return data as adults is positively selected. In other words, eligibility for the Pathways program appears to induce marginal young adults to file a tax return or obtain formal employment.

The results in columns 3-6 of Appendix Table A6 also reinforce the findings from Tables 1 and 3 in the main text. Eligibility for Pathways is estimated to increase the fraction of young adults working, especially after age 23 (column 3), reduce social assistance/welfare benefit receipts (column 4), increase UI benefits (column 5) and reduce the likelihood of having a child by age 28 (column 6). As with the results for postsecondary tuition payments and earnings, the estimated standard errors for the estimates in columns 3-6 are generally larger than those reported in the main text, likely due to the smaller sample size (43,462 versus 48,069).

The main results in the main carry out statistical inference using standard errors based on the clustered robust variance estimator (CVRE). Our tests for statistical significance compare the t statistic computed using the CVRE to the critical value of the t distribution with $70-1 = 69$ degrees of freedom (since there are 70 TCH public housing projects in our data). Recent evidence from Monte Carlo simulations by MacKinnon and Webb (2017) suggests that the CVRE can be biased downwards in applications where the number of treated clusters is small, as in our application. In this situation, tests of statistical significance will tend to over-reject true null hypothesis. MacKinnon and Webb (2017) show that the main alternative to the CVRE, the wild cluster bootstrap, also performs poorly when the number of treated clusters is very small. They show that the wild cluster bootstrap has the opposite problem – tests of a true null hypothesis are never rejected.

To the best of our knowledge, there is no consensus about the best alternative to the CVRE for applications with very few treated clusters such as ours. Given that hypothesis tests based on the CVRE and t distribution with $P - 1$ ($70 - 1 = 69$) degrees of freedom tend to over-reject the null, one way to test the robustness of our main results is to reduce the degrees of freedom. Online Appendix Table A7 presents results using the degrees of freedom correction proposed by Young (2016). Column 1 reports the coefficient estimate for β^a based on the estimation of equation (1) in the main text. Column 2 reports the standard error for the estimate of β^a that uses the bias correction proposed by Young (2016). Column 3 reports Young's effective degrees of freedom and column 4 the associated p-value for the hypothesis test that $\beta^a = 0$. Panels A-C of Table A7 report results for the case where the dependent variable of interest is postsecondary tuition expenditures, earnings and employment, respectively.

One important caveat to keep in mind when interpreting the results in Table A7 is that the bias correction and effective degrees of freedom procedure proposed by Young (2016) also has undesirable properties when the number of treated groups is very small, as in our application. Monte Carlo simulations by MacKinnon and Webb (2018) show that procedure proposed in Young (2016) either severely under-rejects or severely over-rejects true null hypothesis when the number of treated clusters is small and there is heteroskedasticity in the error terms of the treated and untreated clusters. In our application, the standard deviation of earnings and employment rates is lower in Regent Park than for the OPH. On the other hand, the standard deviation of postsecondary tuition expenditures is larger for Regent Park than for the untreated OPH sites. MacKinnon and Webb (2018) show that the procedure suggested by Young (2016) almost never rejects a true null hypothesis in situations where there is only one treated group and where the variance of outcomes in the treated cluster is smaller than the variance of outcomes in the

untreated clusters. The procedure has the opposite problem of over-rejecting when outcomes of the treated cluster are more variable than the outcomes of the untreated clusters (see Figure 14 in MacKinnon and Webb (2018)). Thus, the p-values calculated using the procedure suggested by Young (2016) are likely to be conservative for the earnings and employment outcomes and too small when postsecondary tuition expenditures is the dependent variable of interest.

Panel A, column 2 of Table A7 shows that the standard errors calculated using the bias correction procedure proposed by Young (2016) are much larger than the standard errors from the CVRE for postsecondary tuition expenditures. For example, the standard error on the β^{20} coefficient is 2.5 times larger than the CVRE standard error estimate in Table 1 (\$176 versus \$70). However, the coefficient estimates for $\beta^{20} - \beta^{24}$ remain statistically significant at the one percent level.

Since the earnings of the young adults in our sample are more volatile than tuition expenditures, it is not surprising that the degrees of freedom correction leads to different significance levels compared with the estimates based on the CVRE reported in Table 1. As one example, the p-value on the test for statistical significance of Pathways on earnings at age 26 jumps from $p = 0.0001$ to $p = 0.124$. Indeed, none of the $\beta^{19} - \beta^{25}$ estimates are statistically significant at conventional levels. Furthermore, only the β^{27} estimate is statistically significant at the 5 percent level; the β^{26} and β^{28} estimates are almost statistically significant at the 10 percent levels with p-values of 0.124 and 0.158, respectively. Taken at face value, the standard errors calculated using the Young (2016) correction suggest that we cannot reject the null hypothesis that eligibility for Pathways has no statistically significant impact on earnings at most ages. As mentioned earlier, however, Monte Carlo simulations show that the Young degrees of freedom correction almost never reject a true null hypothesis in a setting such as hours, leading us to be

cautious about relying on the standard errors in Table A7 for inference about the effects of Pathways.

B3. Additional Results

In this section, we describe the results presented in Tables A8-A13 and discuss effects of eligibility for Pathways: (a) at different levels of the earnings distribution (Table A8), (b) on various measure of job quality (Table A9), (c) on male and female students (Tables A10 and A11), and (d) natives and immigrants (Tables A12 and A13).

Table A8 reports results from the estimation of quantile difference-in-differences (QDID) regressions at different quantiles of the 2015 earnings distribution.⁴ The estimates in column 1 show eligibility for Pathways has no effect on earnings at the 25th percentile for all ages. This is not surprising because in any given year, approximately 35 percent of the young adults in our sample have no earnings. Despite the fact that eligibility for Pathways increases the likelihood of working (see Table 1), the effects are not big enough to generate impacts at the 25th percentile of the earnings distribution. The remaining columns of Table A8 show that the positive effects of Pathways on the earnings of young adults age 25-28 are the biggest at the middle of the earnings distribution. In particular, eligibility for Pathways is estimated to raise annual earnings at age 28 by \$4,200 and \$5,200 at the 50th and 75th percentiles, but by only \$2,200 at the 90th percentile.

We explored whether eligibility for Pathways causes youth to work in better jobs, conditional on working. Online Appendix Table A9 reports estimates of the effect of eligibility

⁴ The youngest Grade 9 cohort in our sample entered Grade 9 in 2006. Young adults in this cohort were age 23 in 2015, on average. Consequently, by restricting the sample to the 2015 tax year, we are unable to estimate the effects of eligibility for Pathways at lower ages.

for Pathways on three measures of job quality available in the administrative data. Both measures use information from firm administrative tax files that we link to personal income tax records. The first two measures use information about the earnings of other employees that the firm, namely the median and average wage of workers at the firm (the first column repeats column 5 in Table 3 of the main text). Intuitively, more productive firms pay higher wages (Card et al., 2018). Both measures yield similar results. The estimates in column 1 suggest that Pathways leads to higher job quality, as measured by the median earnings at one's primary employer. For example, eligibility for Pathways increases the median earnings at one's employer by \$2,900 to \$3,800 between ages 19 and 22. The effects are smaller at older ages (around \$2,200 per year), but the estimates become somewhat more imprecise.

The third measure (column 3) is the total payroll at the firm (in thousands of dollars). This captures the fact that firms that have a bigger payroll tend to be larger and more productive, on average.⁵ The estimates suggest that at younger ages (19-23), eligibility for Pathways leads individuals to work at larger firms but this effect disappears by the time young adults reach their late 20s.

Appendix Tables A10 and A11 report the coefficient estimates and standard errors from the estimation of equation (1) on men and women separately. In columns 1 and 2 of both tables, the dependent variable is postsecondary tuition expenditures and earnings, respectively. At all ages, the estimated effects of eligibility for Pathways on both tuition payments and earnings are similar. Eligibility for the program initially increases postsecondary attendance (proxied by tuition payments), eventually leading to higher earnings. Eligibility for Pathways significantly

⁵ Unfortunately, neither the individual nor the corporate tax return data have information on non-wage benefits or measures of job satisfaction.

increases the likelihood of working, especially for young adults over 25 (see Table 1 in the main text). The estimates reported in column 3 of Tables A10 and A11 show that the labor supply response induced by the program is concentrated among women. In particular, while the $\beta^{25} - \beta^{28}$ estimates for men range between 2.2 and 6.2 percentage points, among women eligibility for Pathways increases the likelihood of working by 7.2 to 21.7 percentage points, relative to young women from OPH.

The estimates in column 4 of Tables A10 and A11 show that the positive effects of Pathways on social assistance (welfare) receipt are also larger for women than for men. For example, between the ages of 25 and 28, eligibility for Pathways is estimated to reduce reliance on social assistance by \$210-\$380 per year for men and \$490-\$630 per year for women. Eligibility for the program also reduces the likelihood of having a child by more for women than men at all ages (column 6).

Appendix Tables A12 and A13 report the coefficient estimates and standard errors from the estimation of equation (1) on natives and immigrants separately. With the exception of the employment status, eligibility for Pathways is estimated to increase postsecondary tuition expenditures and earnings and decrease social assistance receipts by more for immigrants than native born adults.

B4. Preliminary Estimates of the Effect of Eligibility for Pathways the Rexdale and Lawrence Heights Locations

Up to now, we have considered estimates of the impact of Pathways at its first location in Regent Park, Toronto. In 2007, the program expanded to two sites in Toronto, Rexdale and

Lawrence Heights (LH). In this section, we discuss the estimated impacts of eligibility for Pathways at these expansion sites. Like Regent Park, the communities of Rexdale and LH each house several hundred tenants paying below market rents and suffer from high levels of poverty. There are, however, some important difference between Regent Park and the Rexdale/LH sites. Whereas the Regent Park community is located in downtown Toronto, the Rexdale and LH communities are located in the suburbs (though still part of the city of Toronto). The racial and ethnic compositions of the Regent Park and Rexdale/LH communities also differ somewhat. As show in Online Appendix Table 2, the share of immigrants in Regent Park is much higher than in Rexdale/LH.

Eligibility for Pathways at the Rexdale and LH locations is based on residence. All students beginning Grade 9 and living within the catchment areas of the two communities are eligible for the program. In Oreopoulos, Brown and Lavecchia (2017), we showed that in a typical year, approximately 80 percent of the 60 students from each community enroll in the Pathways program. Because the average Grade 9 cohort at Rexdale and LH is about half the size of a Grade 9 cohort at Regent Park, the results we discuss below are from regressions that pool the two locations.

Online Appendix Table A14 reports the coefficient estimates and standard errors from the estimation of equation (1) on a sample of students that entered Grade 9 between September 2001 and September 2008 and are at least age 19 in 2005-2015.⁶ It is worth noting that we are not able to estimate the long run effects of Pathways at the Rexdale and LH sites because the first cohort of eligible students, having entered Grade 9 in September 2007, are no older than 23 in 2015 (the

⁶ We restrict the sample to young adults that entered Grade 9 after 2000 to avoid having Regent Park (in the comparison group for Rexdale and LH), change treatment status.

last year of our tax data). Consequently, we interpret the estimates from Table A14 with caution, recognizing that it would be better to follow the progress of young adults that are eligible for Pathways at its Rexdale and LH sites into their late 20s and beyond.

The dependent variable in column 1 of Table A14 is postsecondary tuition expenditures. Unlike the results from Regent Park (see column 1, Table 1 in the main text), eligibility for Pathways at its Rexdale and LH sites has no statistically significant effect on tuition expenditures. Furthermore, each of the $\beta^{19} - \beta^{23}$ estimates are all small in magnitude and negative in sign. In our previous work, we found that the effect of eligibility for Pathways on postsecondary enrollment at its Rexdale and LH sites is about a third as large as the impact at the Regent Park location (see Table 5 in Oreopoulos, Brown and Lavecchia (2017)). That eligibility for Pathways has essentially no impact on postsecondary tuition expenditures is consistent with our earlier results. Unfortunately, the Pathways participation data we collected for Oreopoulos, Brown and Lavecchia (2017) do not have sufficient information on the attendance on tutoring, mentoring and SPSW-student meetings to determine whether the smaller educational attainment results at the Rexdale and LH locations is due to differences in program delivery, heterogeneous treatment effects (due to there being some differences between the populations at the three locations) or both.

Interestingly, the estimates reported in column 2 of Table A14 show that eligibility for Pathways at the Rexdale and LH locations has a positive, albeit modest, impact on earnings. With one exception, the β^{22} coefficient that is imprecisely estimated, the estimates in column 2 suggest that program eligibility increases annual earnings by \$800-\$2000 between the age of 19 and 23. Taken at face value, these estimates suggest that Pathways may increase earnings for participants at the Rexdale and LH locations despite having little impact on postsecondary

education attendance. A fruitful area of future research may be to investigate whether the modest earnings gains persist as young adults age into their late 20s and beyond. Additionally, studying whether subsequent Rexdale and LH cohorts also experience small postsecondary impacts together with positive earnings gains.

The remaining columns of Table A14 show that eligibility for Pathways at its Rexdale and LH locations has no effect on the likelihood of working (column 4), increases UI benefit receipt (column 4) and decreases the fraction of young adults that have a child (column 5).⁷

⁷ Due to residual disclosure concerns caused by the relatively small size of the Rexdale and LH housing projects, estimates of the impact of Pathways on social assistance receipt is unavailable.

Online Appendix C (Benefit-Cost Analysis)

Although Pathways appears to have led to significant benefits for youth at the Regent Park site, the comprehensive nature of the program means that its delivery entails significant costs. The direct (operating) cost per student-year is \$3,500 in 2010 dollars and head-office administrative costs are \$1,200 per student-year.⁸ The present value direct operating costs over a participant's high school tenure is \$13,400, plus indirect administrative costs and costs to provincial governments due to staying in high school longer and attending college or university.⁹

Estimating the long-term benefits of the program requires making assumptions about how the earnings gain from Pathways evolves beyond early adulthood. Our calculations assume that the earnings gain from Pathways at age 28 (\$3,136) persists until retirement at age 65 and that future earnings are discounted at an annual rate of 3 percent (Krueger, 1999; Chetty et al., 2011). We also deflate the costs of Pathways by 0.83 because the direct operating and administrative costs are per Pathways participant, while our estimate for the earnings gain is an average across all individuals eligible for the program. This implies that the expected direct costs of the program per eligible student is $0.83 * \$13,400 = \$11,122$. The expected direct plus administrative cost per eligible student is \$14,935.

Using estimates of the impact of the program on postsecondary education attainment, employment earnings and social assistance payments we calculate the estimated financial benefits

⁸ Direct operating costs comprise 20 percent for public transportation tickets, 15 percent for the postsecondary bursary and 65 percent towards SPSWs, tutoring and group activity operations.

⁹ Whereas the average cost per college or university student can be calculated by dividing college or university operating costs by the number of students, only the marginal cost per student is required for the benefit-cost analysis. Our calculations below abstract from marginal costs given that they are expected to be much smaller than average costs.

from Pathways. We estimate that the discounted lifetime earnings gains from Pathways is \$51,600 per student, on average. If only the direct costs of the program are considered, the long-run benefit-to-cost ratio from Pathways eligibility at the Regent Park site is 4.64 ($\$51,600/\$11,122 = 4.64$). If the indirect administrative (head office) costs are considered, the benefit-to-cost ratio is 3.46 ($\$51,600/\$14,935 = 3.46$). This benefit/cost calculation assumes that the sole financial benefit arises from increased lifetime earnings for individuals. Including other possible pecuniary and nonpecuniary benefits, such as reduced crime and improvements to health would lead to even larger returns to the program (Oreopoulos and Salvanes, 2011; Lochner, 2011; Heckman, Humphries and Veramendi, 2018).

Instead of focusing on the private benefits, one can also estimate the benefit-to-cost ratio of Pathways using the expected fiscal benefits of the program. These benefits include higher labor income tax revenues and reduced spending on social assistance. Assuming a 20 percent average tax rate, our estimates imply that the discounted lifetime fiscal benefit from Pathways is \$21,042. Expected tax revenue gains exceed the direct and indirect administrative costs, leading to a benefit-to-cost ratio of 1.41 ($\$21,042/\$14,935 = 1.41$). This suggests that public investments in the Pathways program are likely fiscally neutral or positive.

While our estimates indicate that eligibility for Pathways leads to large increases in adult earnings, employment and postsecondary education attainment at the Regent Park site, our results do come with some caveats. The first is that with data that only goes up to 2015, we are only able to observe long run outcomes to age 28 (for the oldest Pathways-eligible cohort). Since earnings and other outcomes for young adults are notoriously volatile, some of our estimates are imprecise. The second caveat is that we are only able to estimate the effect of Pathways on long-run outcomes for the Regent Park site. Estimating the long run education and earnings gains of Pathways at its

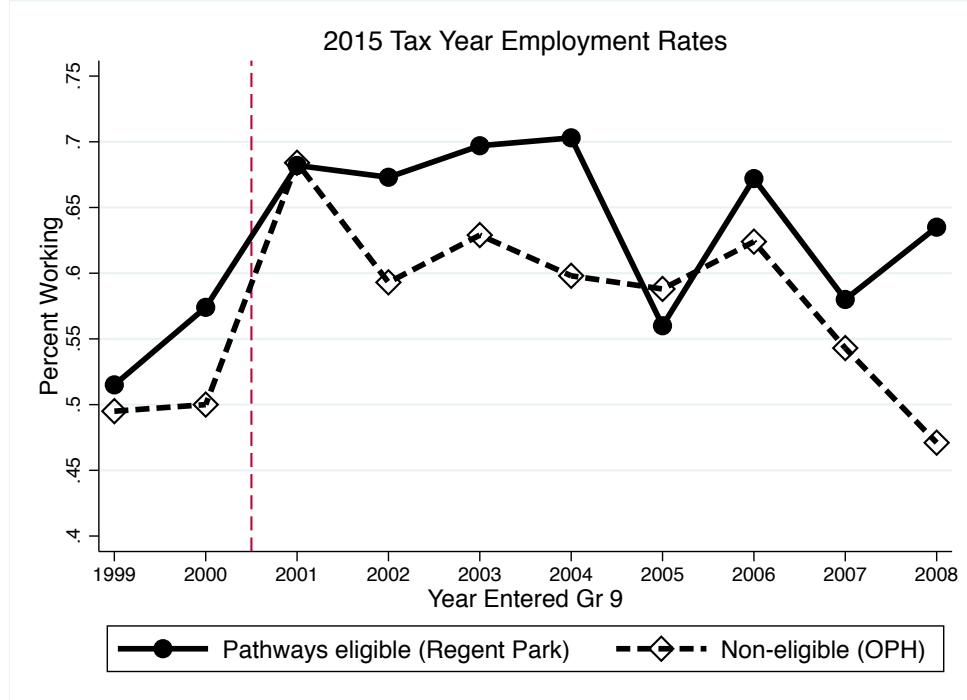
expansion sites will help to better understand whether the program can be ‘scaled-up’ to alternative locations.

The methodology employed in this paper is not able to determine whether the impacts of Pathways are due to one feature of the program or whether the integration of the various features drives the results. This is important not only for understanding how Pathways works, but for containing costs. Experimenting with variations of the program at some of Pathways’ expansion sites or further qualitative research through surveys and ethnographic work may help shed light on this question. Future research that exploits additional administrative data linkages, especially linkages to crime and health data, is also important to determine the extent to which Pathways improves non-pecuniary outcomes.

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Figure A1
2015 Outcomes by Grade 9 Cohort: Legacy Toronto Projects Comparison Group



Notes: Figure A1 plots 2015 tax year employment rates year entered Grade 9 for the 1999-2008 TDSBz cohorts. The means for young adults that lived in Regent Park are represented by the solid circle markers and the means for the legacy Metro Toronto public housing sites are represented by the open diamond markers.

Appendix Table A1: Descriptions of Key Variables

Variable	Description
Earnings	Total earnings from employment at all jobs in a given year (earnings set equal to zero for those without any earnings)
Fraction working	Dummy variable equal to 1 for individuals with positive earnings and zero otherwise
Tuition deduction	Total tuition payments to eligible colleges and universities in a given year
Female	Dummy variable equal to 1 for women and zero otherwise
Immigrant	Dummy variable equal to 1 for individuals who are not born in Canada and zero otherwise
English second language	Dummy variable equal to 1 for individuals who do not speak English as their first language upon enrolling in Grade 9
Cohort	Year entered Grade 9
Age in Grade 9	Age of individual upon enrolling in Grade 9 in a TDSB school
Age (current year)	$age = t - YOB = t - cohort - age\ in\ Grade\ 9$
Number of years claimed tuition deduction	Count of the number of years the variable "Tuition deduction" is positive
Social assistance payments	Social assistance payments received in a given year
EI benefit payments	EI benefits received in a current year
Married or common law	Dummy variable equal to 1 for individuals that are married or are living with a common law partner and zero otherwise
Has child	Dummy variable equal to 1 for individuals who claim a dependant in the CCTB file and zero otherwise

Table A2
Summary Statistics

	(1)	(2)	(3)
	Regent Park	Rexdale/LH	Other Public Housing
Earnings	15,795	10,704	13,257
Working	0.626	0.520	0.568
Tuition Deduction	966	613	771
Age	25.595	24.829	24.970
Female	0.481	0.478	0.485
Immigrant	0.541	0.344	0.321
Observations	1,492	870	5,765

Notes: This table reports means of select variables. The sample is individuals (students) who entered a TDSB high school between 1999 and 2008 and lived in a public housing project during high school. The time-varying variables (earnings, working, tuition tax credits and tuition deduction) are for the 2015 calendar year. All dollar amounts are inflated to 2015 dollars using the Bank of Canada's Consumer Price Index.

Table A3
Means of Various Outcomes For ‘Other Public Housing’ (comparison group)

	(1)	(2)	(3)	(4)	(5)	(6)
	Tuition Expenditures	Earnings	Working	Social Assistance Payments	UI Benefit Payments	Has Child
Age 19	730 [66]***	4,301 [227]***	0.559 [0.018]***	551 [80]***	4,328 [227]***	0.352 [0.018]***
Age 28	388 [57]***	16,390 [837]***	0.550 [0.019]***	1,023 [114]***	16,173 [827]***	0.497 [0.019]***

Notes: The sample is individuals (students) who entered a TDSB high school in 2000 and lived in a non-Regent Park public housing project. In row 1 (2), the sample is further restricted to individuals that are 19 (28) years old. The number in each cell is the average of the outcome variable for individuals in the comparison group based on a regression of the outcome variable on a constant. Robust standard errors are in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table A4
Intent to Treat (ITT) Estimated Effects of Pathways on Adult Outcomes by Age for
the 2000-2003 cohorts

	(1) Tuition Expenditures	(2) Earnings	(3) Working
Pathways*Age 19	121 [361]	-2,348 [465]***	-0.010 [0.022]
Pathways*Age 20	584 [79]***	-629 [520]	0.053 [0.020]**
Pathways*Age 21	725 [76]***	-1,165 [474]**	0.051 [0.018]***
Pathways*Age 22	606 [67]***	-1,290 [478]***	0.065 [0.019]***
Pathways*Age 23	468 [61]***	-565 [476]	0.071 [0.017]***
Pathways*Age 24	324 [56]***	1,468 [455]***	0.087 [0.016]***
Pathways*Age 25	-243 [59]***	-92 [516]	0.156 [0.017]***
Pathways*Age 26	-8 [67]	2,031 [511]***	0.070 [0.016]***
Pathways*Age 27	-95 [95]	4,635 [759]***	0.063 [0.030]**
Pathways*Age 28	- -	3,145 [702]***	0.078 [0.023]***
Age 20	-40 [301]	397 [280]	-0.010 [0.016]
Age 21	11 [320]	1,692 [260]***	-0.006 [0.016]
Age 22	-94 [335]	3,322 [330]***	-0.000 [0.017]

Age 23	-318 [347]	5,292 [451]***	0.002 [0.013]
Age 24	-529 [329]	6,513 [369]***	-0.009 [0.017]
Age 25	-618 [331]*	8,245 [400]***	-0.015 [0.015]
Age 26	-743 [321]**	10,366 [437]***	-0.013 [0.014]
Age 27	-720 [317]**	11,203 [686]***	0.010 [0.026]
Age 28	-759 [291]**	12,834 [544]***	-0.005 [0.013]
Age 29	-816 [280]***	14,107 [643]***	0.001 [0.014]
Constant	6,154 [836]***	38,596 [9,219]***	1.321 [0.335]***
Observations	32,436	32,436	32,436
R-squared	0.079	0.087	0.034

Notes: The sample is individuals (students) who entered a TDSB high school between 2000 and 2003, lived in a public housing project and are at least 19 years old between 2005 and 2015. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with $70-1 = 69$ degrees of freedom. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A5
ITT Estimated Employment (Extensive Margin) Effects for Pathways Using Alternative Comparison Groups

	(1)	(2)	(3)	(4)
	Baseline	Large Density Projects	Priority Neighbourhoods	Legacy Toronto Projects
Pathways*Age 19	0.017 [0.020]	-0.032 [0.025]	0.002 [0.024]	0.024 [0.054]
Pathways*Age 20	0.028 [0.020]	0.003 [0.031]	0.033 [0.034]	0.013 [0.049]
Pathways*Age 21	0.043 [0.017]**	0.021 [0.021]	0.034 [0.024]	0.027 [0.042]
Pathways*Age 22	0.052 [0.017]***	0.031 [0.025]	0.062 [0.024]**	0.026 [0.063]
Pathways*Age 23	0.052 [0.017]***	0.020 [0.027]	0.039 [0.032]	0.049 [0.061]
Pathways*Age 24	0.054 [0.016]***	0.027 [0.015]*	0.045 [0.015]***	0.051 [0.052]
Pathways*Age 25	0.133 [0.018]***	0.089 [0.018]***	0.107 [0.021]***	0.113 [0.057]*
Pathways*Age 26	0.069 [0.017]***	0.030 [0.013]**	0.055 [0.016]***	0.059 [0.045]
Pathways*Age 27	0.061 [0.031]**	0.050 [0.018]**	0.086 [0.014]***	0.078 [0.058]
Pathways*Age 28	0.077 [0.023]***	0.027 [0.022]	0.061 [0.018]***	0.022 [0.058]
Observations	48,069	24,446	20,335	16,969

Notes: The sample is individuals (students) who entered a TDSB high school between 2000 and 2006, lived in a public housing project and are at least 19 years old between 2005 and 2015. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. For column 2, the large density projects include: Alexandra Park, Bleecker Street, East Mall, Edgeley Village, Jane Finch, Firgrove Crescent, Flemingdon Park, Lawrence Heights, Malvern, Moss Park, Pelham Park, Regent Park, Rexdale (Thistletown) and Warden Woods. For column 3, the priority neighbourhoods are comprised of the following 11 housing projects: Duncanwoods Drive, Edgeley Village, Firgrove Crescent, Flemingdon Park, Lawrence Heights, McCowan Road, Pelham Park, Rexdale (Thistletown), Scarlettwoods, Yorkwoods Village, and 'Other' projects (several small projects grouped together to create a publicly available dataset). For column 4, the legacy Metro Toronto projects include: Alexandra Park, Blake Street, Bleecker Street, Don Mount Court, Edgewood Avenue, Greenwood Park, Pelham Park and Regent Park. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with G-1 degrees of freedom (G denotes number of housing projects). *** p<0.01, ** p<0.05, * p<0.1.

Table A6
Intent to Treat (ITT) Estimated Effects of Pathways on Various Outcomes:
Matched Students with a SIN

	(1)	(2)	(3)	(4)	(5)	(6)
	Tuition Expenditures	Earnings	Working	Social Assistance Payments	UI Benefit Payments	Has Child
Pathways*Age 19	243 [246]	-2,373 [473]***	-0.010 [0.020]	-168 [114]	-2,208 [455]***	-0.024 [0.015]
Pathways*Age 20	677 [77]***	-1,344 [555]**	0.003 [0.020]	-193 [105]*	-1,340 [447]***	-0.046 [0.017]***
Pathways*Age 21	811 [73]***	-1,878 [506]***	0.017 [0.016]	-250 [101]**	-1,749 [439]***	-0.060 [0.014]***
Pathways*Age 22	780 [67]***	-2,146 [516]***	0.028 [0.015]*	-233 [108]**	-1,936 [464]***	-0.065 [0.013]***
Pathways*Age 23	494 [60]***	-2,032 [510]***	0.028 [0.015]*	-314 [103]***	-1,861 [486]***	-0.055 [0.015]***
Pathways*Age 24	395 [58]***	-577 [472]	0.026 [0.014]*	-480 [104]***	-402 [407]	-0.050 [0.013]***
Pathways*Age 25	-199 [65]***	-1,126 [569]*	0.093 [0.017]***	-688 [121]***	-799 [509]	-0.104 [0.014]***
Pathways*Age 26	7 [74]	1,184 [532]**	0.036 [0.016]**	-457 [119]***	990 [538]*	-0.060 [0.016]***
Pathways*Age 27	-66 [102]	3,836 [734]***	0.036 [0.028]	-408 [171]**	3,616 [787]***	-0.071 [0.027]**
Pathways*Age 28	-	1,123 [722]	0.020 [0.024]	-628 [132]***	879 [686]	-0.099 [0.021]***
Constant	7,221 [786]***	36,607 [7,762]***	1.439 [0.303]***	-5,442 [1,976]	35,175 [7,518]***	-0.678 [0.280]**
Observations	43,462	43,462	43,462	43,462	43,462	43,462
R-squared	0.079	0.100	0.024	0.065	0.111	0.030

Notes: The sample is the same as in Table A5 with the additional restriction to students who are matched/have a Social Insurance Number (SIN). Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with 70-1 = 69 degrees of freedom. *** p<0.01, ** p<0.05, * p<0.1

Table A7
Intent to Treat (ITT) Estimated Effects of Pathways on Adult Outcomes by Age
Young (2016) Degrees of Freedom Correction

	(1)	(2)	(3)	(4)
	Coefficient	Standard Error	Effective Degrees of Freedom	p-value
A. Tuition Expenditures				
Pathways*Age 19	229	[578]	31.5	0.694
Pathways*Age 20	634	[176]	32.5	0.001
Pathways*Age 21	760	[168]	33.0	0.000
Pathways*Age 22	727	[154]	32.8	0.000
Pathways*Age 23	459	[135]	32.6	0.002
Pathways*Age 24	368	[128]	32.9	0.007
Pathways*Age 25	-174	[136]	33.2	0.207
Pathways*Age 26	-8	[176]	31.8	0.963
Pathways*Age 27	-86	[263]	31.8	0.745
Pathways*Age 28	-	-	-	-
B. Earnings				
Pathways*Age 19	-1739	[1175]	31.5	0.149
Pathways*Age 20	-788	[1311]	32.5	0.552
Pathways*Age 21	-1236	[1213]	33.0	0.315
Pathways*Age 22	-1458	[1271]	32.8	0.260
Pathways*Age 23	-1314	[1308]	32.6	0.322
Pathways*Age 24	138	[1195]	32.9	0.909
Pathways*Age 25	-6	[1315]	33.2	0.997
Pathways*Age 26	2148	[1360]	31.8	0.124
Pathways*Age 27	4542	[2140]	31.8	0.042
Pathways*Age 28	3136	[2166]	30.1	0.158

C. Working				
Pathways*Age 19	0.017	[0.050]	31.5	0.745
Pathways*Age 20	0.028	[0.049]	32.5	0.571
Pathways*Age 21	0.043	[0.042]	33.0	0.316
Pathways*Age 22	0.052	[0.043]	32.8	0.234
Pathways*Age 23	0.052	[0.043]	32.6	0.227
Pathways*Age 24	0.054	[0.039]	32.9	0.181
Pathways*Age 25	0.133	[0.042]	33.2	0.003
Pathways*Age 26	0.069	[0.044]	31.8	0.124
Pathways*Age 27	0.061	[0.085]	31.8	0.477
Pathways*Age 28	0.077	[0.070]	30.1	0.280

Notes: The sample is individuals (students) who entered a TDSB high school between 2000 and 2006, lived in a public housing project and are at least 19 years old between 2005 and 2015. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and are adjusted using the bias correction in Young (2016). Inference is based on the t distribution using the effective degrees of freedom (EDF) from Young (2016).

Table A8
Distribution Effects of Pathways on 2015 Adult Earnings

	(1)	(2)	(3)	(4)
	p25	p50	p75	p90
Pathways*Age 23	0 [144]	-1,175 [4,173]	3,979 [5,110]	-1,534 [6,356]
Pathways*Age 24	-0 [143]	-4,917 [4,122]	-4,167 [5,048]	-2,725 [6,279]
Pathways*Age 25	0 [141]	-469 [4,072]	7,609 [4,986]	-4,110 [6,203]
Pathways*Age 26	0.000 [145]	744 [4,196]	6,295 [5,138]	2,062 [6,391]
Pathways*Age 27	-0 [139]	4,650 [4,021]	12,752 [4,924]***	7,135 [6,125]
Pathways*Age 28	-0 [139]	4,209 [4,008]	5,195 [4,907]	2,243 [6,104]
Constant	2,805 [1,356]**	81,591 [39,186]**	315,477 [47,982]***	449,259 [59,690]***
Observations	5,907	5,907	5,907	5,907

Notes: The sample is individuals who entered a TDSB high school between 2000 and 2006, living in a public housing project and are at least 19 years old in the 2015 tax year. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with 70-1 = 69 degrees of freedom. *** p<0.01, ** p<0.05, * p<0.1.

Table A9
Intent to Treat (ITT) Estimated Effects of Pathways on Job Quality by Age

	(1)	(2)	(3)
	Median Earnings at Primary Employer (dollars)	Average Earnings at Primary Employer (dollars)	Total Payroll at Primary Employer (thousands of dollars)
Pathways*Age 19	3,487 [958]***	2,244 [1,322]*	119,400 [36,039]***
Pathways*Age 20	3,847 [919]***	3,331 [1,019]***	72,442 [36,050]**
Pathways*Age 21	3,385 [777]***	2,198 [842]**	10,500 [38,582]
Pathways*Age 22	2,898 [803]***	2,056 [932]**	78,843 [38,338]**
Pathways*Age 23	498 [1,294]	-104 [1,440]	73,302 [37,664]*
Pathways*Age 24	2,178 [877]**	2,031 [887]**	18,419 [37,502]
Pathways*Age 25	1,324 [926]	72 [1,256]	28,057 [40,030]
Pathways*Age 26	2,149 [1,204]*	2,174 [1,139]*	11,415 [45,573]
Pathways*Age 27	2,374 [1,261]*	2,017 [1,239]	17,595 [47,409]
Pathways*Age 28	2,362 [1,224]*	3,321 [1,258]**	-28,960 [58,739]
Age 20	183 [969]	-246 [1,574]	13,122 [33,802]
Age 21	1,980 [988]**	1,898 [1,481]	38,303 [36,168]
Age 22	3,993 [793]***	4,054 [1,431]***	43,168 [30,550]
Age 23	7,656 [1,302]***	8,019 [1,660]***	53,054 [31,082]*
Age 24	8,242 [970]***	8,302 [1,509]***	62,516 [33,752]*
Age 25	10,412	11,303	68,914

	[997]***	[1,639]***	[34,270]**
Age 26	12,537	13,037	88,689
	[968]***	[1,338]***	[34,444]**
Age 27	13,473	13,896	131,300
	[1,094]***	[1,700]***	[36,283]***
Age 28	16,279	16,569	133,000
	[1,238]***	[1,719]***	[42,711]***
Age 29	17,167	17,947	186,200
	[1,557]***	[2,055]***	[57,478]***
Constant	64,198	81,019	2,420,000
	[11,321]***	[12,626]***	[338,300]***
Observations	26,842	26,842	29,145
R-squared	0.087	0.086	0.016

Notes: The sample is individuals (students) who entered a TDSB high school between 2000 and 2006, lived in a public housing project and are at least 19 years old between 2005 and 2015 and who are employed. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for gender, immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with $70-1 = 69$ degrees of freedom. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A10
Intent to Treat (ITT) Estimated Effects of Pathways on Various Outcomes:
Male Students

	(1)	(2)	(3)	(4)	(5)	(6)
	Tuition Expenditures	Earnings	Working	Social Assistance Payments	UI Benefit Payments	Has Child
Pathways*Age 19	320 [98]***	-2,477 [987]**	-0.037 [0.027]	-115 [73]	-2,612 [775]***	0.000 [0.002]
Pathways*Age 29	497 [96]***	-1,599 [983]	-0.017 [0.027]	-121 [76]	-1,745 [776]**	-0.032 [0.023]
Pathways*Age 21	661 [101]***	-2,180 [884]**	0.002 [0.023]	-207 [78]***	-2,258 [741]***	-0.031 [0.020]
Pathways*Age 22	676 [96]***	-2,407 [889]***	0.011 [0.022]	-183 [82]**	-2,450 [767]***	-0.043 [0.019]**
Pathways*Age 23	380 [89]***	-2,199 [991]**	0.008 [0.025]	-165 [82]**	-2,284 [947]**	-0.019 [0.021]
Pathways*Age 24	337 [90]***	-918 [791]	0.019 [0.022]	-241 [82]***	-1,015 [671]	-0.005 [0.019]
Pathways*Age 25	41 [102]	1,452 [882]	0.023 [0.025]	-383 [96]***	1,622 [862]*	-0.023 [0.021]
Pathways*Age 26	-75 [113]	2,580 [790]***	0.054 [0.024]**	-227 [86]**	2,121 [915]**	-0.055 [0.022]**
Pathways*Age 27	-113 [120]	4,378 [1,028]***	0.022 [0.040]	-211 [114]*	3,870 [1,100]***	-0.027 [0.038]
Pathways*Age 28	- -	2,062 [1,217]*	0.062 [0.029]**	- -	1,883 [939]**	-0.090 [0.025]***
Constant	-5,731 [827]***	29,703 [1,012]***	1.309 [0.391]***	-1,026 [1,742]	25,029 [10,737]**	-0.487 [0.340]
Observations	24,235	24,235	24,235	24,235	24,235	24,235
R-squared	0.062	0.088	0.037	0.035	0.102	0.037

Notes: The sample is the same as in Table A5 with the additional restriction to male students. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with 70-1 = 69 degrees of freedom. *** p<0.01, ** p<0.05, * p<0.1.

Table A11
Intent to Treat (ITT) Estimated Effects of Pathways on Various Outcomes:
Female Students

	(1)	(2)	(3)	(4)	(5)	(6)
	Tuition Expenditures	Earnings	Working	Social Assistance Payments	UI Benefit Payments	Has Child
Pathways*Age 19	177 [351]	-1,053 [792]	0.064 [0.027]**	-93 [180]	-661 [768]	-0.096 [0.023]***
Pathways*Age 20	761 [94]***	18 [612]	0.065 [0.023]***	-123 [166]	131 [594]	-0.100 [0.022]***
Pathways*Age 21	856 [90]***	-267 [635]	0.077 [0.023]***	-137 [156]	-21 [610]	-0.131 [0.021]***
Pathways*Age 22	777 [87]***	-507 [638]	0.085 [0.024]***	-130 [163]	-160 [616]	-0.125 [0.022]***
Pathways*Age 23	547 [72]***	-388 [640]	0.089 [0.022]***	-286 [151]*	-78 [637]	-0.131 [0.023]***
Pathways*Age 24	388 [88]***	1,263 [672]*	0.081 [0.023]***	-520 [160]***	1,578 [660]**	-0.145 [0.021]***
Pathways*Age 25	-229 [93]**	-647 [818]	0.217 [0.027]***	-632 [181]***	-347 [817]	-0.248 [0.024]***
Pathways*Age 26	34 [77]	1,726 [735]**	0.072 [0.022]***	-487 [176]***	1,707 [691]**	-0.121 [0.023]***
Pathways*Age 27	-36 [103]	5,308 [803]***	0.108 [0.026]***	-522 [208]**	5,303 [688]***	-0.169 [0.025]***
Pathways*Age 28	65 [111]	4,133 [866]***	0.086 [0.031]***	- -	3,673 [842]***	-0.223 [0.030]***
Constant	6,825 [1,370]***	30,942 [9,391]***	1.052 [0.364]***	-8,352 [3,481]***	34,361 [9,569]***	-0.306 [0.382]
Observations	23,834	23,834	23,834	23,834	23,834	23,834
R-squared	0.085	0.106	0.031	0.078	0.110	0.049

Notes: The sample is the same as in Table A5 with the additional restriction to female students. Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with 70-1 = 69 degrees of freedom. *** p<0.01, ** p<0.05, * p<0.1.

Table A12
Intent to Treat (ITT) Estimated Effects of Pathways on Various Outcomes:
Natives

	(1)	(2)	(3)	(4)	(5)	(6)
	Tuition Expenditures	Earnings	Working	Social Assistance Payments	UI Benefit Payments	Has Child
Pathways*Age 19	11 [328]	-2,771 [640]***	0.018 [0.025]	-404 [155]**	-2,670 [617]***	-0.091 [0.022]**
Pathways*Age 20	481 [96]***	-2,221 [639]***	0.034 [0.022]	-299 [147]**	-2,314 [631]***	-0.104 [0.020]**
Pathways*Age 21	496 [90]***	-2,799 [640]***	0.044 [0.022]*	-357 [147]**	-2,953 [623]***	-0.096 [0.020]**
Pathways*Age 22	452 [95]***	-3,095 [707]***	0.024 [0.023]	-336 [150]**	-3,035 [702]***	-0.093 [0.019]**
Pathways*Age 23	162 [77]**	-2,333 [772]***	0.066 [0.021]***	-345 [150]**	-2,504 [772]***	-0.123 [0.022]**
Pathways*Age 24	68 [91]	-1,623 [663]**	0.032 [0.021]	-541 [153]***	-1,905 [650]***	-0.081 [0.020]**
Pathways*Age 25	-94 [102]	-665 [736]	0.032 [0.024]	-520 [177.769]***	-854 [727]	-0.092 [0.021]**
Pathways*Age 26	46 [87]	377 [787]	0.071 [0.024]***	-337 [183]*	88 [767]	-0.127 [0.023]**
Pathways*Age 27	-26 [109]	1,764 [657]***	0.100 [0.026]***	-453 [218]**	1,284 [670]*	-0.168 [0.025]**
Pathways*Age 28	- -	-2,741 [980]***	0.110 [0.033]***	-577 [222]**	-3,322 [937]***	-0.197 [0.027]**
Constant	6,199 [915]***	37,034 [12,294]***	1.493 [0.441]***	-4,532 [2,615]	34,872 [2,322]***	-0.521 [0.392]
Observations	27,366	27,366	27,366	27,366	27,366	27,366
R-squared	0.091	0.110	0.032	0.072	0.110	0.031

Notes: The sample is the same as in Table A5 with the additional restriction to natives (students born in Canada). Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with 70-1 = 69 degrees of freedom. *** p<0.01, ** p<0.05, * p<0.1.

Table A13
Intent to Treat (ITT) Estimated Effects of Pathways on Various Outcomes:
Immigrants

	(1)	(2)	(3)	(4)	(5)	(6)
	Tuition Expenditures	Earnings	Working	Social Assistance Payments	UI Benefit Payments	Has Child
Pathways*Age 19	477 [120]***	-1,502 [744]**	0.008 [0.026]	-87 [93]	-1,432 [627]**	-0.006 [0.026]
Pathways*Age 20	710 [117]***	-109 [746]	0.018 [0.031]	-174 [86]**	-118 [593]	-0.040 [0.030]
Pathways*Age 21	902 [107]***	-566 [712]	0.027 [0.026]	-174 [78]**	-312 [622]	-0.065 [0.025]**
Pathways*Age 22	899 [105]***	-738 [678]	0.072 [0.028]**	-142 [84]*	-507 [616]	-0.078 [0.028]***
Pathways*Age 23	677 [88]***	-1,130 [681]	0.027 [0.029]	-283 [84]***	-745 [756]	-0.024 [0.028]
Pathways*Age 24	581 [102]***	896 [687]	0.061 [0.026]**	-380 [100]***	1,327 [634]**	-0.063 [0.025]**
Pathways*Age 25	-165 [90]*	-13 [866]	0.172 [0.025]***	-605 [105]***	607 [797]	-0.152 [0.025]***
Pathways*Age 26	-105 [106]	2,523 [885]***	0.053 [0.028]*	-491 [93]***	2,289 [1,128]**	-0.054 [0.025]**
Pathways*Age 27	-148 [132]	6,202 [1,045]***	0.039 [0.033]	-435 [98]***	6,083 [1,147]***	-0.051 [0.035]
Pathways*Age 28	- -	7,109 [1,037]***	0.049 [0.032]	- -	7,000 [1,031]***	-0.130 [0.031]***
Constant	6,218 [1,238]***	23,872 [8,620]***	0.740 [0.380]*	-4,622 [2,755]*	23,509 [8,013]***	-0.045 [0.350]
Observations	20,703	20,703	20,703	20,703	20,703	20,703
R-squared	0.072	0.088	0.054	0.060	0.107	0.070

Notes: The sample is the same as in Table A5 with the additional restriction to immigrants (students born outside of Canada). Pathways is a binary variable equal to one for students who entered Grade 9 after 2001 and resided in the Regent Park housing project, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with 70-1 = 69 degrees of freedom. *** p<0.01, ** p<0.05, * p<0.1.

Table A14
Intent to Treat (ITT) Estimated Effects of Pathways at the Rexdale/LH Sites
on Various Outcomes

	(1) Tuition Expenditures	(2) Earnings	(3) Working	(4) UI Benefit Payments	(5) Has Child
New-Pathways*Age 19	-89 [211]	805 [456]*	0.042 [0.030]	899 [348]**	-0.020 [0.023]**
New-Pathways*Age 20	-109 [315]	1,240 [354]***	0.016 [0.015]	1,359 [257]***	-0.025 [0.012]**
New-Pathways*Age 21	-96 [217]	2,076 [407]***	0.012 [0.038]	2,149 [287]***	-0.054 [0.036]
New-Pathways*Age 22	-84 [151]	-312 [823]	-0.035 [0.062]	-214 [683]	-0.036 [0.044]
New-Pathways*Age 23	-89 [211]	805 [456]*	0.042 [0.030]	899 [348]**	-0.020 [0.023]**
Constant	6,755 [834]***	25,626 [6,824]***	0.845 [0.294]***	24,850 [2,476]***	-0.065 [0.272]
Observations	45,094	45,094	45,094	45,094	45,094
R-squared	0.077	0.103	0.033	0.112	0.039

Notes: The sample is individuals (students) who entered a TDSB high school between 2001 and 2008, lived in a public housing project and are at least 19 years old between 2005 and 2015. New-pathways is a binary variable equal to one for students who entered Grade 9 after 2007 and resided in the Rexdale or Lawrence Heights housing projects, and zero otherwise. All regressions include cohort (year started Grade 9) and housing project fixed effects, as well as the following covariates: age started Grade 9 and dummies for immigrant status and English as a second language (ESL) status. Student immigrant status and first language status is based on TDSB administrative records. Standard errors are clustered at the housing project level and inference is based on the critical values of the t distribution with 70-1 = 69 degrees of freedom. *** p<0.01, ** p<0.05, * p<0.1.