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

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Offering comprehensive education support services to disadvantaged students shows promise for improving academic attainment. We explore longer-term impacts of the Pathways to Education program, a set of coaching, tutoring, group activities, and financial incentives initially offered in 2001 to grade-nine students living in the largest public housing community in Toronto. Using a difference-in-difference methodology and matching school records to income tax data through age 28 for a sample of students living in public housing under similar circumstances, we find that Pathways eligibility increased adult annual earnings by 19 percent, employment by 14 percent, and reduced welfare receipt by more than 30 percent. (*JEL* I22, I23, I24, I26, I28, L31)

Children who 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, Kling, and Liebman 2001; Ludwig et al. 2013; Chetty, Hendren, and Katz 2016; Chetty and Hendren 2018), reforms to school accountability and teacher pay (Goodman and Turner 2013, Gilraine 2016), lowering class sizes (Chetty et al. 2011), expanding effective charter schools (Abdulkadiroğlu et al. 2011; Dobbie and Fryer 2011, 2013; Fryer 2014), and subsidies for higher education (Conger and Turner 2017; Denning, Marx, and Turner 2019).

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

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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 Programs (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 (Weiss et al. 2019). The Carolina Covenant 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. Clotfelter, Hemelt, and Ladd (2018) finds that eligibility increased credit accumulation, 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 9–12 free public transportation and post-secondary 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 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 investigated the causal effects of eligibility for Pathways on high school graduation rates and college enrollment using a difference-in-difference strategy that compared students who lived in Regent Park to those who lived in other public housing sites in Toronto before and after the program was introduced. With long waiting lists for public housing spots, students from the comparison group entered grade nine under very similar circumstances as those from Regent Park. We found that Pathways increased high school graduation and college enrollment by about 10 to 20 percentage points (Oreopoulos, Brown, and Lavecchia 2017).

Though programs like Pathways and ASAP appear effective at improving education attainment, policymakers are ultimately concerned with 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 (Deming 2009, Chetty et al. 2011), the ability for comprehensive programs to improve long-run outcomes remains an open question.

[1] Page et al. (2017) found that the Dell Scholars Program increased the likelihood that low-income students earned a bachelor's degree.

This paper delivers encouraging evidence that comprehensive student support programs like Pathways can indeed lead to meaningful, long-run labor market benefits. We take advantage of unique administrative data that links school records, personal income tax files, and information from employers. This data allows us to follow those eligible for Pathways and a comparison group of students living in other public housing communities through college and into early adulthood. Using the same difference-in-difference methodology as our prior paper, we find that eligibility for Pathways increases post-secondary education attendance and the earnings of young adults. Between the ages of 19 and 24, eligibility for Pathways increases annual tuition expenditures at two-year colleges and four-year universities (a proxy for attending a post-secondary institution) by between $360 and $795 or 47 to 100 percent. Consistent with a delayed labor market entry due to staying in school longer, eligibility for Pathways leads to lower earnings from ages 19 to 23 but higher earnings between ages 25 and 28. We estimate that by age 28, eligibility for Pathways increases earnings by about $3,200 per year (2015 Canadian dollars) or 19 percent and the likelihood of being employed by 8–9 percentage points or 14–16 percent. Our results should be interpreted as intent-to-treat (ITT) estimates of the effect of being eligible for Pathways at the Regent Park public housing project. With sign-up rates for Pathways in the range of 85–90 percent, these ITT effects will be very similar to participation effects.

We also find that Pathways has an impact on a variety of other monetary and non-monetary outcomes. Eligibility reduces social assistance (welfare) receipt by $300–$500 (30–50 percent) and reduces the likelihood of having a child as a young adult by a third (33.1 versus 49.9 percent). Our estimates suggest that the long-run fiscal gains from Pathways, including higher tax revenue and reduced spending on the social safety net, may offset the costs from offering a comprehensive set of services to disadvantaged youth.

The remainder of the paper is structured as follows. Section I describes the main features of the Pathways to Education program. In Section II, we describe the administrative datasets and empirical strategy. Sections III and IV report the main results and various sensitivity checks. Section V provides concluding comments.

I. 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 grassroots 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 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 poverty and crime. Around the time of the introduction of

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

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 nine cohort in September 2001. The fact that older Regent Park cohorts were never eligible for the program—even grade-nine students in September 2000—allows us to evaluate the impact of Pathways using a difference-in-difference design, described in Section II. Over the past decade and a half, Pathways has expanded to 20 sites across 8 provinces in Canada, including 3 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).

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 (SPSW) who is employed full-time by Pathways. Students meet with their SPSW at least twice a month 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 post-secondary 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 assistance is provided through a trust fund for each participant. For each year a student is registered, Pathways sets aside $1,000 CAD, up to a maximum of $4,000 (tax-free), that can be used toward 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 who 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 nine and ten, 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, cooking, community recycling projects, and martial arts. The activities are designed to

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

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 3 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.

II. Data and Empirical Strategy

A. *Data*

We merged administrative data from the 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 nine beginning in September 2000, the year before Pathways was introduced. We also use data for a smaller cohort of students that enrolled in grade nine 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 (hereafter referred to as the legacy Metro Toronto sample). This additional year adds a second pre-Pathways cohort to the one we already have, thereby allowing us to examine the pre-trends of Regent Park and the other public housing sites. The TDSB data are matched to TCH data using uniquely identifiable postal codes from school enrollment forms. This allows us to construct a dataset of all students enrolled in TDSB schools and living in one of the 70 public housing projects built by the TCH that only house families paying subsidized rents.[4]

That the application process for TCH housing units is centralized and the demand for units far exceeds supply is important for our empirical strategy. Applying for a TCH unit requires filling out a standardized form that assesses an applicant's income and need for housing, as well as broad geographic preferences. Because the number of applications far exceeds the number of available units, offers are made on a first-come, first-serve basis, with some preferential treatment for applicants who are survivors of domestic abuse and human trafficking, terminally ill applicants, and over-housed tenants. In the years leading up to the introduction of Pathways, most applicants indicated they were interested in all TCH projects to reduce their waitlist time, which averaged around five 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. 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.

[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.

We match the TDSB-TCH data to administrative data from Statistics Canada for the 2005–2015 years. These data offer rich information on Canadian tax filers' post-secondary enrollment and tuition expenditures, earnings, social assistance, and UI receipt, as well as marital status and number of children. TDSB public housing students are matched to the 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 and file a tax return, we restrict the analysis sample to those at least 19 years old in each calendar (tax) year. This leaves us with an unbalanced panel of 8,029 public housing students between 2005 and 2015 or 46,798 individual-year observations.

In any given year, the young adults in our sample vary in age. For example, students who entered grade nine in 2000 (the year before Pathways was introduced) are age 29, on average, in 2015.[5] Our youngest cohort of students who entered grade nine in September 2006 were 23, on average, in 2015. Thus, pooling tax return data from 2005–2015 and accounting for the introduction of Pathways in 2001 means that we observe students from the 2000 grade-nine cohort from ages 19–29. This group was not eligible for Pathways regardless of whether or not they lived in Regent Park. Those who entered grade nine from other public housing projects after September 2001 are observed from ages 19–28. Similarly, students eligible for Pathways because they enrolled in grade nine after 2001 and lived in Regent Park are observed from age 19 up to age 28.

We estimate the causal effect of eligibility for Pathways on a variety of long-term outcomes beginning with persistence in post-secondary education programs. The tax data contain information on the tuition payments students make to recognized post-secondary institutions over a calendar year.[6] We use these tuition payments to proxy for attendance in college or university. Our two primary labor market outcome variables are an individual's total earnings over a calendar year and a dummy variable equal to one if an individual reports positive employment earnings.[7] 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 age 6 and under age 18).[8] Background variables were constructed from both the TDSB and tax data and include gender, immigrant status, language spoken at home, age at the start of high school, and age in the current tax year.[9] We deflated all dollar amounts to 2015 dollars using the Bank of Canada's consumer price index.

B. *Empirical Strategy*

Below we present estimates of the causal effect of eligibility for Pathways on long-term outcomes using a difference-in-difference approach. Our research design

[5] Most students enroll in high school at age 14, though in each cohort a few students start at 13 or 15.

[6] Canadian tax filers over the age of 16 may claim a nonrefundable tax credit for eligible tuition payments. The tuition payments we observe are used to calculate this nonrefundable tax credit.

[7] For individuals who work 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.

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

[9] Online Appendix Table A2 reports summary statistics for select dependent and independent variables for 2015.

compares the outcomes of individuals who were assigned to live in Regent Park during high school with students who were assigned to other Toronto public housing projects before and after Pathways was introduced. Since we expect that the impact of Pathways will vary through the life cycle, we exploit the longitudinal nature of our data to estimate the long-run impacts of the program by age. Our main estimating equation is

$$(1) \qquad y_{i(pc)t} = \sum_{a=19}^{28} \beta^a \left(Pathways_{i(pc)} \times \mathbf{1}\left[Age_{i(pc)t} = a\right] \right) + \gamma_a + X'_{i(pc)}\delta + e_p + e_c + e_{i(pc)t},$$

where $y_{i(pc)t}$ is the outcome for individual i (who lived in housing project p and started grade nine in cohort c) in year t. The term $Pathways_{i(pc)}$ is a dummy variable equal to one for those who lived in Regent Park and entered grade nine after September 2001 (those eligible for Pathways) and equal to zero otherwise. The binary variable $\mathbf{1}[Age_{i(pc)t} = a]$ is equal to one if individual i is age a in year t and zero otherwise. Consequently, the $Pathways_{i(pc)} \times \mathbf{1}[Age_{i(pc)t} = a]$ terms capture the full set of treatment-by-age interactions (the main treatment effect is omitted). The individual time invariant characteristics (dummy variables for gender, immigrant status, and language spoken at home and a continuous variable for age in grade nine) are encapsulated by the vector $X'_{i(pc)}$, and e_p and e_c are housing project and grade-nine cohort fixed effects, respectively. Variables γ_a are age fixed effects (the omitted age dummy is for age 19).[10] Standard errors are clustered at the housing project level (70 clusters) to allow for serial correlation and heterogeneity in the outcomes of students who resided in the same housing project (Cameron and Miller 2015).[11]

The coefficient β^a is the average causal effect of being eligible for Pathways on outcome y at age a.[12] If eligibility for Pathways increases post-secondary persistence and delays labor market entry, we expect that the β^a coefficients will be decreasing in age when post-secondary tuition 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 to 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 IV and the online Appendix to assess the validity of this assumption.

Our estimate of the causal effect of eligibility for Pathways on earnings for young adults may understate the effect of the program on permanent earnings (i.e., earnings

[10] Since a few students (about 7 percent in each cohort) start high school at age 13 or 15, we can identify both the 2000 grade-nine cohort fixed effect and the age 29 fixed effect.

[11] 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 discussed in online Appendix B. In general, the estimated standard errors using this procedure are larger than those reported in the main text.

[12] We choose to present ITT or eligibility effects rather than treatment-on-the-treated (TOT) effects because of the high sign-up rate for Pathways and because participation can be defined in multiple ways (e.g., ever signing up, how many years signed up, participation in tutoring and mentoring activities).

of mid- and late-career adults). 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 III.

III. Results

A. *Main Results*

Figures 1–3 present the main results for post-secondary tuition expenditures (Figure 1), earnings (Figure 2), and employment (Figure 3), respectively. Each of these figures plot the estimated β^a coefficients from equation (1) and the associated 95 percent confidence intervals against age. Table A4 in the online Appendix reproduces the graphical results by reporting the estimated β^as, age fixed effects γ_a, and standard errors.

The age pattern for the effects of Pathways on post-secondary tuition expenditures exhibits an inverse U-shape pattern. Eligibility for Pathways increases the tuition expenditures of students by a statistically significant $437 at age 19. Between the ages of 20 and 24, eligibility for Pathways increases post-secondary tuition expenditures by between $360 and $795. Each of the β^{19}–β^{24} estimates is statistically significant at the 1 percent level. To put these numbers in perspective, the average tuition expenditure of 19-year-olds from the OPH comparison group is $763 (see online Appendix Table A3). Compared with this benchmark, eligibility for Pathways increases tuition expenditures by 47 to 104 percent between the ages of 19 and 24. Consistent with traditional age patterns for post-secondary attendance, the effect of eligibility for Pathways on tuition expenditures fades out beginning at age 25.[13]

The tuition expenditures claimed by individuals on their tax return proxy for attendance in colleges and universities. The estimates displayed in Figure 1 suggest that Pathways increases attendance at post-secondary institutions during traditional college-going years. Higher tuition expenditures can arise from an increase in the fraction of young adults enrolled at a post-secondary institution, a shift in the fraction of young adults attending four-year universities over two-year colleges, or both. In previous work, we found that eligibility for Pathways increased the fraction of youth that accepted offers of admission from both two-year colleges and four-year universities (Oreopoulos, Brown, and Lavecchia 2017). However, accepting offers of admission does not guarantee success or graduation, especially for students from disadvantaged families who face additional pressures such as financial constraints, work requirements, and family obligations (Oreopoulos and Petronijevic 2013, Weiss et al. 2019). Together with our previous research, the estimates displayed in Figure 1 suggest that Pathways increased persistence in post-secondary institutions.

Figure 2 plots the treatment effects for earnings by age. The β^a estimates for earnings follow the opposite age pattern as the coefficients for post-secondary tuition

[13] 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.

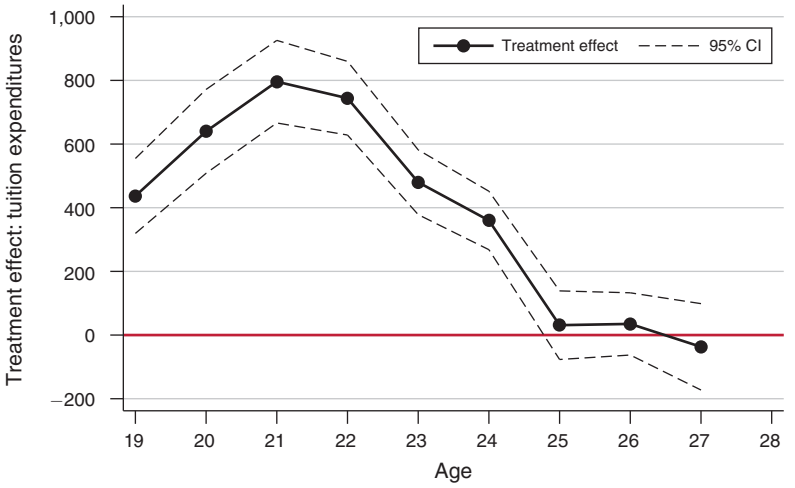

FIGURE 1. EFFECTS OF ELIGIBILITY FOR PATHWAYS ON TUITION EXPENDITURES (POSTSECONDARY ATTENDANCE)

Notes: Figure 1 presents estimates of the causal effect of eligibility for Pathways on individual tuition expenditure claims by age. The black markers represent the coefficient estimates for β^a from equation (1) in the main text and the dashed lines the corresponding 95 percent confidence intervals. Standard error estimates are calculated using the clustered robust variance estimator (CRVE) with $70 - 1 = 69$ degrees of freedom.

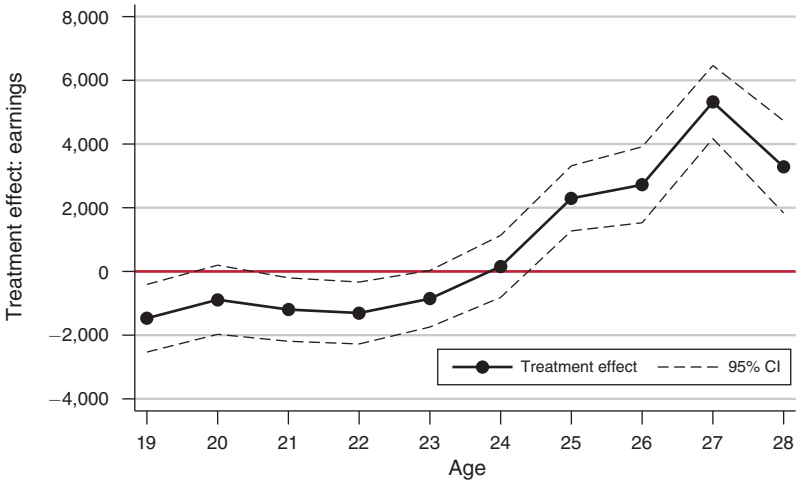

FIGURE 2. EFFECTS OF ELIGIBILITY FOR PATHWAYS ON EARNINGS

Notes: Figure 2 presents estimates of the causal effect of eligibility for Pathways on earnings by age. The black markers represent the coefficient estimates for β^a from equation (1) in the main text and the dashed lines the corresponding 95 percent confidence intervals. Standard error estimates are calculated using the CRVE with $70 - 1 = 69$ degrees of freedom.

expenditures. Eligibility for Pathways initially lowers (unconditional) earnings for young adults between the ages of 19 and 23. For example, at age 19 eligibility for Pathways lowers earnings by a statistically significant $1,470. The earnings of young adults from Regent Park remain between $857 and $1,305 below the earnings of

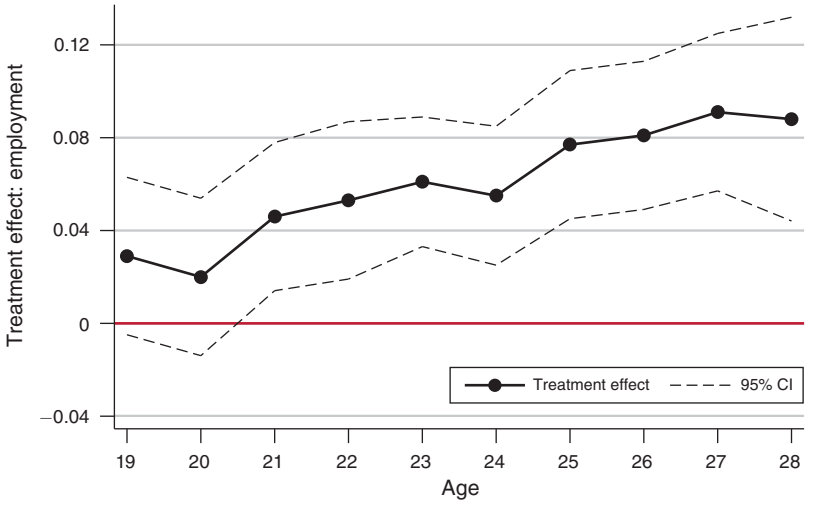

FIGURE 3. EFFECTS OF ELIGIBILITY FOR PATHWAYS ON EMPLOYMENT

Notes: Figure 3 presents estimates of the causal effect of eligibility for Pathways on the likelihood of being employed by age. The black markers represent the coefficient estimates for β^a from equation (1) in the main text and the dashed lines the corresponding 95 percent confidence intervals. Standard error estimates are calculated using the CRVE with $70 - 1 = 69$ degrees of freedom.

those from the comparison group from ages 20–23. Beginning at age 24, the relative earnings of young adults from Regent Park begin to rise and eventually exceed the earnings of young adults from OPH. In particular, eligibility for Pathways increases annual earnings by (a statistically insignificant) $158 at age 24 and $2,720 at age 26. By age 28, eligibility for Pathways increases unconditional annual earnings by a statistically significant $3,282. This represents a 19 percent increase over the $16,402 earned by the average 28-year-old in the 2000 OPH grade-nine cohort.[14]

Participation in the Pathways program may increase the unconditional earnings of young adults by increasing the likelihood of working (extensive margin), increasing earnings conditional on working (intensive margin), or both. Figure 3 presents the estimates of the effect of eligibility for Pathways on the extensive margin by age. The coefficient estimates suggest that the program increases the likelihood of working at all ages. Furthermore, the age pattern of the estimates suggests that the effect of Pathways on the probability of reporting positive earnings is increasing as young adults progress through their 20s. By age 28, Pathways is estimated to increase the likelihood of working by a statistically significant 8.8 percentage points. This represents a 16 percent increase over the 55 percent employment rate of the comparison group at age 28.

Together with the results in Figures 1 and 2, the estimates in Figure 3 show that eligibility for Pathways increases employment in two different ways as young

[14] The 19 percent estimate is of similar magnitude as recent estimates of the return to college admission for academically marginal students (Zimmerman 2014; Heckman, Humphries, and Veramendi 2018). Relating our estimates to this literature is challenging because of the many channels through which Pathways may influence earnings. For example, the coaching and mentoring of students by SPSWs may influence labor market outcomes. Also, we do not observe education attainment, only tuition expenditures.

adults progress through their 20s. First, Pathways increases part-time employment during the traditional college-going years. This is because the coefficient estimates in Figure 3 are consistently positive and the earnings estimates in Figure 2 are negative between ages 19 and 23. Second, our results suggest that Pathways increases earnings as young adults enter their late 20s, an effect driven in part by an increase in the likelihood of working.

Eligibility for Pathways may also increase the earnings of those who would have worked in the absence of the program. 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 firms that pay higher wages. 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 subsample of individuals with positive earnings will lead to biased estimates of β^a coefficients because of the significant extensive margin response. If young adults induced to work because of Pathways have lower potential earnings, on average, than those who would have worked in the absence of the program, then conditioning on those with positive earnings will result in estimates of β^a that are biased downwards. In online Appendix B1, we show that the extensive margin effect explains a majority of the impact of Pathways on unconditional earnings.

B. *Robustness Checks*

The validity of our difference-in-difference strategy requires that the counterfactual outcomes of youth who resided in Regent Park follow the same trend as those who 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 who entered high school between September 2000 and 2006. In this subsection, we address this limitation in two ways. First, we present results from the estimation of equation (1) for three different subsamples of OPH sites that most closely resemble Regent Park in size and composition. Second, we estimate equation (1) on the subsample of students from the legacy Metro Toronto school board. The advantage of restricting the analysis to this subsample is that it contains two pre-Pathways cohorts. This allows us to investigate whether the pre-trends of young adults from Regent Park followed the same path as young adults from OPH.[15]

Figure 4 reports the results from our sensitivity checks for tuition expenditures (Figure 4, panel A) and earnings (Figure 4, panel B). The results for employment are reported in online Appendix Figure A1 and online Appendix Table A8. The baseline estimates from Figures 1 and 2 are displayed with black circle markers (the dashed lines represent 95 percent confidence intervals) as a benchmark. The light grey square markers represent estimates of the effect of eligibility for Pathways when the comparison group is restricted to the 11 largest public housing sites. The age pattern of the coefficients using this subsample is very similar to the baseline estimates. Indeed, all of the estimates fall within the 95 percent confidence intervals of

[15] 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 unique matches only are similar but noisier.

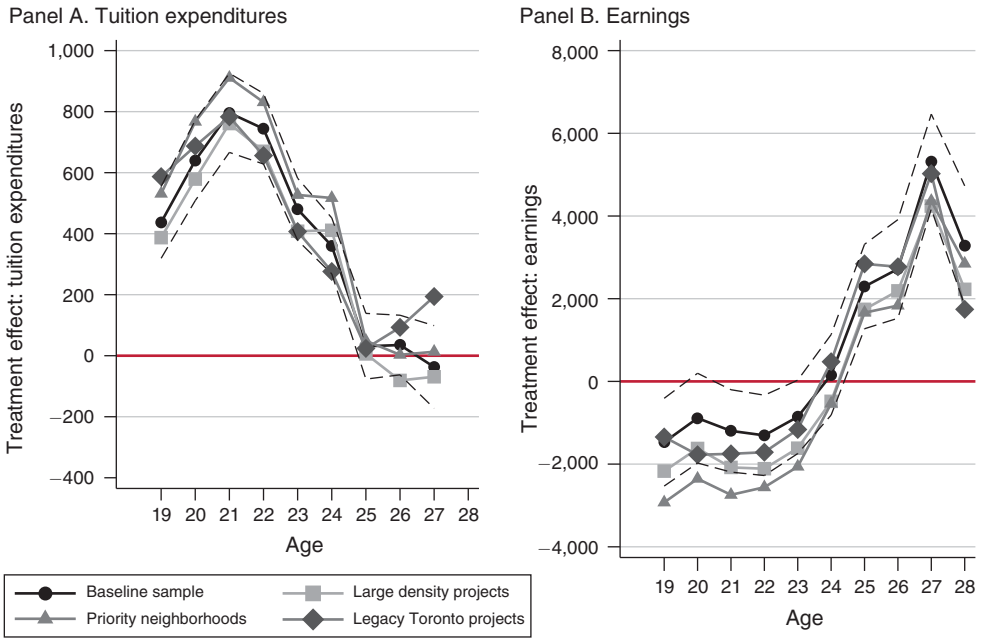

FIGURE 4. SENSITIVITY ANALYSIS: TUITION EXPENDITURES AND EARNINGS

Notes: Figure 4 presents estimates of the causal effect of eligibility for Pathways on individual tuition expenditure claims (panel A) and earnings (panel B) by age. The black markers represent the coefficient estimates for β^a from equation (1) using the baseline sample and the dashed lines the corresponding 95 percent confidence intervals. Standard error estimates are calculated using the CRVE with $70 - 1 = 69$ degrees of freedom. The light grey square markers represent the coefficient estimates for β^a from equation (1) when the comparison group is restricted to the 11 largest public housing projects in Toronto. The dark grey triangle markers represent the coefficient estimates for β^a from equation (1) when the comparison group is restricted to the 13 "priority neighborhoods" in Toronto that feature high concentrations of poverty. The black diamond markers represent the coefficient estimates for β^a from equation (1) when the comparison group is restricted to public housing projects in the legacy Metro Toronto school board.

the estimates from the baseline sample. The results when the sample is restricted to young adults who lived in one of Toronto's so-called "priority neighborhoods," areas with concentrated levels of crime and poverty, are depicted using dark grey triangles. Reassuringly, the estimates from this third subsample are also very similar to the baseline estimates.

We also investigate whether our baseline estimates are robust to using a sample of young adults who lived in one of the nearby public housing sites in the legacy Metro Toronto school board. The black diamonds in Figure 4, panels A and B present the estimates from this sensitivity check. The results from the legacy Metro Toronto subsample are very similar to the baseline estimates but have larger standard errors. This is probably because the sample size drops from 46,798 to 16,581 in spite of having an additional cohort of students. The estimates in Figure 4, panel B suggest that eligibility for Pathways increases annual earnings by between $1,700 and $5,000 between ages 25 and 28, similar to the estimates in Figure 2. Furthermore, online Appendix Figure A2a plots the average earnings by grade-nine cohort separately for young adults from Regent Park and the comparison group for the 2015 calendar year. Reassuringly, there appears to be no difference in the pre-Pathways trends of young

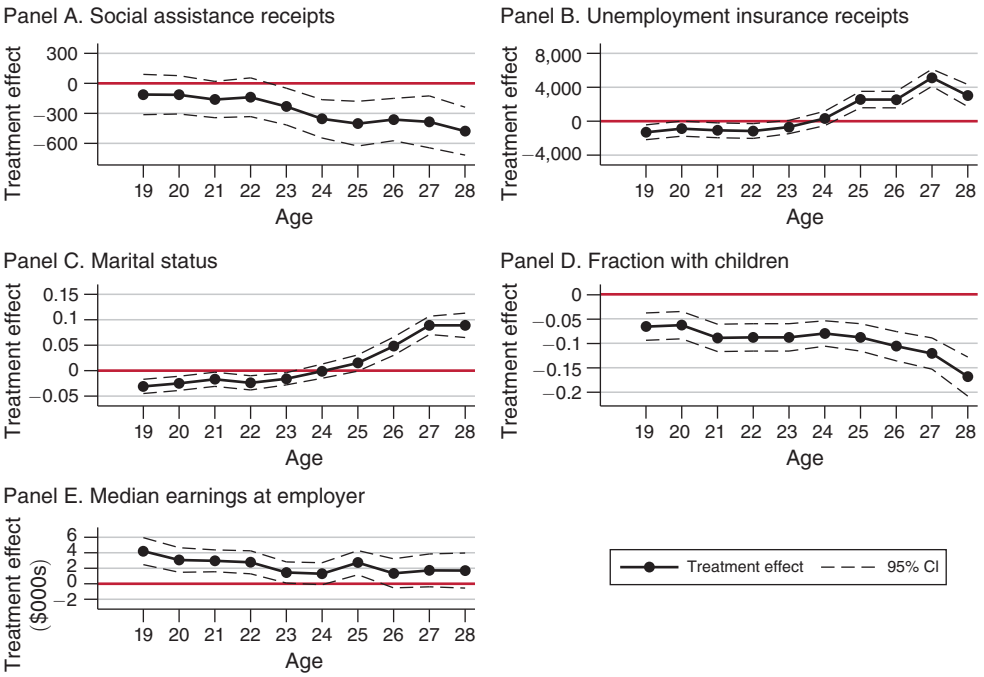

FIGURE 5. EFFECTS OF ELIGIBILITY FOR PATHWAYS ON ADDITIONAL OUTCOMES

Notes: Figure 5 presents estimates of the causal effect of eligibility for Pathways on various outcomes. The black markers represent the coefficient estimates for β^a from equation (1) in the main text and the dashed lines the corresponding 95 percent confidence intervals. Standard error estimates are calculated using the CRVE with $70 - 1 = 69$ degrees of freedom. Panels A, B, C, D, and E present estimates of the causal effect of eligibility for Pathways on social assistance (welfare) receipts, unemployment insurance receipts, a binary marital status variable, a binary parent status variable, and the median earnings at one's main employer (a measure of job quality), respectively.

adults from Regent Park and the legacy Metro Toronto comparison group. This suggests that the parallel trends assumption underlying our difference-in-difference methodology is plausible.

IV. Additional Long-Term Outcomes

Figure 5 presents estimates of the effect of eligibility for Pathways on additional economic and family outcomes (online Appendix Table A6 reports the same results in a table). The estimates in Figure 5, panel A on social assistance receipt corroborate our results for earnings and suggest that Pathways reduces reliance on welfare. Furthermore, the estimates are generally decreasing in age, which suggests that the program's effect on welfare decreases as the effect on earnings increases. For example, at age 21 eligibility for Pathways decreases welfare benefits received by $160, an estimate that is only statistically significant at the 10 percent level. By age 28, eligibility for Pathways decreases these benefits by a statistically significant $480. This represents a 46 percent decrease compared with the $1,035 received by young adults from the 2000 cohort in the comparison group at age 28.

The estimates for UI benefit receipts in Figure 5, panel B are mixed. While eligibility for Pathways reduces the UI benefit payments by approximately $800–$1,600

between the ages of 19 and 23, by ages 25–28 the program increases UI benefit payments by $2,500–$5,100. The interpretation of the estimates in Figure 5, panel B is complicated by the fact that eligibility for UI benefits in Canada requires satisfying a minimum hours of work requirement. Given that eligibility for Pathways increases the employment rates, young adults from Regent Park who entered grade nine after 2001 are more likely to qualify for UI than the comparison group. It is likely that the increase in benefits we estimate for those in their late 20s reflects, at least in part, the increased eligibility for UI.

Figure 5, panels C and D show that eligibility for Pathways postpones marriage decisions and decreases the likelihood of having children. Between the ages of 19 and 25, our estimates suggest that Pathways lowers the likelihood of being married by 1.5 to 3 percentage points. However, by age 28, the program increases the fraction of young adults that are married by 8.9 percentage points or nearly 100 percent. Figure 5, panel D shows that Pathways reduces the likelihood of having children for young adults of all ages. For example, we estimate that the program reduces the likelihood of having children by 16 percentage points or 33 percent compared with the mean of 49.9 percent for 28-year-olds in the comparison group.

Finally, we investigate the effect of Pathways on job quality in Figure 5, panel E. We proxy for job quality using the median earnings at the firm an individual is employed with.[16] Our estimates suggest that eligibility for Pathways causes individuals to work at higher-paying firms at all ages, although estimates for young adults ages 26–28 are not statistically significant. Together with the results discussed earlier, the estimates in Figure 5, panel E suggest that Pathways increases both employment and job quality for young adults.

V. Discussion

In this paper, we estimate the impact of the Pathways to Education program on the long-term outcomes of disadvantaged youth. Using unique administrative data from Statistics Canada, the TDSB, and the TCH, we estimate the effect of Pathways on earnings, employment, persistence in post-secondary 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 adulthood. We find that eligibility for Pathways increases annual earnings at age 28 by approximately $3,200 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 post-secondary education attainment. The program also decreases the likelihood of receiving social assistance.

Pathways receives financial support from a mix of government and private sector donors. Like many programs delivered to disadvantaged youth, the costs of Pathways are borne up front while the benefits to individuals and society as a whole accrue incrementally over many years. For example, the fiscal benefits of Pathways include the income tax revenues from higher individual earnings. In online Appendix C, we

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

report the results of a benefit–cost calculation that compares the fiscal gains from Pathways with its direct operating and administrative costs (approximately $13,400 per student). Based on our estimates of the impact of the program on earnings and social assistance receipts, we conclude that the costs of Pathways are likely more than offset by its fiscal gains.

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 have the potential to improve labor market outcomes and reduce reliance on social assistance more than a decade after students participate in the program. An important question remains around whether watered-down versions of these programs could generate similar effects for less cost. An equally interesting question is whether programs like Pathways at the high school and ASAP at the college level are substitutes or work even better when delivered together.

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