Post-Secondary Attendance by Parental Income in the U.S. and Canada: Do Financial Aid Policies Explain the Differences?*

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Abstract

We examine the extent to which tuition and need-based aid policies explain important differences in family income – post-secondary attendance relationships between Canada and the U.S. Using data from recent cohorts, we estimate substantially smaller attendance gaps by parental income in Canada relative to the U.S., even after controlling for family background, cognitive achievement, and local residence fixed effects. We next document that U.S. public tuition and financial aid policies are actually more generous to low-income youth than are Canadian policies. Equalizing these policies across Canada and the U.S. would likely lead to a greater difference in income attendance gradients.

Résumé

Nous étudions les frais de scolarité et l'aide financière afin d'expliquer d'importantes différences entre le Canada et les États-Unis quant à la relation entre le revenu parental et la fréquentation des études postsecondaires. Nous trouvons que les écarts entre les taux de fréquentation des jeunes adultes de différents niveaux de revenu familial sont considérablement plus faibles au Canada qu'aux États-Unis, et ce, même en tenant compte des acquis cognitifs, des effets fixes résidentiels, et d'autres caractéristiques familiales. Nous documentons aussi le fait que l'aide financière aux étudiants de famille à bas revenus est beaucoup plus généreuse aux États-Unis qu'au Canada. S'ils avaient les mêmes politiques d'aide financière, les différences entre les États-Unis et le Canada quant à la relation entre le revenu parental et les études postsecondaires seraient plus prononcées.

1 Introduction

There is a longstanding interest in the ubiquitous relationship between educational attainment and parental resources. This relationship has important implications for intergenerational mobility, given

the key roles played by schooling and human capital in determining lifetime economic and social success. The relationship is also of interest to economists considering the efficiency of education systems in the presence of imperfect credit markets.

A large literature in social science examines differences in post-secondary (PS) attendance and completion by family income, focusing on two main explanations for these differences. First, family income is correlated with many other family and child characteristics (e.g. parental education, child 'ability') that are likely to affect academic preparedness and the desire for higher education. Accounting for these differences typically reduces the estimated importance of family income as emphasized by Carneiro and Heckman (2002). Second, remaining differences in PS attendance rates are often attributed to factors related to education costs and a lack of available resources and credit for low-income families. As pointed out by Becker (1967), children from low-income families may forego a higher education (even if they are academically prepared) due to the inability to borrow against their future earnings.[1] Of course, there are other possible explanations as well : high-income families may place greater weight on education for its own intrinsic worth or they may be better informed about educational opportunities, rewards and costs.

While schooling costs and financing concerns are central to explanations for PS schooling differences by parental income, previous studies rarely explore the extent to which differences in tuition costs or the structure of financial aid might contribute to or ameliorate economy-wide family income – PS attendance gaps. This is likely due, in part, to the fact that nearly all empirical studies examining these gaps focus exclusively on a single country (and time period) where systematic differences in costs and credit are relatively small (e.g. Manski and Wise 1983, Cameron and Heckman 1998, 2002, Ellwood and Kane 2000, Christofides, Cirello and Hoy 2001, Carneiro and Heckman 2002, Corak, Lipps and Zhao 2003, Belley and Lochner 2007, Frenette 2007).[2] At the same time, most studies examining the impacts of financial aid policies on PS attendance focus narrowly on a single institution or state program without considering the extent to which the full array of federal, state and institutional tuition and aid policies influence aggregate family income – PS attendance patterns (e.g. Dynarski 2000, Van der Klaauw 2002, Kane 2003, 2007).

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[1] For a recent review of the literature on family income – PS attendance patterns and the role of borrowing constraints, see Lochner and Monge-Naranjo (2012).

[2] In related work, Keane and Wolpin (2001) and Johnson (2011) estimate dynamic lifecycle models of schooling, work, and savings decisions with borrowing constraints, simulating the impacts of changes in tuition on educational outcomes by socioeconomic background. Only Johnson (2011) incorporates need-based financial aid in his analysis. Neither study considers the impacts of changing the need-based structure of financial aid and schooling costs for income – PS attendance relationships. A few U.S.-based studies estimate whether PS attendance rates are more or less responsive to tuition differences (e.g. Cameron and Heckman 1998, Kane 2006) ; however, these studies do not draw implications from this about income – PS attendance gradients. Importantly, these studies generally measure schooling costs by posted tuition prices, neglecting need-based aid and its impacts on actual prices paid by potential students.

This paper considers whether differences in tuition and the overall structure of need-based aid policies between Canada and the United States can help explain important differences in the relationship between parental income and PS attendance in these countries. We begin by estimating parental income – PS attendance gradients for recent cohorts in Canada and the U.S. using data from the Youth in Transition Survey (YITS) and 1997 Cohort of the National Longitudinal Survey of Youth (NLSY97), respectively. Our results establish that family income is much more strongly related to PS schooling in the U.S. than in Canada, even after controlling for adolescent cognitive achievement, family background, and local area of residence.

Next, we carefully document tuition costs and the structure of need-based financial aid in Canada and the U.S. In particular, we calculate measures of annual *net tuition* (tuition less all non-repayable aid) and *out-of-pocket expenditures* (net tuition less available government loan amounts) for public institutions as functions of parental income. While average annual tuition at four-year public institutions was nearly 40% higher in the U.S. than it was in Canada in 2003-04, we show that, on average, the U.S. is considerably more generous (than Canada) in offering aid to the most economically disadvantaged. American youth from the bottom of the parental income distribution face lower net tuition and out-of-pocket expenditures (at public PS institutions) than their Canadian counterparts.[3] Canada is slightly more generous (than the U.S.) towards middle-income youth.

Because the net price of attendance and out-of-pocket expenditures are lower for low-income Americans and increasing more steeply with income in the U.S., differences in PS costs and financial aid cannot explain the stronger family income – PS attendance gradients in the U.S. Our findings imply that factors other than net costs and available student credit must explain the sizeable difference in income – attendance gradients between these countries, and that this difference would likely be even greater if both countries had more similar tuition and aid policies. Put another way, our analysis suggests that the underlying demand for higher education is much more strongly related to income in the U.S. than it is in Canada.[4]

Using consensus estimates from the literature on PS attendance responses to tuition and financial aid (e.g. see recent reviews in Kane 2006, Deming and Dynarski 2009), we calculate the likely extent to which differences in current financial aid policies mask even greater differences in underlying demand

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[3]Quebec is an exception within Canada. Net tuition in Quebec is similar to that in low-tuition American states; however, out-of-pocket expenditures are generally higher at all parental income levels than low- or high-tuition American states.

[4]It is also possible that low-income American students are either less aware of the aid they might receive or less likely to apply for it due to high application 'costs' compared to their Canadian counterparts. Dynarski and Scott-Clayton (2006) emphasize the costs of financial aid complexity in the US, but comparisons between Canada and the U.S. on these issues are difficult as noted by Frenette and Robson (2011).

for higher education by family income between Canada and the U.S. We also consider the extent to which additional aid would be needed to eliminate family income – PS attendance gradients altogether in the U.S. and in Canada. Our (admittedly rough) calculations suggest that greater intergenerational mobility achieved via increased need-based student aid would not come cheap, especially in the United States.

This paper is organized as follows. Section 2 briefly describes the structure of education in Canada and the U.S. Data from YITS and the NLSY97 are described in Section 3, followed by an empirical analysis of PS attendance by parental income in Section 4. Section 5 documents PS costs and financial aid policies in Canada and the U.S., focusing on the dependence of net tuition and out-of-pocket expenditures on parental income. Section 6 considers the implications of Canada and U.S. financial aid policies for family income – PS attendance relationships, and Section 7 concludes.

2 The Structure of Education in Canada and the U.S.

In most Canadian provinces, students obtain a high school diploma after completing twelve years of elementary and secondary schooling. At that point, youth are eligible to begin 'college' (usually a two- or three-year program) or 'university' (usually lasting four years for an undergraduate degree). The province of Quebec differs, however. Students in Quebec normally graduate with a high school diploma after completing 11 years of schooling. Those that want to attend university must first complete a two-year college program at CEGEP ('College d'enseignement général et professionnel', meaning College of General and Vocational Education). As a result, Quebec students normally only require three additional years to complete an undergraduate university degree. Those wishing to obtain a terminal college diploma (rather than attend university) must complete a three-year CEGEP program. For the cohort examined in this study, the system also differed in Ontario where most students attending university would have attended 13 years of elementary and secondary schooling.

In the U.S., high school completion typically requires twelve years of primary and secondary schooling; however, a state-wide test must also be passed to receive a high school diploma in some states. Students that do not graduate from high school may take the General Educational Development (GED), which is meant to substitute for a high school diploma. In most cases, a high school diploma or GED is required for admission to PS institutions, especially four-year schools.

An important difference between the higher education systems of Canada and the U.S. is the existence of many (often small) expensive private PS institutions in the U.S. Except for a small number of private career colleges, as well as some elite professional programs at the university level,

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PS institutions in Canada are heavily funded by the government and are effectively 'public' schools. By contrast, roughly 40% of all U.S. degree-granting PS institutions are private; however, they only enroll about one-in-four American PS students.[5]

3 NLSY97 and YITS Data

Our main empirical analysis uses data from the NLSY97 and YITS, focusing on educational attainment as of age 21. The NLSY97 samples American youth ages 12-16 at the beginning of 1997, while YITS surveys Canadian youth age 15 at the start of 2000. In the NLSY97, we exclude youths from the minority over-sample, using only the full random sample in our analysis. When we use the weighted full NLSY97 sample we obtain very similar results (see the online appendix). Youth in both samples made their PS attendance decisions in the early to mid-2000s. Most importantly, NSLY97 and YITS contain comparable measures of adolescent cognitive achievement, parental income during adolescence, and rich measures of family background.

In 1997, NLSY97 respondents took a large battery of tests known as the Armed Forces Vocational Aptitude Battery (ASVAB). In 2000, YITS respondents took math, reading, and science tests from the Programme for International Student Assessment (PISA). All YITS respondents took the reading assessment, but only half took the math assessment while the other half (both randomly assigned) took the science assessment. We focus on the half taking both the reading and mathematics assessments. Our analysis uses a combined math-reading achievement measure, which is simply the average of normalized math and reading assessment scores. For comparability in the NLSY97, we create a combined math-reading achievement measure from four ASVAB assessments (arithmetic reasoning, mathematics knowledge, paragraph comprehension, and word knowledge).[6] Finally, we categorize individuals according to their normalized test score quartiles.[7]

The NLSY97 measures income for all household members (received in 1996), while YITS only

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[5]About 60% of all American PS students attend four-year institutions. About two-thirds of students in four-year institutions attend public schools, whereas nearly all students enrolled in two-year schools do. These institutional and enrollment statistics are taken from Tables 168 and 243 of the *Digest of Education Statistics, 2005* (Snyder, et al. 2006).

[6]Among individuals with observed educational outcomes, roughly 5% have missing parental income measures and 15% have missing math-reading achievement measures due to unavailable ASVAB scores. The main results reported in the paper drop all cases with missing regressors; however, results are quite similar when we use multiple imputation methods to account for missing achievement scores and income levels as discussed in the online appendix.

[7]For both data sources, we first normalize individual test scores by subtracting the mean score and dividing by its standard deviation. This generates normalized scores for all tests with a mean of zero and standard deviation of one. In the NLSY97, we normalize within each age group (in years). In YITS, our math-reading achievement measure is the simple average of the normalized math and reading scores. In the NLSY97, we first create a math (reading) score by taking an average of normalized scores for arithmetic reasoning and mathematics knowledge (paragraph comprehension and word knowledge). We normalize these scores and then take their average as our math-reading achievement measure — its correlation with percentiles of the commonly used Armed Forces Qualifying Test is over 0.97 in our sample.

contains measures of *parental income* (received in 1999). For comparability, we use total *parental income* (excluding income from other household or family members) in both samples for our analysis. Parental income is measured when youth are age 15 in YITS and ages 12-16 in the NLSY97; however, this discrepancy does not play an important role in our findings. We denominate income in year 1999 dollars, using the U.S. Consumer Price Index for all urban consumers (CPI-U) to adjust for inflation in the NLSY97. We also adjust U.S. incomes to account for differences in the Canada–U.S. purchasing power parity (PPP) index. In 1999, the U.S. dollar was worth 1.19 Canadian dollars based on PPP calculations.

Our analysis examines whether individuals ever attended a PS institution as of age 21.[8] Individuals in the NLSY97 are considered to have attended a PS institution if they *attended* at least 13 years of regular school. This includes traditional two- and four-year colleges and universities but would generally exclude participation in shorter training or vocational programs. In YITS, our measure of PS attendance is based on reported attendance by age 21 in a qualifying PS program or institution, including 'colleges' (two-year institutions), 'universities' (four-year institutions), or Quebec's CEGEP program. Consistent with our NLSY97 measure, we exclude participation in shorter vocational, training, licensing, or apprenticeship programs. Both data sources further allow us to determine whether youth ever attended a four-year PS institution by age 21.

Our data sources also contain a rich set of family background measures. We categorize maternal education depending on whether mothers had dropped out of high school, completed high school or more, or completed at least one year of PS schooling. We also account for family structure with the number of household members under the age of 18 as of the first survey date. Additional family structure information is provided by an indicator variable for whether both biological parents are present in the home at the time of the initial survey. Our analysis includes indicators for whether the youth is an immigrant and whether at least one parent is an immigrant. We account for family residence in a metropolitan area at age 15.[9] We measure the mother's age at the time of the respondent's birth as well as gender in both surveys. Finally, we create indicators for race (blacks, hispanics, other non-whites, and whites) and year of birth in the NLSY97.

Descriptive statistics for these variables are provided in Table 1 for both surveys.[10] Comparisons

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[8]Schooling attainment at age 22 is used in the NLSY97 if it is missing or unavailable at age 21 (fewer than 10% of all respondents).

[9]In the NLSY97, 'metropolitan residence' reflects residence in a U.S. Metropolitan Statistical Area (MSA) at age 15 if available; otherwise, we use residence at age 16 (or 17 if also unavailable at 16). An analogous Canadian measure was created for YITS using an indicator for whether the respondent's Census Metropolitan Area (CMA) or Census Agglomeration Area (CA) had a population of greater than 50,000.

[10]These samples are restricted to individuals for whom we observe both math-reading scores and parental income. The online appendix reports these descriptive statistics within each income category. For all but the lowest income

across samples suggest that schooling attainment is higher in Canada, except at the top end. Both high school and PS attendance rates are about 10% higher in Canada than in the U.S. (93% vs. 83% for PS attendance and 71% vs. 63% for high school completion).[11] By contrast, 42% of youth attended a 4-year PS school in both countries. Educational attainment is higher among Canadian mothers. Compared to American youth, Canadian youth are less likely to be non-white, but more likely to be first- or second-generation immigrants. Canadian youth also tend to have slightly older mothers and are more likely to have both biological parents present in the household during adolescence. Fewer Canadian youth grow up in metropolitan areas.

For comparability, the table shows U.S. income levels after adjusting for differences in PPP. With this adjustment, American parents average about $7,500 less in annual income than Canadian parents.[12] Income is more dispersed in the U.S. Most notably, parents with incomes of $40,000 or less represent a third of the NLSY97 sample compared with about a fifth of the YITS sample. At the top of the income distribution, 16.5% of American parents (NLSY97) and 14.8% of Canadian (YITS) parents earn $100,000 or more.

Table 2 reports the joint distribution of parental income and math-reading achievement in Canada (YITS) and the U.S. (NLSY97). As the table shows, parental income and achievement are strongly correlated in both samples. Most youth of high achievement also come from high-income families and vice versa.

4 Achievement, Parental Income and Educational Attainment

Figure 1 reports PS attendance rates by parental income category in Canada and the U.S. Education and parental income are positively correlated in both countries, but the correlation is substantially stronger in the U.S. Canadian youth with parents in the highest income category are roughly 25 percentage points more likely to attend a PS institution than are youth from the lowest income category. In the U.S., this difference is more than 50 percentage points. High income youth from both countries have similar PS attendance rates, but low income youth in the U.S. have much worse educational outcomes than their Canadian counterparts.

category, differences in background characteristics between Canada and the U.S. are generally similar to those reported in Table 1. Among families with incomes below $20,000, differences in maternal education are notably more exaggerated with nearly 15% fewer low-income American mother's finishing high school or attending PS schooling than their Canadian counterparts.

[11]In the NLSY97, respondents are assumed to have completed high school if they *completed* 12 or more years of school by age 21. In YITS, high school completion is self-reported as of age 21.

[12]Using the (higher) official currency exchange rate of 1.49, average parental income in the U.S. ($80,000) was almost $9,000 higher than in Canada.

Of course, a stronger correlation between parental income and PS attendance in the U.S. could be due to other differences between the two countries. For example, parental education and other background characteristics may be more strongly correlated with income in the U.S. than in Canada. To account for this possibility, we estimate linear regressions of educational outcomes on nearly identical family background measures, math-reading achievement quartiles, and parental income categories during the respondent's late teenage years. Parental income is categorized in five bins of $20,000, and a sixth bin for parental income of $100,000 or more, where all amounts are denominated in Canadian dollars. Since we are interested in comparing parental income – educational attainment relationships across Canada and the U.S., we employ very similar estimation specifications for both YITS and the NLSY97. We primarily use parental income categories and achievement quartiles to allow for non-linear relationships; however, we consider alternative assumptions about the role of parental income below.

Table 3 reports estimates of our main specifications for the YITS and NLSY97 data. First, consider the determinants of PS attendance in Canada and the U.S. reported in the first two columns. There is general agreement between both countries regarding the role played by family background. Immigration status (of the youth and his or her parents) and maternal education have fairly strong positive effects on PS attendance rates in both countries. Youth born to older mothers, youth living in metropolitan areas, and youth living in intact families (both biological parents present) during adolescence are more likely to have attended a PS institution by age 21. The magnitudes of these effects are modest and similar across the two countries. Math-reading achievement and parental income are both substantially more important determinants of PS attendance in the U.S. compared to Canada.[13] In Canada, the most able are 37 percentage points more likely to attend college relative to the least able; this gap is more than 50 percentage points in the U.S. The difference in attendance rates between the highest and lowest income categories is about 9 percentage points in Canada and about 21 percentage points in the U.S. (Youth with annual parental incomes above $100,000 reflect the baseline omitted category in these regressions.) While these differences are less than half the unconditional differences shown in Figure 1 (largely the result of controlling for cognitive achievement), they are nonetheless substantial. Most importantly, the income – attendance gradients reported in Table 2 are roughly twice as large for the U.S. as they are for Canada. Accounting for family background and cognitive achievement does

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[13]If *ability* is measured equally well by the ASVAB and PISA tests, then Canada – U.S. differences in the effects of achievement can be attributed to differences in the importance of ability. However, if PISA provides a noisier measure of ability than the ASVAB tests, then we would expect to estimate a weaker relationship between achievement and PS attendance in Canada. Given a positive correlation between ability and parental income, this would likely lead to a small upward bias in the estimated effect of parental income in Canada relative to the U.S.

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not alter the conclusion that family income is much more important for PS attendance in the U.S.[14]

The final two columns of Table 3 examine identical specifications for attendance at four-year PS institutions. Interestingly, the relationship between achievement and attendance at four-year schools is quite similar in Canada and the U.S. The estimated coefficients on income suggest that attendance at four-year institutions is increasing in parental income for incomes above $20,000; however, youth from families earning less than $20,000 are more likely to attend a four-year school than youth from families earnings $20-40,000. This gap is significant in Canada; although, less than 6% of Canadians in the YITS sample are in the lowest income category. Overall, parental income is substantially more positively related to attendance at four-year institutions in the U.S. than in Canada.

Figures 2a and 2b report the estimated relationship between parental income and PS schooling using linear splines (with knots every $10,000 from $20,000 to $100,000) rather than five income category indicators; otherwise, the specifications are the same as in Table 3. The figures normalize all lines to zero at an income level of $10,000 (few families have income below this amount).[15] This makes it easier to compare the effects of income in Canada and the U.S., since we are interested in the slopes of these lines rather than their intercepts. These figures are consistent with Table 3 and show that parental income matters much more in the U.S., whether we use the PPP index or official exchange rates to adjust for currency differences. The income – attendance gradients are most strongly positive over the income range of $30-80,000, particularly in the U.S.

To shed additional light on factors that might drive income – attendance relationships, we estimate similar specifications to those of Table 3 for different subsamples of our data and including some additional regressors. First, we report results for different Canadian provinces and American states to determine the extent to which different institutional or aid/cost structures influence income – attendance relationships within Canada and the U.S. Second, we consider the income – attendance relationship for a more homogeneous population of native-born whites. Third, we account for differences by local area of residence and briefly comment on the influence of peer effects.

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[14]We have explored specifications that use finer measures of achievement (e.g. deciles for math-reading scores) or that include separate quartiles for math and reading achievement. These specifications yield very similar results (for the relationship between family income and PS schooling) to those reported in Table 3 (available upon request). Belley and Lochner (2007) show that the effect of parental income in the NLSY97 is largely unchanged when controlling for adolescent participation in criminal activities to account for differences in non-cognitive skills. In the YITS data, Frenette (2007) finds that self-esteem and mastery (feeling control over one's life) play little or no role in explaining the income – university attendance gap after controlling for family background and cognitive achievement. We have also estimated our models including measures of both maternal and paternal education. Results are very similar to those in Table 3 and can be found in the online appendix.

[15]U.S. income figures are presented in Canadian dollars using both the PPP index and the Canada-U.S. currency exchange rate. The PPP (nominal exchange rate) was 1.19 (1.49) in 1999, meaning that the U.S. dollar was worth 1.19 (1.49) Canadian dollars.

While our main focus in this paper is a comparison across Canada and the U.S., it is useful to examine whether there are important differences in income – attendance gradients across Canadian provinces or American states. As discussed in Section 2, both Ontario and Quebec have different institutional environments for higher education than other Canadian provinces. Quebec is also culturally unique and has a very different structure for PS aid/costs relative to the rest of Canada. Most notably, Quebec charges lower levels of tuition than other Canadian provinces and targets relatively more aid to the bottom of the parental income distribution. There is also heterogeneity in tuition costs across U.S. states. (Section 5 provides considerable detail on tuition costs and aid in Canada and the U.S.)

Table 4 presents estimates for specifications identical to our baseline results (shown in Table 3) separately for Ontario, Quebec, and all other Canadian provinces (columns 1-3), as well as for low- vs. high-tuition American states (columns 4 and 5).[16] Although, the province-specific gradients estimated here are much less precise than the national estimates of Table 3, we observe roughly similar income – attendance gradients across Canada with a few coefficients suggesting slightly stronger gradients in Ontario and Quebec relative to all other provinces. Estimated gradients for low-tuition states in the U.S. are very similar to their counterparts for high-tuition states. Most importantly for our discussion, parental income – attendance gradients are much larger in both high- and low-tuition American states than in any of the Canadian provinces.

Because there are notable differences in racial composition and the fraction of immigrants in Canada and the U.S., we replicate our main analysis for a more restricted sample that is more demographically homogeneous : white native-born youth with native-born parents. We also restrict the Canadian sample to those with English as their native tongue to best generate a similar ethnic, racial, and cultural sample across the two countries. As columns 1 and 3 of Table 5 reveal, income – attendance gradients are stronger for these subsamples in both countries (compared to Table 3). More importantly, however, the difference in income – attendance gradients between Canada and the U.S. is qualitatively similar to that of Table 3.

There are many reasons to think that residential segregation by family income may help explain family income – PS attendance relationships. For example, higher income youth may attend 'better' primary and secondary schools or they may live in areas with closer access to PS institutions or more college-level jobs. Their peers and social networks are also likely to be more education-friendly. With greater residential segregation by income in the U.S., these factors could contribute to a stronger

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[16]We separate U.S. states into those with tuition above and below the median in-state public tuition at four-year institutions. Tuition at public two-year and four-year schools is highly correlated : roughly three-quarters of all individuals with four-year tuition above the median also have two-year tuition above the median. See Table 313 of the 2005 Digest of Education Statistics (Snyder, et al. 2006).

income – attendance relationship there. To explore this possibility, we consider additional specifications that control for local area of residence fixed effects.

Column 2 of Table 5 controls for school (at age 15) fixed effects in Canada. The estimated income gradients are only slightly smaller than our baseline estimates in Table 3. The NLSY97 sampling scheme stratified by geographic area rather than school, so it is not possible to estimate models with school fixed effects. Column 4 of Table 5 instead estimates our baseline model with fixed effects for county × MSA residential status at age 15 (not in MSA, in MSA but not central city, in MSA and central city). These estimates are also remarkably similar to their counterparts in Table 3. This is, perhaps, more surprising given the dramatic differences in schools, inequality, and local labor market conditions across U.S. counties (and metropolitan status within counties).

The fixed effects estimates of Table 5 suggest that income plays an important role even within schools or local geographic areas. Of course, peers and social networks may operate on a much more micro level within schools and local residential areas that may not be picked up by school or county × MSA status fixed effects. In separate specifications for YITS (available upon request), we find that respondents' perceived returns to schooling and their peers' education plans affect their schooling decisions but not the income – attendance gradient. In the U.S., within-county heterogeneity is likely to be most confounding in more populous areas. Yet, we find similar effects of family income on PS attendance regardless of whether youth come from high or low population density counties, or non-metropolitan versus metropolitan areas (available upon request).

5 Post-Secondary Costs and Financial Aid in Canada and the U.S.

To better understand the role of education costs and financial aid in shaping family income – PS attendance patterns in Canada and the U.S., we carefully document the structure of financial aid, net tuition and out-of-pocket expenditures as functions of parental income in both countries. Our analysis focuses on the following key factors that determine the financial situation of potential PS students : (i) tuition, fees, and other costs ; (ii) expected family contributions (EFC) towards PS schooling ; (iii) grants and other non-repayable aid like tax credits ; and (iv) student loans. These factors determine both the net price of PS attendance as well as the out-of-pocket expenditures required of students.[17]

We consider costs and aid for the 2003-04 academic year unless otherwise noted, since most of the youth in the NLSY97 and YITS would typically be enrolled in PS school during that year and because we can obtain detailed information about PS financial aid and costs for the U.S. that year

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[17]Although foregone earnings (i.e. the expected earnings one could receive if not enrolled in school) are an important component of costs, they are roughly similar in Canada and the U.S. (Burbidge, Magee, and Robb 2002).

from the 2004 National Post-Secondary Aid Survey (NPSAS04).[18] Although comparable individual-specific information about financial aid for students in Canada is not available, the vast majority of aid in Canada is distributed by the federal or provincial governments subject to known rules. We, therefore, use provincial and Canada Student Loans Program (CSLP) rules in 2003-04 to determine financial aid availability. We specifically consider detailed rules in the three largest provinces (Quebec, Ontario, and British Columbia), where 75% of the Canadian population resides. We also incorporate Millennium Foundation awards to determine financial aid as a function of parental income in those provinces.[19] Financial aid in most other provinces is similar in nature to that of British Columbia and Ontario.

The high costs of many private American schools inflate measures of average tuition costs in the U.S.; yet, they are unlikely to be very relevant to marginal students considering a higher education. We, therefore, focus attention on costs and financial aid associated with public PS institutions, which enroll three-quarters of all American PS students and virtually all Canadian students.

5.1   Costs

In 2003-04, average tuition at Canadian four-year universities was $4,025. Tuition levels at two-year colleges are roughly half that of university levels (except in Quebec). Variability in tuition is quite small in Canada relative to the U.S. At the two-year college level, tuition is remarkably similar across programs and most provinces; although, Quebec is a clear exception, where in-province CEGEP students pay only nominal registration fees. At the four-year university level, tuition varies somewhat from about $2,500 in Quebec to $4,800 in British Columbia to $5,600 in Ontario.

In the 2003-04 academic year, average tuition and fees for undergraduates in the U.S. amounted to $1,900 at two-year public schools, $4,600 at four-year public schools, and $19,000 at four-year private schools (College Board 2004). Adjusting for the relevant PPP inflates these U.S. costs by about 20%, so American students considering in-state public PS schools typically face costs that are about 40% higher than those faced by their Canadian counterparts. Of course, tuition and fees vary substantially across American states as we discuss below.

Among four-year students living away from home, room and board charges added another six to seven thousand dollars in both Canada and the U.S. (Usher and Steele 2006). Living at home can save considerably on these costs. Do (2004) notes that about half of U.S. high school graduates do not have

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[18]See the online appendix for a detailed discussion of how financial aid schedules are obtained from the NPSAS04 data.

[19]The Canada Millennium Scholarship Foundation was a private organization created by an act of the Parliament of Canada in 1998. It received an initial endowment of $2.5 billion from the federal government to provide awards annually for ten years. The foundation distributed $325 million in the form of bursaries and scholarships each year throughout Canada in support of post-secondary education.

local access to a state-funded PS institution, while Frenette (2004) finds that only one-in-six Canadian students do not have access to a local university and nearly all Canadian students have local access to a two-year college. These differences appear to be important for residential choices given that 35% of recent dependent university students who received CSLP aid in Canada lived with their parents while only 22% of their American counterparts did.[20]

5.2 Financial Aid

Both Canada and the U.S. provide considerable aid in the form of grants (including loan remissions in Canada), tax credits, and loans. In both countries, the vast majority of financial aid is need-based; although, merit-based aid has grown recently in the U.S. We focus our discussion primarily on need-based aid, since we are primarily interested in understanding PS attendance gaps by family income conditional on adolescent student achievement.

Throughout most of Canada, student grants and loans are administered through (or in concert with) the CSLP, with the federal government providing 60% of student assessed need and provincial governments the rest. (Quebec is an exception with its own student financial aid system.) The Millennium Foundation also provided considerable grant and bursary aid in 2003-04, which we account for in our figures below. While the details of provincial aid programs differ, all provide some combination of loans and grants based on student need. In the U.S., federal rules determine federal grants and loans as a function of student need. Most states and institutions use a similar need calculation in determining their support.

Generally, determined 'need' equals total estimated costs (including tuition, fees, living expenses, books and equipment, and travel expenses) less an expected family contribution (EFC). While actual EFC formulas differ between Canada and the U.S., they are based on similar information.

EFCs depend on a student's own savings and income, as well as that of his parents (dependent students) or spouse (married students).[21] Canadian students in provinces other than Quebec are expected to contribute all of their savings towards post-secondary schooling, while student savings are fully exempt in Quebec. American students are expected to contribute 35% of any savings. Because

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[20]The U.S. figure is based on all full time/full-year dependent students ages 18-24 who applied for federal aid and attended an in-state 4-year public institution in 2003-04 (based on NPSAS04). Canadian residential status figures are based on dependent students receiving some form of aid from the CSLP (excludes Quebec) in 2004-05. (We thank Leesha Lin from the CSLP for providing us with these statistics from the Provincial Need Assessment Data.) Comparable figures in YITS are higher (around 45%) than that for all CSLP aid recipients, since students living with their parents are less likely to qualify for financial aid.

[21]Parental resources are not considered for independent students. In Canada, a student must typically be married, have children, been in the workforce for at least 2 years, or been out of secondary school for at least 4 years (5 years in Ontario, out of full-time studies for 7 years in Quebec) in order to be considered independent. In the U.S., independent students must be over age 24, married, or with children.

most traditional students accumulate little savings, these differences are relatively unimportant. More importantly, Canada and the U.S. differ substantially in the way they treat student income in calculating the EFC. In Canada, students are expected to contribute a minimum amount each year from summer employment, with any additional income above a modest living amount taxed at rates typically above 80%. Minimum contribution rates can be sizeable, ranging between two and three thousand dollars in most provinces.[22] In contrast, the U.S. imposes no minimum contribution from students, instead allowing them to earn $2,380 before 'taxing' them at a 50% rate. This differential treatment of student income plays an important role in determining EFCs and financial aid at the low end of the parental income distribution in the U.S. and Canada.

Expected parental contributions depend primarily on parental income in both countries, with assets playing only a minor role. Generally, parents with income below an exemption amount are not expected to contribute to their children's PS education. Exemption levels are relatively low in the U.S. and Quebec compared to other Canadian provinces. Parents earning above the exemption level are effectively taxed by financial aid formulas as their expected contribution rises with income.

Figure 3 shows EFCs as a function of pre-tax parental income for students from two-parent/two-child families in British Columbia, Ontario, and Quebec.[23] The figure also reports average EFC amounts by parental income for dependent undergraduate students in the U.S. from the NPSAS04. (Note that U.S. dollars in this and other figures of this section have been inflated by 19% reflecting the PPP difference between Canada and the U.S.) The differential treatment of student contributions from summer work is evident at the low end of the income scale, where the U.S. expects much less from disadvantaged families. However, the EFC increases quickly in the U.S., overtaking the EFCs in Ontario and British Columbia at around $30-35,000. Implicit tax rates on parental income above the exemption level are modest but cover a broad range of incomes for the U.S. and Quebec, whereas in other Canadian provinces, implicit tax rates on non-exempt income are higher but only apply to families earning above $55,000 (slightly below the median family income for our YITS sample).

In Canada, government student aid is offered to cover the difference between costs and the EFC,

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[22]In some cases, students may be given an exemption from the minimum contribution if they are unable to find summer employment. Exemption rates vary from year to year, but for 2004-05, 23% of dependent university students from British Columbia and 5% of students from Ontario received an exemption. (We thank Leesha Lin from the CSLP for providing us with these exemption rates from the Provincial Need Assessment Data.)

[23]In both Canada and the U.S., the expected parental contribution is equally divided across all children currently enrolled, so parents with the same resources and two children in PS schooling are expected to contribute one-half their expected contribution towards each child. Our figures for Canada assume only one child is enrolled in PS schooling; however, calculated aid amounts below are largely insensitive to the number of enrolled siblings, especially at the low end of the income distributions where expected parental contributions are negligible or zero. See the online appendix for a detailed discussion of EFC and aid calculations, as well as the impacts of additional enrolled siblings on net tuition and out-of-pocket expenditures.

subject to a generous upper limit. (Institutions themselves sometimes provide additional aid to help meet any need that has not been satisfied by federal and provincial sources; however, institutional aid plays a minor role in Canada relative to the U.S.) In most provinces, total government aid (loans plus grants) is limited to no more than $275 per week ($9,350 for a typical 34-week academic year) for single dependent students. While a few provinces offer slightly higher limits, Quebec sets much higher annual limits of $14,792 (CEGEP) and $17,293 (university undergraduates). Generally, government loans are the first form of aid provided, with grants reserved for those with the greatest need. The mix between grants and loans is largely a provincial decision. Again, Quebec differs substantially from the rest of Canada in favoring grants heavily over loans. Quebec limits loan amounts to about $2,500 per year for university undergraduates ($2,000/yr for CEGEP students), providing all other aid in the form of grants. Other provinces typically offer more of their assistance in the form of loans. See the online appendix for further details.

Most federal grant aid in the U.S. is distributed in the form of Pell grants, targeted to very low income families. (In 2003-04, the maximum Pell grant award was $4,050, while the maximum Supplemental Educational Opportunity Grant was $4,000.) States and institutions are also an important source of grant aid, especially for students from middle and higher income families. The Stafford Loan Program offers loans to all students (regardless of need) of up to $2,625 for the first year of PS schooling, $3,500 for the second year, and $5,500 for each of the next three years.[24] The total amount of federal grants and subsidized loans cannot exceed the total cost of tuition, fees, room and board (TFRB) less the EFC. However, all students can take out unsubsidized Stafford loans up to maximum loan limits or the total cost of schooling (less any subsidized loan amounts) regardless of calculated need. In this respect, the U.S. federal aid system is more generous to youth from higher income families compared to the Canadian system. Canada does not offer government student loans irrespective of need, so students with parents providing little financial support may have difficulties making ends meet.

5.3   Net Tuition and Out-of-Pocket Expenditures

In Figures 4-7, we show how financial aid, net tuition, and out-of-pocket schooling costs for PS students attending four-year public institutions in Canada and the U.S. depend on parental income.[25] Canadian figures are based on the CSLP and provincial rules (including Millennium and provincial grants and

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[24]These limits have increased since 2003-04. Low-income students may receive subsidized Stafford and Perkins Loans, for which the government pays the interest while the student is enrolled. Higher income students can take out unsubsidized Stafford Loans; however, interest accumulates while in school at a rate of 1.7% plus the three-month treasury bill rate. Student loans in Canada do not accumulate interest while students are enrolled.

[25]Patterns are similar for two-year institutions, see the online appendix.

bursaries), using province-specific information about average university costs and student residential status. We focus on the three largest Canadian provinces (British Columbia, Ontario, and Quebec); however, patterns for other provinces are governed by similar rules to those of British Columbia and Ontario (see, e.g., Junor and Usher, 2004). Figures for the U.S. are calculated from the NPSAS04 and are based on 18-24 year-old dependent students that are enrolled in-state in a public four-year PS institution and applied for federal financial aid.[26] We separately consider students attending high- and low-tuition institutions in the U.S. based on whether the student pays more or less than the median level of tuition ($4,350). Average tuition for the bottom half is $3,300, while it is $6,000 for the top half. Since most of the variation in public four-year PS institution tuition is found across states, our focus on in-state students implies that we effectively present aid schedules for low- and high-tuition states. Aid figures for Canada are reported separately for students living at 'home' with their parents and those living 'away' from their parents. Surprisingly, average aid amounts differ very little by student residential status in the U.S. We, therefore, show averages for American students regardless of residential status.

Our figures for the U.S. include merit and institutional aid as reported in the NPSAS04; however, we are unable to obtain these amounts for Canadian students. Survey estimates of institutional merit and need-based aid amounts in Canada suggest that their omission is unlikely to affect the general structure of aid, net tuition, or out-of-pocket costs, since both sources only provided about $100 million each in non-repayable aid (about $350 per university student) around the time our YITS cohorts were enrolled (Junor and Usher 2004). We return briefly to the potential role of institutional need-based aid in Canada below.

Figure 4 reports total non-repayable aid, including tax credits, grants, scholarships and bursaries, by parental income.[27] (See the online appendix for a discussion of non-repayable aid disaggregated by source.) American students with parental income below $20,000 received almost $10,000 in non-repayable aid from high tuition states and roughly $7,000 from low tuition states. This difference nearly compensates for the difference in tuition. The figure also shows how non-repayable aid (in particular, grant and scholarship aid) declines sharply and continuously with income in the U.S. for

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[26]Using the NPSAS04, we calculate average aid for parental income categories (adjusted for PPP) zero to twenty thousand dollars, then by every ten thousand dollars up to one hundred thousand dollars, and for one hundred thousand dollars and above.

[27]We include loan remissions in total non-repayable aid for Ontario and Quebec. The NPSAS04 imputes federal Hope and Lifetime Learning tax credits as well as any education deductions based on reported parental income and documents by the Internal Revenue Service reporting education tax credits claimed by income. We do not include the benefits associated with subsidized interest payments on Perkins, Subsidized Stafford, and CSLP loans. Accounting for the difference in subsidized vs. unsubsidized Stafford loans in the U.S. would slightly strengthen the relationship between aid/costs and parental income.

families earning less than $60,000. Total non-repayable aid (especially grants and bursaries) in Canada is generally much lower and varies considerably by student residential status, reflecting the difference in costs. As noted earlier, Quebec provides all aid in the form of grants above $2,500; however, Ontario and British Columbia simply have a cutoff need level, above which students receive Millennium or provincial bursaries/grants and below which they do not.[28] Non-repayable aid for Quebec follows a similar pattern to that of the U.S., phasing out continuously over the bottom half of the income distribution. By contrast, non-repayable aid in British Columbia and Ontario phases out quite quickly but at much higher income levels.

Figure 5 subtracts total non-repayable aid from tuition and fees to obtain a measure of 'net tuition' at public four-year institutions. This measure does not account for living expenses, which are typically estimated at $6-7 thousand for students living away from home. So, while net tuition appears to be higher for Canadian students living at home, the total net cost of university may be lower. Because financial aid and net tuition figures for the U.S. differ little by residential status, total net costs are noticeably higher for American students living on their own.

A few general comments about net tuition are in order. First, the U.S. is, on average, relatively generous at the low end of the income distribution, even among high tuition states. The Canada – U.S. difference in net tuition for very low income families largely reflects the differential treatment of student income by EFC formulas : Canada expects all students to pay $2-3 thousand towards their own education while the U.S. does not. Quebec is also quite generous due to its emphasis on grants over loans. Indeed, net tuition as a function of family income is remarkably similar for Quebec (students living away from their parents) and low tuition states in the U.S. Second, net tuition increases substantially with income over the bottom half of the distribution (up to around $60,000) in the U.S. and Quebec. In Ontario and British Columbia, net tuition is largely independent of family income until it reaches about $65-75,000, at which point it jumps up $2-3 thousand. These differences are largely due to differences in the levels of parental income exemptions, below which parents are not asked to contribute to their child's education. As figure 3 shows, the exemption levels are low in the U.S. and Quebec relative to British Columbia and Ontario (as well as other Canadian provinces).

Figure 6 reports available government loans in the U.S. and Canada. U.S. amounts assume all students can access Stafford Loans up to the maximum limits; they also include any need-based loans (e.g. Perkins loans) as reported by the NPSAS04. Government student loan access is largely

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[28]Through loan remissions, Ontario effectively limits loans to $7,000 and provides all aid above that amount in the form of grants. The modest increases in aid at very low income levels in Canada are due to the inability of very low income families to fully benefit from education tax credits.

independent of parental income in the U.S.[29] This is not true in Canada, where loans phase-out over a similar income range as does grant aid. In Ontario and British Columbia, both grants and loans are available up to fairly high income levels (roughly $70,000 for students living away from home), then phase-out very quickly. Private loans are also a growing source of financing for undergraduate students in both the U.S. and Canada. Unfortunately, we are unable to compare Canada and the U.S. with respect to private student credit by parental income; however, overall private student borrowing amounts appear to be roughly similar.[30]

In addition to the net price of attendance, out-of-pocket costs may be an important determinant of PS attendance for youth who have limited access to credit. Figure 7 shows out-of-pocket expenses, defined as net tuition less available government loans, for Canada and the U.S. This reflects the total amount of money students are expected to raise on their own (or from parents or other relatives) each year to finance tuition costs. On average, the U.S. is relatively generous at the low end of the income distribution; however, total available aid (repayable and non-repayable) is more generous in British Columbia and Ontario for middle income families. While Quebec is generous in terms of grant aid, it is not in terms of total aid. As a result, out-of-pocket expenses are relatively high in Quebec compared to other Canadian provinces and the U.S. Out-of-pocket expenses in Ontario and British Columbia do not depend much on parental income for lower and middle income families; however, they rise considerably with income among higher income families. The value of the Stafford Loan program in the U.S. for students from high-income families is evident in their low out-of-pocket expenditures relative to their Canadian counterparts.

It is natural to question whether differences in the way we measure aid in Canada and the U.S. may account for some of the striking differences in net tuition and out-of-pocket expenditures between these countries reported in Figures 5 and 7. We consider a few key differences. First, our figures do not incorporate institutional aid in Canada. Despite low total amounts of aid distributed by institutions, it is likely that most, if not all, of need-based institutional aid goes towards students from the bottom of the income distribution. The Educational Policy Institute (2008) reports that Ontario offered need-based bursaries of about $1,800 to about 20% of the undergraduate population, while Canadian institutions from other provinces offered less than $1,500 on average to 11% of their undergraduates. While these sums are likely to be important for low-income families in Canada, they do not come close

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[29]Low-income students in the U.S. may qualify for subsidized Stafford and Perkins loans, while all students qualify for unsubsidized Stafford loans. See footnote 24.

[30]In the U.S., private student loans represented 16% of all student loan dollars taken out in 2003-04 (College Board 2006). Junor and Usher (2004) report that roughly 15% of Canadian students reported taking out a private student loan in 2001-02 (with average annual loan amounts of $5,600).

to eliminating the sizeable gaps in aid between the U.S. and most Canadian provinces at the bottom of the income distribution.

Second, our figures do not take into account the differences in student residential status (home vs. away) between Canada and the U.S. More Canadian students live with their parents while attending PS school, which should help lower their costs. However, as Figures 5 and 7 reveal, much of the potential savings from reduced living expenses is offset by less aid in Canada but not in the U.S. In the online appendix, we show that our general conclusions about net tuition and out-of-pocket expenditures in Canada vs. the U.S. are unchanged if we account for the higher fraction of students living with their parents in Canada (35% vs. 22%) and compute average measures of total net PS schooling costs (averaged across those living at home and away) that incorporate added costs associated with living away from home.

Third, all NPSAS04 figures for the U.S. are based on students choosing to enroll in a four-year public institution. It is possible that students receiving less generous financial aid offers never enroll in the first place, so our total grant figures may be biased upwards and net tuition figures downwards compared to the amounts a typical *potential* student might face. In the online appendix, we consider bounds on net tuition and out-of-pocket costs (by parental income) to account for this self-selection. Assuming that youth who do not attend PS school would have received zero institutional grant aid produces very similar conclusions to those of Figures 5 and 7.

6 Tuition, Financial Aid, and Family Income – Post-Secondary Attendance Patterns

The relationship between net tuition and family income is important, since it determines the price paid by different types of families. Reductions in tuition due to need-based aid should encourage PS attendance regardless of whether low-income families have adequate access to credit. Out-of-pocket expenditures are likely to affect attendance decisions for those families that face cash-flow problems arising from imperfect credit markets.

Net tuition increases much more with parental income in the U.S. than in Canada (see Figure 5). Out-of-pocket expenditures are also relatively low in the U.S. (relative to Canada) for low-income families, rising much more quickly than in BC or Ontario over the bottom half of the income distribution. The greater targeting of aid to disadvantaged families in the U.S. not only implies that these families receive a bigger discount on their tuition bills relative to middle- and high-income families than their Canadian counterparts, but their out-of-pocket expenses are actually lower as well. The

latter suggests that liquidity problems should be less severe for low-income American youth (relative to their Canadian counterparts). Based on the net tuition and out-of-pocket expenditure patterns shown in Figures 5 and 7, it is quite surprising that parental income – PS attendance gaps are so much stronger in the U.S. Indeed, Figures 5 and 7 suggest that, all else equal, the opposite should be true.[31] That it is not implies that the underlying demand for PS education must be much more strongly increasing in parental income among American than Canadian youth. As further evidence of this differential demand, Table A1 shows that high school completion rates are also more strongly related to parental income in the U.S. and that this explains a good share of the U.S. – Canada difference in PS attendance gradients.

6.1 Quantifying the Role of Need-Based Financial Aid

Ideally, we would measure the underlying demand for education (by family income) in an environment where everyone faced the same price. Instead, low-income students face a lower price than high-income students in both Canada and the U.S., and this difference is greater in the U.S. Using estimates from the literature on PS enrolment responses to schooling costs; however, it is possible to predict what family income – PS attendance relationships might look like in Canada and the U.S. in the absence of need-based aid.

Surveying a broad range of studies dating back decades, Kane (2006) and Deming and Dynarski (2009) conclude that a $1,000 reduction in PS costs leads to a roughly 3-5 percentage point increase in PS attendance rates in the U.S.[32] Fortin (2005) estimates similar enrolment responses to changes in tuition in Canada and the U.S.

Based on these estimates, Figure 8 shows how PS attendance rates are predicted to change (by family income) in Canada and the U.S. if non-repayable aid amounts for all families were reduced to the amounts reported for families with incomes above $100,000.[33] While the figure reports overall income

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[31]BC and Ontario sharply reduce both grant and loan aid at the top of the income distribution. This leads to steep but modest increases in net tuition and substantial increases in out-of-pocket costs as income rises above $60,000. By contrast, most need-based aid has been exhausted in the U.S. These patterns suggest that we might expect steeper income – attendance relationships in the U.S. compared to BC and Ontario for upper-middle and upper-income families. This is generally consistent with our results of Section 4.

[32]Estimates are roughly translated into responses to tuition reported in year 2003 dollars. Examining the introduction of Pell Grants in the mid-1970s, Hansen (1983) and Kane (1994) estimate smaller impacts on PS enrolment rates among low-income American youth. This has led some to suggest that PS attendance may respond less to changes in non-repayable aid than to tuition (e.g. Kane 1999); however, recent studies from a variety of policy changes estimate enrolment responses to aid that are quite consistent with those estimated for tuition (e.g., Dynarski 2000, 2003, Abraham and Clark 2006, Kane 2003, 2007).

[33]This would not actually eliminate all non-repayable aid, since even students from very high income families receive tax credits (and, in the U.S., some institutional and state aid). These numbers are based on net tuition schedules for public four-year schools reported in Figure 5. Estimates for Canada take population-weighted averages for British Columbia, Ontario, and Quebec. The online appendix provides details on the calculations presented here.

– attendance gaps, the same changes would be observed for gaps conditional on family background and adolescent achievement. We see that the reductions in aid would cause American (Canadian) youth from families earning $25,000 to reduce their PS attendance rates by 14-23 (8-13) percentage points, whereas reductions would be less than 4 (2) percentage points for youth from families earning $75,000. Put another way, these calculations suggest that eliminating need-based aid would roughly double conditional income – attendance gaps in the U.S. and Canada. Also, notice that even if U.S. aid had no effect on attendance, while aid in Canada had effects of 3-5 percentage points per $1,000, income – attendance relationships would still be stronger in the U.S.

Based on similar assumptions about enrolment responses to net price, Figure 9 shows how much additional non-repayable aid would need to be offered to students from different family income backgrounds to completely eliminate the relationship between income and attendance conditional on family background and cognitive achievement (see Figures 2a and 2b). These calculations suggest that financial aid would need to increase by 60-100% for low-income students in both countries. Of course, this would require substantially larger outlays in the U.S. where current aid levels are already relatively high for those at the bottom of the income distribution.

7   Conclusions

Education is central to future labor market success, so it is important to know whether youth from low-income backgrounds are taking full advantage of higher education systems. If they are not, then intergenerational mobility is likely to be severely limited. Our findings suggest that this concern is more pronounced in the U.S. than in Canada. In particular, we show that PS attendance rates among recent cohorts are more strongly related to parental income in the U.S. than in Canada, even after controlling for similar measures of family background, adolescent cognitive achievement, and local area of residence fixed effects. Our estimates, therefore, suggest that the stronger U.S. income – attendance relationship is not simply explained by Canada – U.S. differences in the correlation between family income and student ability, residential segregation, peers/social networks, local labor market conditions, or local access to PS institutions.

One common concern is that a lack of adequate credit prevents lower income youth from attending PS school. To explain the stronger income – attendance relationship in the U.S., these constraints would need to be more binding in the U.S. Yet, we show that out-of-pocket expenditures are lower, on average, for low-income American youth compared to their Canadian counterparts. We also observe that PS attendance increases with family income even among middle- and upper-income families in

both Canada and the U.S. Family income is also more strongly related to high school completion in the U.S. relative to Canada. However important borrowing constraints may be, they are unlikely to explain much of the Canada – U.S. difference in family income – PS attendance patterns.

Our primary aim is not to fully account for the relationships between family income and PS attendance in Canada and the U.S. Instead, we focus on understanding the extent to which the need-based structures of Canadian and American financial aid programs contribute to the dramatic difference in attendance patterns.[34] Both countries spend billions each year on financial aid in the pursuit of greater educational equity – it is important to know what this money 'buys'. We, therefore, undertake a careful accounting of all need-based financial aid in Canada and the U.S., documenting the dependence of net tuition and out-of-pocket expenditures on family resources.

We show that the U.S. provides more aid than Canada at the bottom of the income distribution but quickly 'taxes' non-repayable aid away as parental income rises toward the median. Canada provides similar aid to low- and middle-income families, 'taxing' both non-repayable and loan aid away quickly for families above the median. Overall, the U.S. is relatively more generous at the low (and high) end of the income distribution, while Canada is more generous in the middle.

Consensus estimates of the impact of tuition and aid on PS attendance imply an important role for need-based aid in shaping family income – PS attendance relationships and, by extension, intergenerational mobility in both the U.S. and Canada. Combining these estimates with the structure of financial aid, our calculations suggest that family income – attendance relationships would be roughly twice as strong as they are now (in both the U.S. and Canada) in the absence of any need-based aid. Furthermore, the relationship between income and PS attendance is likely to be even more pronounced in the U.S. relative to Canada in the absence of need-based aid. Thus, underlying differences in the demand for education by family income appear to be much stronger in the U.S. Although we are unable to fully determine why, our analysis casts doubt on many traditional explanations. We also demonstrate that eliminating the relationship between income and attendance (conditional on family background and cognitive achievement) would likely require substantial increases in aid for both countries, but more so in the U.S.

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[34]We do not explore the complexity of student financial aid forms in the U.S. and/or differences in knowledge about costs and benefits of post-secondary schooling, which may contribute to lower attendance rates among youth from low-income families. Frenette and Robson (2011) review existing studies examining both of these factors in Canada in the U.S.; however, data comparability issues make it difficult draw firm conclusions regarding their relative importance for income – attendance relationships. There are two reasons these types of problems may affect income – attendance gradients more in the U.S. : (i) there is considerable heterogeneity in tuition levels across states and institutions, with the popular press emphasizing the skyrocketing costs of elite private institutions and (ii) a large share of American financial aid is institution-specific, making it more difficult to for students to predict the actual amount they would receive. The latter, especially, may contribute to a steeper income – attendance gradient in the U.S., since poor information and uncertainty about financial aid is more detrimental to the most disadvantaged.

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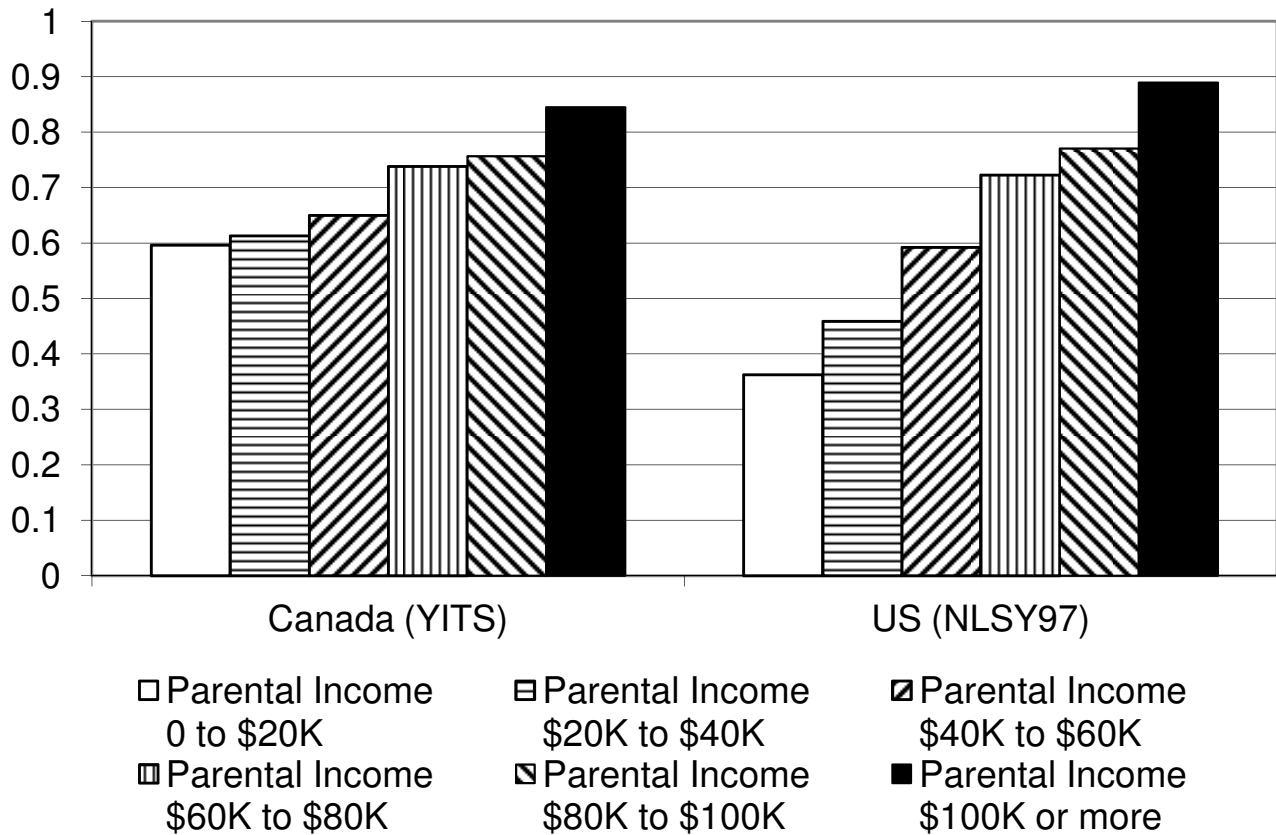
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Figure 1: PSE Attendance by Parental Income Categories Quartiles in Canada (YITS) and the US (NLSY97)

Legend:
- □ Parental Income 0 to $20K
- ⊟ Parental Income $20K to $40K
- ▨ Parental Income $40K to $60K
- ▥ Parental Income $60K to $80K
- ◩ Parental Income $80K to $100K
- ■ Parental Income $100K or more

Figure 2a: Estimated Effects of Parental Income on Post-Secondary Attendance (Spline Function Estimates)
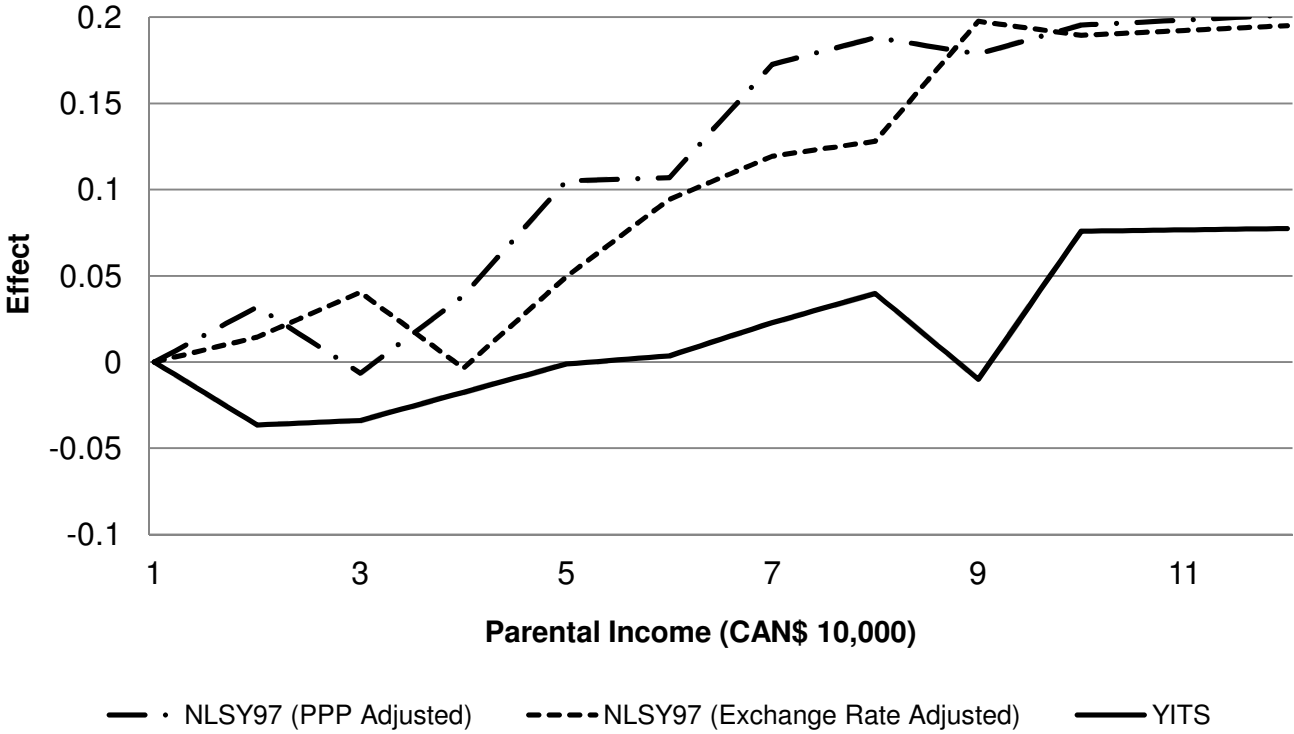
Figure 2b: Estimated Effects of Parental Income on Attendance at a Four-Year PS Institution (Spline Function Estimates)
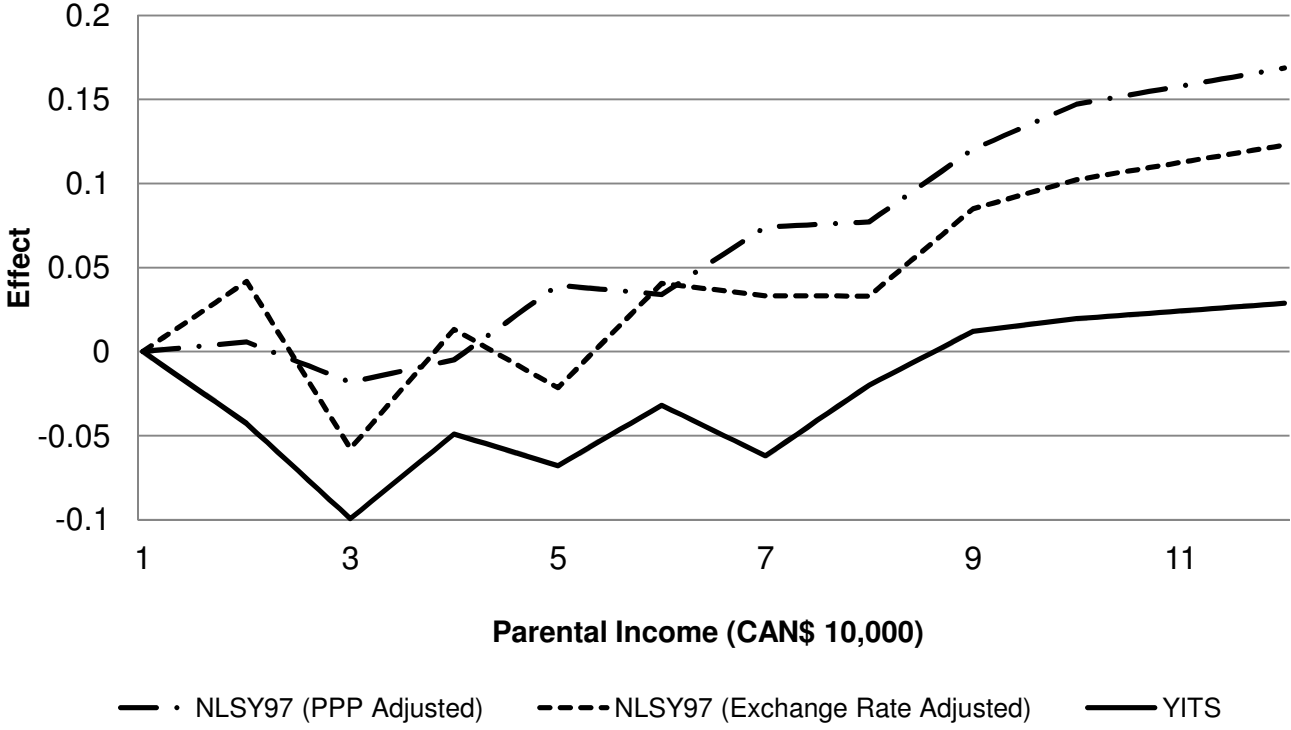
Figure 3: Expected Family Contribution
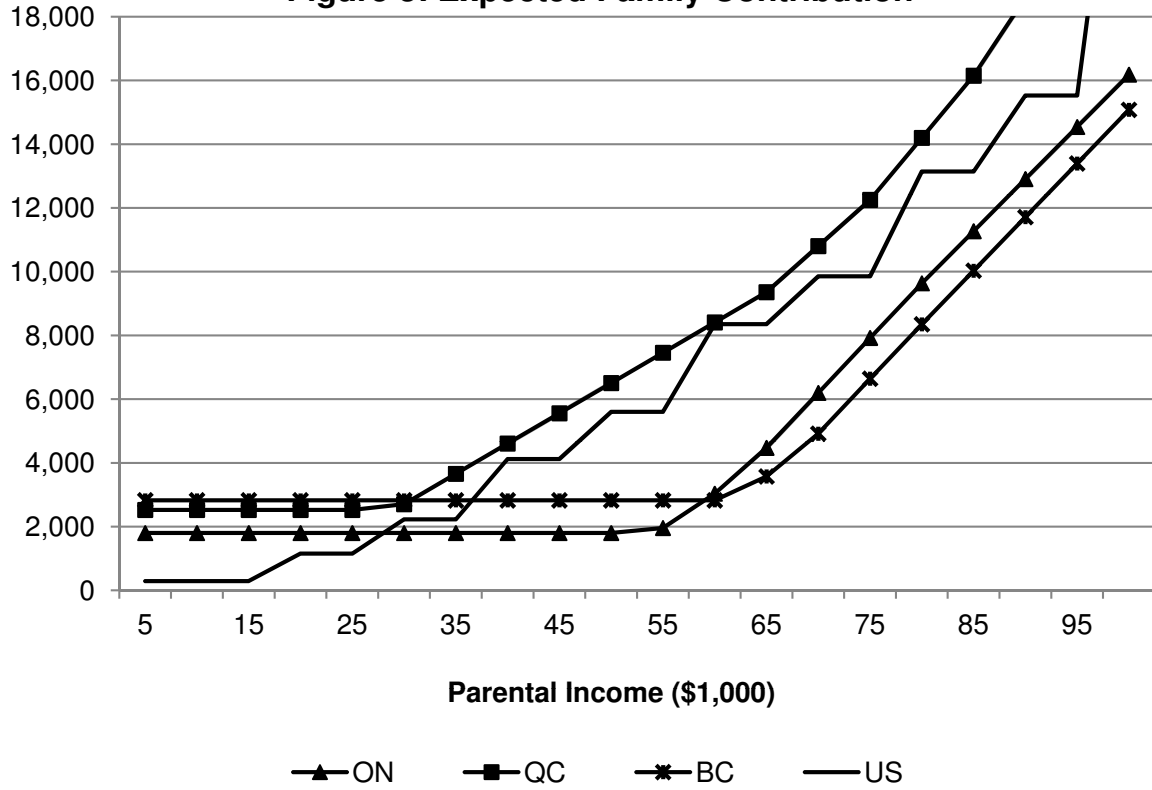
Figure 4: Total Non-Repayable Aid

Parental Income ($1,000)
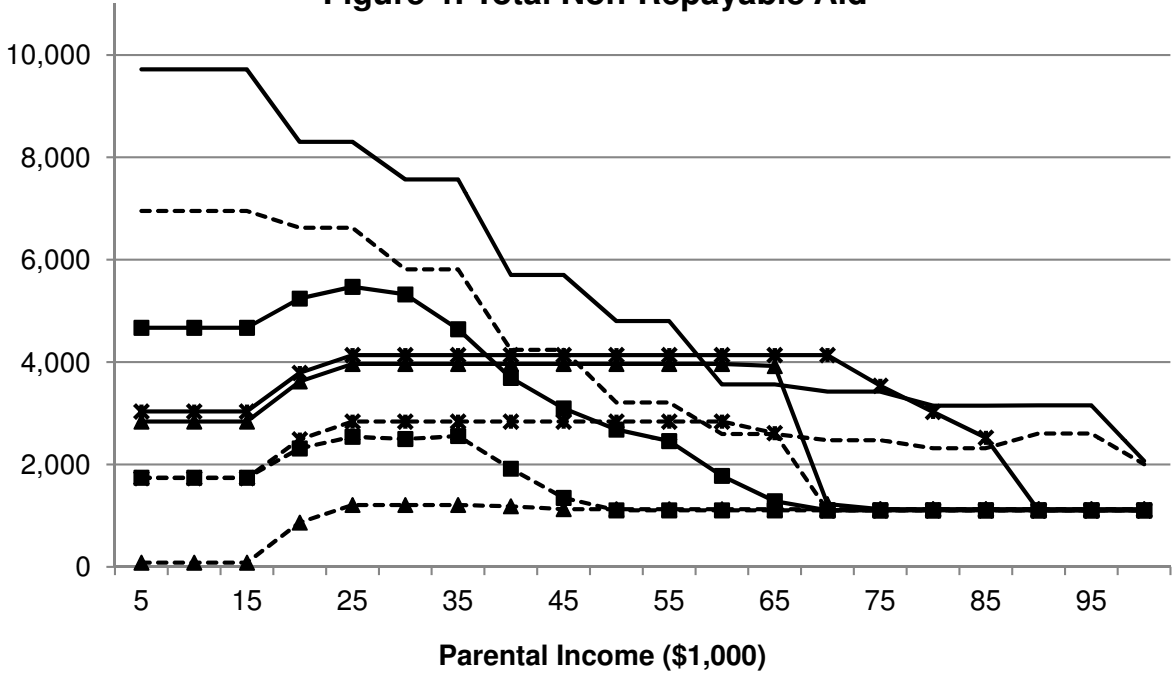
- --▲-- ON Home
- --▲— ON Away
- --■-- QC Home
- --■— QC Away
- --✳-- BC Home
- --✳— BC Away
- ----- US LowTuition
- —— US High Tuition

Figure 5: Net Tuition (Tuition less Non-Repayable Aid)
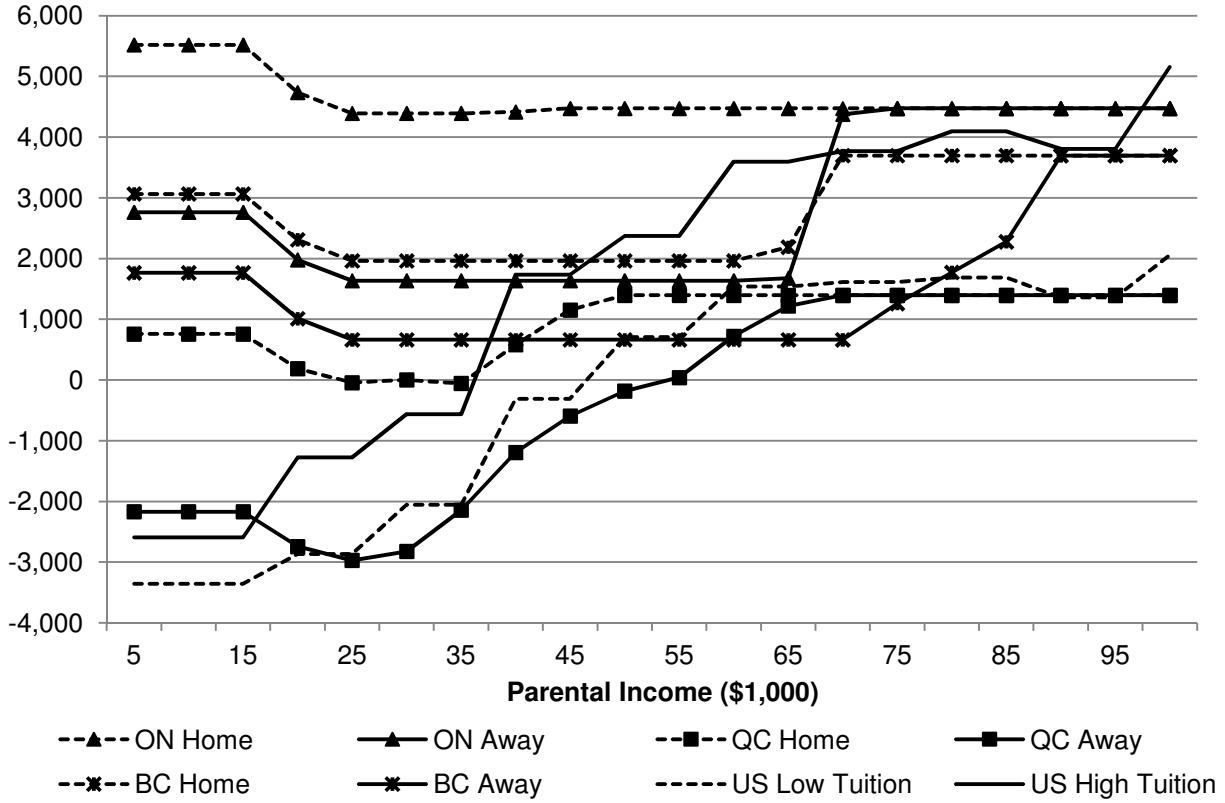
Figure 6: Total Available Government Loans

X-axis: Parental Income ($1,000)

Legend: ON Home, ON Away, QC Home, QC Away, BC Home, BC Away, US

Figure 7: Out-of-Pocket Costs

Table 1: Sample Descriptive Statistics

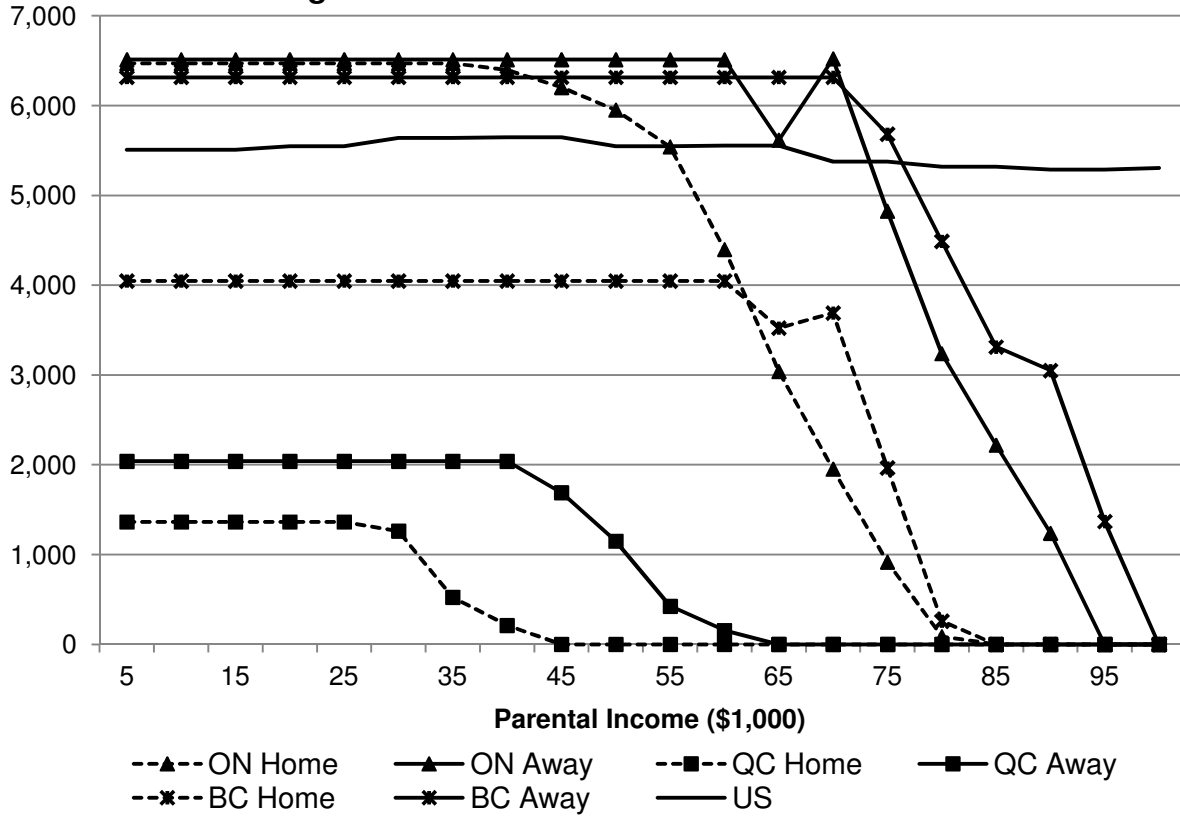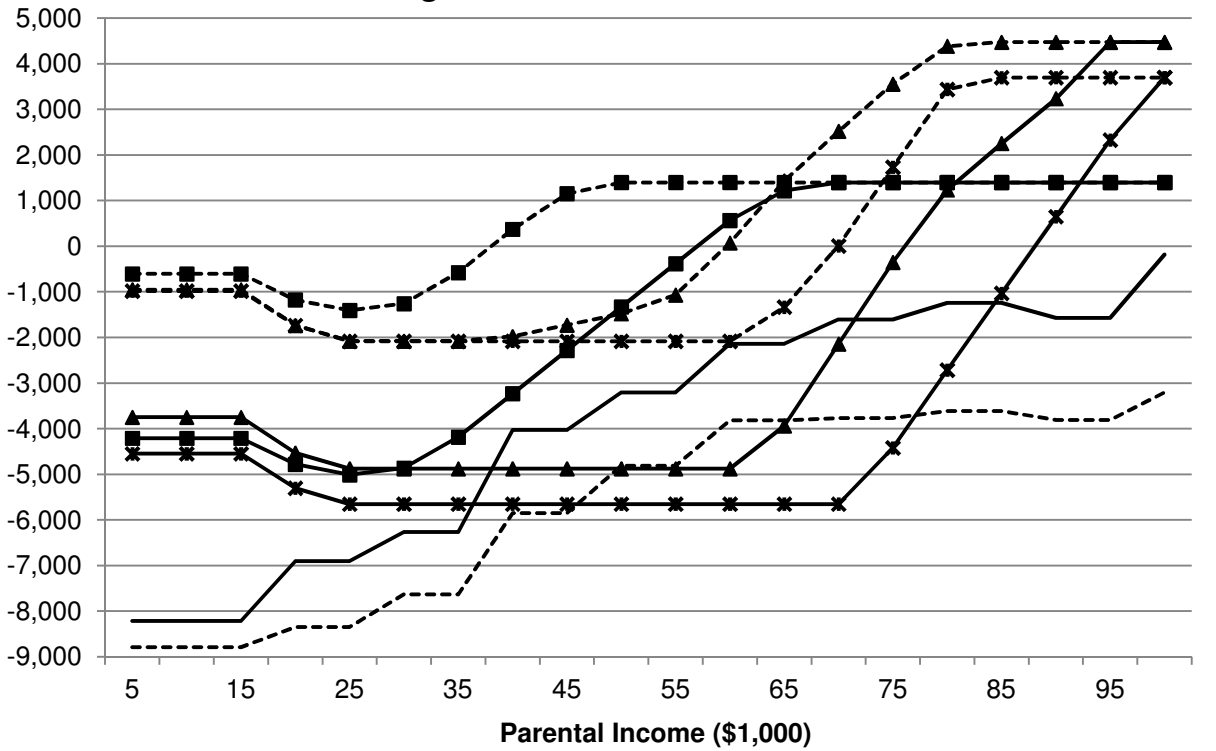|	Canada (YITS)	US (NLSY97)
Completed High School (as of age 21)	0.930	0.832*
	(0.255)	(0.374)
Post-Secondary Attendance (as of age 21)	0.710	0.625*
	(0.454)	(0.484)
Post-Secondary Attendance at 4-yr Institution (as of age 2	0.423	0.420
	(0.494)	(0.494)
Male	0.498	0.506
	(0.500)	(0.500)
White	0.875	0.695*
	(0.331)	(0.460)
Immigrant	0.082	0.033*
	(0.275)	(0.178)
At Least One Parent an Immigrant	0.269	0.126*
	(0.444)	(0.332)
Mother's Age at Birth	28.171	25.991*
	(4.855)	(5.323)
Intact Family during Adolescence	0.754	0.563*
	(0.431)	(0.496)
Metropolitan Area during Adolescence	0.679	0.790*
	(0.467)	(0.407)
Number of Children in Household under 18	1.472	2.329*
	(0.508)	(1.147)
Mother High School Graduate	0.887	0.847*
	(0.316)	(0.360)
Mother at Least Some Post-Secondary Schooling	0.594	0.493*
	(0.491)	(0.500)
Parental Income (in $10,000) during Late Adolescence	7.174	6.422*
	(5.557)	(4.773)
Parental Income $20,000 or Less	0.058	0.146*
	(0.234)	(0.353)
Parental Income $20,000 to $40,000	0.155	0.189*
	(0.362)	(0.392)
Parental Income $40,000 to $60,000	0.228	0.215
	(0.420)	(0.411)
Parental Income $60,000 to $80,000	0.236	0.162*
	(0.425)	(0.368)
Parental Income $80,000 to $100,000	0.175	0.123*
	(0.380)	(0.329)
Parental Income $100,000 or More	0.148	0.165*
	(0.357)	(0.371)
Sample Size	9,028	4,108

Note: Table reports means with standard deviations in parentheses. YITS sample includes individuals with non-missing reading and mathematics scores and parental income. NLSY97 sample includes individuals with non-missing reading and mathematics scores and parental income measured in 1997 if they had reached age 21 by 2005. All dollar values denominated in year 1999 dollars. U.S. incomes adjusted by PPP = 1.19. * denotes mean is statistically different for U.S. and Canada at 0.05 signficance level.

Table 2: Distribution over Parental Income Categories and Math-Reading Achievement Quartiles

	Math-Reading Achievement Quartile:			
	1	**2**	**3**	**4**
a. Canada (YITS)				
Parental Income $20,000 or Less	2.36%	1.85%	0.90%	0.72%
Parental Income $20,000 to $40,000	4.97%	4.14%	3.69%	2.67%
Parental Income $40,000 to $60,000	6.79%	5.77%	5.34%	4.91%
Parental Income $60,000 to $80,000	5.03%	5.83%	6.44%	6.31%
Parental Income $80,000 to $100,000	3.56%	4.22%	4.55%	5.19%
Parental Income $100,000 or More	2.29%	3.11%	4.13%	5.24%
b. US (NLSY97)				
Parental Income $20,000 or Less	7.21%	3.58%	2.51%	1.29%
Parental Income $20,000 to $40,000	6.28%	5.79%	3.80%	3.07%
Parental Income $40,000 to $60,000	5.28%	5.55%	5.60%	5.11%
Parental Income $60,000 to $80,000	2.19%	3.89%	4.63%	5.45%
Parental Income $80,000 to $100,000	1.53%	2.80%	3.70%	4.28%
Parental Income $100,000 or More	0.93%	2.73%	4.80%	8.01%

Notes: YITS sample contains 9,028 individuals. NLSY97 sample contains 4,108 individuals. See Table 1 for data sample description.

**Table 3: Estimated Relationship between Post-Secondary Education and Parental
Income, Achievement, and Family Background**

	PS Attendance		Attendance at a Four-Year PS Institution	
	Canada (YITS)	**US (NLSY97)**	**Canada (YITS)**	**US (NLSY97)**
Male	-0.1270	-0.0923	-0.1487	-0.0882
	(0.0086)	(0.0130)	(0.0089)	(0.0133)
Immigrant	0.0792	0.1610	0.0930	0.1554
	(0.0179)	(0.0444)	(0.0186)	(0.0455)
At Least One Parent an Immigrant	0.0811	0.0481	0.1159	0.0149
	(0.0113)	(0.0242)	(0.0117)	(0.0248)
Mother's Age at Birth	0.0068	0.0031	0.0058	0.0036
	(0.0010)	(0.0014)	(0.0010)	(0.0014)
Intact Family during Adolescence	0.0525	0.0750	0.0567	0.0971
	(0.0107)	(0.0151)	(0.0111)	(0.0155)
Metropolitan Area during Adolescence	0.0316	0.0116	0.0325	-0.0005
	(0.0097)	(0.0163)	(0.0101)	(0.0167)
Number of Children under 18	0.0223	-0.0078	0.0405	-0.0014
	(0.0089)	(0.0062)	(0.0093)	(0.0063)
Mother HS Graduate	0.1116	0.0890	0.0734	0.0280
	(0.0152)	(0.0210)	(0.0158)	(0.0214)
Mother at Least Some PSE	0.0559	0.0745	0.0757	0.1119
	(0.0100)	(0.0150)	(0.0103)	(0.0154)
Math-Reading Achievement Quartile 2	0.1978	0.2516	0.1659	0.1328
	(0.0122)	(0.0197)	(0.0126)	(0.0202)
Math-Reading Achievement Quartile 3	0.2991	0.3928	0.3163	0.3248
	(0.0124)	(0.0203)	(0.0128)	(0.0208)
Math-Reading Achievement Quartile 4	0.3704	0.5157	0.5220	0.5563
	(0.0126)	(0.0211)	(0.0130)	(0.0217)
Parental Income $20,000 or Less	-0.0853	-0.2108	-0.0516	-0.1823
	(0.0223)	(0.0279)	(0.0232)	(0.0286)
Parental Income $20,000 to $40,000	-0.1000	-0.1935	-0.1249	-0.2203
	(0.0166)	(0.0243)	(0.0173)	(0.0250)
Parental Income $40,000 to $60,000	-0.0845	-0.1261	-0.0966	-0.1738
	(0.0148)	(0.0224)	(0.0153)	(0.0231)
Parental Income $60,000 to $80,000	-0.0537	-0.0705	-0.1013	-0.1511
	(0.0144)	(0.0228)	(0.0150)	(0.0236)
Parental Income $80,000 to $100,000	-0.0457	-0.0450	-0.0389	-0.0962
	(0.0152)	(0.0244)	(0.0157)	(0.0255)
Test of no Income Effects (P-value)	<.0001	<.0001	<.0001	<.0001
Sample Size	9,028	3,812	9,028	3,700

Notes: Education measured as of age 21. NLSY97 regressions also control for year of birth
and race/hispanic ethnicity indicators. Test of no Income Effects is an F-test (5 d.o.f.) that all
five coefficients on family income are zero. Standard errors are in parentheses.

Table 4: Estimated Income -- Attendance Gradients for Selected Provinces and by Low and High Tuition States

	Canada (YITS)			US (NLSY97)	
	Ontario	Quebec	All Other Provinces	Low Tuition States	High Tuition States
A. Post-Secondary Attendance					
Parental Income $20,000 or Less	-0.1246	-0.0213	-0.0415	-0.2049	-0.2357
	(0.0348)	(0.0555)	(0.0286)	(0.0398)	(0.0394)
Parental Income $20,000 to $40,000	-0.0653	-0.0953	-0.0428	-0.1675	-0.2261
	(0.0412)	(0.0427)	(0.0209)	(0.0350)	(0.0338)
Parental Income $40,000 to $60,000	-0.1443	-0.0861	0.0071	-0.1262	-0.1316
	(0.0334)	(0.0393)	(0.0192)	(0.0328)	(0.0307)
Parental Income $60,000 to $80,000	-0.0415	-0.0188	-0.0503	-0.1066	-0.0443
	(0.0318)	(0.0383)	(0.0190)	(0.0340)	(0.0307)
Parental Income $80,000 to $100,000	-0.0707	-0.0357	-0.0159	-0.0788	-0.0244
	(0.0323)	(0.0427)	(0.0202)	(0.0375)	(0.0321)
Test of no Income Effects (P-value)	0.0060	0.0651	0.0025	<.0001	<.0001
Sample Size	1,341	1,392	6,295	1,838	1,974
B. Attendance at a Four-Year Institution					
Parental Income $20,000 or Less	-0.0453	-0.0511	-0.0285	-0.2158	-0.1549
	(0.0603)	(0.0553)	(0.0288)	(0.0406)	(0.0407)
Parental Income $20,000 to $40,000	-0.1219	-0.1571	-0.0736	-0.2296	-0.2099
	(0.0465)	(0.0425)	(0.0211)	(0.0357)	(0.0351)
Parental Income $40,000 to $60,000	-0.0981	-0.1274	-0.0486	-0.1791	-0.1695
	(0.0377)	(0.0392)	(0.0193)	(0.0337)	(0.0319)
Parental Income $60,000 to $80,000	-0.0986	-0.1205	-0.0694	-0.1852	-0.1236
	(0.0358)	(0.0382)	(0.0191)	(0.0349)	(0.0319)
Parental Income $80,000 to $100,000	-0.0360	-0.0386	-0.0380	-0.1014	-0.0950
	(0.0364)	(0.0426)	(0.0203)	(0.0388)	(0.0337)
Test of no Income Effects (P-value)	0.0239	0.0006	0.0031	<.0001	<.0001
Sample Size	1,341	1,392	6,295	1,793	1,907

Notes: Regressions control for gender, immigrant status, whether at least one parent is an immigrant, mother's education (HS graduate, PS attendance), intact family during adolescence, number of children under 18, mother's age at child's birth, metropolitan area during adolescence, and math-reading achievement quartiles. Education measured as of age 21. Test of no Income Effects is an F-test (5 d.o.f.) that all five coefficients on family income are zero. Standard errors are in parentheses.

<p style="text-align: center;">Table 5: Alternative Specifications for Income -- Attendance Gradients</p>

	Canada (YITS)		US (NLSY97)	
	White English-Speaking Native Youth with Native Parents	Controls for School Fixed Effects	White Native Youth with Native Parents	Controls for County x MSA Residential Status Fixed Effects
A. Post-Secondary Attendance				
Parental Income $20,000 or Less	-0.1451	-0.0695	-0.2665	-0.2290
	(0.0306)	(0.0340)	(0.0347)	(0.0311)
Parental Income $20,000 to $40,000	-0.1188	-0.0665	-0.2187	-0.1973
	(0.0222)	(0.0247)	(0.0289)	(0.0268)
Parental Income $40,000 to $60,000	-0.0921	-0.0552	-0.1352	-0.1260
	(0.0191)	(0.0217)	(0.0255)	(0.0246)
Parental Income $60,000 to $80,000	-0.0549	-0.0237	-0.0804	-0.0658
	(0.0186)	(0.0197)	(0.0254)	(0.0249)
Parental Income $80,000 to $100,000	-0.0387	-0.0286	-0.0647	-0.0538
	(0.0192)	(0.0211)	(0.0277)	(0.0263)
Test of no Income Effects (P-value)	<.0001	0.0688	<.0001	<.0001
Sample Size	5,637	9,028	2,537	3,797
B. Attendance at a Four-Year Institution				
Parental Income $20,000 or Less	-0.0703	-0.0393	-0.2220	-0.2144
	(0.0303)	(0.0341)	(0.0360)	(0.0319)
Parental Income $20,000 to $40,000	-0.1552	-0.1206	-0.2132	-0.2307
	(0.0220)	(0.0260)	(0.0301)	(0.0274)
Parental Income $40,000 to $60,000	-0.1036	-0.0867	-0.1911	-0.1735
	(0.0189)	(0.0239)	(0.0266)	(0.0253)
Parental Income $60,000 to $80,000	-0.1041	-0.0829	-0.1550	-0.1368
	(0.0184)	(0.0238)	(0.0266)	(0.0257)
Parental Income $80,000 to $100,000	-0.0533	-0.0301	-0.0944	-0.1107
	(0.0190)	(0.0245)	(0.0293)	(0.0274)
Test of no Income Effects (P-value)	<.0001	<.0001	<.0001	<.0001
Sample Size	5,637	9,028	2,465	3,685

Notes: Regressions control for gender, immigrant status, whether at least one parent is an immigrant, mother's education (HS graduate, PS attendance), intact family during adolescence, number of children under 18, mother's age at child's birth, metropolitan area during adolescence, and math-reading achievement quartiles. Education measured as of age 21. Test of no Income Effects is an F-test (5 d.o.f.) that all five coefficients on family income are zero. Standard errors are in parentheses.

Table A1: Income -- Schooling Gradients for High School Completion and Post-Secondary Attendance Conditional on High School Graduation

	Canada (YITS)		US (NLSY97)	
	HS Completion	**PS Attendance Conditional on HS Graduation**	**HS Completion**	**PS Attendance Conditional on HS Graduation**
Parental Income $20,000 or Less	-0.0648	-0.0552	-0.1231	-0.1589
	(0.0133)	(0.0230)	(0.0232)	(0.0304)
Parental Income $20,000 to $40,000	-0.0138	-0.0973	-0.0890	-0.1479
	(0.0099)	(0.0166)	(0.0201)	(0.0253)
Parental Income $40,000 to $60,000	-0.0292	-0.0733	-0.0421	-0.0931
	(0.0088)	(0.0147)	(0.0186)	(0.0227)
Parental Income $60,000 to $80,000	-0.0033	-0.0476	-0.0163	-0.0530
	(0.0086)	(0.0142)	(0.0189)	(0.0228)
Parental Income $80,000 to $100,000	0.0037	-0.0461	0.0049	-0.0411
	(0.0090)	(0.0149)	(0.0202)	(0.0242)
Test of no Income Effects (P-value)	<.0001	<.0001	<.0001	<.0001
Sample Size	9,028	8,540	3,785	3,180

Notes: Regressions control for gender, immigrant status, whether at least one parent is an immigrant, mother's education (HS graduate, PS attendance), intact family during adolescence, number of children under 18, mother's age at child's birth, metropolitan area during adolescence, and math-reading achievement quartiles. The dependent variable for all specifications is PS attendance measured as of age 21. Test of no Income Effects is an F-test (5 d.o.f.) that all five coefficients on family income are zero. Standard errors are in parentheses.