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## Understanding the Gaps in Postsecondary Education Participation Based on Income and Place of Birth: The role of high school course selection and performance

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## Executive Summary

We use data for a large sample of Ontario students who are observed over five years from their initial entry into high school to study differences in postsecondary education participation. The students are grouped by average neighbourhood income and birthplace (Canadian or foreign-born). We find substantial differences in the allocation of students based on their performance in Grade 9 courses and the types of PSE participation within achievement groupings.

We document differences in PSE participation based on the students' birthplace. Foreign-born students, conditioning on performance in high school, are more likely to continue onto university and college. Foreign-born students in higher income neighbourhoods are more likely to pursue a university degree than a college credential. Uniformly, Canadian-born students are less likely to pursue a PSE credential upon the completion of high school.

Our report raises the question of whether students are fully utilizing the flexibility offered by the high school curriculum. The high school curriculum is designed to offer courses at different levels. Most courses are offered at levels termed "academic/university" or "applied/college." The academic path is key for university participation but can also be used to prepare students for college programs. The applied-path courses, however, cannot be used for admission into university programs. The high school curriculum does not require a student to take only academic- or applied-path courses. Students could take academic-path courses in their stronger disciplines and applied-path courses in the others. In some instances, students can take courses termed "mixed" that count as both academic and applied levels of courses. Despite the freedom to mix and match courses from the academic and applied paths, most students still opt for one of the two paths. Few students take both types.

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## Introduction

The Ontario government expects that 70% of all new jobs will require postsecondary education or skills training by 2020. In anticipation, the government has set goals of ensuring a college or university spot for any qualified student and of improving access to postsecondary education in other ways. These goals raise the following questions: From where will the expansion come? Are there qualified students not seeking a postsecondary education? Are students who choose not to pursue postsecondary education directly out of high school properly prepared should they choose to do so in the future? What information, programs or other mechanisms are needed to encourage greater participation? This report addresses these questions by analyzing high school transcript and postsecondary application data to better understand the pathways students take in high school and how these pathways affect postsecondary education applications and registrations.

This report uses a newly acquired data set on one cohort of Ontario high school students.<sup>1</sup> We group the data by students' birthplace and by neighbourhood income to explore how high school curriculum choices and performance lead to differences in postsecondary education (PSE) participation. The unique nature of our data allows us to shed additional light on some findings that we and others have reported previously (see, Dooley, Payne and Robb, 2009). For example, most Canadian research shows that foreign-born students have a higher PSE participation rate than do Canadian-born students.<sup>2</sup> We report similar findings in this study, but go on to show that this difference in PSE attendance rates is driven in large part by two key factors. First, mid-performing Canadian students are not applying to or registering in college or university at the same rates as mid-performing foreign-born students. Second, even after controlling for many variables including first-year high school achievement, Canadian-born students are less likely to register in college or university than foreign-born students. We also document that foreign-born students are more likely to register in a university than college, raising questions around why a higher share of foreign-born students are concentrating on university.

Dooley, Payne and Robb (2009) documented that during the 1990s and early 2000s in Ontario, while rates of university enrolment were increasing for students residing in middle- to higher-income neighbourhoods, enrolments were relatively flat for students residing in lower-income neighbourhoods.<sup>3</sup> We confirm in this report that this phenomenon continues to this day. A higher share of students residing in neighbourhoods in the top two terciles of average household income register in PSE than students in the bottom tercile of neighbourhoods. These differences are not readily explained by factors related to potential resource constraints faced by students in lower-income neighbourhoods, given that the share of foreign-born students residing in lower-income neighbourhoods registering in PSE is similar to the share observed for Canadian-born students residing in higher-income neighbourhoods.

One explanation for differences in PSE participation is that students may not be fully utilizing the flexibility offered by the high school curriculum. The high school curriculum is designed to offer courses at different

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1 We received data for two cohorts. One cohort started tracking students from Grade 9 and the other cohort started tracking students from Grade 10. We have focused our analysis using the data for the students for which we can observe Grade 9 course selection and performance.

2 See, e.g., Abada et al., 2009; Bonikowska, 2008; Childs et al., 2010; Picot & Hou, 2010, 2011.

3 See also Frenette, 2008; Bouchard & Zhao, 2000; Christofides, Cirello & Hoy, 2001; Corak, Lipps & Zhao, 2003; Bowlby & McMullen, 2002; Tomkowicz & Bushnik, 2003; Barr-Telford et al., 2003; and Drolet, 2005.

levels. Most courses are offered at levels termed “academic/university” or “applied/college.”<sup>4</sup> The academic path is key for university participation but also can be used to prepare students for college programs. The applied-path courses, however, cannot be used for admission into university programs. The high school curriculum does not require a student to take only academic- or applied-path courses. Students could take academic-path courses in their stronger disciplines and applied-path courses in the others. In some instances, students can take courses termed “mixed” that count as both academic and applied levels of courses. Despite the freedom to mix and match courses from the academic and applied paths, most students still opt for one of the two paths. Few students take both types of courses.

This report proceeds as follows. In section two, we provide a brief overview of the high school curriculum and the requirements for receiving a diploma and applying to PSE in Ontario. In section three, we describe the data used in this report. Sections four to six present our analysis and section seven contains a summary of our findings.

## High School Curriculum and Application to PSE

Ontario students typically enter Grade 9 at age 14 and are expected to graduate in four years, though it is not uncommon to take five.<sup>5</sup> The curriculum is set out with an expectation that students will enrol in level 1 courses in Grade 9, level 2 courses in Grade 10, and so forth. Two types of high school graduation certifications are offered: the Ontario Secondary School Diploma (OSSD) and the Ontario Secondary School Certificate. The OSSD has more rigorous requirements and is obtained by most students, especially those who intend to pursue PSE. To obtain an OSSD, a student is required to complete 30 credits,<sup>6</sup> with each course typically counting as one credit. Some courses, however, earn students a half-credit (e.g., career studies and civics). In addition, students may receive more than one credit for courses that contain considerable applied components (e.g., technological education, interdisciplinary studies and co-operative education). To complete OSSD requirements, most students earn between seven and eight credits per year. Of the 30 required credits, 18 represent compulsory courses, including four credits in English or French (typically satisfied by taking one language course per year) and three credits in mathematics, at least one of which must be at the Grade 11 or 12 level. There are also requirements for courses in science, history, geography and languages. The only level 4 course required for the OSSD is the English or French course requirement. Thus, while we might expect to observe students taking level 1 courses in Grade 9, level 2 courses in Grade 10, and so forth, this is not always the case.<sup>7</sup> In particular, given that students are only required to take one level 4 course, students may or may not take a full complement of level 4 courses in the fourth year of high school.

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4 There are other levels as well. For instance, there are workplace-level courses that are designed for students interested in working after high school and/or going into an apprentice program.

5 Historically, Ontario had a five-year high school system. The fifth year, known as Grade 13, was eliminated in 2003. Under the current curriculum, students may remain enrolled in high school beyond the four years that are required to graduate either to complete requirements or to improve grades in courses needed for PSE admission.

6 Students are also required to pass a literacy test and complete 40 hours of community service.

7 For more detailed information on the requirements, see Ministry of Education (2011), *Ontario Schools: Kindergarten to Grade 12, Policy and Program Requirements*.

The curriculum is standardized across the province.<sup>8</sup> In most subjects, the level 1 (Grade 9) and level 2 (Grade 10) courses are offered in two versions: academic and applied. Level 3 and 4 courses (Grades 11 and 12, respectively) can be offered in three versions: university, mixed and college. The designation of these courses was designed to reference the intended PSE destination. Universities require the completion of level 4 university or mixed courses, whereas colleges accept completion of university-, mixed- or college-designated courses in levels 3 and 4. For the sake of simplicity, we use the terminology of the level 1 and 2 courses in this report when discussing level 3 and 4 courses. As a result, we will refer to the university and mixed courses as the “academic path” and to the college courses as the “applied path.” The core difference between these paths is that the level 4 academic path gives students options to pursue both university and college programs, whereas the applied path only gives students the option to pursue a college program.

Some courses across the different levels (mostly levels 3 and 4) do not fall within the academic/applied paths and are instead identified as “open.” The courses with this designation are designed to have a set of expectations that are appropriate for all students.<sup>9</sup> These courses typically are designed to broaden knowledge and skills but are not designed with the specific requirements of university or college in mind. For example, all courses offered around learning strategies and careers are offered as open courses. Some level 3 and 4 subjects are also offered as “workplace” versions. These courses are designed to provide students with the skills needed to meet the expectations of employers upon the completion of high school and/or the requirements for admission to apprenticeship programs. Finally, school boards may offer “locally-developed” courses. The intent of these courses is to target students in a particular school or region and to accommodate educational and/or career preparation needs not met through courses offered in the provincial curriculum. Boards are permitted to develop these courses as level 1 and 2 compulsory courses. The development of a compulsory course might happen, for instance, in schools with low student enrolments, where it is challenging to offer both the academic and applied paths. All locally-developed courses must be approved by the Ministry of Education, and the maximum number of credits a student may earn from the compulsory set of courses for the OSSD is seven.<sup>10</sup>

Students who choose a given academic or applied track in level 1 courses (Grade 9) typically take the same track in level 2, though this is not a formal requirement and the curriculum is designed to permit a student to switch tracks in level 2. Beyond level 2, most courses have prerequisites drawn from either the academic or the applied path. Typically, it is more difficult to switch from the applied path to the academic path after level 2, while a student can switch from academic to applied with relative ease. Of course, in subjects where the mixed path is offered, a student has greater flexibility in course selection.<sup>11</sup> Moreover, students may take different paths across subjects. For example, a student might take applied-path courses in languages but take academic-path courses in math or science.

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8 For a description of the courses and a mapping of the courses across levels, including the prerequisites, see Ministry of Education, *The Ontario Curriculum Grades 9 to 12: Course Descriptions and Prerequisites*.

9 For example, a single level 2 “computer studies” course is offered with an open designation. In level 3, two courses are offered, one with a university and one with a college designation. The level 3 courses, however, do not use the level 2 course as a prerequisite.

10 For more information on locally developed courses, see Ministry of Education (2004), *Guide to Locally Developed Courses, Grades 9 to 12: Development and Approval Procedures*.

11 Mixed courses are offered in the arts (dance, drama, media arts, music, media arts), business studies, geography, history, English/French (level 3 only), math (level 3 only), native studies, science (but not in biology, chemistry or physics), environmental science, social science and humanities, and technological education.



In the final year of high school, students who wish to attend one of the province’s public universities must submit an application through the Ontario Universities’ Application Centre (OUAC). Students complete a common application form (typically in January) and the OUAC collects transcript information directly from high schools and forwards it to the admissions office at each university to which the student wishes to apply. The Ontario College Application Service (OCAS) handles applications to public Ontario colleges in a similar fashion.<sup>12</sup> A small fraction of Ontario students attends colleges or universities outside the province (Dooley, Payne & Robb, 2012). The exact number, however, is not uniformly collected by high schools or by Ontario postsecondary institutions. Since we only have application information from provincial institutions, we define PSE participation in this report as entry to an Ontario college or university.

## Data Description

We obtained longitudinal data from the Ministry of Education on two cohorts of students in the province’s publicly funded high schools: students enrolled in Grade 9 in the 2005–06 academic year.<sup>13</sup> Students are followed if they move from one publicly funded Ontario high school to another, but disappear from the data set if they leave the publicly funded high school system for any reason (e.g. switch to a private school, switch to a school outside of the province, or drop out). We have information on credits attempted, credits earned and course grades for a maximum of five years for each cohort. We also have confirmation of whether they received an OSSD or OSSC. We were only given information on academic and applied courses (including the university, mixed and college courses in levels 3 and 4). No information was provided on courses with the designation of open, workplace or locally developed. We also know if the student applied to or registered in any publicly funded Ontario PSE institution during the fourth and fifth years after high school entry.

The school records include information on each student’s gender, birth year and place of birth (Canadian- or foreign-born), home postal code (the first three characters only) and special status (i.e., indicators for second language learners, gifted students, and/or special needs). We also have information on each student’s performance in the province-wide math test administered in Grade 9 and whether the student wrote the academic or applied version of the test.

We use the information available on each student’s residential location in the first year of high school to link to various neighbourhood characteristics from the 2006 Census, including median family income and the local fraction of single-parent families.<sup>14</sup> For the purposes of matching in the Census measures, we use the first known residential location of the student. Using the Census measures, we grouped neighbourhoods (as identified by the first three characters of the postal code) based on the average household income. Neighbourhoods that fall into the bottom third are classified as lower-income and those in the upper two-thirds are classified as higher-income. Students are, therefore, classified as lower- or higher-income based on neighbourhood income measures.

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12 In Ontario, “universities” offer bachelor degree programs that typically require three to four years of full-time study (or the equivalent), and “colleges” offer diploma programs that typically require two to three years of full-time study (or the equivalent). However, colleges are increasingly offering degree programs. In addition to the 20 universities and 28 colleges accessed via OUAC and OCAS (all publicly funded), there is a small number of private religious universities in the province and a large number of private career colleges. We have no information on applications to these institutions in this data set.

13 The province provides equal funding for Catholic high schools and so-called “public” (non-religious) high schools in both English and French. Our data include all four sets of high schools.

14 The Census data are tabulated at the level of the “forward sortation area” (FSA), which corresponds to the first three digits of the postal code.

We use the student record data to construct a variety of school-level statistics, including the share of students identified as second-language learners and the share of students enrolled in academic track courses. Finally, we have cohort-level information on Grade 6 standardized mathematics and reading scores for students at each high school based on a data set from the provincial testing authority (the Education Quality and Accountability Office, or EQAO). This information, however, is not available for the students under study. It is available for students entering Grade 9 in 2007–08 or later. This information, however, is useful as it provides a proxy for pre-high school performance of students attending schools in a given local area (as defined by the first three characters of the postal code). For the students for whom we observe a Grade 6 and 9 standardized test score, we constructed measures to reflect overall Grade 6 test performance (e.g., average score, share of students with a score of 3 or 4) for Grade 9 students (by gender) attending schools in the same local area (defined by the first three characters of the school postal code). We assigned the values of these measures to our Grade 9 cohort students by gender and local area of the Grade 9 school attended.

### Construction of Sample of Students Used for Analysis

Our primary focus in this paper is to relate differences in PSE registration by neighbourhood income and/or birthplace to choices and performance by students over the course of high school. Moreover, the focus of this report is to study students who follow a typical path through high school. Such paths include the earning of credits in level 1 English or French, science, geography/history and math as required under the standards set by the Ministry of Education.

Our sample of students for this report covers those students enrolled in Grade 9 in 2005–06 in a publicly funded high school and who were born within one year of the standard age for Grade 9 (age 14). There are 166,670 such students (Table 1). Approximately 30% of the students are classified as residing in lower-income neighbourhoods and 13% of the students are foreign-born. Given the constraints of the information with which we were provided, we have further restricted our sample of students as follows. As indicated above, we do not observe all courses for a given student, but only those taken in the applied and academic paths, as these are the paths that are expected to lead to PSE registration. In addition, we observe students who leave our sample for one or more years before the expected departure time (four years after entering high school or upon completion of the OSSD). Finally, as with any use of administrative data, there are records or measures that are anomalous and/or not easily understood. Taking these issues into account, we have dropped students from the analysis for the following reasons (see Table 1, column 1):

- We observe no courses for the students in Grade 9. As explained above, it is expected that students will attempt an academic- or applied-path course for most of their required courses. For 6,621 students, we do not observe a single course being attempted in either the academic or applied path in 2005–06. Approximately 42% of these students reside in lower-income neighbourhoods, a higher share than what we observe in the overall sample, raising the question of what is different about these students. We lack core information on these students to help us better understand why the rate of students with no course information is higher in these neighbourhoods. Given this, we have dropped these students from the sample.
- Recall that to receive a high school diploma, a student is expected to take between seven and eight credits per year. While some of these courses may not be in the academic or applied path, most

students are observed attempting five academic/applied courses per year. In addition to observing students with no course information in 2005–06, a high number of students (~8% of the starting sample) are observed attempting only one or two courses in 2005–06. Given that we cannot observe the non-applied and non-academic path courses, we do not know if these students are enrolled part-time or are following a track that is different from what is expected, especially in the first two years of high school. Therefore, we also drop these students. A higher proportion of these students reside in lower-income neighbourhoods and/or are foreign-born.

- If schools have special conditions (e.g., special-needs oriented or prison schools) or have very low enrolments, the course offerings and the path taken through high school may be different from the typical student experience. We therefore drop students registered in a special-condition school or in a school with a cohort of less than 25 students.
- Despite the requirement of taking Grade 9 math and English/French, there are students who we do not observe in these courses. As we use level 1 (Grade 9) math and language courses to provide a baseline for analysis, we drop 7,451 students for whom we do not observe these courses.
- Beyond the first year in which we observe the students, we also identify students who do not appear to be taking a full course load and/or who are not observed for one or more years in the data set. In some of these cases, though, the gaps are explained by the student receiving his or her high school diploma prior to the expected date of graduation (four years from starting high school), and we retain these students. As explained above, if a student switches into a private school or leaves the province, we do not observe their performance for this period of time and without a complete transcript or more information to explain the gap, it is difficult to study student choice and performance and then relate it to PSE participation. We drop 3,580 students who are missing for one or more of three years beyond 2005–06, who do not receive a high school diploma, and who have attempted less than nine academic or applied credits during these three years.

After our exclusions, we are left with 135,464 students (81% of the initial sample). The share of these students residing in lower-income neighbourhoods drops to 29% from 31% and the share of these students who are foreign-born drops to 11% from 13%. The analysis that follows uses this restricted sample of students. As noted above, we exclude students who are not taking academic- and applied-path courses and/or who are not observed registered in a high school for one or more years. Thus, our analysis is based on students most likely to receive their diploma given the types of courses observed for these students.

One might very well want to study the progression of students excluded from the sample. However, without more information on these students (e.g., why are they significantly older, why do they not take courses expected to be taken under the provincial curriculum), we would be left with a very partial and uninformative analysis of matters pertaining to high school completion and PSE registration.

**Table 1: Construction of Working Data Set**

	Grade 9 Cohort		
	Total	Share Lower-income Neighbourhood	Share Foreign-born
<b>Initial cohort</b>	166,670	31.0%	13.3%
No courses observed in 2005–06	6,621	42.3%	15.5%
Less than 3 courses observed in 2005–06	12,973	40.1%	17.6%
School in 2005–06 is a special-condition school and/or rural (low enrolment)	581	44.6%	3.3%
Do not observe the student taking Grade 9 math and/or Grade 9 English/French	7,451	31.7%	38.7%
For years 2006–07 to 2008–09, a student is missing transcript information for one or more years and/or has fewer than nine credits for this period	3,580	38.0%	22.9%
<b>Cohort studied</b>	135,464	29.3%	11.2%

Notes: Based on administrative records from the Ontario Ministry of Education. See text for a description of the data transformation process. Students are classified as being from lower- or higher-income neighbourhoods based on 2006 Census characteristics for the neighbourhood in which they are observed residing in the 2005–06 school year. Lower-income captures those neighbourhoods in the bottom third of all neighbourhoods in Ontario, whereas higher-income captures those neighbourhoods in the top two-thirds of all neighbourhoods in Ontario.

## The End Game: Are There Differences in High School Completion and PSE Registration Rates Based on Income or Birthplace?

We concentrate our analysis on two characteristics of the high school student sample: average neighbourhood household income and place of birth (Canada/foreign country).<sup>15</sup> Basic theories on human capital suggest that neither income nor place of birth should matter when making decisions about PSE participation. Yet, in what follows, we observe striking differences in PSE participation according to these characteristics. Given that PSE participation follows high school completion, a natural starting point is to examine differences in high school completion rates across the groups of students.

15 In Dooley, Payne and Robb (2009), we reported that students residing in lower-income neighbourhoods were 13% less likely to apply to university than students from other neighbourhoods. For that report, however, we did not have individual high-school records. We used data on university applications matched to high-school level enrolments to derive application and registration rates. Our current data set has individual-level high school data matched to PSE application and registration data. Hence, we can more accurately explore end of high school decisions around completion and PSE participation with data grouped by country of birth and residential location.

We first explore whether there are differences in high school completion rates and PSE registration by country of birth and residence in either a lower- or higher-income neighbourhood. Our measure of high school completion is the Ontario Secondary School Diploma (OSSD). In Table 2, we report the share of students receiving the OSSD and registering in an Ontario postsecondary educational institution. Column 2 shows that approximately 78% of students residing in lower-income neighbourhoods and 85% of students residing in higher-income neighbourhoods are observed receiving a diploma, a difference of seven percentage points. Within each income group, there is little difference in the receipt of a high school diploma between the Canadian- and foreign-born students.

The share of students registering in postsecondary education and by type of institution are reported in columns 3, 4 and 5. Overall, there is a 10 percentage point difference in PSE participation between students in lower- and higher-income neighbourhoods. Students in lower-income neighbourhoods are equally likely to register in college and university programs, and the students in higher-income neighbourhoods are more likely to register in university. There are sharp differences between the Canadian- and foreign-born students in both income groupings. Overall, foreign-born students are more likely to go on to a PSE institution and more likely to attend a university than a college. The stark differences are easily seen in Figure 1. The group least likely to go on to PSE are Canadian-born students residing in lower-income neighbourhoods. Close to 45% of these students do not go on to PSE. Interestingly, the registration rates of the foreign-born students residing in lower-income neighbourhoods are similar to the rates of Canadian-born students residing in higher-income neighbourhoods.

**Table 2: High School Diplomas and PSE Registration, by Student Grouping**

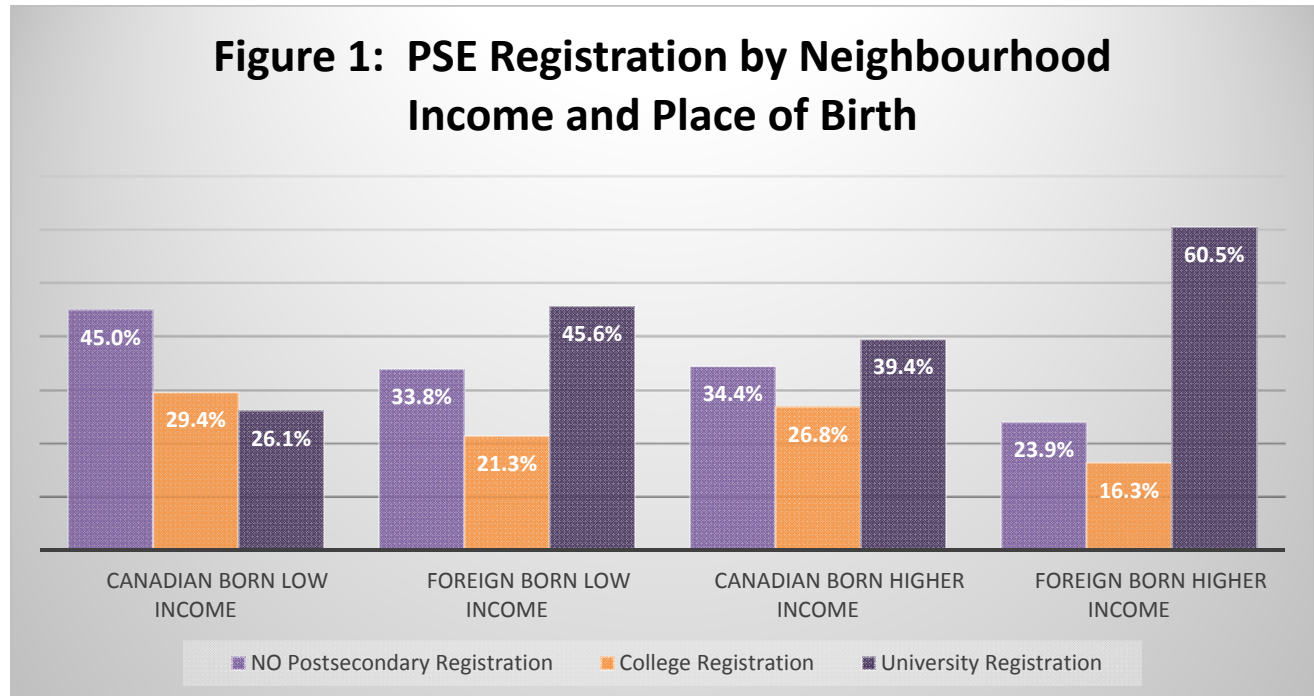
	# of Students	Share with a High School Diploma	Postsecondary Registration	College Registration	University Registration
	(1)	(2)	(3)	(4)	(5)
Lower-income neighbourhood: All students	39,714	78.3%	56.2%	28.6%	28.2%
Canadian-born	35,419	78.2%	55.0%	29.4%	26.1%
Foreign-born	4,295	78.9%	66.2%	21.3%	45.6%
Higher-income neighbourhood: All students	95,750	85.2%	66.8%	25.6%	41.8%
Canadian-born	84,849	85.0%	65.6%	26.8%	39.4%
Foreign-born	10,901	86.8%	76.1%	16.3%	60.5%

Notes: Students are classified as being in lower- or higher-income neighbourhood based on 2006 Census characteristics for the neighbourhood in which they are observed residing in school year 2005–06. Lower-income captures those neighbourhoods in the bottom third of all neighbourhoods in Ontario, whereas higher-income captures those neighbourhoods in the top two-thirds of all neighbourhoods in Ontario.

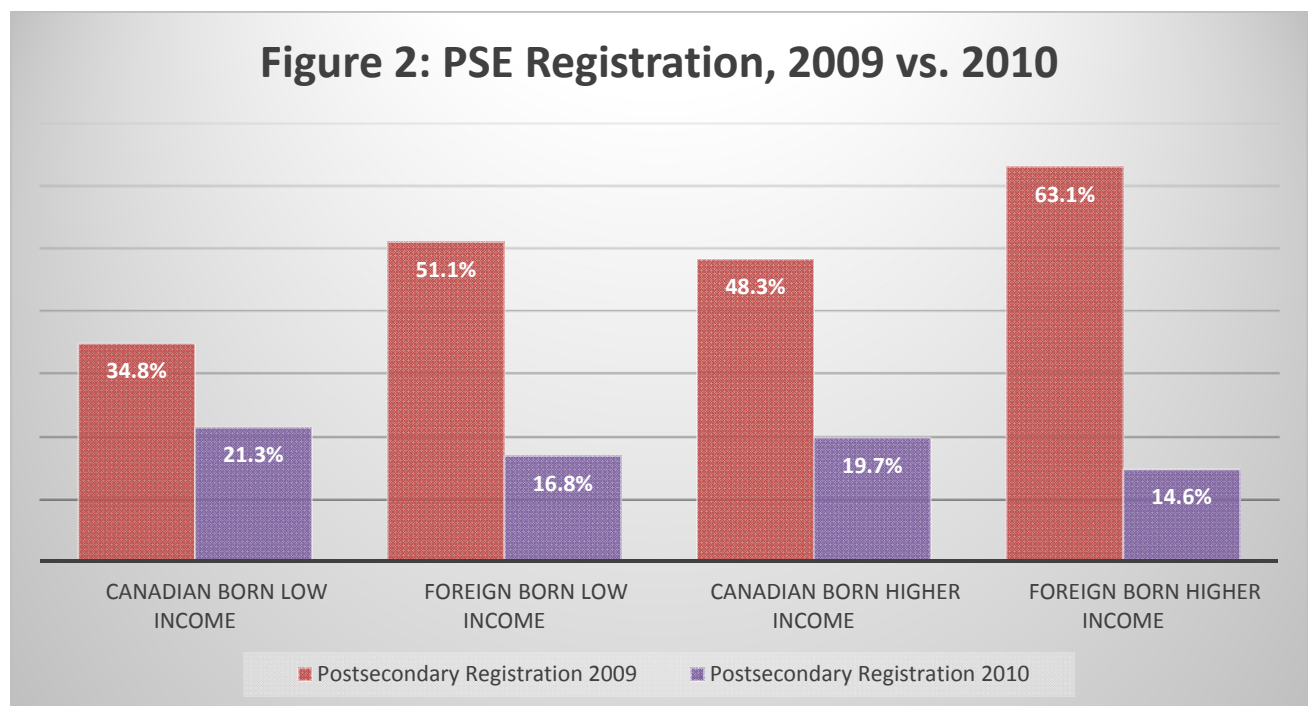
In Figure 1, we grouped the registrations over a two-year period (the normal expected registration year plus the following year). Does it matter if the registration is observed for one rather than two years? Despite the current high school curriculum anticipating the completion of high school after four years of study, we

continue to observe students enrolling in a fifth year of study. That fifth year might be used to complete credits and/or to improve one’s chances of getting into college or university.

**Figure 1: PSE Registration by Neighbourhood Income and Place of Birth**



**Figure 2: PSE Registration, 2009 vs. 2010**





In Figure 2, we depict the differences in PSE registration rates across our four groupings of students for the two years separately. There is a more pronounced effect in registrations during the fifth year of study for the Canadian-born than for the foreign-born students, and a higher share (38%) of the registrations for those residing in lower-income neighbourhoods are attributable to the second year of registrations. Close to 20% of the PSE registrations for the Canadian-born students are observed in 2010, the second year of PSE registrations (after year 5 in high school). This figure suggests that looking only at the expected year of registration (after Grade 12) would, in fact, exaggerate the differences between Canadian- and foreign-born students and between the income groupings.

A stated goal in the 2012–13 briefing book of the Ministry of Advanced Education and Skills Development was to achieve the attainment of a postsecondary education credential by 70% of Ontarians. For our restricted sample of students, with the exception of Canadian-born students residing in lower-income neighbourhoods, nearly 70% of the other students (78% of foreign-born in higher-income neighbourhoods) have registered in PSE programs. Although registration and completion are two different things, it certainly appears that the ministry is progressing in meeting its PSE participation target, conditional on the fact that our restricted sample captures those students who progress through high school as expected under the curriculum.

Across all of the groups, two-year registration rates are higher than one-year registration rates, emphasizing the continued use of a fifth year of high school by many students despite its elimination in the early 2000s. Most notable, however, is the gap in overall PSE registration rates between Canadian-born, lower-income and foreign-born, higher-income students, and the higher college registration rates by the Canadian-born students. This leads us to consider the extent to which high school course selection explains the differences observed in PSE registrations. Given that there are striking differences between the two dimensions under study (neighbourhood income and birthplace), we separate the analysis to study students by place of birth and look at differences based on residential location within each of these groups. We start first with Canadian-born students.

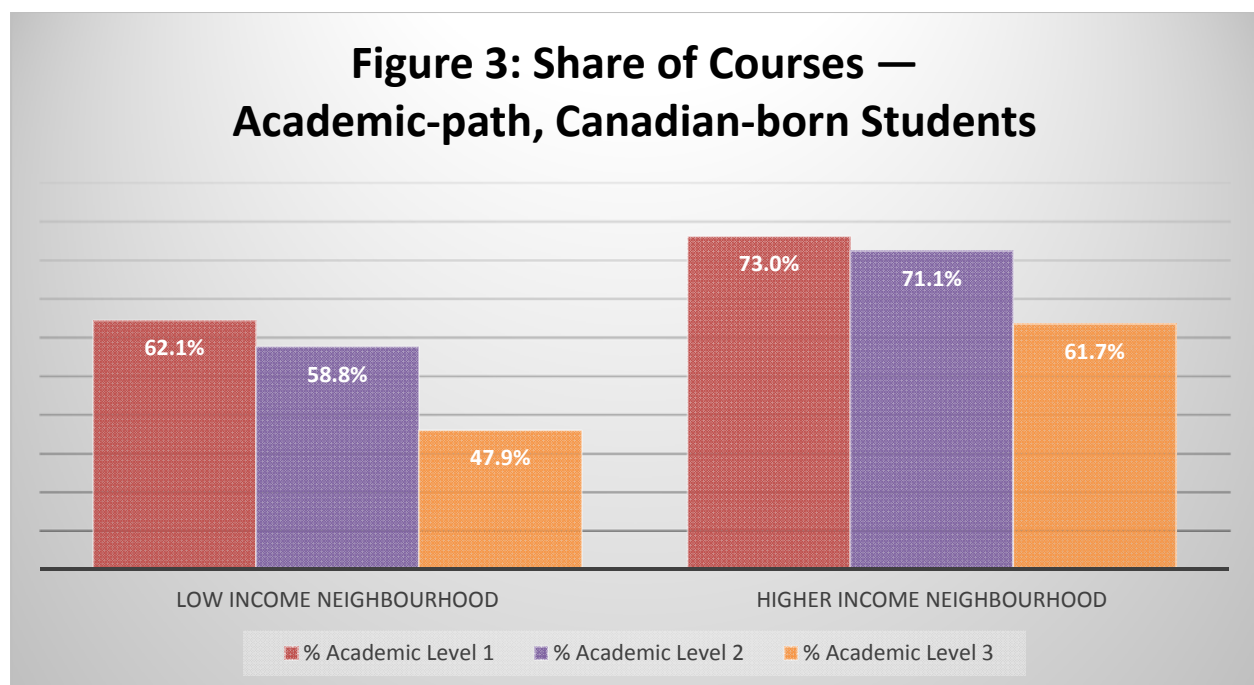
## Canadian-born Students: What Might Explain Differences in PSE Registration Gaps between Students Residing in Lower- and Higher-income Neighbourhoods?

There is likely a range of reasons underlying the differences in PSE participation by students. Typical explanations include a lack of information on the benefits of PSE participation and completion, a lack of financial resources to support college and university attendance, the structure of the educational system and the role played by course selections. With our data, we can explore how decisions made in the early years of high school influence choices and performance in the last years of high school. In Ontario, the structure of the high school curriculum is progressive, in that many courses at each level reflect actions taken at earlier levels. A natural approach is to examine the courses taken in each year of high school to better understand the evolution of decisions about high school completion and PSE participation. Given the curriculum structure, one might expect students to take level 1 courses in Grade 9, level 2 courses in Grade 10, and so forth. After extensive exploration of the data, however, we discovered that many students follow quite different paths through high school. These different paths make it difficult to analyze student course selection and performance on a yearly basis. However, given the progressive structure of the

curriculum, we can study pathways as they relate to the different levels of courses. Thus, in this next section, we explore choices and performance for each level of courses (level 1, level 2, and so forth).

In Figure 3, we group students based on neighbourhood income to depict choices made in course selection at each level as evidenced by their having earned credits in academic or applied courses. We depict the share of courses that are in the academic path for the first three levels of high school courses. Recall that we observe only applied- and academic-path courses, so the percentages represents the share of these chosen courses that are in the academic path. Recall also that colleges accept courses taken in either path, whereas universities base admission decisions on performance in level 4 academic-path courses.<sup>16</sup> Thus, students wanting to keep their options open with respect to PSE participation would want to pursue the academic path.

**Figure 3: Share of Courses — Academic-path, Canadian-born Students**



The share of earned courses in the academic path is uniformly lower for students residing in lower-income neighbourhoods than for students residing in higher-income neighbourhoods. There is an 11 percentage point gap in level 1 courses. On average, 73% of the earned courses in level 1 are in the academic path for students residing in higher-income neighbourhoods, compared to 62% for students residing in the lower-income neighbourhoods. As we progress to the level 2 and level 3 courses, there is a drop in the share of courses that are in the academic path across both groups of students. The gap in these shares remains relatively persistent and increases slightly. By level 3, there is nearly a 14 percentage point gap in the share of courses that are in the academic path between students residing in lower- and higher-income neighbourhoods.

<sup>16</sup> As noted above, we treat the courses identified as “mixed” path as academic path courses.



While earning credits and progressing through high school is important for going on to PSE, likely more important is performing well in a course. To explore further the relationship between taking academic-path courses and performing well in courses, we group our students based on their level 1 math and language (English or French) earned credits and performance in these courses. We use a cut-off of 70% or higher, since informal discussion with teachers suggested that this is a benchmark used in making recommendations to students about path choice for the next school year. We group our students into three subgroups: (a) those who received marks of 70% or better in both academic-path math and language; (b) those who received marks of 70% or better in either academic-path math or academic-path language; (c) those who earned marks of less than 70% in academic-path math and language courses, and those who opted to take only applied-path math and/or language courses.

In Table 3, we report the distribution of the students across these three groupings, as well as the share of students in each grouping who are observed registering in PSE. Starting first with the students residing in lower-income neighbourhoods, we observe that more than half of these students (53%) fall into the lowest achievement group (those observed not taking academic-path math/language courses, and/or earning a mark less than 70%). Only 27% of the students earned a mark of 70% or better in both academic-path math and language courses. This compares to 36% of students residing in higher-income neighbourhoods.

Within each performance grouping of students, we also report the share of students observed registering in PSE overall, in university, and in college by neighbourhood income assignment. Card and Payne (2015) engaged in a similar analysis to decompose differences in PSE participation for males and females. They found that much of the gap in participation was attributable to student achievement at level 1.

We do not observe the same phenomenon for Canadian-born students grouped by residential income for our bottom two groups. Starting first with our highest achievers (columns 3 and 4), there is a three percentage point difference in participation, with 81% of those residing in lower-income neighbourhoods and 84% of those residing in higher-income neighbourhoods registering in a postsecondary institution. There is, however, a more pronounced difference between neighbourhood groupings in the distribution of students registering in university or college. Of students residing in lower-income neighbourhoods in this group, 62% (vs. 71% of higher-income neighbourhood students) are observed registering in university and 19% (vs. 13% of higher-income neighbourhood students) are observed registering in college.

For the middle achievement group of students, there is an overall gap for PSE attendance of six percentage points between students residing in lower- and higher-income neighbourhoods. A higher proportion of students residing in higher-income neighbourhoods chose to register in university (41% vs. 31%) and a higher proportion of students residing in lower-income neighbourhoods chose to register in college (36% vs. 31%). For the lowest achievement group of students, those residing in higher-income neighbourhoods are more likely both to register in university (11% vs. 6%) and in college (36% vs. 32%) than those residing in lower-income neighbourhoods.

**Table 3: Postsecondary Outcomes by Grade 9 (Level 1) Course Selection and Outcomes, Canadian-born Students**

	<i>Level 1 Language/Math Track Choice and Grade Outcomes</i>							
	Overall Cohort		Level 1 Academic-path Language AND Math with Grades >70		Level 1 Academic-path Language OR Math with Grades >70		No Level 1 Academic-path Language OR Math; or both Grades <70	
	Lower-income (1)	Higher-income (2)	Lower-income (3)	Higher-income (4)	Lower-income (5)	Higher-income (6)	Lower-income (7)	Higher-income (8)
Number of students	35,419	84,849	9,625	30,763	7,147	18,934	18,647	35,152
Percent of cohort			27.2%	36.3%	20.2%	22.3%	52.6%	41.4%
<i>Postsecondary registration (percent registered within 5 years)</i>								
Register in university	26.0%	39.4%	62.1%	71.2%	30.9%	41.2%	5.5%	10.6%
Register in college	29.4%	26.8%	18.9%	12.8%	36.0%	31.4%	32.4%	36.5%
Register in university or college	55.5%	66.2%	81.0%	84.0%	66.9%	72.6%	37.9%	47.1%

Notes: See notes to Table 1 for sample description. Subgroup in columns 3 and 4 completed level 1 academic-path courses in math and English/French and received grade of 70% or higher in both. Subgroup in columns 5 and 6 completed one level 1 academic-path course in math or English/French with a grade of 70% or higher. Subgroup in columns 7 and 8 did not enroll in level 1 academic-path math or English/French, or did not receive at least one grade of 70% or higher.

**Table 4: Share of the Gap between Lower- and Higher-income Explained by Observed Characteristics**

Panel A: Level 1 Performance	Share with Level 1 Academic-path Language AND Math Grades $\geq$ 70	Share with Level 1 Academic-path Language OR Math Grades $\geq$ 70	Share with NO Level 1 Academic-path Language OR Math Grades; or marks <70	
	(1)	(2)	(3)	
Mean for students in lower-income neighbourhoods	0.272	0.202	0.526	
Mean for students in higher-income neighbourhoods	0.363	0.223	0.414	
Lower-higher income gap	-0.091	-0.021	0.113	
<b><i>Decomposition using student and school characteristics<sup>1</sup></i></b>				
Share of the income gap explained by observed characteristics	<b>47.1%</b>	<b>29.3%</b>	<b>43.7%</b>	
Panel B: PSE Registration, Middle- and Lower-achieving students	For Middle Students (those with Level 1 Academic-path Language OR Math Grades $\geq$ 70)		For Bottom Students (those with NO Level 1 Academic-path Language OR Math Grades; or marks <70)	
	Any PSE Registration	University Registration	Any PSE Registration	University Registration
	(1)	(2)	(3)	(4)
Mean for students in lower-income neighbourhoods	0.662	0.309	0.377	0.056
Mean for students in higher-income neighbourhoods	0.718	0.412	0.469	0.106
Lower-higher income gap	-0.057	-0.103	-0.091	-0.051
<b><i>Decomposition using student/school characteristics plus previous choice and performance in level 1 courses<sup>2</sup></i></b>				
Share explained by characteristics	<b>36.3%</b>	<b>46.4%</b>	<b>70.7%</b>	<b>73.5%</b>

Notes: Table 4 shows Oaxaca-style decompositions based on linear regression models for outcome measures (share of courses that are academic).

<sup>1</sup>Student characteristics are: dummies for gender, special needs, gifted, whether the school attended is Catholic, the share of students in the cohort at the school that are ESL students, the share of students at the school that are Aboriginal Canadians. Neighbourhood characteristics are: distance to nearest college, distance to nearest university, total population and fraction of population in age 15-24 age range in FSA, visible minority share, and fraction of single-parent households in FSA as well as our proxy for grade 6 EQAO performance in the area.

<sup>2</sup>Measures of previous choice and performance for the panel B analysis: the measures of previous choice and performance are the share of level 1 courses that are academic, the GPA for level 1 courses, the number of level 1 courses that the student failed.

Thus, unlike in Card and Payne (2015), there appear to be two key factors to account for differences in PSE participation by neighbourhood income grouping. The first is the difference in the distribution of students across the three achievement groupings.

In Panel A of Table 4, we explore the differences in the classification of the lower- and higher-income students into our three groupings of level 1 performance. While the lack of information on pre-high school courses and test results limits our explanatory power, we can look at differences in the following measures: gender; special-needs status; population demographics of the neighbourhood in which the student resides (total population and share of the population aged 15-24); the selection of a public or Catholic high school; characteristics of the high school such as the proportion of students identified as English-language learners; the share of students in the cohort who attend the school but are not in the sample of students used in the analysis; the distances from the high school to the closest college and university; and the local area proxies for performance on the Grade 6 EQAO math and reading tests.<sup>17</sup> We use a regression-based decomposition approach (see Fortin, Lemieux & Firpo, 2011). Specifically, we use as outcomes whether a student falls into one of the three achievement groups (high, medium or low) and then look at the difference in the means of these values based on the residential neighbourhood location.

The decomposition analysis allows us to estimate the differences in the gap in our outcome measure that is attributable to the background characteristics of the students (e.g., if those residing in lower-income neighbourhoods were given the same mean characteristics of those residing in higher-income neighbourhoods and vice versa). As we observed in Table 3, the biggest differences in students in the achievement groups are in the top and bottom groupings. For the top and bottom achievement groups, the gap in the distribution of the students in these groups is attributable to background characteristics by approximately 47% and 44%, respectively. These results suggest that background characteristics play a big role in the gap in allocation across the three achievement groups.

The second area of exploration of the PSE participation gap concerns the gaps observed within each student achievement group. Given these within-group gaps in PSE participation, in Panel B of Table 4 we report the results of the decomposition of the gaps for students within the middle- and lower-achievement groups to background characteristics. We include as background characteristics performance in level 1 courses (indicators for if the student earned academic credits in math, language and science; the number of total academic credits earned in level 1; and the overall average for level 1 courses). Columns 1 and 2 report the mean differences and share of the difference that can be attributed to background characteristics for PSE and university registration for the middle grouping of students, respectively. These characteristics explain 36% of the differences in PSE registration and 46% of the difference in university registration. Despite falling into a broadly defined achievement group, a good proportion of the gap is explained by the end of Grade 9.

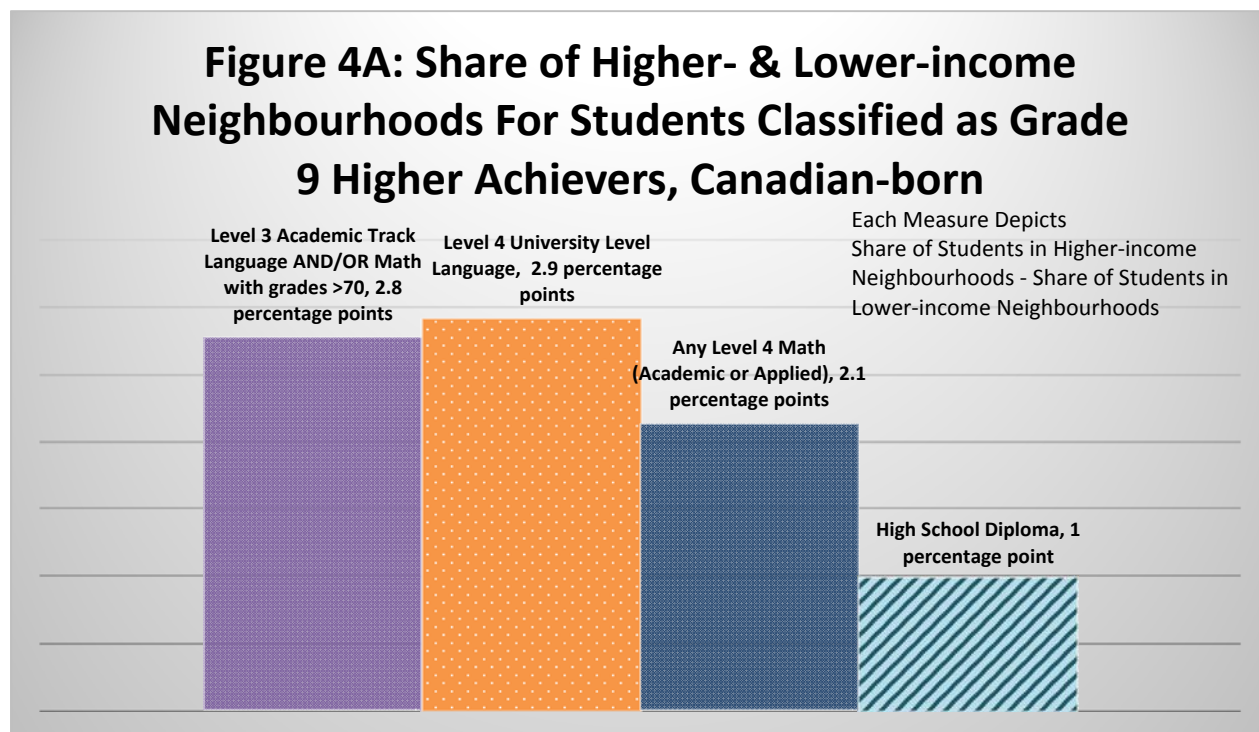
Columns 3 and 4 report the differences and results from the decomposition of the factors attributable to the differences for the lower-achievement group. More than 70% of the gap is explained by these background differences. This latter finding suggests that the bulk of PSE participation differences is attributable to actions taken by the end of Grade 9.

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<sup>17</sup> As we do not observe the actual performance on the Grade 6 tests by our sample of students, these measures capture both information on performance in earlier years and student characteristics of the peers the student likely encountered prior to high school.

Figures 4A to 4C illustrate that these baseline differences observed in pre-Grade 9 and Grade 9 choices and performance are observed in course selection and performance in upper-year high school courses. Let's return to our high achievers, those who perform well in both level 1 academic-path math and language. Figure 4A explores differences in course selection and course performance in upper years for our higher-achieving students. We start first by looking at the differences in the choice of academic-level courses in math and/or language in level 3 (Grade 11) and a mark of 70% or better in at least one of the courses. By this level, we observe a difference of three percentage points (89% vs. 86%) between the students based on their residing in higher- or lower-income neighbourhoods. The same is true of the differences in taking university level 4 English or French courses. Does the same hold true for level 4 math courses? Recall that math courses in the fourth year are optional. Hence, we look at the decision to take a level 4 math course at any level (academic or applied). There is a difference of only two percentage points between the students residing in lower- and higher-income neighbourhoods. Overall, 81% of the students in lower-income neighbourhoods and 83% of students in the higher-income neighbourhoods take a level 4 academic or applied math course. If taking a higher-level academic math course in level 4 is a proxy for taking challenging courses more generally, then the participation gap in this course could help to explain the difference in student choice between university and college.

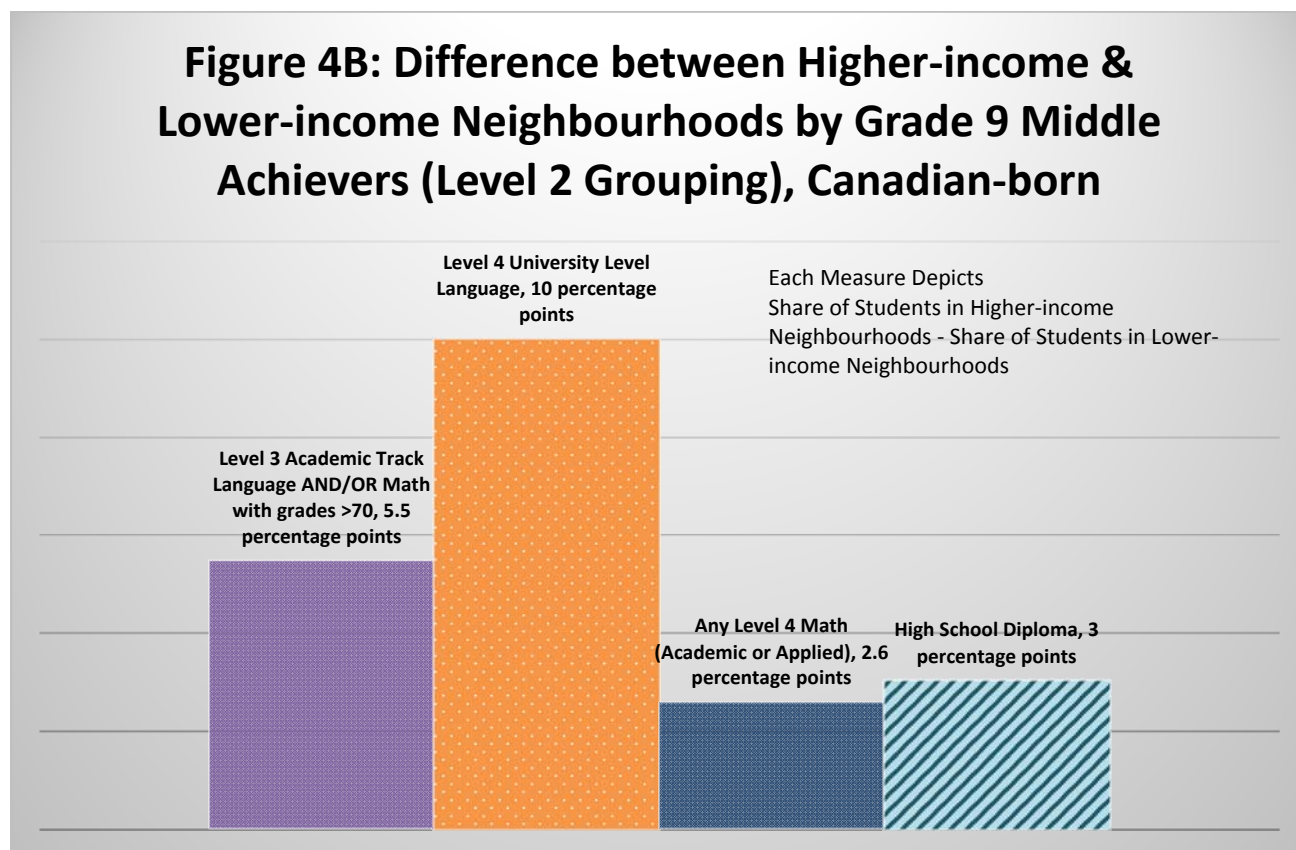
**Figure 4A: Share of Higher- and Lower-income Neighbourhoods for Students Classified as Grade 9 Higher achievers, Canadian-born**



The last column of Figure 4A shows only a one percentage point difference in receiving the high school diploma by neighbourhood income grouping, which is not enough to explain the difference in PSE participation. More than 96% of these students receive a diploma.

Figure 4B depicts the differences among middle achievers across neighbourhood groupings. This group could be the most diverse group, given that we observe good performance in either math or language in level 1 courses but not in both. With a mixed performance in level 1, some students might be motivated to buckle down and study harder, while other students might become less motivated. Across all of the measures, we observe a sizable difference between the students in the higher- and lower-income neighbourhoods.

**Figure 4B: Difference between Higher-income and Lower-income Neighbourhoods by Grade 9 Middle achievers, Canadian-born**



By level 3, we observe a gap of almost six percentage points, similar in size to that observed in PSE participation. More than 90% of the students in both income groups are observed taking a level 4 (applied or academic) course in English or French, but less than 60% of the students are observed taking a level 4 math course (academic or applied). There is a sizable gap with respect to the share of students who enrol in level 4 academic-path language courses. With respect to receiving a high school diploma, there is a three percentage point gap based on residential location, with close to 90% of students in higher-income neighbourhoods receiving a diploma.



**Figure 4C: Difference between Higher-income and Lower-income Neighbourhoods by Grade 9 Lower achievers, Canadian-born**

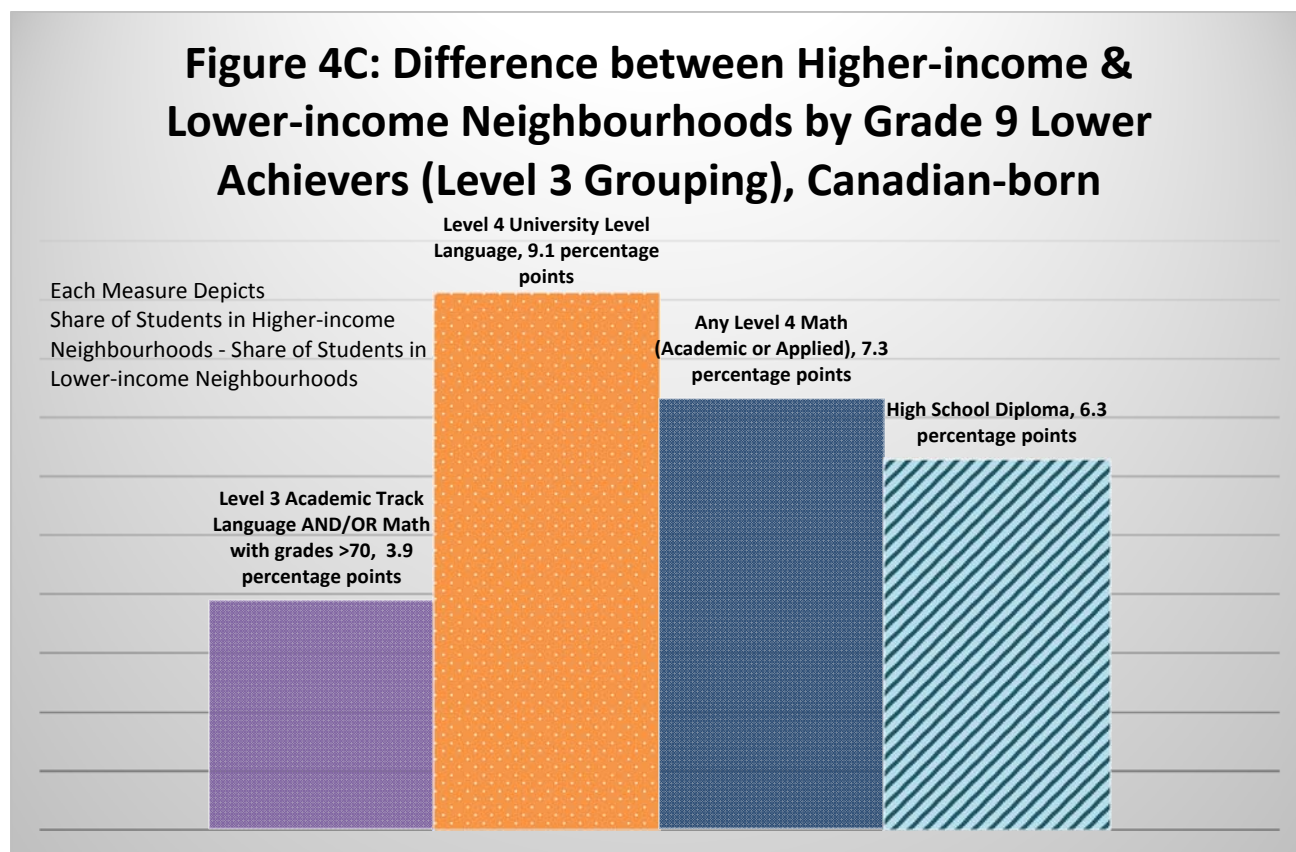


Figure 4C depicts the differences between the students in higher- and lower-income neighbourhoods for the lower-achieving group of students. Here we observe, for the most part, the biggest difference between neighbourhood groupings. Starting first with those students observed with academic-path math and/or language courses in level 3 and a grade of 70% or better, there is a four percentage-point difference, with 12% of higher-income neighbourhood students meeting this criteria. For both groups, there is a lower share of students observed taking any level 4 language (academic or applied) course (82% for higher-income neighbourhoods), any level 4 academic-level language course (26% for higher-income neighbourhoods), and any level 4 math (academic or applied) course (43% for higher-income neighbourhoods). And we observe sizable gaps between the two neighbourhood groupings in terms of receiving a high school diploma.

Across the three groupings of students, it appears as though much of the difference we are observing in PSE participation is attributable to actions taken early on in high school with respect to the level 1 courses. We continue to observe, however, increasing differences in course selection and performance in later years of high school.

## Foreign-born Students: What Might Explain Differences in PSE Registration Gaps between Students Residing in Lower- and Higher-income Neighbourhoods?

We now apply the analysis used in the preceding section to our sample of foreign-born students. Figure 5 depicts the share of courses taken at each level in the academic path. The students in both types of neighbourhoods have a higher average share of courses in the academic path in level 1 compared to the Canadian-born students depicted in Figure 3 (71% for lower-income neighbourhoods and 82% for higher-income neighbourhoods), but the gap between the lower- and higher-income neighbourhoods is there and remains fairly persistent across the three levels of courses. Compared to Canadian-born students, the gap between the students in the lower- and higher-income neighbourhoods is fairly constant and the drop in the share of academic courses from level 2 to 3 is not as steep.

Figure 5: Share of Courses – Academic-path, Foreign-born Students

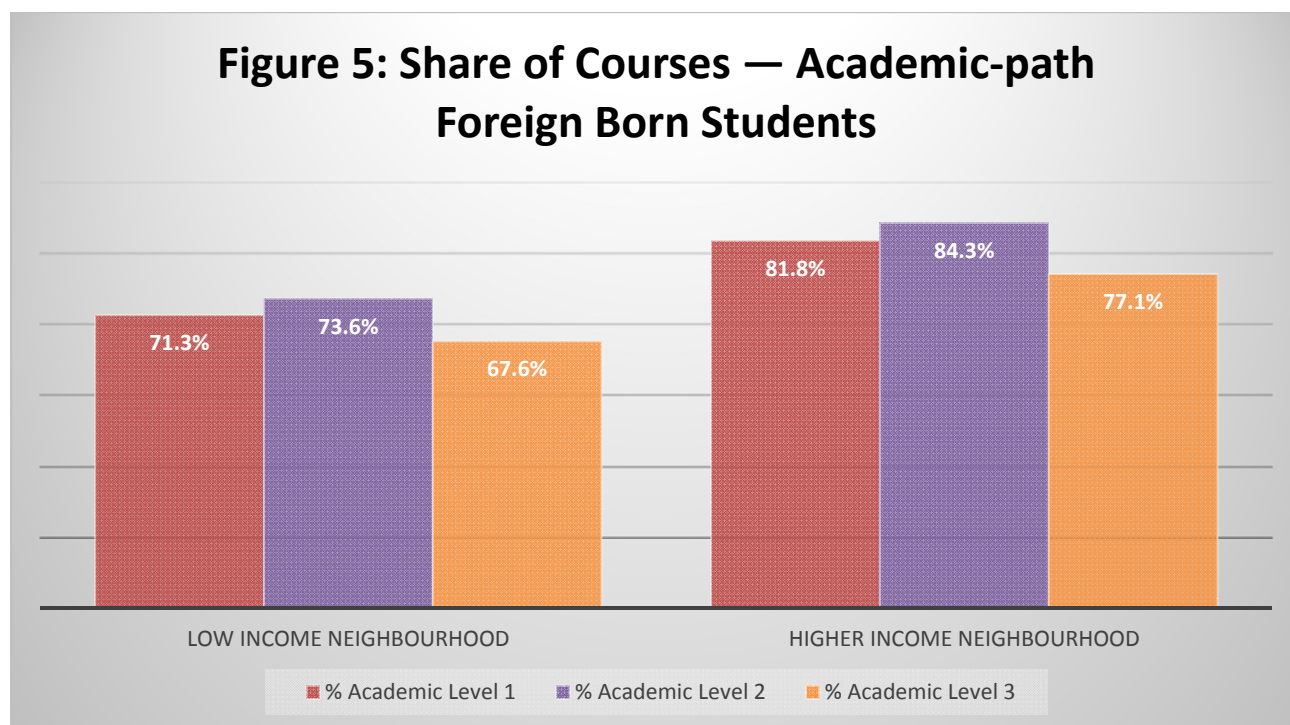


Table 5 reports the distribution of foreign-born students based on the choice and performance in level 1 math and language courses. Starting first with the higher-achieving students, of those who took the academic path for both courses and achieved a mark of 70% or better, we observe that 48% of those residing in higher-income neighbourhoods and 35% of those residing in lower-income neighbourhoods fall into this group. The lowest proportion of students for both income groups (~22%) fall into the middle group of achievers, similar to what was observed for the Canadian-born students. Approximately 43% of the students in lower-income neighbourhoods fall into the third group, our lowest-achieving students. Approximately 30% of the students in higher-income neighbourhoods fall into this last group. Thus, unlike



our Canadian-born students, the foreign-born students in both income groupings start with a high level of performance in the level 1 (Grade 9) courses.

The gap in PSE participation by income grouping for each achievement level is approximately the same as the gap observed for Canadian-born students, but the share moving on to PSE is higher for the foreign-born. With respect to registration in university or college, there is a higher gap based on income for university than for college across all three achievement groups. A greater proportion of students residing in lower-income neighbourhoods, however, are observed registering in college than those residing in higher-income neighbourhoods. A much higher proportion of the lower-achieving, foreign-born students (columns 7 and 8) are observed registering in PSE compared to Canadian-born students, but the gap between the higher- and lower-income neighbourhoods is sizable, around 10 percentage points, attributable primarily to differences in university participation.

**Table 5: Postsecondary Outcomes by Grade 9 (Level 1) Course Selection and Outcomes, Foreign-born Students**

	<i>Level 1 Language/Math Track Choice and Grade Outcomes:</i>							
	Overall Cohort		Level 1 Academic-path Language AND Math with Grades >70		Level 1 Academic-path Language OR Math with Grades >70		No Level 1 Academic-path Language OR Math; or both Grades <70	
	Lower-income (1)	Higher-income (2)	Lower-income (3)	Higher-income (4)	Lower-income (5)	Higher-income (6)	Lower-income (7)	Higher-income (8)
Number of students	4,295	10,901	1,519	5,199	933	2,414	1,843	3,288
Percent of cohort			35.4%	47.7%	21.7%	22.1%	42.9%	30.2%
<i>Postsecondary registration (percent registered within 5 years)</i>								
Register in university	45.6%	60.4%	78.2%	83.1%	51.2%	59.7%	15.9%	25.1%
Register in college	21.3%	16.3%	8.2%	5.1%	22.2%	18.2%	31.6%	32.5%
Register in university or college	66.9%	76.7%	86.4%	88.2%	73.4%	77.9%	47.5%	57.7%

**Table 6: Decomposition of Differences in Choice of Courses by Neighbourhood Income, Foreign-born**

<b>Panel A: Level 1 Performance</b>	Share with Level 1 Academic-path Language AND Math Grades $\geq$ 70	Share with Level 1 Academic-path Language OR Math Grades $\geq$ 70	Share with NO Level 1 Academic-path Language OR Math Grades; or marks $<$ 70	
	(1)	(2)	(3)	
Mean for students in lower-income neighbourhoods	0.354	0.217	0.429	
Mean for students in higher-income neighbourhoods	0.477	0.222	0.301	
Lower-higher income gap	-0.123	-0.004	0.128	
<b><i>Decomposition using student and school characteristics</i></b>				
Share of the lower-higher income gap explained by observed characteristics	<b>57.4%</b>	<b>-189.0%</b>	<b>49.4%</b>	
<b>Panel B: PSE Registration, Middle- and Lower-achieving Students</b>	For Middle Students (those with Level 1 Academic-path Language OR Math Grades $\geq$ 70) PSE Enrolment		For Bottom Students (those with NO Level 1 Academic-path Language OR Math Grades; or marks $<$ 70) PSE Enrolment	
	Any PSE Registration	University Registration	Any PSE Registration	University Registration
	(1)	(2)	(3)	(4)
Mean for students in lower-income neighbourhoods	0.723	0.512	0.471	0.159
Mean for students in higher-income neighbourhoods	0.772	0.597	0.573	0.252
Lower-higher income gap	-0.048	-0.084	-0.102	-0.093
<b><i>Decomposition using student/school characteristics plus previous choice and performance in level 1 courses</i></b>				
Share explained by characteristics	<b>51.7%</b>	<b>47.8%</b>	<b>56.8%</b>	<b>66.9%</b>

Notes: Table shows Oaxaca-style decompositions based on linear regression models for outcome measures (share of courses that are academic).

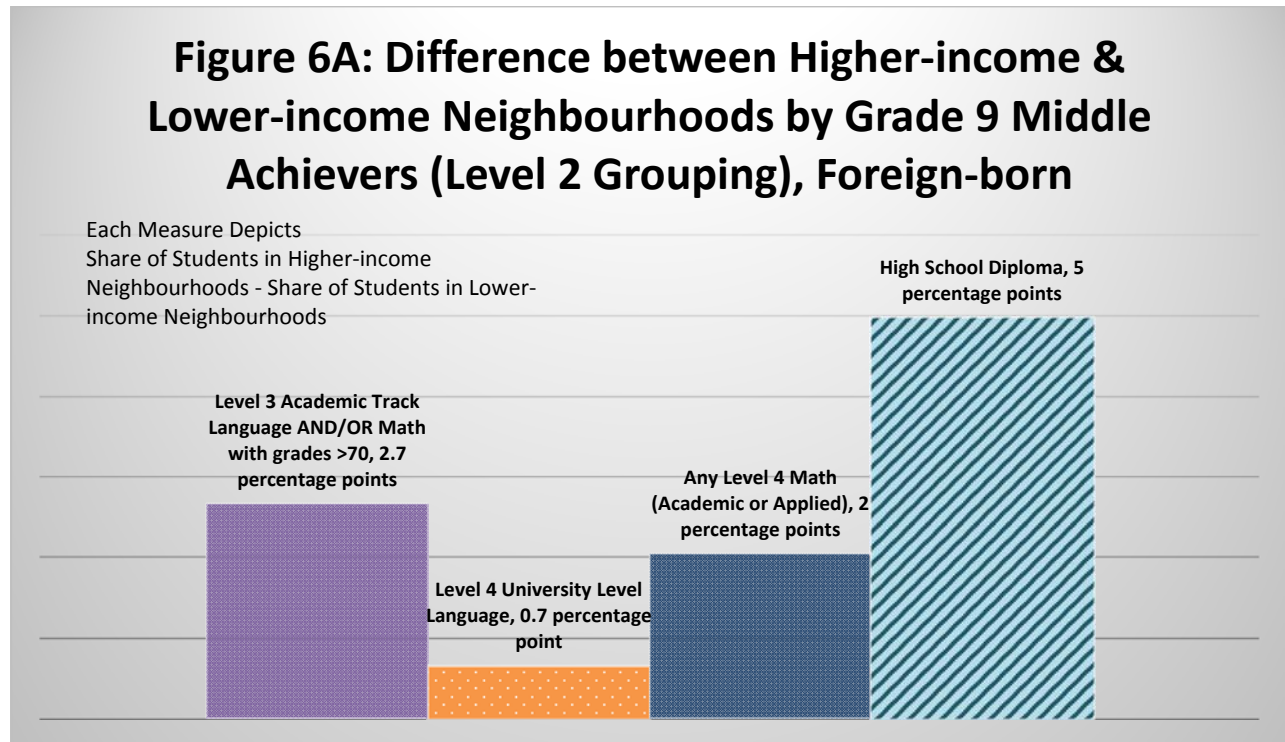
See notes to Table 4.

Panel A of Table 6 reports the results from the decomposition of the differences in the distribution of students across the three achievement groupings that is attributable to background characteristics of the students and the schools they are attending. As with the Canadian-born students, the distribution of students falls mostly between the higher- and lower-achievers. In the decomposition analysis, more than 50% of the gap is attributable to the background characteristics, suggesting that students from these two income groupings enter high school with core differences. While we do not know the countries of origin of our students, it very well could be that the background differences in the two income groupings is attributable to location decisions of immigrants upon arriving to Canada.

Panel B of Table 6 reports the results from the decomposition of the differences in PSE registration for the middle- and lower-achieving students. For both PSE and university registration, close to 50% or more is attributable to differences in the background characteristics and the performance of the students in Grade 9 courses.

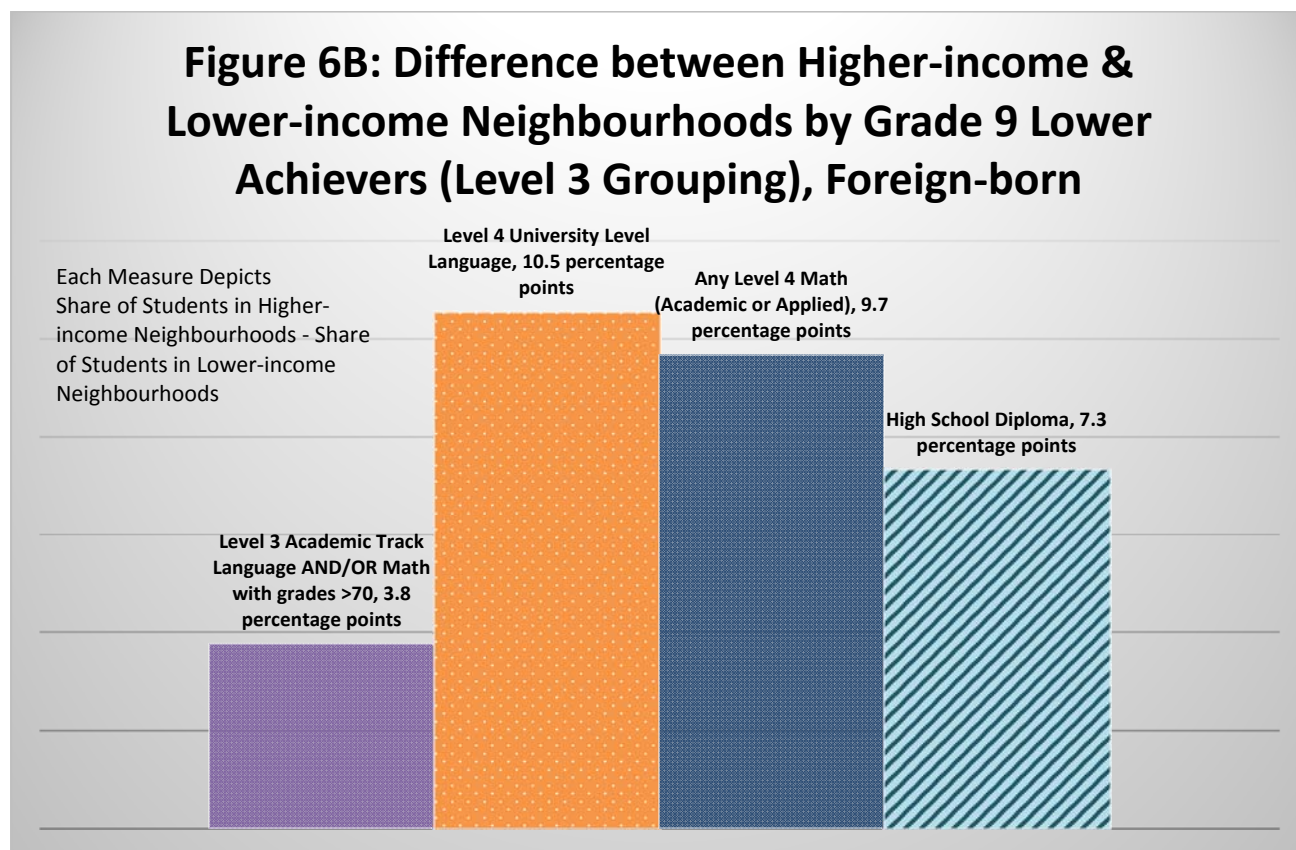
In Figures 6A and 6B, we repeat the same exercise for the foreign-born students by looking at course participation in level 3 and level 4 based on observed level 1 course selection and performance. Given that there is little difference in PSE participation for the higher achievers, we start first with our middle achievers in Figure 6A. The overall gap in PSE registration for this group by income grouping is 4.9 percentage points. Level 3 course selection and performance (2.7 percentage points) do not completely explain this gap. There also seems to be a slightly larger gap in receipt of a high school diploma for this group compared to the Canadian-born, middle-achieving group of students (Figure 4B). Approximately 83% of the middle-achieving, foreign-born students in lower-income neighbourhoods are observed receiving a high school diploma. This is four percentage points lower than what is observed for the Canadian-born students residing in the same neighbourhoods. Thus, it appears that the difference in PSE participation for the foreign-born students in this achievement grouping is linked to both participation in academic-path courses in upper years and to receiving a high school diploma.

**Figure 6A: Differences between Higher-income and Lower-income Neighbourhoods by Grade 9 Middle achievers, Foreign-born**



Finally, Figure 6B depicts the gaps for the lower-achieving students based on income grouping. The pattern of the gaps looks similar to the pattern for the lower-achieving, Canadian-born students. The gaps between the higher- and lower-income groupings, however, are greater for the foreign-born students in the level 4 academic math courses. One big difference by place of birth is that we observe a greater share of students in this grouping in the academic courses compared to the equivalent Canadian-born student group. For example, approximately 18% of the lower-income group of foreign-born students are observed taking the level 3 academic math and/or language courses and achieving a mark of 70% or greater; 35% of these students are observed in a level 4 university-level language course; and 12% of these students are observed in the level 4 math functions course. The comparable set of statistics for the Canadian-born students in the lower-income group is 8%, 17% and 3%, respectively. The differences between Canadian- and foreign-born students are troubling, in that one has to wonder why students from similarly-situated neighbourhoods behave differently. Admittedly, the statistics for the Canadian-born students are based on a sample of ~18,000, compared to ~1,800 foreign-born students, so there could be greater variation in the decisions of Canadian-born students. Moreover, there likely are differences between Canadian- and foreign-born students that are not easily observed, such as motivation, which might also explain the differences in these statistics.

**Figure 6B: Differences between Higher-income and Lower-income Neighbourhoods by Grade 9 Lower achievers, Foreign-born**



## What Have We Learned from this Exploration?

We have reviewed many figures and tables and the evidence points to several findings. First, there are stark differences in PSE participation rates between Canadian-born and foreign-born students, and between students residing in lower- and higher-income neighbourhoods. Foreign-born students in both lower- and higher-income neighbourhoods are more likely to register in university than are Canadian-born students. While Canadian-born students are well represented in both universities and colleges, a lower share of foreign-born students are registered in colleges. An important caveat is that we only have information on students for the five years after they enter high school. We cannot observe PSE enrolment after this period, and there may well be important differences in this regard by place of birth, neighbourhood income, and type of PSE participation.

Our second observation is that the differences in PSE participation rates are largely driven by background factors that existed prior to entering high school and by course performance in Grade 9. This is true regardless of place of birth. If we decompose these gaps based on observable characteristics, we can attribute between 40% and 75% of the gap in PSE participation to background characteristics of the students, and the decisions made concerning courses and early performance in those Grade 9 courses.

This analysis should push parents, schools and government to consider how we prepare our students for high school and how we promote achievement in high school. If students do not perform well in the first year of high school, how can we help them to recover and overcome early challenges? Finally, we need to consider in more detail why foreign-born students pursue PSE in greater proportions than do Canadian-born students, even after controlling for performance in Grade 9 courses.

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