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by Youjin Choi and Li Xu

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Fields of study and occupations of immigrants who were international students in Canada before immigration

by Youjin Choi  and Li Xu

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This study was jointly conducted by Immigration, Refugees and Citizenship Canada and Statistics Canada.

Abstract

This study explores the alignment between fields of study and occupations among international students who have become permanent residents in Canada. Using data from the 2021 Census of Population, the study examines the fields of study and occupations of immigrants with a postsecondary education who held study permits before becoming permanent residents from 2011 to 2021. It compares them with other immigrants who became permanent residents during the same period and Canadian-born postsecondary graduates. The focus is on the fields of science, technology, engineering, and mathematics and computer science (STEM); health care; and business and administration. Among immigrants who were formerly international students in Canada, the degree of alignment between field of study and employment varied by field and level of study. It was lowest among those who studied STEM or business and administration in postsecondary programs below the bachelor's level and highest among those with a bachelor's degree from health care-related programs. The overall alignment rates between field of study and occupation among former international students were higher than those among immigrants who were not former international students. The role of Canadian education in increasing the degree of alignment between field of study and employment among immigrants was prominent when former international students attained their highest level of education in Canada.

Keywords: Immigrants, international students, postsecondary education, fields of study, occupations, alignment of education and occupation

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Introduction

Postsecondary education is a key element in developing a skilled workforce. With the rapidly growing number of international postsecondary students and of immigrants selected from this pool, international students are often seen as a potential source of labour supply beyond their temporary employment while studying. An unanswered question is whether they worked in the fields aligned with their postsecondary education. Despite skilled labour shortages in the fields of science, technology, engineering, and mathematics and computer science (STEM) and health care, the field of business, management and public administration was the most popular among recent international students in postsecondary programs (Crossman, Choi, & Hou, 2021). Little is known about the distribution of fields of study among international students who become permanent residents and whether they use their skills in the fields they were trained for. To fill this knowledge gap, this study examines the alignment between fields of study and employment among former international students.

This article uses data from the 2021 Census of Population and examines the fields of study and occupations of immigrants with a postsecondary education who held study permits before becoming permanent residents from 2011 to 2021 (hereafter “former international students”). It compares them with other immigrants who became permanent residents during the same period and Canadian-born postsecondary graduates.¹ A total of 260,730 immigrants were former international students. The focus is on the fields of STEM, health care, and business and administration.

About 40% of immigrants who were former international students and attained their highest level of education in Canada studied in the field of science, technology, engineering, and mathematics and computer science

The distribution of immigrants by field of study was analyzed by their highest level of education to provide the composition of their educational background (Table 1). The fields of study were grouped into four broad categories (STEM, business and administration, health care, and other fields) based on a variant of the Classification of Instructional Programs Canada 2021. The highest level of postsecondary education was aggregated into three levels (below a bachelor’s degree, bachelor’s degree and above a bachelor’s degree).² The fields of study in this article are for the highest level of education (the highest certificate, diploma or degree completed). For former international students who attained their highest level of education outside Canada, the field of study is the educational subject pursued in other countries before entering Canada with a study permit.³ The distribution of fields of study among former international students was analyzed separately by the location of the highest level of education (in or outside Canada). For some immigrants, the field of study may be for the highest level of education completed in Canada after transitioning to permanent residency.

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1. Based on the classification of pre-admission experience of immigrants in the 2021 Census, former international students include those who had only study permits before admission and those who had work and study permits before admission. Immigrants who were not former international students include a very small number of study permit holders (e.g., those with an asylum claim and a study permit before admission). This is because the categories of pre-admission experience of immigrants are derived in the following order: “with asylum claim before admission,” “with work permits only before admission,” “with study permits only before admission,” “with work and study permits before admission,” “with other permits before admission,” and “without pre-admission experience.”
 2. The educational level below a bachelor’s degree includes apprenticeship, trades or non-university (e.g., college) certificates or diplomas, and university certificates or diplomas below the bachelor’s level. The level above a bachelor’s degree includes university certificates or diplomas above the bachelor’s level; degrees in medicine, dentistry, veterinary medicine or optometry; and master’s and doctoral degrees.
 3. This case includes former international students who held a foreign university degree and studied in a college certificate or credential program in Canada.

Table 1
Field of study distribution, by immigrant type, landing cohort and highest level of education

| | 2011-to-2015 landing cohort | | | 2016-to-2021 landing cohort | | |
|--|-------------------------------|----------------------------------|-----------------------------------|-------------------------------|----------------------------------|-----------------------------------|
| | Former international students | | Not former international students | Former international students | | Not former international students |
| | Highest education in Canada | Highest education outside Canada | | Highest education in Canada | Highest education outside Canada | |
| people | | | | | | |
| All levels of education | | | | | | |
| Total count | 61,800 | 24,435 | 568,915 | 113,440 | 61,060 | 590,250 |
| percent | | | | | | |
| Percentage by field of study | | | | | | |
| STEM | 36.1 | 30.4 | 27.6 | 38.8 | 35.1 | 30.2 |
| Science and science technology | 8.1 | 6.6 | 6.4 | 6.7 | 6.4 | 5.9 |
| Engineering and engineering technology | 17.7 | 13.6 | 13.5 | 19.5 | 18.0 | 14.4 |
| Mathematics and computer and information science | 10.3 | 10.2 | 7.7 | 12.6 | 10.7 | 9.9 |
| Business and administration | 32.0 | 26.3 | 23.6 | 33.2 | 26.5 | 26.8 |
| Health care | 5.5 | 13.0 | 15.7 | 4.1 | 11.3 | 12.0 |
| Other | 26.4 | 30.3 | 33.1 | 23.9 | 27.1 | 31.0 |
| people | | | | | | |
| Below a bachelor's degree | | | | | | |
| Total count | 15,960 | 3,715 | 197,840 | 34,110 | 7,420 | 160,085 |
| percent | | | | | | |
| Percentage by field of study | | | | | | |
| STEM | 21.2 | 21.9 | 18.8 | 26.2 | 26.5 | 19.8 |
| Science and science technology | 2.0 | 3.8 | 2.8 | 3.0 | 3.2 | 2.6 |
| Engineering and engineering technology | 11.1 | 10.2 | 10.1 | 13.1 | 13.5 | 10.1 |
| Mathematics and computer and information science | 8.1 | 7.9 | 5.9 | 10.1 | 9.8 | 7.1 |
| Business and administration | 36.3 | 25.3 | 21.6 | 38.9 | 28.7 | 24.0 |
| Health care | 10.0 | 12.4 | 20.1 | 7.3 | 12.2 | 15.8 |
| Other | 32.5 | 40.4 | 39.5 | 27.6 | 32.6 | 40.4 |
| people | | | | | | |
| Bachelor's degree | | | | | | |
| Total count | 21,685 | 13,315 | 221,360 | 32,745 | 36,310 | 233,050 |
| percent | | | | | | |
| Percentage by field of study | | | | | | |
| STEM | 31.8 | 32.7 | 32.1 | 34.0 | 37.9 | 34.3 |
| Science and science technology | 8.2 | 6.1 | 7.1 | 7.4 | 5.3 | 5.8 |
| Engineering and engineering technology | 12.6 | 16.7 | 17.0 | 13.7 | 21.2 | 18.0 |
| Mathematics and computer and information science | 11.0 | 9.9 | 8.0 | 12.9 | 11.4 | 10.5 |
| Business and administration | 35.0 | 25.1 | 24.3 | 34.4 | 24.7 | 24.5 |
| Health care | 3.9 | 13.3 | 12.5 | 3.1 | 11.4 | 10.6 |
| Other | 29.3 | 28.9 | 31.1 | 28.5 | 26.0 | 30.6 |
| people | | | | | | |
| Above a bachelor's degree | | | | | | |
| Total count | 24,155 | 7,410 | 149,715 | 46,585 | 17,330 | 197,120 |
| percent | | | | | | |
| Percentage by field of study | | | | | | |
| STEM | 49.9 | 30.2 | 32.6 | 51.4 | 32.5 | 33.9 |
| Science and science technology | 12.0 | 8.7 | 10.3 | 8.9 | 9.8 | 8.7 |
| Engineering and engineering technology | 26.8 | 9.8 | 12.8 | 28.3 | 12.9 | 13.5 |
| Mathematics and computer and information science | 11.1 | 11.7 | 9.5 | 14.2 | 9.8 | 11.7 |
| Business and administration | 26.4 | 28.8 | 25.4 | 28.1 | 29.5 | 31.9 |
| Health care | 4.2 | 12.7 | 14.9 | 2.5 | 10.9 | 10.8 |
| Other | 19.5 | 28.3 | 27.1 | 18.0 | 27.1 | 23.4 |

Notes: STEM = science, technology, engineering, and mathematics and computer science. Landing cohorts are based on the year of immigration to Canada.

Source: Statistics Canada, 2021 Census of Population.

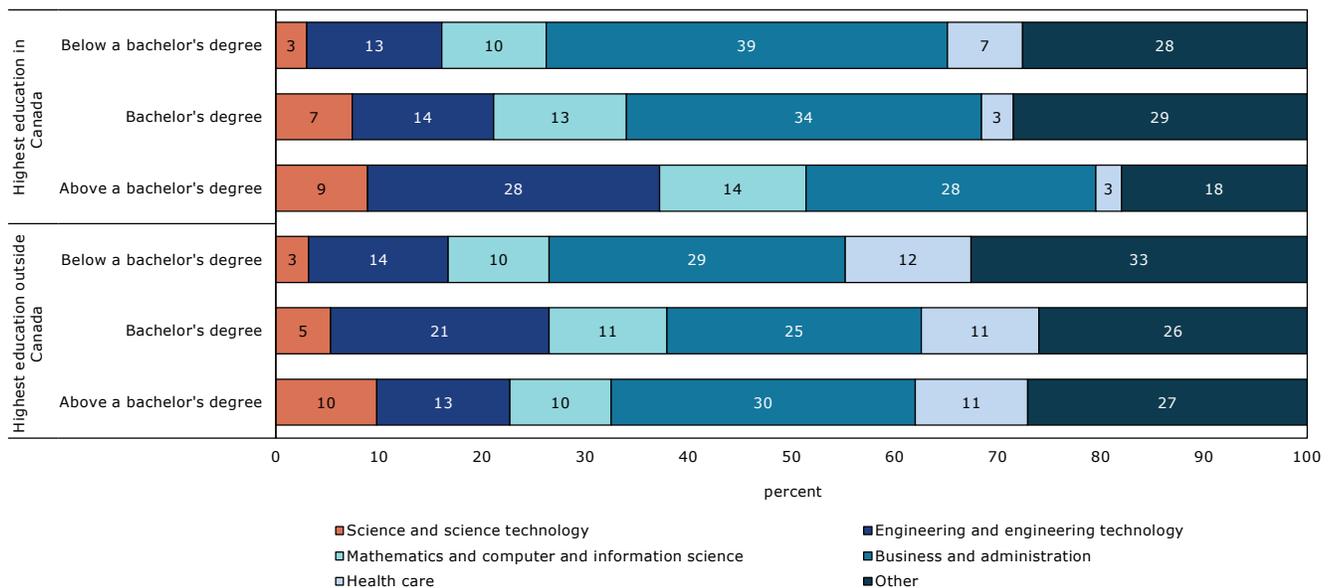
Among former international students who attained their highest level of education in Canada and became permanent residents from 2016 to 2021, 39% studied STEM, 33% studied business and administration, and less than 5% studied in health-related areas. The percentage of STEM graduates was lower for the other immigrants (35% for former international students who attained their highest level of education outside Canada and 30% for immigrants who were not former international students). The percentage of graduates from health-related programs was higher for the other immigrants (11% and 12%, respectively).

The overall statistics mask large variations across different levels of education.

First, different groups of immigrants had different compositions by educational attainment (i.e., the highest level of education). Among the former international students who attained their highest level of education in Canada, 41% (46,585 divided by 113,440 and multiplied by 100) had a credential above a bachelor’s degree, 29% had a bachelor’s degree and 30% had a credential below the bachelor’s level. Among the former international students who had their highest level of education outside Canada, the majority (59%) had a bachelor’s degree, while 28% had a higher educational attainment.

Second, the composition within each group of immigrants by field of study varied by educational attainment (Chart 1). Among the former international students who attained their highest level of education in Canada, the share of STEM graduates was smaller among those with a postsecondary education below the bachelor’s level (26%) than among those with a higher educational attainment (34% for those with a bachelor’s degree and 51% for those with a credential above a bachelor’s degree). In contrast, the percentages of graduates from the health care (7%) and business and administration (39%) fields were highest among those with a postsecondary education below a bachelor’s degree.

Chart 1
Field of study distribution of immigrants who held study permits and became permanent residents from 2016 to 2021, by location of highest education and educational attainment



Source: Statistics Canada, 2021 Census of Population.

About two in five former international students who studied in the field of science, technology, engineering, and mathematics and computer science and more than half who studied health care worked in an occupation related to their field of study after immigration

What percentage of former international students worked in the field they trained for? To answer this question, the occupational distribution of former international students who became immigrants from 2011 to 2021 was analyzed by field of study (Table 2). For individuals who worked in 2020 or 2021, occupations were grouped into five categories: STEM, STEM-related, business and related (excluding low-skill occupations), health, and other occupations (see Data appendix for details). The percentage of individuals who trained in a particular field and worked in that field (hereafter “field-of-study alignment rate”) is presented for each level of education. While all STEM, STEM-related and health occupations require some postsecondary education, some business and related occupations do not require any postsecondary education (e.g., receptionists, data entry clerks, shippers and receivers). Other occupations were further split by skill level, represented by three groups of training, education, experience and responsibilities (TEER) categories: TEER 0 and 1 for high-skill occupations, TEER 2 and 3, and TEER 4 and 5 for low-skill occupations.

Table 2
Occupation distribution of immigrants who were former international students and became permanent residents from 2011 to 2021, by field of study and highest level of education

| | STEM | | | | | |
|---|--------|------------------------|----------------------------|----------------------------------|-----------------------------|-------------|
| | Total | Science and technology | Engineering and technology | Mathematics and computer science | Business and administration | Health care |
| Total | | | | | | |
| Total count | 95,190 | 18,090 | 47,395 | 29,700 | 79,980 | 18,225 |
| | | | | | | |
| | | | | | | |
| Percentage by occupation | | | | | | |
| Did not work in 2020 and 2021 | 5.3 | 8.8 | 4.1 | 5.3 | 7.7 | 8.0 |
| STEM | 43.0 | 23.9 | 47.3 | 47.9 | 5.3 | 2.5 |
| STEM-related | 4.8 | 5.9 | 5.2 | 3.6 | 1.5 | 1.0 |
| Business and related (excluding TEER 4 and 5) | 8.5 | 10.4 | 6.7 | 10.2 | 35.2 | 4.4 |
| Health | 2.0 | 7.8 | 0.6 | 0.6 | 1.0 | 56.7 |
| Other | 36.4 | 43.2 | 36.1 | 32.4 | 49.3 | 27.4 |
| TEER 0 and 1 (high-skill occupations) | 11.9 | 19.5 | 11.2 | 8.4 | 12.6 | 7.5 |
| TEER 2 and 3 | 12.9 | 9.3 | 14.3 | 12.9 | 15.8 | 7.5 |
| TEER 4 and 5 (low-skill occupations) | 11.5 | 14.4 | 10.5 | 11.2 | 20.9 | 12.4 |
| Field-of-study alignment rate | 43.0 | 23.9 | 47.3 | 47.9 | 35.2 | 56.7 |
| | | | | | | |
| Below a bachelor's degree | | | | | | |
| Total count | 15,135 | 1,745 | 7,600 | 5,790 | 22,135 | 5,410 |
| | | | | | | |
| | | | | | | |
| Percentage by occupation | | | | | | |
| Did not work in 2020 and 2021 | 6.8 | 12.6 | 5.9 | 6.4 | 10.3 | 9.7 |
| STEM | 21.9 | 12.3 | 19.9 | 27.5 | 1.6 | 0.6 |
| STEM-related | 6.2 | 5.2 | 6.7 | 6.0 | 1.2 | 0.3 |
| Business and related (excluding TEER 4 and 5) | 5.3 | 4.0 | 5.2 | 5.9 | 19.3 | 4.6 |
| Health | 1.6 | 6.9 | 0.9 | 0.9 | 1.2 | 53.8 |
| Other | 58.2 | 59.0 | 61.4 | 53.3 | 66.4 | 31.0 |
| TEER 0 and 1 (high-skill occupations) | 8.4 | 10.0 | 9.7 | 6.4 | 11.5 | 4.3 |
| TEER 2 and 3 | 27.2 | 16.9 | 31.0 | 25.4 | 23.9 | 8.8 |
| TEER 4 and 5 (low-skill occupations) | 22.4 | 32.4 | 20.9 | 21.4 | 30.9 | 17.7 |
| Field-of-study alignment rate | 21.9 | 12.3 | 19.9 | 27.5 | 19.3 | 53.8 |
| | | | | | | |
| Bachelor's degree | | | | | | |
| Total count | 36,170 | 6,955 | 17,150 | 12,055 | 31,155 | 7,735 |
| | | | | | | |
| | | | | | | |
| Percentage by occupation | | | | | | |
| Did not work in 2020 and 2021 | 5.9 | 9.4 | 4.1 | 6.3 | 7.9 | 6.0 |
| STEM | 39.6 | 17.3 | 43.9 | 46.3 | 3.9 | 2.3 |
| STEM-related | 4.7 | 5.7 | 5.0 | 3.6 | 1.7 | 1.0 |
| Business and related (excluding TEER 4 and 5) | 10.9 | 15.3 | 8.2 | 12.1 | 38.4 | 3.3 |
| Health | 2.1 | 8.0 | 0.6 | 0.7 | 1.0 | 62.1 |
| Other | 36.8 | 44.3 | 38.2 | 31.0 | 47.1 | 25.3 |
| TEER 0 and 1 (high-skill occupations) | 8.8 | 13.7 | 8.7 | 6.1 | 11.9 | 6.7 |
| TEER 2 and 3 | 14.8 | 12.1 | 16.8 | 13.4 | 14.8 | 8.1 |
| TEER 4 and 5 (low-skill occupations) | 13.4 | 18.5 | 12.7 | 11.5 | 20.4 | 10.5 |
| Field-of-study alignment rate | 39.6 | 17.3 | 43.9 | 46.3 | 38.4 | 62.1 |

Notes: STEM = science, technology, engineering, and mathematics and computer science. TEER = training, education, experience and responsibilities. TEER categories represent the necessary skill levels of an occupation. The field-of-study alignment rate is the percentage of individuals trained in a particular field who worked in the same field.

Source: Statistics Canada, 2021 Census of Population.

Table 2

Occupation distribution of immigrants who were former international students and became permanent residents from 2011 to 2021, by field of study and highest level of education (continued)

| | STEM | | | | | |
|---|--------|--------------------------------------|---|---|--------------------------------|-------------|
| | Total | Science and science technology | Engineering and engineering technology | Mathematics and computer and information science | Business and administration | Health care |
| Above a bachelor's degree | | | | | | |
| Total count | 43,885 | 9,395 | 22,640 | 11,855 | 26,685 | 5,075 |
| | | | | people | | |
| | | | | percent | | |
| Percentage by occupation | | | | | | |
| Did not work in 2020 and 2021 | 4.4 | 7.7 | 3.4 | 3.6 | 5.2 | 9.2 |
| STEM | 53.1 | 31.0 | 59.1 | 59.3 | 10.1 | 4.5 |
| STEM-related | 4.5 | 6.3 | 4.9 | 2.4 | 1.6 | 1.9 |
| Business and related (excluding TEER 4 and 5) | 7.7 | 7.9 | 6.1 | 10.4 | 44.6 | 5.9 |
| Health | 2.1 | 7.8 | 0.5 | 0.5 | 0.8 | 51.6 |
| Other | 28.2 | 39.3 | 26.0 | 23.8 | 37.7 | 26.9 |
| TEER 0 and 1 (high-skill occupations) | 15.6 | 25.5 | 13.6 | 11.6 | 14.2 | 12.1 |
| TEER 2 and 3 | 6.5 | 5.7 | 6.9 | 6.3 | 10.2 | 5.4 |
| TEER 4 and 5 (low-skill occupations) | 6.1 | 7.9 | 5.5 | 5.9 | 13.1 | 9.5 |
| Field-of-study alignment rate | 53.1 | 31.0 | 59.1 | 59.3 | 44.6 | 51.6 |

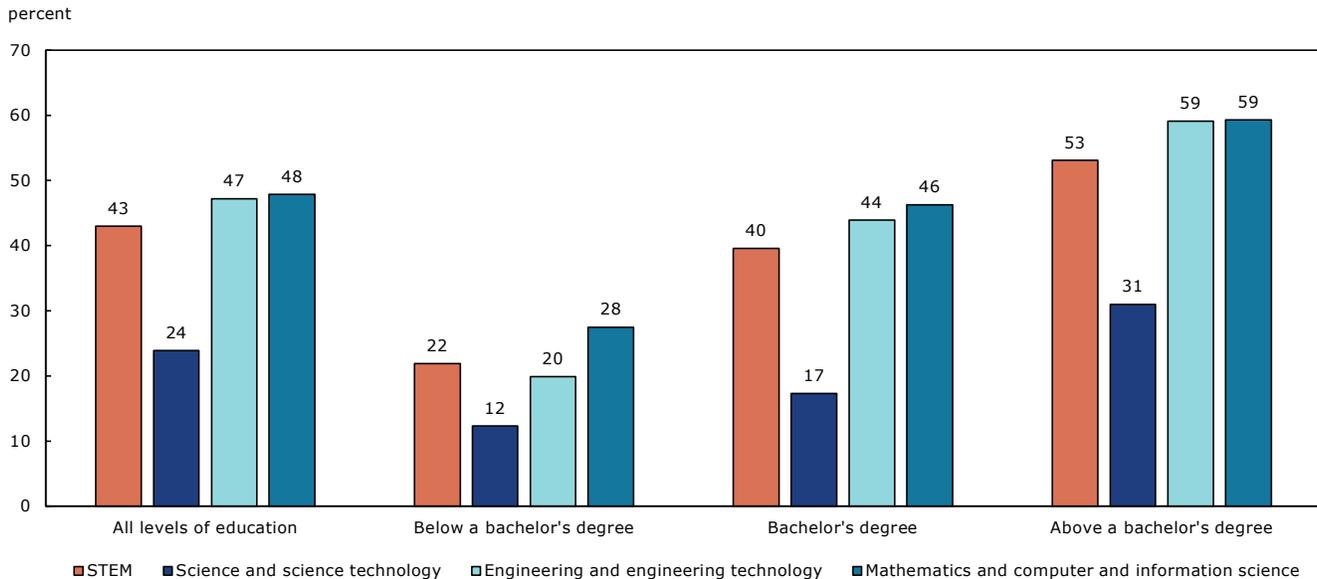
Notes: STEM = science, technology, engineering, and mathematics and computer science. TEER = training, education, experience and responsibilities. TEER categories represent the necessary skill levels of an occupation. The field-of-study alignment rate is the percentage of individuals trained in a particular field who worked in the same field.

Source: Statistics Canada, 2021 Census of Population.

Among the former international students who studied STEM, 43% had STEM occupations (not including 5% with STEM-related occupations). The field-of-study alignment rate in the STEM field increased with educational levels, from 22% for those with a postsecondary education below a bachelor's degree to 40% for those with a bachelor's degree and 53% for those with an education above a bachelor's degree.

The field-of-study alignment rate varied across subfields in STEM (Chart 2). About half of graduates from engineering and engineering technology (47%) and mathematics and computer and information science (48%) had STEM occupations, whereas about one-quarter of graduates from science and science technology (24%) did. Compared with other STEM subfields, graduates from science and science technology were more likely to have health occupations (8%); other high-skill occupations (20%), including occupations in education services (12%, not presented in the table); and other low-skill occupations (14%), including sales and service occupations (8%, not presented in the table). Similar patterns held for all three levels of education.

Chart 2
Field-of-study alignment rates of former international students who graduated from the field of science, technology, engineering, and mathematics and computer science, by highest level of education



Notes: STEM = science, technology, engineering, and mathematics and computer science. Former international students are immigrants who held study permits before becoming permanent residents from 2011 to 2021. The field-of-study alignment rate is the percentage of individuals trained in a particular field who worked in the same field.

Source: Statistics Canada, 2021 Census of Population.

At 57%, the field-of-study alignment rate in the health care field was higher than that in the other fields. It was above 50% for all three levels of education and highest among individuals with a bachelor’s degree (62%).

Among the three broad fields of study, business and administration had the lowest field-of-study alignment rate, at 35%. Nearly 50% of individuals who majored in business and administration had other occupations, including low-skill occupations (21%). The field-of-study alignment rate in the field increased with educational attainment, from 19% for those with a postsecondary education below a bachelor’s degree to 45% for those with a credential above a bachelor’s degree. The percentage who worked in low-skill occupations was highest among those with an education below a bachelor’s degree (31%).

Canadian education increased the degree of alignment between field of study and employment among immigrants, especially when former international students attained their highest level of education in Canada

Compared with immigrants without Canadian study experience before landing, former international students were more likely to work in 2020 and 2021 (not presented in the table). The percentages of former international students who achieved their highest level of education in Canada and did not work in 2020 and 2021 (ranging from 5% for STEM graduates to 8% for health care graduates) were one-third to half those of immigrants who were not former international students.

If employed, former international students were more likely than immigrants who were not former international students to work in the same field as their education (Table 3). Among immigrants who studied health care, where the alignment rates are higher than in other fields, just under half (49%) of immigrants who were not former international students worked in the same field. The percentage was

higher for former international students (58% for those who attained their highest level of education in Canada and 56% for those who attained it outside Canada).

Table 3
Field-of-study alignment rates, by immigrant type, field of study and highest level of education

| | Former international students | | | Immigrants who were not former international students | Canadian-born postsecondary graduates aged 23 to 41 |
|--|-------------------------------|-----------------------------|----------------------------------|---|---|
| | Total | Highest education in Canada | Highest education outside Canada | | |
| | percent | | | | |
| All levels of education | | | | | |
| STEM | 43.0 | 47.9 | 31.7 | 30.1 | 31.9 |
| Science and science technology | 23.9 | 26.9 | 16.9 | 13.7 | 15.0 |
| Engineering and engineering technology | 47.3 | 53.8 | 32.1 | 31.4 | 40.0 |
| Mathematics and computer and information science | 47.9 | 51.3 | 40.1 | 39.4 | 44.4 |
| Business and administration | 35.2 | 37.6 | 29.0 | 25.2 | 44.8 |
| Health care | 56.7 | 57.5 | 56.0 | 49.3 | 65.8 |
| Below a bachelor's degree | | | | | |
| STEM | 21.9 | 23.0 | 17.4 | 12.2 | 24.6 |
| Science and science technology | 12.3 | 12.5 | 11.7 | 5.2 | 11.5 |
| Engineering and engineering technology | 19.9 | 20.8 | 15.2 | 10.4 | 20.7 |
| Mathematics and computer and information science | 27.5 | 28.8 | 21.8 | 18.0 | 38.2 |
| Business and administration | 19.3 | 19.8 | 16.3 | 14.3 | 33.6 |
| Health care | 53.8 | 55.9 | 47.4 | 48.1 | 55.7 |
| Bachelor's degree | | | | | |
| STEM | 39.6 | 46.4 | 32.8 | 30.7 | 38.1 |
| Science and science technology | 17.3 | 18.8 | 14.7 | 9.1 | 13.2 |
| Engineering and engineering technology | 43.9 | 58.2 | 33.6 | 34.4 | 63.5 |
| Mathematics and computer and information science | 46.3 | 51.1 | 40.5 | 38.7 | 56.1 |
| Business and administration | 38.4 | 44.8 | 28.4 | 23.9 | 54.1 |
| Health care | 62.1 | 66.4 | 60.7 | 54.1 | 80.4 |
| Above a bachelor's degree | | | | | |
| STEM | 53.1 | 57.2 | 34.5 | 40.0 | 33.3 |
| Science and science technology | 31.0 | 34.5 | 20.3 | 20.4 | 22.4 |
| Engineering and engineering technology | 59.1 | 62.7 | 35.4 | 42.9 | 56.6 |
| Mathematics and computer and information science | 59.3 | 63.0 | 46.2 | 53.6 | 38.1 |
| Business and administration | 44.6 | 48.1 | 35.3 | 35.5 | 60.9 |
| Health care | 51.6 | 53.2 | 50.1 | 45.5 | 78.6 |

Notes: STEM = science, technology, engineering, and mathematics and computer science. The field-of-study alignment rate is the percentage of individuals trained in a particular field who worked in the same field. For business and administration, the alignment rate excludes low-skill business, finance and administration occupations.

Source: Statistics Canada, 2021 Census of Population.

Among former international students, those who attained their highest level of education in Canada showed higher field-of-study alignment rates than those who attained their highest level of education outside Canada (Table 3). Among former international students with a bachelor's degree in the STEM field, 46% of those who attained their highest level of education in Canada worked in that field. The percentage was lower for those who attained their highest level of education outside Canada (33%) and similar to that of immigrants who were not former international students (31%).

When former international students attained their highest level of education outside Canada, pre-immigration Canadian education did not always improve field-of-study alignment rates, compared with those of immigrants who were not former international students. Despite their Canadian study

experience, former international students who studied STEM in foreign programs above the bachelor's level had lower alignment rates (34%) than immigrants who were not former international students but had the same level of educational attainment in the same field (40%). Former international students who completed their highest level of education in Canada had a much higher alignment rate (57%). Former international students who attained their highest level of education outside Canada may study at a lower level in Canada to improve their chances of securing Canadian employment by retraining in another field and changing careers. Alternatively, they may study in a short program at a lower level to quickly transition to the labour market with a postgraduate work permit and pursue permanent residency. If so, they may work in a job unrelated to the field of study of their highest educational level attained outside Canada.

Overall, former international students who attained their highest level of education in Canada had higher field-of-study alignment rates in the field of science, technology, engineering, and mathematics and computer science but lower rates in the business and administration field and the health care field, compared with Canadian-born graduates

In terms of the field-of-study alignment, former international students who studied in the STEM field above the bachelor's level and attained their highest level of education in Canada fared better than their Canadian-born counterparts (Table 3). Canadian-born graduates are Canadian citizens by birth who were of similar age (23 to 41 years) and held a postsecondary certificate, diploma or degree in 2021.⁴ About 57% of former international students who attained their highest level of education in Canadian programs above the bachelor's level in the STEM field worked in that field, whereas one-third (33%) of their Canadian-born counterparts did so. The difference in their alignment rates is partly because a larger share of the Canadian-born population who studied science and science technology worked in health occupations (19% versus 7% among former international students who attained their highest level of education in Canada, not presented in the table). Also, some Canadian-born STEM graduates (e.g., engineering and computer science) may have left Canada for higher-paying STEM jobs in other countries, such as the United States.

At the bachelor's level, the overall alignment rate for the STEM field is higher among former international students who attained their highest level of education in Canada (46%) than among their Canadian-born counterparts (38%). However, examining each of the three STEM subfields separately shows that the alignment rate is lower among former international students who attained their highest level of education in Canada than among Canadian-born graduates in the fields of engineering and engineering technology (58% versus 64%) and mathematics and computer and information science (51% versus 56%).

For STEM graduates with an educational level below a bachelor's degree, the overall field-of-study alignment rate was slightly lower for former international students who attained their highest level of education in Canada (23%) than for Canadian-born individuals (25%). Among those who studied in the field of mathematics and computer and information science, the field-of-study alignment rate was about 10 percentage points lower for former international students who attained their highest level of education in Canada (29%) than for those born in Canada (38%).

For health care majors at or above the bachelor's level, former international students who attained their highest level of education in Canada were less likely than their Canadian-born counterparts to work in their field of study. Among graduates from bachelor's programs in health care, the field-of-study alignment

4. This age range covers the 5th to 95th percentiles of age for former international students who attained their highest level of education in Canada.

rate for Canadian-born individuals was 80%, while the rate for former international students who attained their highest level of education in Canada was 66%. Among graduates with an educational level below a bachelor's degree, the alignment rate was similar for both groups (56%).

Among those who studied business and administration at all three educational levels, former international students had lower field-of-study alignment rates than their Canadian-born counterparts, regardless of whether they attained their highest level of education in Canada. At the bachelor's level, 45% of former international students who attained their highest level of education in Canada worked in business and related occupations, whereas 54% of Canadian-born individuals did so. At the level above a bachelor's degree, alignment rates for both groups were higher, with a larger difference between them (48% versus 61%, respectively). Differences in alignment rates were largest among graduates with a postsecondary education below a bachelor's degree (20% versus 34%, respectively).

Conclusion

This article examined whether recent immigrants who studied in Canada before immigration had occupations that corresponded to their field of study. Among former international students, the degree of field-of-study alignment varied by field and level of study. It was lowest among those who studied STEM or business and administration in postsecondary programs below the bachelor's level and highest among those with a bachelor's degree from health care programs. The overall field-of-study alignment rates were higher among former international students than among immigrants who were not former international students. The role of Canadian education in increasing the degree of field-of-study alignment among immigrants was prominent when former international students attained their highest level of education in Canada.

The field-of-study alignment rates among former international students who attained their highest level of education in Canada exceeded those among Canadian-born graduates for some fields of study and levels of highest education. In the STEM field, attaining their highest level of education in Canada at or above the bachelor's level increased alignment rates among former international students beyond those of Canadian-born graduates. In contrast, in the health care field and the business and administration field—especially in business and administration programs below the bachelor's level, which is the most common field of study at colleges among international students—the alignment rates among immigrants were lower than those of Canadian-born graduates.

This study focused on international students who transitioned to permanent residency, not on all international students. International students who left Canada after their studies or stayed in Canada and had not yet become permanent residents were excluded from the analysis. While this narrower scope provides a limited view of international students' labour market participation after graduation, it offers new insights into their post-immigration skill utilization as a long-term source of skilled labour, compared with other immigrants and their Canadian-born counterparts.

Appendix: data

The five occupation categories in this article are based on a variant of the National Occupational Classification 2021 for STEM, where the highest levels of aggregation are STEM occupations, STEM-related occupations and other than STEM occupations. STEM occupations include occupations in science and science technology; engineering and engineering technology; and mathematics, computer, and information sciences. Business and related occupations include business, finance and administration occupations (both STEM-related occupations and other than STEM occupations) and senior management occupations. Health occupations are grouped into a single category regardless of whether they are STEM-related.

STEM-related occupations in this article encompass the remaining STEM-related occupations in the variant: natural and applied sciences and related occupations; occupations in education, law and social, community and government services (e.g., energy policy analyst and natural and applied sciences researcher); natural resources, agriculture and related production occupations; and occupations in manufacturing and utilities.

Other occupations cover the remaining other than STEM occupations: natural and applied sciences and related occupations (e.g., office equipment service technician); occupations in education, law and social, community and government services; occupations in art, culture, recreation and sport; sales and service occupations; trades, transport and equipment operators and related occupations; natural resources, agriculture and related production occupations; and occupations in manufacturing and utilities. Low-skill business and related occupations (TEER 4 and 5 categories) were included in this group. Refer to Statistics Canada (n.d.) for detailed examples of occupations.

References

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