# Chapter 9
# Accreditation and the Labor Market Integration of Internationally Trained Engineers and Physicians in Canada

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Labor migration has always been an integral part of international migration. However, the skills that are sought by countries of settlement have changed over time, away from agricultural and manufacturing labor to those consistent with knowledge economies. Stressing the importance of highly educated labor in their post-industrial economies, many nations now favor the admission of highly educated and professionally trained migrants in their migration policies.

However, the admission of high-skilled migrants need not translate into their employment in high-skill jobs or in the professions for which they trained. As new members of a society, well-educated immigrants may experience initial downward mobility if they lack familiarity with the structure of local and national labor markets, strong job-search related networks, and language skills and host society "experience". Also professionals often face accreditation barriers. In many destination countries, regulated occupations in certain trades, law, engineering, and health areas require certification and/or licensing, primarily through professional associations, often based on government statutes. All new recruits to such occupations must be accredited, including newcomers who may have been trained outside the host society.

Analysis presented in this paper is funded by the Canada Research Chair award to the author, and it is made possible by the joint university-SSHRC-Statistics Canada funding of the Research Data Centres and the availability of the 2001 Census of Population File at the University of Toronto Research Data Centre. Xingshan Cao and Lisa Kaida were research assistants on the project. The author takes full responsibility for the material presented in this paper; neither the views nor the analysis in this paper necessarily reflect those held or undertaken by other individuals, Statistics Canada, or any organization.

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T. Triadafilopoulos (ed.), *Wanted and Welcome?*, Immigrants and Minorities, Politics and Policy, DOI: 10.1007/978-1-4614-0082-0_9,

The term "brain waste" is commonly used to describe the under-employment that results when skilled migrants work in less-skilled jobs. Although the word "skill" generally refers to a proficiency or facility that is acquired through training and experience, many international migration studies measure skill through formal education, generally arguing that high levels of educational training should translate into better jobs, higher status occupations, and higher earnings. Assessments of the discrepancies between specific types of training and the subsequent labor market integration of migrants with those skills are much less frequent, in part because large surveys and censuses often do not collect the data needed to match training and jobs.

This chapter helps to remedy this knowledge gap by focusing on the occupations and earnings of internationally trained foreign born engineers and physicians; engineers represent a large group of professionally trained workers in Canadian labor flows while physicians are of interest because their recruitment is heralded as essential to the maintenance of health care services in aging societies but also as draining away needed practitioners from origin countries (see Chap. 10, this volume). Three questions are asked and answered using data from citizenship and immigration Canada's (CIC) landed immigrant database (LIDS) and the 2001 Canadian Census of Population for persons with engineering and medical training. First, what have been the trends during the past two decades with respect to international flows of engineers and physicians? Second, to what extent are the internationally educated engineers and physicians in occupations that would be expected, given their training? Third, what are the earnings deficits for immigrant engineers and physicians that result when internationally trained immigrants do not find employment commensurate with their training? The empirical answers not only demonstrate unanticipated consequences of immigration policies targeted toward recruiting high-skilled labor but also highlight the problems that can arise when immigration policy stimulates high-skilled labor flows while domestic policies determine the licensing of professionals for employment.

## Brain Gain? Coming to Canada, Working in Canada?

Over the course of the twentieth century, immigration has been the cornerstone of Canada's nation building efforts (Boyd and Alboim 2012; Green and Green 1999; Kelley and Trebilcock 1998; Knowles 2007). Immigrants have been sought for two demographic reasons, to settle less developed part of Canada, and more recently to substitute for declining births among the Canadian born. Immigrants also have been sought to build the economy. As a signatory to the *Convention Relating to the Status of Refugees*, and the *Convention Against Torture* Canada also domiciles those in need of protection. As a result, its policy of admitting international migrants for permanent residence rests on three pillars: family unification (the social component), humanitarian concerns, and economic contribution.

However, the comparative importance of each category of admissibility has varied over time since the 1950s, depending on the state of Canada's economy,

and the use of a "tap-on, tap-off" approach to regulating numbers by the authorized government department (the names of the government departments mandated to regulate immigration flows have changed over time). In the late 1970s and the 1980s, admissions in the family class surpassed those in the economic category, partly because the introduction of a point system in the late 1960s made entry in the economic class more difficult (Knowles 2007) and partly because during the recessionary period of 1982–1983, the Canadian government dramatically curbed the admission of those seeking to enter in the economic class. By the mid-1990s, however, the policy stance was one of favoring the admission of skilled immigrants via the economic category; as a result, by 1995 over half of all immigrants who were admitted to Canada as permanent residents were in the economic class. As shown in Fig. 9.1, the percentages grew to over 60 % in 2001.

What is administratively termed the "economic class" includes skilled workers, business immigrants, provincial nominees, and live-in caregivers, as well as members of their immediate family. Most of those entering under the criterion of making an economic contribution fall into the "skilled workers" category. This group is admitted through a system that assesses the likely economic contributions of would be immigrants by awarding points to the principal applicant for age, education, knowledge of French or English (Canada has two official languages), and to other factors such as occupational demand and occupational skill (Boyd 1976; Boyd and Alboim 2012; Green and Green 1999). The point system began in 1967, and was sustained in the Immigration Act of 1976 (effective in 1978), and subsequent Acts and amendments to the Acts. The most recent legislation—the Immigration and Refugee Protection Act (IRPA)—which became effective in June

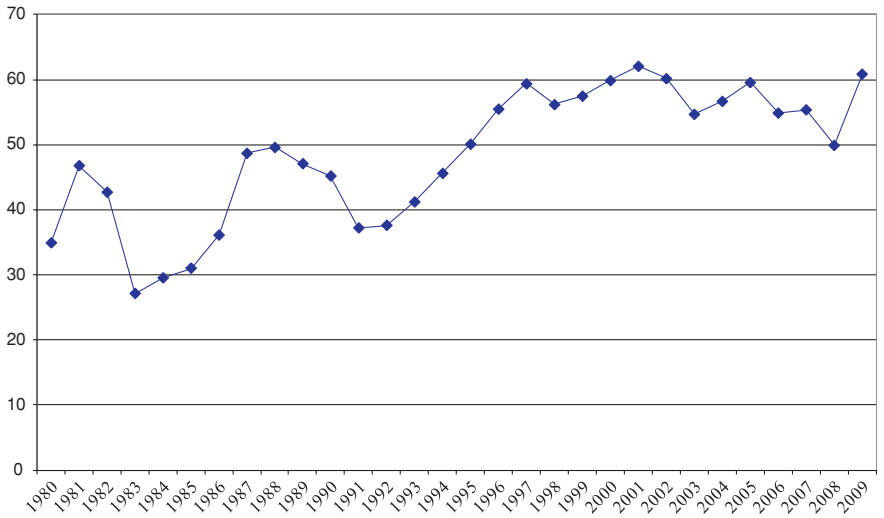


**Fig. 9.1** Percentage of all permanent residents who entered in the economic class, Canada, annual flows 1980–2009

2002 continues to apply the point system to those applicants seeking entry in the skilled worker category.

The 2002 legislation departs from earlier attempts prevalent in the early to mid-1980s to link the labor supply of applications to occupational demand and to the robustness of the economy. IRPA now focuses on selecting immigrants with the flexible and transferable skills needed to succeed in a rapidly changing, knowledge-based economy, rather than on qualifications for specific occupations. The current criteria place more emphasis than previous point systems on the applicants' level of education and previous work experience, and there is greater importance attached to their knowledge of English or French. Starting in 2008, visa issuing officers were instructed only to process those federal skilled worker applicants (and their accompanying family members) who either had pre-arranged employment or who were in 38 high-demand occupations (out of over 500 occupations) such as health, skilled trades, finance, and resource extraction. In 2009, the list was reduced to 29 high-demand occupations.

As might be expected from the emphasis on education in the points system and the policy focus on the knowledge economy, "skilled" migration to Canada increased throughout the 1990s and beyond. This stream of migrants contains not just the university educated but also those with highly specific skills, those represented by a very specific knowledge base and training commonly called "professional" training. In Canada, engineers and physicians are two examples of professions where knowledge is highly specialized. Flow data on annual admissions of permanent residents to Canada include information on previous occupation of immigrants and provide conservative estimates of the inflows of these professionals, as not everyone trained in these fields will have worked in these professions. The data show that the number of persons declaring previous work as physicians has stayed relatively flat over the two decades between 1980 and 2001, ranging from less than 100 in 1998 to over 200 in 1993. Slightly fewer than 3,800 immigrants with declared previous employment as physicians came to Canada between 1980 and 2001. However, the number who have worked as "engineers" prior to entering Canada has soared, drawing close to 4,000 annual admissions by 2001 (Fig. 9.2). One implication of this trend is that the annual inflow of foreign trained engineers is now larger than the annual Canadian graduating cohorts. Based on field of study rather than past occupation and census data rather than annual flow data, Picot and Hou (2009) found that in 2000 far more engineering graduates were entering Canada through immigration (17,000) than graduating from the Canadian university system (11,400).

However, the admission of these migrants cannot be equated with employment that either matches their skills or matches their previous work. Different jurisdictions exist with strong implications for the employment of professional workers. The Canadian federal government is responsible for immigration policies that dictate who shall be admitted for permanent residency. Labor standards, however, lie within provincial jurisdictions. Provinces grant licensures to a large number of professions and trades (estimates reveal over 50 such bodies in Ontario alone)

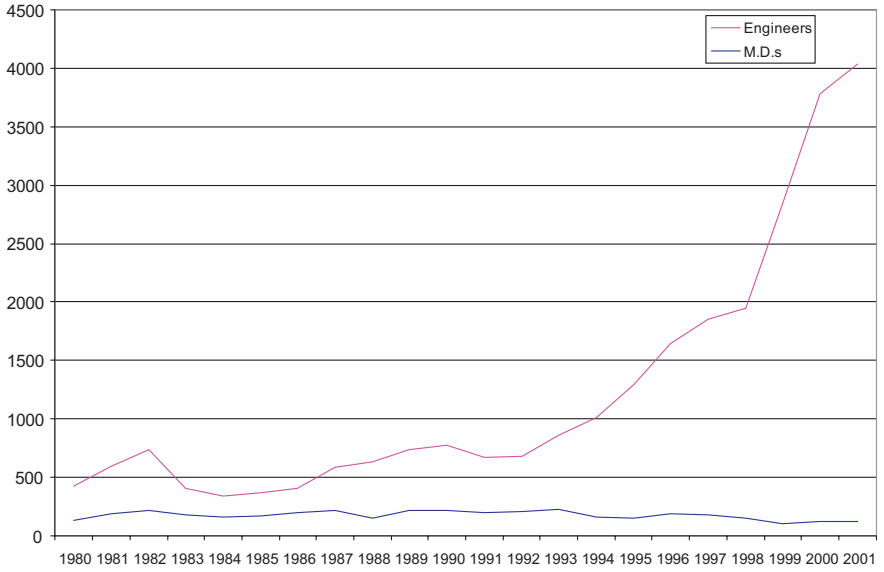


**Fig. 9.2** Numbers of permanent residents admitted annually with previous engineering or physician occupations, Canada 1980–2001

primarily on the grounds of public safety. Skilled foreign trained workers in these mandated occupations thus have to meet the requirements set by these associations if they wish to work in the areas for which they trained.

To be sure, these requirements also exist for Canadian trained personnel; however, professional schools in Canada have training programs that meet the requirements of these licensing bodies. As well, persons educated in Canada, of whom the vast majority are Canadian born, also are able to meet other related standards including the ability to communicate well, which is represented by language competency criteria. One question that arises is whether internationally trained immigrants are as likely as the Canadian trained to find employment in those areas for which they studied and for which they must be re-accredited.

This question can be answered for those who studied medicine and engineering and who received at least a bachelor's degree. The analysis uses the 2001 census of population data, which was the most recent at the time of this project in 2007–2008, and it focuses on the population age 32–54 in 2001. In order to capture groups that would most likely have received their education inside and outside Canada, three groups are studied: those who are Canadian born, those who are foreign born but arrived before age 19 (and who presumably received their advanced degrees in Canada), and those who arrived at age 28 and at least 4 years prior to the census. The first two groups are likely to have received their degrees in Canada while the third group is considered to be internationally trained (Boyd and Thomas 2001). Additional details on the research design are found in Appendix A.

## Who are the Internationally Educated Engineers and Doctors?

Canada's emphasis on admitting high-skilled workers can be seen in the ratio of foreign trained engineers relative to numbers of Canadian born. In the population age 32–54, there are approximately 32,000 persons who entered Canada as adults, who have bachelors' degrees, at least 4 years of university (3 years in Quebec) and whose major field of study was engineering. There are over 76,000 Canadian born persons with the same characteristics. Among those aged 32–54 who studied medicine and have received medical degrees, there are nearly 5,000 immigrants who arrived after age 28 and are considered internationally educated compared with 24,000 Canadian born and 3,800 immigrants who entered Canada before they were age 19.

Normally, those trained as engineers might be expected to find employment in engineering occupations or as managers; movement into management is part of the career path of engineers (Tang 1993, 1997). Similarly, most of those trained as physicians should be employed as doctors. However, as shown in Figs. 9.3 and 9.4, immigrants who arrived as adults with international training and who worked during 2000 or 2001 are less likely than the Canadian educated to be employed in occupations that fully utilize their training. Of those immigrants in the 2000 or 2001 labor force who are internationally educated and studied engineering, only four out of ten (43 %) are working in engineering occupations or in management compared to nearly seven out of ten of the Canadian born. Conversely over one-third of this internationally educated group are in occupations unrelated in any way to engineering

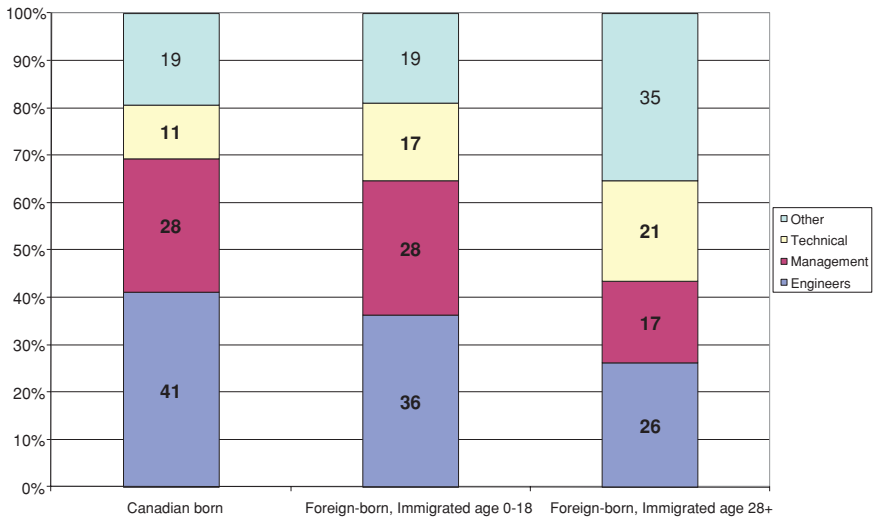


**Fig. 9.3** Occupational locations of engineering graduates with bachelor's degrees or higher and in the experienced labor force, age 32–54, Canada, 2001

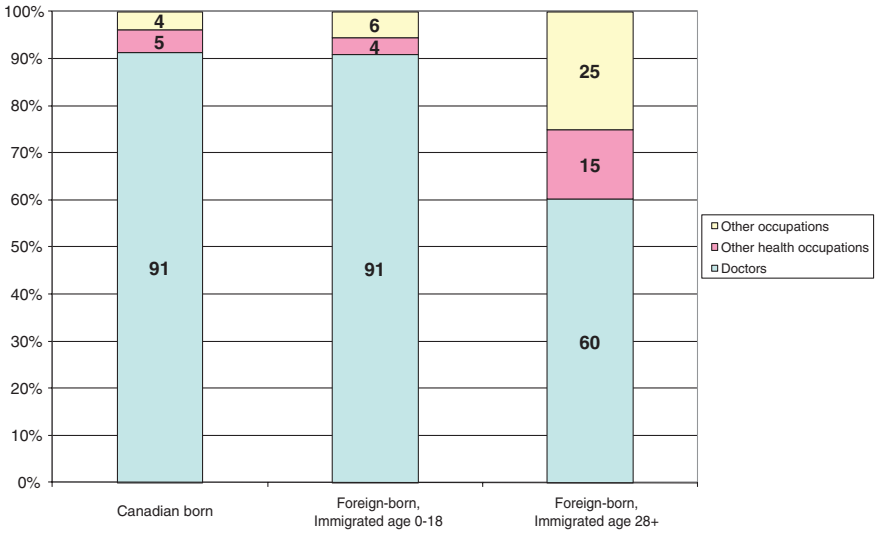


**Fig. 9.4** Occupational locations of medical graduates with bachelor's degrees or higher and in the experienced labor force, age 32–54, Canada, 2001

compared to less than one-fifth of those who are Canadian born or who are foreign born but arrived as children or teenagers (Fig. 9.3).

Similar trends are found for those who studied medicine. As shown in Fig. 9.4, groups educated outside Canada differ dramatically from the Canadian educated in the propensity to hold medical occupations. Of those census respondents who were in the Canadian labor force during 2000 or 2001, nine out of ten of the Canadian born and those arriving as children who studied medicine are employed as physicians. In contrast six out of ten of the internationally educated work as doctors; one-fourth work in occupations that are unrelated to fields of medicine or health.

In addition, and undoubtedly related to their occupational profiles, the internationally educated earn less than do those born in Canada and/or receiving their degrees in Canada. As shown in Fig. 9.5, the annual wage and self-employment earnings of the foreign trained who worked one week or more in 2000 were just under $53,000 for those who studied engineering compared to their Canadian born counterparts who earned approximately $86,500. Those who studied medicine outside Canada on average earned nearly $103,000 in 2000 compared to almost $144,500 for the Canadian born.

## Why These Differences?

What explains the lower percentages of the foreign educated in occupations that are consistent with their training as engineers and physicians? What explains their lower earnings? One possibility is that such differences simply

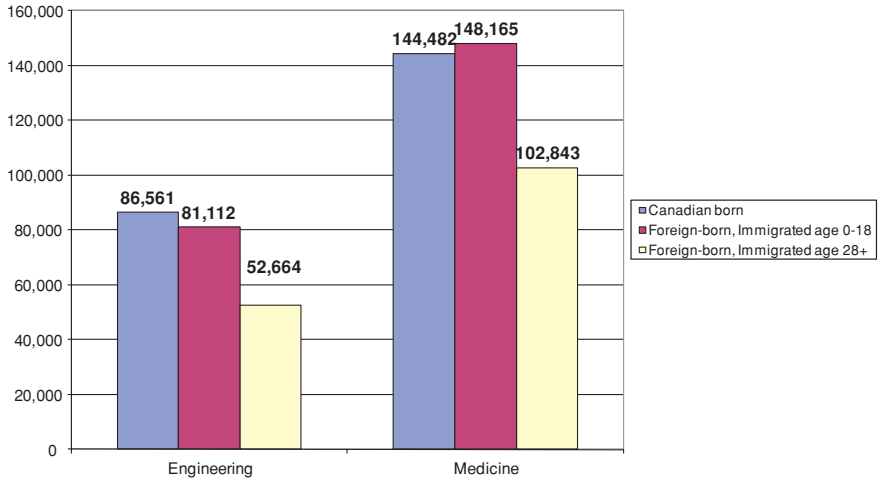


**Fig. 9.5** Annual earnings for university graduates in engineering and medicine, age 32–64, Canada, 2001 census Canada

reflect differences between the three groups (Canadian born, arrived age 0–18 and arrived age 28 plus) in their demographic, social, and economic characteristics. This supply side explanation focuses on the characteristics of workers and argues that compositional differences between groups in characteristics which are known to influence employment account for much of the different occupational locations. For example, if compared to the Canadian educated, those who are internationally educated as engineers or as physicians have fewer years of university or different fields of specialization; or, if they are less likely to be linguistically proficient in English or French, they might be less likely to work as engineers or as doctors. As well, place of origin and recent arrival might influence the occupational location of the foreign trained, both because employers face difficulties in recognizing the worth of degrees obtained outside Canada (Boyd and Thomas 2001) and because recent arrivals may lack job and professionally related networks that would assist in finding employment in areas of study.

Appendix B contains descriptive data that confirm demographic, social, and economic differences exist between the Canadian educated and those who immigrated later as adults and who are considered to be foreign educated for the purposes of this study. Compared with the Canadian born and those who arrived as children, the population that is internationally educated in the field of engineering is older, has a higher proportion of women, is highly concentrated in Canada's two magnet cities for immigrants (Toronto and Vancouver) and therefore more likely to reside in the provinces of Ontario and British Columbia. Educational characteristics differ slightly as well. Compared to the Canadian born and those arriving as children, internationally educated persons who studied engineering have

slightly higher percentages who attended school in 2000, higher percentages with masters and Ph.D. degrees, and higher percentages studying mechanical engineering (Appendix B, Table B1).

Similar findings exist for those who studied medicine. Compared with the Canadian born and those who arrived as children, the population that is internationally educated in medicine also is slightly older, more concentrated in Toronto and Vancouver, and more likely to have trained as a specialist and more likely to also have masters or Ph.D. degrees in addition to medical degrees (Appendix B, Table B2).

Reflecting the dismantling of the national origins criteria of admissibility in the 1960s and 1970s, and the increasing reliance by CIC on the point system for skilled workers, those who are internationally educated in engineering and medicine are more likely to be from areas other than the United States or North and Western European countries, particularly from Asian countries. However, nearly one in three of those trained in engineering are born in Eastern Europe where as one in five of those educated internationally in medicine is born in Africa. Further, three out of five of the engineering educated and nearly half of the foreign trained in medicine arrived in the first 5 years of the 1990s. Not surprisingly given their regions of birth and duration in Canada, persons arriving in adulthood with engineering or medical fields of study have high percentages using one or more languages other than English or French in the home; seven out of ten for engineers and nearly half of those trained in medicine speak unofficial languages at home (Appendix B, Tables B1 and B2).

## Do Characteristics Matter for Occupational Location and Earnings?

The different stock of human capital that characterize the populations of Canadian born, those arriving as children and those who are internationally educated undoubtedly influence the occupations and the earnings of these diverse groups. However, even after adjustments are made for group differences in characteristics (Appendix B), the basic patterns persist; the foreign born who are internationally educated in the fields of engineering and medicine continue to be less likely to be employed in occupations related to their training and they continue to earn less than the Canadian educated, including those who are born in Canada or who immigrated before age 19.

These conclusions derive from multivariate analyses that compare occupational distributions and earnings between the three groups of interest, after adjusting for compositional differences between groups in proportions female and male, age, place of residence, language spoken at home, type of degree and years of university, and subfield of study. Table 9.1 shows the expected occupational profiles that would exist for those with engineering training if all groups had the same set of demographic and social characteristics. Compared to the Canadian born and the

**Table 9.1** Predicted probabilities of employment in management, engineering, technical, and other occupations for engineering graduates 32–54 years old in Canada, 2001 census

| | Total[a] (1) | Management (2) | Engineers (3) | Technical (4) | Other (5) |
|---|---|---|---|---|---|
| Born in Canada | 100 | 28 | 40 | 11 | 21 |
| Immigrated before age 19 | 100 | 28 | 39 | 14 | 20 |
| Immigrated after age 28 | 100 | 19 | 30 | 18 | 32 |
| Born in Canada | 100 | 28 | 40 | 11 | 20 |
| Immigrated before age 19 | 100 | 28 | 38 | 14 | 19 |
| Immigrated 28+, before 1980 | 100 | 20 | 43 | 13 | 24 |
| Immigrated 28+, 1980–1985 | 100 | 25 | 34 | 17 | 24 |
| Immigrated 28+, 1986–1990 | 100 | 22 | 30 | 16 | 32 |
| Immigrated 28+, 1991–1996 | 100 | 17 | 29 | 20 | 34 |
| Born in Canada | 100 | 28 | 40 | 11 | 21 |
| Immigrated before age 19 | 100 | 28 | 39 | 14 | 20 |
| Immigrated after age 28 | | | | | |
| North American, North Europe | 100 | 20 | 39 | 18 | 23 |
| Eastern Europe | 100 | 15 | 33 | 22 | 30 |
| Carribean, South America | 100 | 18 | 32 | 16 | 34 |
| Africa | 100 | 22 | 30 | 18 | 29 |
| South Asia | 100 | 21 | 32 | 17 | 30 |
| Southeast Asia | 100 | 10 | 13 | 18 | 59 |
| East Asia | 100 | 26 | 29 | 21 | 24 |
| West Asia | 100 | 32 | 26 | 11 | 31 |

[a]Rows may not sum to 100 % because of rounding
*Note* See Appendix A for details
*Source* Multinomial regressions of data from Statistics Canada 2001 Census of Population, RDC version

foreign born arriving before age 19, those immigrating after age 28 are still less likely to hold management or engineering occupations, as are those who arrived more recently. Only the foreign trained who are born in the United States and North and West Europe have percentages employed as engineers that are similar to those for the Canadian born and the foreign born arriving as children. Other birthplace groups are still more likely to work in occupations that are either technical but related to engineering or in occupations that are unrelated. The Southeast Asian born are particularly likely to work in jobs that are unrelated to engineering training, a feature that reflects a large number of persons from the Philippines (see Boyd and Thomas 2002).

After adjusting for compositional differences between groups, the chances of working as physicians is three out of four (76 out of 100) for the foreign educated compared to nine out of ten for those born in Canada or immigrating by age 18 (Table 9.2). The experiences of the foreign born who arrived as children in terms of working as a physicians are not different from those of the Canadian born, suggesting that education in Canadian institutions is very important in facilitating employment as a physician.

Among those who are internationally educated and arrived as adults, the chances of working as a physician vary by period of arrival and birthplace. The chances that a foreign trained doctor who arrived before 1980 would work as a physician are very similar to those of a Canadian born person who studied medicine, at 92 and 91 % respectively, when other factors are controlled for. However, the predicted probabilities of finding employment in their preferred profession decline for more recent arrivals. A foreign trained physician who arrived in the early 1980s would have an 86 % chance of working as a doctor, but only a 67 % chance if he or she had come in the early 1990s. When demographic and socio-economic factors that influence the likelihood of working as a physician are taken into account, it is clear that those born in some regions have lower chances of finding employment as physicians. The internationally educated who are born in Africa or South Asia would also have very good chances, estimated at 84 and 86 out of 100 respectively. In contrast, foreign trained physicians born in other regions of Asia or in Eastern Europe have the lowest chances (less than 67 chances out of 100) of being in their chosen profession (Table 9.2).

**Table 9.2** Predicted probabilities of employment as doctors, in other health occupations, and non-health occupations for medical graduates 32–54 years old in Canada, 2001 census

| | Total[a] | Doctors | Other health occupations | Other occupations |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Born in Canada | 100 | 91 | 5 | 4 |
| Immigrated before age 19 | 100 | 92 | 3 | 4 |
| Immigrated after age 28 | 100 | 76 | 10 | 14 |
| Born in Canada | 100 | 91 | 5 | 4 |
| Immigrated before age 19 | 100 | 92 | 3 | 5 |
| Immigrated 28+, before 1980 | 100 | 95 | 2 | 3 |
| Immigrated 28+, 1980–1985 | 100 | 86 | 9 | 5 |
| Immigrated 28+, 1986–1990 | 100 | 77 | 9 | 14 |
| Immigrated 28+, 1991–1996 | 100 | 67 | 12 | 21 |
| Born in Canada | 100 | 91 | 5 | 4 |
| Immigrated before age 19 | 100 | 92 | 3 | 5 |
| Immigrated after age 28 | | | | |
| North American, North Europe | 100 | 78 | 11 | 11 |
| Eastern Europe | 100 | 67 | 19 | 14 |
| Carribean, South America | 100 | 76 | 9 | 15 |
| Africa | 100 | 84 | 5 | 11 |
| South Asia | 100 | 86 | 3 | 11 |
| Southeast Asia | 100 | 62 | 21 | 17 |
| East Asia | 100 | 57 | 20 | 24 |
| West Asia | 100 | 63 | 6 | 32 |

[a]Rows may not sum to 100 % because of rounding

*Note* See Appendix A for details

*Source* Multinomial regressions of data from Statistics Canada 2001 Census of Population, RDC version

Earnings differentials between the internationally educated and those receiving degrees in Canada also persist after statistically removing the effects of group differences in demographic and socio-economic characteristics (See Appendix B for details). Model 1 in Table 9.3 (column 1) shows that the foreign born who arrive after age 28 earned $33,600 less in 2000 than did the Canadian born who studied engineering. If the influences of group differences in characteristics are removed, the differential would have been $32,721 (Table 9.3, Model 2, column 2). Stated somewhat differently, the Canadian born who studied engineering earned just under $87,000 compared to approximately $53,000 earned by those who arrived after age 28 and who are assumed to have received their training outside Canada. If group differences in demographic and socio-economic characteristics are taken into account, the earnings of the internationally educated would rise to just over $54,000 (Table 9.3, column 5).

Of course, other factors besides socio-economic and demographics characteristics can influence earnings. As Fig. 9.2 and Table 9.1 demonstrate, the foreign trained who studied engineering are the least likely to hold engineering occupations relative to the Canadian born and those who arrived by age 19. Not working in occupations consistent with fields of training also is likely to depress earnings. If impacts of group-specific occupational profiles also are taken into account (using the categories found in Figs. 9.3 and 9.4), the earnings gap between the Canadian born and the internationally educated narrows to just under $29,000 (Table 9.3, column 3). The expected earnings of the Canadian born would be just under $86,000 while the earnings of the foreign trained would rise to $57,000. The final two columns of Table 9.3 summarize these impacts. The actual earnings of $53,224 for the internationally educated reflect a "loss" of $960 because of the socio-demographic profile of this group compared to the overall population. Further, an additional loss of $2,930 occurs because this group does not have the same occupational distribution of the overall population, which is a group heavily dominated by the Canadian born (who receive a $1,080 increment because of their occupational profile).

Similar interpretations can be made for the internationally educated by their period of arrival and their regions of birth. Those who arrived most recently and studied engineering have the lowest earnings of all groups, earning nearly $39,000 less than the Canadian born (Table 9.2, columns 1 and 4). They lose on average $4,190 because of their socio-demographic characteristics and another $3,780 because of their occupational profile, in which they are less likely to be employed in engineering occupations (Table 9.3, columns 7 and 8). Those born in Eastern Europe, the Caribbean and Latin-South America, and Southeast Asia have the lowest actual earnings of all groups (Table 9.3, columns 1 and 4). Most birthplace groups incur a "loss" associated with having occupational distributions that differ from that of the overall population; the penalty for those born in Southeast Asia—a group already noted for working in occupations unrelated to engineering (see Table 9.1)—is particularly high, standing at over $8,000 (Table 9.2, column 8).

Table 9.4 provides earnings information for those who studied medicine. Again, those who immigrated after age 28 and are likely internationally trained earn

**Table 9.3** Regression coefficients, actual and predicted 2000 wage, and self-employment earnings for the Canadian born and foreign born bachelor's or higher degree holders with engineering as the major field of study, age 32–54, Canada 2001

| | Regression coefficients (b's) | | | Actual and net earnings | | | Change due to | |
|---|---|---|---|---|---|---|---|---|
| | Model 1[a] | Model 2[b] | Model 3[c] | Actual (gross effects) | Socio-demographic Variables[b] | Occupation | Socio-demo-graphic variables[b] | Occupation |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| *Age at Immigration* | | | | | | | | |
| Canadian born | (rg) | (rg) | (rg) | 86,829 | 86,909 | 85,829 | −80 | 1,080 |
| Immigrated, before age 19 | −5,268* | −8587*** | −8544*** | 81,564 | 78,324 | 77,284 | 3,240 | 1,040 |
| Immigrated, after age 28 | −33,606*** | −32721*** | −28716*** | 53,224 | 54,184 | 57,114 | −960 | −2,930 |
| *Nativity, age at immigration and period of immigration*[d] | | | | | | | | |
| Canadian born | (rg) | (rg) | (rg) | 86,829 | 87,089 | 85,974 | −260 | 1,115 |
| FB, arrived before age 19 | −5,268* | −8,804*** | −8,708*** | 81,564 | 78,284 | 77,264 | 3,280 | 1,020 |
| FB, arrived age 28+, before 1980 | −8,230 (ns) | −20,512** | −17,466** | 78,599 | 66,579 | 68,509 | 12,020 | −1,930 |
| FB, arrived age 28+, 1980–1985 | −16,754*** | −25,792*** | −24,064*** | 70,074 | 61,299 | 61,914 | 8,775 | −615 |
| FB, arrived age 28+, 1986–1990 | −32,795*** | −35,078*** | −31,534*** | 54,034 | 52,014 | 54,439 | 2,020 | −2,425 |
| FB, arrived age 28+, 1991–1996 | −38,868*** | −34,946*** | −30,047*** | 47,959 | 52,149 | 55,929 | −4,190 | −3,780 |
| *Nativity, age at immigration and region of birth*[d] | | | | | | | | |
| Canadian born | (rg) | (rg) | (rg) | 86,829 | 87,454 | 86,374 | −625 | 1,080 |
| Immigrated, before age 19 | −5,268* | −9,112*** | −9,057*** | 81,559 | 78,344 | 77,319 | 3,215 | 1,025 |

(continued)

**Table 9.3** (continued)

| | Regression coefficients (b's) | | | Actual and net earnings | | | Change due to | |
|---|---|---|---|---|---|---|---|---|
| | Model 1[a] | Model 2[b] | Model 3[c] | Actual (gross effects) | Socio-demographic Variables[b] | Occupation | Socio-demographic variables[b] | Occupation |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Immigrated, after age 28 | | | | | | | | |
| FB, N. Am., W. Europe, Oceania, Oth. | −13,243*** | −16,554*** | −13,798*** | 73,584 | 70,899 | 72,574 | 2,685 | −1,675 |
| FB, Eastern Europe | −35,248*** | −34,729*** | −29,655*** | 51,579 | 52,724 | 56,719 | −1,145 | −3,995 |
| FB, Caribbean and Latin-South America | −34,510*** | −34,745*** | −30,094*** | 52,319 | 52,714 | 56,284 | −395 | −3,570 |
| FB, Africa | −31,412*** | −33,341*** | −30,575*** | 55,419 | 54,114 | 55,799 | 1,305 | −1,685 |
| FB, South Asia | −31,036*** | −37,256*** | −33,580*** | 55,794 | 50,199 | 52,794 | 5,595 | −2,595 |
| FB, Southeast Asia | −44,736*** | −42,468*** | −33,112*** | 42,094 | 44,989 | 53,259 | −2,895 | −8,270 |
| FB, East Asia | −38,193*** | −39,722*** | −37,932*** | 48,634 | 47,729 | 48,444 | 905 | −715 |
| FB, West Asia | −40,621*** | −40,934*** | −40,064*** | 46,209 | 46,524 | 46,309 | −315 | 215 |

[a]Main effects, no other independent variables
[b]Controlling for compositional effects due to sex, age, CMA-place of residence, province of residence, language spoken at home subfield of study, and highest degree
[c]Controlling for work in management occupations, engineering occupations, other technical occupations and all other occupations
[d]Separate regressions run for period of immigration and for region of birth. See Appendix B
*Note* (rg) Reference group
*Note* $*p < 0.05$; $**p < 0.01$; $***p < 0.001$
*Source* Ordinary least square regressions of data from Statistics Canada 2001 Census, RDC version

**Table 9.4** Ordinary least squares regression coefficients, actual and predicted 2000 self-employment and wage earnings for the Canadian born or foreign born with bachelor's or higher degree holders with medicine as the major field of study, Canada 2001

| | Regression coefficients (b's) | | | Actual and predicted earnings | | | Change due to | |
|---|---|---|---|---|---|---|---|---|
| | Model 1[a] | Model 2[b] | Model 3[c] | Actual (gross effects) | Socio-demographic variables[6] | Occupation | Socio-demographic variables[b] | Occupation |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| *Age at immigration* | | | | | | | | |
| Canadian born | (rg) | (rg) | (rg) | 145,066 | 142,326 | 141,286 | 2,740 | 1,040 |
| Immigrated, before age 19 | 3,382 (ns) | 3843 (ns) | 3090 (ns) | 148,451 | 146,166 | 144,376 | 2,285 | 1,790 |
| Immigrated, after age 28 | −41,534*** | -23653*** | -16143 *** | 103,536 | 118,671 | 125,141 | −15,135 | -6,470 |
| *Nativity, Age at Immigration, and Period of Immigration*[d] | | | | | | | | |
| Canadian born | (rg) | (rg) | (rg) | 145,071 | 142,596 | 141,511 | 2,475 | 1,085 |
| FB, arrived before age 19 | 3,382 (ns) | 3,117 (ns) | 2,618 (ns) | 148,451 | 145,716 | 144,131 | 2,735 | 1,585 |
| FB, arrived age 28+, before 1980 | 16,704 (ns) | 26,335* | 23,129* | 161,776 | 168,936 | 164,641 | −7,160 | 4,295 |
| FB, arrived age 28+, 1980–1985 | −18,117** | −12,321 (ns) | −11,239 (ns) | 126,951 | 130,276 | 130,271 | −3,325 | 5 |
| FB, arrived age 28+, 1986–1990 | −39,559*** | −21,484*** | −13,751* | 105,511 | 121,116 | 127,761 | −15,605 | −6,645 |
| FB, arrived age 28+, 1991–1996 | −60,773*** | −39,355*** | −27,502*** | 84,296 | 103,246 | 114,006 | −18,950 | −10,760 |
| *Nativity, age at immigration, and region of birth*[d] | | | | | | | | |
| Canadian born | (rg) | (rg) | (rg) | 145,066 | 143,616 | 142,411 | 1,450 | 1,205 |
| Immigrated, before age 19 | 3,382 (ns) | 2,345 (ns) | 1,907 (ns) | 148,451 | 145,961 | 144,321 | 2,490 | 1,640 |
| Immigrated, after age 28 | | | | | | | | |
| FB, N. Am., W. Europe, Oceania, Oth. | −9,023 (ns) | −4,472 (ns) | 739 (ns) | 136,046 | 139,146 | 143,146 | −3,100 | −4,000 |
| FB, Eastern Europe | −65,330*** | −29,964 *** | −19,911* | 79,741 | 113,651 | 122,501 | −33,910 | −8,850 |
| FB, Caribbean, and Latin-South America | −36,214** | −36,655** | −27,943* | 108,856 | 106,961 | 114,466 | 1,895 | −7,505 |
| FB, Africa | −19,982** | −15,382* | −11,694 (ns) | 125,086 | 128,236 | 130,716 | −3,150 | −2,480 |
| FB, South Asia | −14,205 (ns) | −13,381 (ns) | −11,306 (ns) | 130,866 | 130,231 | 131,106 | 635 | −875 |
| FB, Southeast Asia | −59,049*** | −38,846*** | −25,923* | 86,021 | 104,771 | 116,486 | −18,750 | −11,715 |

(continued)

**Table 9.4** (continued)

| | Regression coefficients (b's) | | | Actual and predicted earnings | | | Change due to | |
|---|---|---|---|---|---|---|---|---|
| | Model 1[a] | Model 2[b] | Model 3[c] | Actual (gross effects) | Socio-demographic variables[6] | Occupation | Socio-demographic variables[b] | Occupation |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| FB, East Asia | −95,606*** | −81,723*** | −64,915*** | 49,466 | 61,891 | 77,496 | −12,425 | −15,605 |
| FB, West Asia | −84,482*** | −84,741*** | −67,884*** | 60,586 | 58,876 | 74,526 | 1,710 | −15,650 |

[a]Main effects, no other independent variables
[b]Controlling for compositional effects due to sex, age, CMA-place of residence, province of residence, language spoken at home, medical specialist(1) (2) (3) years of university, and highest degree
[c]Controlling for work in medical, health occupations, and all other occupations
[d]Separate regressions run for period of immigration and for region of birth. See Appendix B
*Note* (rg) Reference group
*Source* Ordinary least square regressions of data from Statistics Canada 2001 Census, RDC version

substantially less, approximately $41,500 less, in 2000 than the Canadian born or those who arrived before age 19. The earnings differential narrows when group differences in socio-demographic characteristics are taken into account, indicating that about $15,000 of the $41,500 gap is due to the characteristics of the internationally educated, including age differences, years of schooling, and language spoken at home. Approximately another $6,500 of the gap reflects the different occupational distribution of those who are internationally educated, relative to the profile found for the total population under analysis (Table 9.4, columns 1–3, 7, and 8).

As observed for the internationally educated in engineering fields of study, earnings for those who studied medicine outside Canada decline with shorter duration in Canada. Those arriving during the early 1990s lose just under $20,000 because of their socio-demographic characteristics and just under $11,000 because of their unfavorable occupational profiles, in which they are not employed as doctors (see Fig. 9.3 and Table 9.2). Earnings losses associated with occupational profiles are particularly severe for the internationally educated who are born in Southeast Asian, East Asia, and West Asia (Table 9.4, column 8).

## Professional Training and Domestic Accreditation Requirements

Compared with those educated in Canada, the foreign born who are internationally educated in the fields of engineering and medicine are less likely to be employed in engineering occupations or as physicians. Their annual earnings in 2000 also are lower. Differences in characteristics that influence labor market integration (age, sex, level of education, language use) only partly explain the occupational and earnings gaps. Further, variations by period of arrival and by birthplace exist in the propensities to be employed in engineering occupations or in medicine and in earnings.

The Canadian census provides a portrait of the Canadian population in its entirety. As a result, using census data to probe further the occupational profiles and earnings of the internationally trained is limited. However, one additional explanation seems likely: in order to utilize their training to the fullest, the foreign trained must meet the professional certification requirements that exist in Canada for engineers and for physicians. These requirements can create barriers to employment in professional occupations for those who studied engineering and medicine outside Canada. Indeed, Canadian certification requirements are often described as a form of systemic discrimination, in that criteria are created which are universally applied to the Canadian born and foreign born alike, but have disproportionate effects in restricting access to trades or professions among the foreign born (Bolaria 1992; McDade 1988). A brief discussion of the requirements for engineers and physicians indicates the specific ways in which such requirements can create barriers to the internationally educated and help to explain the variations observed with census data by period of arrival and by birthplace.

*Accrediting Engineers*: The Canadian engineering profession is a publicly regulated occupation with its own "reserve" title. This means that by law, no one may offer engineering services to the public unless they first obtain a license from one of the 12 provincial and territorial engineering associations (*ordre* in Quebec) that have been mandated by provincial/territorial law. In Canada, regulating the conditions of work is under the legal jurisdiction of each province. Although requirements vary by province, to be licensed as a professional engineer, individuals must satisfy the following requirements: (1) be a Canadian citizen or a permanent resident; (2) possess an undergraduate degree at the Bachelor level from an accredited Canadian university program in engineering or possess an otherwise recognized engineering degree and complete an assigned exam program (normally associations will assign a program if an applicant does not have a Bachelor degree in engineering from an accredited Canadian university engineering program); (3) complete 3–4 years of engineering work experience and a minimum of 12 months of experience must be in North America; (4) write and pass a professional practice examination on professional practice, ethics, engineering law, and liability; (5) be of good character and reputation; and (6) be proficient in English or French in Quebec (English or French in New Brunswick). Once licensed, as a full member of a provincial or territorial association, engineers may legally use the designation P.Eng. (*ing.* in Quebec) after their names. It is illegal to use the "P.Eng./ing." title without having a license and being a member of the provincial/territorial association. As of the year 2000, approximately 157,000 engineers were licensed, representing 60 % of the 262,000 persons age 21 and older who had at least a Bachelor degree and gave engineering as their major field of study in the 1996 census (Schwanen 2000).

As an umbrella association linking the provincial licensing bodies, Engineers Canada (formerly the Canadian Council of Professional Engineers) assesses the equivalency of the accreditation systems used outside Canada, and it monitors mutual recognition international agreements affecting accredited programs in the United States, the United Kingdom, Ireland, France, Australia, New Zealand, South Africa, and Hong Kong. Until March 31, 2003, Engineers Canada operated "The Initial Assessment Program," developed in conjunction with CIC. To assess the engineering qualifications of people applying for permanent residence in Canada who intended to work as engineers. The purpose of this assessment was to evaluate the likelihood of acceptance into the examination program by a provincial or territorial engineering association. A site visit in 2001 to the question and answer section on the Initial Assessment web-based documentation found several conditions under which an individual should not proceed with the initial assessment application. These conditions included: absence of a bachelor's degree in engineering from a university; the applicant is a computer programmer, architect, scientist, or an agronomist; the applicant has a degree from the Philippines (see Boyd and Thomas 2002). The latter stipulation reflects a Canadian licensing requirement of 16 years or more of schooling which exceeds the norm in the Philippines (personal conversation, CCPE staff, Ottawa, June 6, 2001).

Currently, Engineers Canada operates the Engineering International-Education Assessment Program (EIEAP), which assesses the educational qualifications of individuals who were educated and trained outside of Canada by comparing their education to a Canadian engineering education. The 2008–2009 assessment form emphasized that in order to be licensed as a professional engineer in Canada, a foreign trained person must formally apply to the appropriate engineering licensing body, pay the required fees, and meet all of its admission requirements, including:

- successful completion of technical examinations;
- demonstration of 4 years of acceptable engineering experience, including 1 year in a Canadian Environment; and
- completion of the Professional Practice (Law and Ethics) examination, and provision of satisfactory references from professional engineers.

As the preceding discussion indicates, a complex set of factors determine who is likely to work in engineering in Canada, with the result that variations should exist among the internationally educated by period of arrival and place of birth. Since time is required to complete examinations and undertake any required new training, persons who have recently arrived should be less likely to be employed in occupations that are consistent with their fields of study. As well, persons arriving in Canada in the 1990s face a different, and less favorable, labor market than earlier arriving cohorts, and this may dampen the match between credentials and occupational locations (Picot and Sweetman 2005).

Pronounced birthplace differences in the experiences of the internationally educated also would appear likely for several reasons. First, in keeping with previous studies (Boyd 2001; Boyd and Thomas 2001, 2002), little difference should exist in the labor market experiences of the Canadian born and those who immigrated as children, regardless of country of birth since these two populations have received their professional education from Canadian institutions. Second, among those who received their engineering education outside Canada (defined as those immigrating after age 27), those who are from the U.S.A., the U.K., North and West European countries, and from countries with Canadian international agreements should be more likely to be in occupations commensurate with their fields of study than are those born elsewhere. One reason for this expected pattern might be the greater familiarity of these groups with English and/or French, a fact that would enhance their potential productivity for would be employers and would facilitate re-accreditation where required. A second reason is that the Engineers Canada has mutual agreements with the U.S., the U.K., France, Australia, New Zealand, and Hong Kong, thus minimizing the potential barriers associated with accreditation requirements in engineering.

Census data on the occupational profiles and earnings of the foreign born who studied engineering outside Canada show variations by recent arrival and by birthplace that are consistent with the requirements and practices associated with re-accreditation. The foreign born who arrived after age 27 and who are presumed to have received their degrees in engineering fields of study outside of Canada

are the least likely to be employed in engineering occupations when they are recent arrivals, and when they come from regions where mutual agreements with Engineers Canada do not exist.

*Licensing Physicians*: Persons who seek to practice as physicians in Canada also must be licensed by regulatory bodies found in provinces. For those who are internationally educated, basic medical knowledge must be evaluated before being considered for licensure. In most cases this means that persons with foreign training in medicine must pass the Medical Council of Canada's Evaluating Examination (MCCEE). This examination evaluates general medical knowledge compared to that of graduates of Canadian medical schools by testing the understanding of the principal fields of medicine—including internal medicine, obstetrics and gynecology, pediatrics, psychiatry, preventive medicine and community health, and surgery. The examination given in English and in French and it is held four times a year, in various centers in Canada and abroad. Candidates are eligible to write it only if they hold medical degrees that are listed with the World Health Organization or the International Medical Education Directory.

Passing the MCCEE examination does not automatically mean that persons who are educated in medicine outside of Canada are eligible for licenses to practice medicine. In most provinces, graduates of foreign medical schools are required to have 2–6 years of postgraduate medical training at a Canadian university and must pass the appropriate certification examinations of the College of Family Physicians of Canada or the Royal College of Physicians and Surgeons of Canada. Some provinces and territories have a form of licensure for underserviced areas.

A prevalent concern is that the internationally educated who have studied medicine face barriers in becoming licensed, in part because of the small number of residencies available to them. The Canadian Resident Matching Service (CaRMS) matches prospective physicians to a training program. However, not all medical schools participating in the matching service accept graduates of foreign medical schools into their postgraduate medical training programs. Applications from graduates of medical schools outside of Canada are processed according to the policies established by each institution. Overall, numbers are small for the period under study in this chapter. For the years 1996–1999, the number of international medical graduates (IMG) accepted in the second iteration of the resident match ranged from 11–35. Numbers rose thereafter, but in 2005 only 80 matches were made, involving IMG placements in Canadian medical schools. This represented 13 % of the total number of foreign trained applicants who applied to the 2005 CaRMS, and this rate is in general higher than observed in the early 1990s (CaRMS 2005). In 2006 and 2007, placements in the second iteration rose to 111 then fell to 69 foreign trained doctors respectively. However, following a motion agreed upon by the Association of Faculties of Medicine in Canada (AFMC), international medical graduates who meet the eligibility criteria are now permitted to apply to the first iteration in six out of eight provinces (CaRMS 2010).

That the accreditation of the foreign trained who have studied medicine is lower than the actual pool of the internationally educated is also supported with 2001

census data. As was true for the internationally educated who studied engineering, groups differ dramatically in the propensity to hold medical occupations. Nine out of ten of the Canadian born and those arriving as children who studied medicine are employed as physicians. In contrast slightly more than half of those who are internationally educated and immigrated as adults work as doctors; one-third are employed in occupations that are unrelated to fields of medicine or health more generally (Fig. 9.4). These foreign trained permanent residents also are less likely to be physicians if they are recent arrivals or if they are born in regions such as Eastern Europe, South Asian, Southeast Asia, and East Asia.

## Conclusion

The collision of migration policies with domestic requirements of professional accreditation creates a paradox: while recruited on the basis of their potential professional contributions, migrants often face re-accreditation requirements that act as barriers to the full utilization of their skills. The data-based conclusion of this chapter is that individuals who train outside Canada as medical doctors or as engineers pay a higher price compared to those who received Canadian training. Foreign trained doctors and engineers are less likely to be employed in occupations that correspond to their training; they earn less; and part of their lower earnings reflects the mismatch between their training and the occupations where they work. These patterns are accentuated for persons who have recently immigrated to Canada and for those who are from areas such as Eastern Europe and Asia.

Yet if nations are formulating migration policies to favor the migration of professionals, they are not wholly insensitive to the paradoxes that may result. Among the various initiatives existing worldwide are those in which individual applications are reviewed by licensing boards before the decision for admission is taken (Australia) or where governments and associations are working in collaboration to remove unnecessary barriers.

So far, Canada has followed the latter path. Developments during the past two decades include: (1) the creation of several provincial task forces on the recognition of credentials obtained outside of Canada (Ontario 1989); (2) the generation of reports by policy institutes and federal government departments on the under-recognition of foreign credentials (Becklumb and Elgersma 2008; Mata 1992, 1999; McDade 1988; Wright and McDade 1992); (3) the establishment in 1992 of a federal interdepartmental group on the topic; (4) funding commitments in the 2003 Speech from the Throne on barriers to the effective use of skilled immigrant labor; (5) on April 25, 2005, the announcement of a federally funded *Internationally Trained Work Initiative* as well as a federal Foreign Credential Recognition (FCR) Program, housed in the federal department of Human Resources and Social Development Canada. Most recently, in 2010, a new Pan-Canadian Framework for the Assessment and Recognition of Foreign Qualifications was adopted, involving the federal and provincial governments,

with the goals of speeding up the assessment and recognition of foreign credentials (Canada 2009).

Under the FCR Program announced in April 2005, the Canadian federal government stated that it would provide funding for two projects that are explicitly targeted at those with engineering training. The Canadian Council of Professional Engineers would receive approximately $181,000 to "conduct research in order to develop a database of foreign institutions offering degrees in engineering." The Canadian Foundation for Economic Education (CFEE) would receive $468,000 to "help Canada's engineering regulated profession reach newcomers with relevant information related to credential assessment and recognition in Canada; help newcomers obtain credential assessment recognition and required upgrading to work in the engineering field in Canada; and to help employers verify and assess the credentials of newcomers to Canada" (Canada 2005).

Under the Internationally Trained Worker Initiative, an additional $75 million was to be provided over 5 years to assist in the assessment and integration into the workforce of up to 1,000 physicians, 800 nurses, and 500 other regulated health care professionals. The numbers were to vary, however, according to the priorities of provincial and territorial governments. The funding was to be applied to the following projects: (a) the launch of a national website to help international medical graduates prepare to become licensed to practice in Canada; (b) a National Credential Verification Agency to be established by the Medical Council of Canada to provide a streamlined process for verifying the credentials of international medical graduates (Health Canada 2005).

In the May 2007 announcement, the federal government once again emphasized the initiatives targeted at foreign trained engineers and physicians. Over $500,000 was allocated to Engineers Canada to develop a database of foreign engineering degree programs that will be used by provincial regulatory bodies in their assessment of international engineering graduates thus building on the earlier initiative announced in April 2005. As well, the press release noted that $3.6 million had gone to the Medical Council of Canada to develop improved processes that will help integrate internationally trained physicians into the Canadian labor market. The projects included the development of an online self-examination to allow applicants to assess their level of medical knowledge and determine their readiness to take the other examinations leading to licensure, as well as support for Medical Council of Canada to increase the frequency of the Evaluation Examination (Citizenship and Immigration Canada 2007).

These federal initiatives are organizational in scope since professional associations—not governments—license professionals including those who have studied engineering and medicine. The future impacts of these initiatives remain to be determined. However, it is worth noting that these developments are motivated by a number of concerns, including that barriers to the use of internationally obtained credentials hamper an adequate delivery of professional services, the rational utilization of human resources, and the equitable participation of all individuals, including the foreign born, in Canadian society (Mata 1992, p. 2; also see Chapman and Iredale 1993; Mata 1999). Clearly, the reconciliation of a Canadian

federal immigration policy that actively recruits professionally trained labor with provincial labor related policies that include professional accreditation requirements remains an over-arching challenge in Canada today.

## Appendix A: Data Sources and Methodologies

In order to determine the occupational profiles of internationally trained engineers and physicians, 2001 Census data, housed in the Research Data Centres (RDC) are analyzed. This database contains responses to the "2B long form" which collected detailed demographic and socio-economic information from approximately 1 in 5 households in Canada (Statistics Canada 2001). In order to limit the effects of both student enrolment associated with lengthy training and later retirements, the population of interest consists of those individuals who were age 32–54 at the time of the Census (May 2001), and living in private households. The age parameters are chosen because the period between age 32 and 54 is the core of the productive life for most people, and excludes variation associated with school completion and selective early retirement. In addition, persons who were attending school during the 8 months preceding the census are excluded from the analysis as are those persons who are in Canada on a temporary basis (students, refugee claimants, and those on work permits) for whom year of arrival are not available. It should be noted that at well under 5 %, temporary, or non-permanent residents, represented a fraction of the foreign born population at the time of the 2001 census percent

Using information on country of birth, age at immigration, and year of immigration, categories were developed that corresponded to degrees obtained within and outside Canada. These "proximate" measures are used because at the time of analyzing the available 2001 census data, no census information existed on where the highest degree was obtained; only in the 2006 census were persons asked to report the place of their highest degree. However, this database was not available for analysis when this chapter was written. Following procedures used in previous studies (Boyd 2001; Boyd and Schellenberg 2007; Boyd and Thomas 2001, 2002), individuals are grouped into one of three mutually exclusive categories: (1) those born in Canada; (2) those foreign born who immigrated before 19 years of age; and (3) those foreign born who immigrated here when they were 28 years of age or older. Individuals in the first two groups are assumed to have received their highest degree in Canada. Those in the second group by and large immigrated as children; they account for 11.5 % of the study population of physicians and 9.5 % of the study population for engineers. Those in the third group are assumed to have received highest degrees elsewhere. Also, very recent arrivals in the third category are excluded. Since the census enumerates all residents in Canada, some immigrants may have resided in Canada for a very short period of time—possibly only a few months—leaving them with little time to take the steps needed to enter medical or engineering professions. To remove the initial dislocating effects of migration, the sample is limited to immigrants (permanent residents)

who arrived in Canada when they were 28 years of age or older *and* who arrived in Canada before 1997. Consequently, these individuals had been in Canada for at least 4 years by December 2000. This procedure of removing recent arrivals also removes problems associated with analyzing earnings for recently arrived foreign born workers. In the census, 2000 earnings in Canada are prorated for those arriving in 2000; they are not applicable and coded as zero in the census for those arriving in 2001. In addition, the analysis excludes persons who indicated that they were attending school in the 12 months preceding the census, and who therefore might be working only part time or part year.

Three criteria are used to identify individuals trained as engineers or as medical doctors. First, respondents to the census who had completed a post-secondary qualification were asked: "What was the major field of study or training of this person's **highest** degree, certificate or diploma (**excluding** secondary or high school graduation certificates)?" (bold print appears on the questionnaire). This question on major field of study permits identifying those who underwent training in engineering fields. Those who cited any one of 21 engineering fields of study or any one of 20 medical-related fields were identified. Second, respondents to the census were also asked about the highest level of schooling and the numbers of years spent in post-secondary and university study. Persons trained as engineers were defined from these first two criteria—they had to have completed 4 or more years of university, received bachelors degrees or higher (3 years in Quebec), and studied engineering (one of the 21 fields) for their highest degrees. Third, a census question on certificates, diplomas or degrees permitted individuals to indicate they had completed "A degree in medicine, dentistry, veterinary medicine or optometry." Persons trained as medical doctors were thus identified as those whose highest degree was in the study in the field of medicine, who indicated completion of a medical degree, and who had completed at least 6 years of university (5 years in Quebec).

These criteria for inclusion in this study, particularly years of university education, describe minimal current expectations and protocols in Canada for professional training in medicine and engineering, ones that are applied to new labor market entrants that are both Canadian and foreign born. The internationally educated population selected thus permits a conservative test of what happens to foreign trained professionals since I omit from analysis those who have fewer years of schooling by Canadian standards, and thus who might experience additional difficulty in having credentials recognized.

Multinomial regression analysis and ordinary least squares regression assess the fit between training and labor market insertion of the internationally educated who trained in engineering and in medicine. Multinomial regression analysis (Liao 1994) examines the (logged) likelihood of Canadian employment in engineering and as physicians, for the experienced labor force, defined as those who had one or more jobs (and thus gave their main occupations in the census) in 2000 or 2001. The analysis controls for differences between the three groups of interest in sex composition, age, place of residence, language spoken at home, type of degree and years of university, and subfield of study. Details on the grouping of occupations

are found in Boyd and Schellenberg (2007). Probabilities are calculated from the logits and multiplied by 100 to demonstrate the likely chances out of 100 of individuals in a specific group being employed in the occupations for which they trained.

Ordinary least squares regression assesses annual wage, salary, and self-employment earnings in 2000 for those who worked at least one week (or more) in 2000. Again, the focus is on the three groups of interest (the Canadian born, the foreign born arriving under age 19, and the foreign born arriving after age 28), also controlling for group differences in sex composition, age, place of residence, visible minority status, language spoken at home, type of degree and years of university, and subfield of study. In order to calculate the cumulative impacts of group compositional differences in demographic, educational, and occupational distributions, earnings are coded in dollar amounts rather than being transformed into logged (ln) metric (also see Hodson 1985). Further, because of the interest in assessing the effects of differential access to engineering occupations, the earnings determination model does not include variables such as full or part time work or weeks worked. Although, economists frequently argue that occupations are exogenous to their theoretical modeling of earnings as productivity functions, occupations heavily influence whether or not work is full or part-time, and full year or not. In this analysis, including variables such as full or part-time work or weeks worked thus would mask the direct effect of occupational location on the earnings of those who studied engineering (Alwin and Hauser 1975). In order to demonstrate earnings differences between groups that are attributable to differences in characteristics and to differences in occupational location, stepwise dummy variable regression is performed. Coefficients are transformed into deviations around the mean and then into actual "expected" dollar amounts using multiple classification analysis (Andrews et al. 1967). Then a decomposition method is used to illustrate the increments or decrements in earnings that groups experience as a result of their characteristics and occupational location. This technique is initially discussed in Featherman and Hauser (1978); it is a variation of the technique that decomposes total effects into indirect and direct effects.

Only summary tables of the multivariate techniques are presented in this chapter. Tables that contain logits from the multinomial regression analysis and regression coefficients from ordinary least squares regression of earnings are available from the author upon request until January 1, 2014. Because the analysis includes the Canadian born, the analyses do not simultaneously include place of birth and period of arrival; instead two separate multinomial regressions and ordinary least square regressions are produced; one includes region of birth but not period of arrival and the second includes period of arrival but not region of birth. Analysis of only the foreign born population was conducted in which region of birth and period of arrival were included in the same regressions. The results are not presented in this paper, but they showed that the general patterns regarding occupational location and earnings persist; these findings indicate that the occupational and earning gaps found in this chapter are not explained by the omission of duration or region of birth in the analytical models.

## Appendix B: Demographic and Socio-Economic Characteristics

**Table B1** Descriptive statistics of engineering graduates reporting an occupation in 2000 and ages 32–54, by immigration status, 2001 census Canada

| | Canadian born | Foreign born, immigrated age 0–18 | Foreign born, immigrated age 28+ | Total |
|---|---|---|---|---|
| Estimated total population counts | 76,585 | 11,465 | 32,395 | 120,445 |
| *Immigration year and places of birth* | | | | |
| Canadian born | 100 | | | 64 |
| Immigrated aged 0–18 | | 100 | | 10 |
| Immigrated aged 28+, before 1980 | | | 4 | 1 |
| Immigrated aged 28+, 1980–1985 | | | 12 | 3 |
| Immigrated aged 28+, 1986–1990 | | | 24 | 6 |
| Immigrated aged 28+, 1991–1996 | | | 61 | 16 |
| North America, West Europe, Oceania, Other | | 45 | 14 | 8 |
| Caribbean, Central and South America | | 7 | 5 | 2 |
| Eastern Europe | | 5 | 29 | 8 |
| Africa | | 6 | 8 | 3 |
| South Asia | | 5 | 8 | 3 |
| Southeast Asia | | 8 | 11 | 4 |
| East Asia | | 18 | 16 | 6 |
| West Asia | | 5 | 9 | 3 |
| *Sex* | | | | |
| Men | 92 | 91 | 84 | 90 |
| Women | 8 | 9 | 16 | 10 |
| *Age* | | | | |
| 32–39 | 42 | 46 | 23 | 37 |
| 40–49 | 43 | 36 | 54 | 45 |
| 50–54 | 15 | 18 | 23 | 17 |
| Average | 42 | 42 | 44 | 42 |

(continued)

**Table B1** (continued)

| | Canadian born | Foreign born, immigrated age 0–18 | Foreign born, immigrated age 28+ | Total |
|---|---|---|---|---|
| *Place of residence* | | | | |
| Montreal | 18 | 14 | 11 | 16 |
| Toronto | 14 | 34 | 45 | 24 |
| Vancouver | 6 | 10 | 13 | 8 |
| Other CMAs | 43 | 33 | 27 | 38 |
| Non-CMA | 20 | 8 | 4 | 14 |
| *Region of residence* | | | | |
| Atlantic/territories | 7 | 3 | 1 | 5 |
| Quebec | 31 | 16 | 12 | 24 |
| Ontario | 36 | 56 | 61 | 44 |
| Man/sask | 4 | 2 | 2 | 3 |
| Alberta | 14 | 12 | 9 | 13 |
| BC | 9 | 12 | 15 | 11 |
| *Visible minority status* | | | | |
| No | 98 | 57 | 48 | 80 |
| Yes | 2 | 43 | 52 | 20 |
| Home language | | | | |
| English and/or French | 99 | 82 | 32 | 79 |
| Other language | 1 | 18 | 68 | 21 |
| *Years of universities* | | | | |
| 3 | 3 | 2 | | 2 |
| 4 | 50 | 51 | 29 | 44 |
| 5 | 22 | 22 | 41 | 27 |
| 6 | 12 | 12 | 12 | 12 |
| 7 | 6 | 5 | 5 | 6 |
| 8 | 3 | 3 | 3 | 3 |

(continued)

**Table B1** (continued)

| | Canadian born | Foreign born, immigrated age 0–18 | Foreign born, immigrated age 28+ | Total |
|---|---|---|---|---|
| 9 | 1 | 1 | 2 | 1 |
| 9 or more years | 3 | 4 | 8 | 5 |
| Average years of university | 5 | 5 | 5 | 5 |
| *Occupations* | | | | |
| Management | 28 | 28 | 17 | 25 |
| Technical | 11 | 17 | 21 | 14 |
| Other | 19 | 19 | 35 | 24 |
| Engineers | 41 | 36 | 26 | 37 |
| *Highest level of education* | | | | |
| BA Only | 77 | 75 | 49 | 69 |
| BA with certificate | 5 | 5 | 12 | 7 |
| Masters | 15 | 15 | 29 | 19 |
| PhD | 3 | 4 | 9 | 5 |
| *Field of study* | | | | |
| Chemical engineering | 7 | 7 | 6 | 7 |
| Civil engineering | 18 | 13 | 19 | 18 |
| Electrical engineering | 19 | 22 | 24 | 21 |
| Mechanical engineering | 17 | 16 | 21 | 18 |
| Engineering NEC | 25 | 30 | 18 | 23 |
| Other engineering | 13 | 12 | 12 | 13 |
| Annual self-employment and wage earnings[a] | 86,561 | 81,112 | 52,664 | 76,925 |
| Weekly self-employment and wage earnings[a] | 1,757 | 1,706 | 1,133 | 1,585 |

[a]For persons working at least one week or more in 2000.A113

**Table B2** Descriptive statistics of medical graduates reporting an occupation in 2000 and ages 32–54, by immigration status, 2001 census Canada

| | Canadian born | Foreign born, Immigrated age 0–18 | Foreign born, Immigrated age 28+ | Total |
|---|---|---|---|---|
| Estimated total population counts | 24,245 | 3,800 | 4,975 | 33,015 |
| *Immigration year and places of birth* | | | | |
| Canadian born | 100 | | | 73 |
| Immigrated aged 0–18 | | 100 | | 12 |
| Immigrated aged 28+, before 1980 | | | 7 | 1 |
| Immigrated aged 28+, 1980–1985 | | | 20 | 3 |
| Immigrated aged 28+, 1986–1990 | | | 26 | 4 |
| Immigrated aged 28+, 1991–1996 | | | 48 | 7 |
| North America, West Europe, Oceania, Other | | 44 | 22 | 8 |
| Caribbean, Central and South America | | 6 | 6 | 2 |
| Eastern Europe | | 6 | 14 | 3 |
| Africa | | 9 | 22 | 4 |
| South Asia | | 10 | 9 | 2 |
| Southeast Asia | | 6 | 8 | 2 |
| East Asia | | 16 | 13 | 4 |
| West Asia | | 3 | 6 | 1 |
| *Sex* | | | | |
| Men | 65 | 69 | 63 | 65 |
| Women | 35 | 31 | 37 | 35 |
| *Age group* | | | | |
| 32–39 | 32 | 44 | 14 | 30 |
| 40–49 | 50 | 40 | 57 | 50 |
| 50–54 | 18 | 16 | 29 | 19 |
| Average age | 43 | 41 | 46 | 43 |

(continued)

**Table B2** (continued)

| | Canadian born | Foreign born, Immigrated age 0–18 | Foreign born, Immigrated age 28+ | Total |
|---|---|---|---|---|
| *Place of residence* | | | | |
| Montreal | 16 | 10 | 10 | 14 |
| Toronto | 12 | 27 | 29 | 17 |
| Vancouver | 7 | 12 | 10 | 8 |
| Other CMAs | 37 | 38 | 34 | 37 |
| Non-CMA | 28 | 14 | 16 | 24 |
| *Region of residence* | | | | |
| Atlantic/territories | 8 | 5 | 5 | 7 |
| Quebec | 32 | 12 | 13 | 27 |
| Ontario | 32 | 50 | 46 | 36 |
| Man/sask | 6 | 5 | 6 | 6 |
| Alberta | 9 | 11 | 13 | 10 |
| BC | 13 | 16 | 16 | 14 |
| *Visible minority status* | | | | |
| Nonvisible minorities | 97 | 56 | 51 | 85 |
| Visible minorities | 3 | 44 | 49 | 15 |
| *Home language* | | | | |
| Official language | 99 | 91 | 57 | 92 |
| Non-official languages | 1 | 9 | 43 | 8 |
| *Years of university* | | | | |
| 5 | 6 | 2 | | 5 |
| 6 | 13 | 13 | 29 | 15 |
| 7 | 12 | 15 | 20 | 14 |
| 8 | 15 | 17 | 14 | 15 |
| 9 | 11 | 10 | 7 | 10 |

(continued)

**Table B2** (continued)

| | Canadian born | Foreign born, Immigrated age 0–18 | Foreign born, Immigrated age 28+ | Total |
|---|---|---|---|---|
| 10 | 13 | 11 | 11 | 12 |
| 11 | 8 | 10 | 6 | 8 |
| 12 | 9 | 8 | 6 | 8 |
| 13 or more years | 12 | 13 | 7 | 12 |
| Average years of university | 9 | 9 | 8 | 9 |
| *Occupations* | | | | |
| Doctors | 91 | 91 | 60 | 87 |
| Other health occupations | 5 | 4 | 15 | 6 |
| Other occupations | 4 | 6 | 25 | 7 |
| *Specialist or not* | | | | |
| General practice | 82 | 83 | 79 | 82 |
| Specialist | 18 | 17 | 21 | 18 |
| *Highest degree of Education* | | | | |
| Bachelors | 87 | 87 | 75 | 85 |
| Masters | 9 | 9 | 13 | 10 |
| PhD | 3 | 4 | 12 | 5 |

[a]For persons working at least one week or more in 2000

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