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Relative Labour Market Performance of Former International Students: Evidence from the National Graduates Survey

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Le Canada se tourne de plus en plus vers les étudiants étrangers comme source de revenus de frais de scolarité associés aux études postsecondaires et comme source de nouveaux immigrants. Les auteurs comparent la performance des anciens étudiants étrangers sur le marché du travail au cours de la première décennie des années 2000 à celle de leurs homologues nés et scolarisés au Canada et nés et scolarisés à l'étranger. Ils constatent qu'au chapitre de la performance, les anciens étudiants étrangers surclassent de loin les étudiants immigrants nés et scolarisés à l'étranger, mais que leur performance est inférieure à celle des étudiants nés et scolarisés au Canada diplômés de programmes postsecondaires similaires. Leurs observations révèlent également une détérioration de la performance des anciens étudiants étrangers par rapport aux deux autres groupes de référence. Selon eux, l'explication la plus plausible de cette détérioration est un compromis au chapitre de la qualité, l'offre d'étudiants internationaux n'ayant pas suivi le rythme de la croissance de la demande.

Mots clés : étudiants étrangers, intégration sur le marché du travail, politique de sélection des immigrants

Canada is increasingly looking to international students as a source of post-secondary tuition revenues and new immigrants. We compare the labour market performance of former international students (FISs) through the first decade of the 2000s with that of their Canadian-born and -educated (CBE) and foreign-born and -educated (FBE) counterparts. We find that FISs outperform FBE immigrants by a substantial margin but underperform CBE graduates from similar post-secondary programs. We also find evidence of a deterioration in FIS outcomes relative to both comparison groups. We argue that this deterioration is most consistent with a quality trade-off because the supply of international students has not kept pace with the growth in demand.

Keywords: international students, labour market integration, immigrant selection policy

Introduction

In January 2015, Canada introduced a new system for processing economic-class immigrants in response to a growing application backlog. Rather than process applications on a first-in, first-out basis, the new Express Entry (EE) system gives priority to candidates deemed most likely to succeed economically. Within months of its introduction, the EE system was criticized for being unfairly biased against international students, because the criteria used to rank candidates gave no preference to candidates with Canadian educational credentials. Instead, the system prioritized candidates with arranged employment, regardless of their educational backgrounds. In response to growing concerns that foreign students were being bypassed in the applicant pool, the government revised the EE system in November 2016, stating that it sought to increase its reliance on international students as a source of new immigrants.

Arguably, the biggest proponents of the government's objective to ease the transition to permanent residency for international students, besides foreign students themselves, are Canada's post-secondary institutions. Following significant cuts to provincial funding through the 1990s, universities and colleges were forced to increase their reliance on tuition revenues. This provided a solution while enrolments were increasing, but recent demographic shifts are resulting in a decline in the university-aged population. Post-secondary institutions are responding by looking to the tuition fees of foreign students to balance their budgets; unlike domestic fees,

foreign fees are not capped by provincial governments.[1] Critical to foreign student recruitment are immigration policies that promise international students a pathway to Canadian permanent residency. In this regard, recent changes in immigration policy are highly complementary to the efforts of post-secondary institutions.

In theory, the government's preference for international students is well justified. Canadian-educated immigrants are less likely to experience credential recognition issues. The skills they have acquired are more likely to be relevant to the Canadian workplace. Their time spent studying in Canada should help them to acculturate more easily to Canadian society. This process of acculturation includes acquiring superior English and French skills, as well social networks that may be critical in a job search after graduation. Canadian education may also provide opportunities to gain Canadian work experience, for example through cooperative education, which may be advantageous in finding a good job after graduation. In justifying his intention to revise the EE System, former Minister of Immigration John McCallum argued, "International students are the best source of immigrants, in the sense that they're educated, they're young, they speak English or French, and they know something of the country. So we should be doing everything we can do to court them" (Zilio and Chiose 2016).

Notwithstanding the conventional wisdom, the Canadian evidence on the labour market performance of former international students (FISs) is mixed. Studies estimating separate labour market returns to foreign and Canadian sources of education have consistently found little to no evidence that immigrants' foreign credentials are discounted relative to their Canadian credentials (Bonikowska, Hou, and Picot 2015; Ferrer and Riddell 2008; Skuterud and Su 2012).[2] Sweetman and Warman (2014) compare weekly and hourly earnings of FISs who immigrated to Canada as principal applicants under the government's Federal Skilled Worker program with those of other immigrants who entered under this program and find some evidence of higher earnings among FISs 4 years after landing. Finally, Hou and Lu (2017) use a linkage of administrative immigration and tax data to compare the annual earnings of two cohorts (early 1990s and mid-2000s) of university-educated FISs to both foreign-born and -educated (FBE) immigrants and Canadian-born and -educated (CBE) university graduates who entered the labour market at similar times. In contrast to much of the existing evidence, they find significantly higher average earnings among FISs than among FBE immigrants, both in the short run and 10 years after arrival. However, this earnings advantage is small in comparison to the gap relative to the CBE comparison group.

In this article, we exploit data from the Canadian National Graduates Survey (NGS), which samples graduates of post-secondary programs and identifies whether

respondents were enrolled as international students during their studies. Using the 2002, 2005, 2007, and 2013 waves, we compare the labour market performance of three graduating cohorts (2000, 2005, and 2009–2010) of FISs who have transitioned to permanent residency with that of their CBE counterparts graduating at the same time with similar credentials in similar fields of study. In addition, using data from the Labour Force Survey (LFS), we extract a sample of FBE immigrants whose landing years in Canada correspond with the graduating years of the FISs in our NGS sample and compare labour market outcomes among similarly educated FISs and FBE immigrants from similar regions of the world.

The contribution of our analysis is threefold. First, in comparing FISs and FBE immigrants, we obtain evidence on whether using the Canadian post-secondary education system to screen immigrants leads to better labour market outcomes than screening immigrants on their educational credentials, regardless of their source. This evidence directly informs whether giving preference to Canadian-educated applicants in the EE system is optimal. Second, in comparing FISs with CBE individuals graduating from similar academic programs, we obtain evidence on the challenges FISs experience, thereby informing immigrant settlement policies. Of particular importance are (a) job search frictions, because FISs are likely to have weaker social networks; (b) discrimination in recruitment by Canadian employers against FISs with foreign names (Oreopoulos 2011); and (c) English–French language difficulties, which may present communication challenges in the job search process and in the workplace. However, note that in comparing FISs with CBE individuals from the same academic programs, credential recognition issues, emphasized in much of the current literature, cannot be a contributing factor.

Finally, with three cohorts of FISs spanning the first decade of the 2000s, we obtain evidence on whether there has been any deterioration in the labour market performance of FISs as post-secondary institutions and governments have reached deeper into foreign student pools to meet their student and immigration demands. As Canada moves to increase its reliance on international students, monitoring the relative labour market performance of FISs is critical.[3] Because FBE immigrants from common-origin countries are likely to be similarly affected by weak social networks, discrimination, and language difficulties, evidence that the labour market outcomes of FISs are declining relative to both comparison groups is arguably most consistent with a trade-off in the average labour market quality of FISs as their share of post-secondary graduates and immigrants has increased.

Consistent with the findings of Hou and Lu (2017), we find that FISs outperform FBE immigrants by a substantial margin, but lag their CBE counterparts. This is true for men and women and over a wide range of labour market

outcomes. However, the FIS gaps we identify relative to the CBE comparison group are modest. In fact, we find essentially no shortfall in the average earnings of male FISs and CBE post-secondary graduates and only small gaps for women when we do not condition on education level and field of study. However, when we compare FISs and CBE graduates from similar academic programs, the gaps become larger and tend to be largest for women with college diplomas, in fields outside of math and computer science, among Chinese men and South Asian women, and at the lower end of the earnings distribution than at the top. Moreover, we find some evidence, particularly among women, that the relative performance of FISs has tended to deteriorate over time relative to both the FBE and the CBE comparison groups.

The remainder of the article is organized as follows. In the following section, we examine recent changes in the international student share of Canadian post-secondary graduates and new immigrants. The following two sections describe the NGS and LFS data and the methodology we use to examine the relative labour market performance of FISs. The fourth section examines the results, and the concluding section summarizes our main findings and discusses their implications for foreign student selection and settlement policies of post-secondary institutions and governments.

International Student Shares of Graduates and Immigrants

According to data from Statistics Canada's Post-Secondary Information System (PSIS), the international student share of post-secondary student enrolments and graduates increased steadily from about 3 percent in 1999 to slightly more than 10 percent by 2014.[4] In Figure 1, we plot the international student shares of graduates separately for universities and colleges and by gender. The data reveal a shift toward foreign student enrolments in both colleges and universities. Although universities relied more on foreign students than did colleges throughout the period, recent years have seen a larger shift in colleges. Among male college students, the increase has been particularly dramatic, doubling from 6 percent to 12 percent between 2010 and 2014. As post-secondary institutions reach deeper into the foreign student applicant pools, the question is whether there has been any trade-off in the average quality of graduating foreign students. Of course, to the extent that pools of applicants have been similarly growing through the student recruitment efforts of post-secondary institutions and immigration policy changes luring students with ambitions to settle permanently in Canada, it is possible that quality has been maintained.
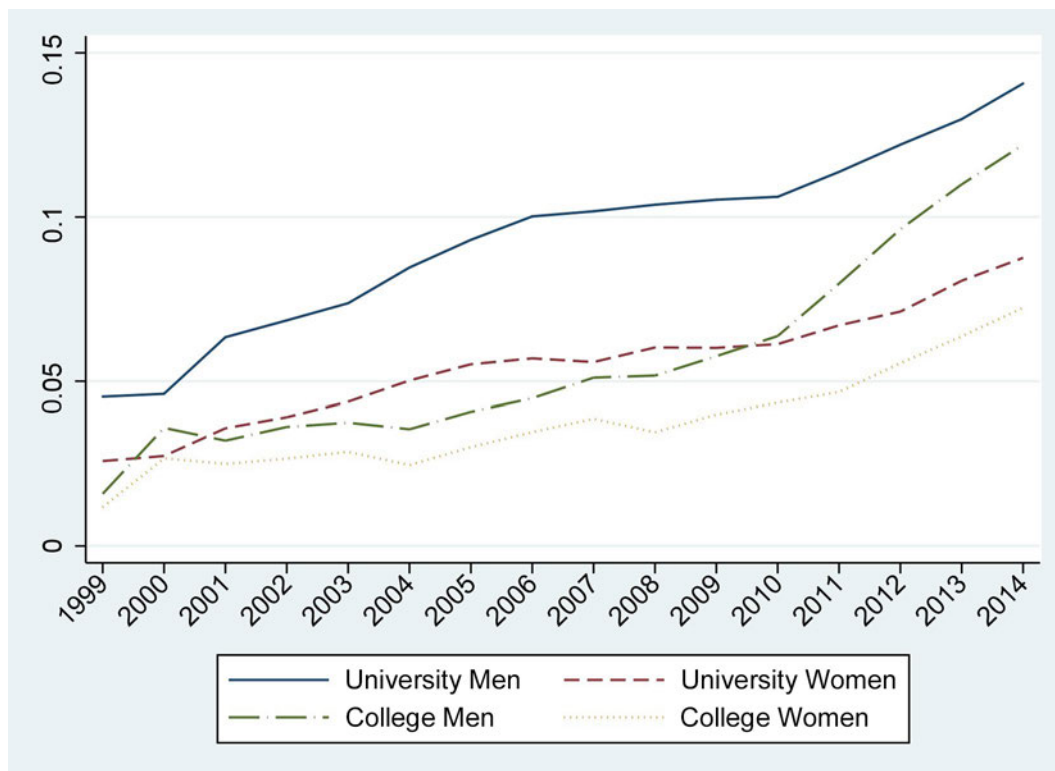

Figure 1: International Student Share of Post-Secondary Graduates by Gender and Education Level, 1999–2014

Source: Postsecondary Information System, CANSIM Tables 477–0031 and 477–0032.
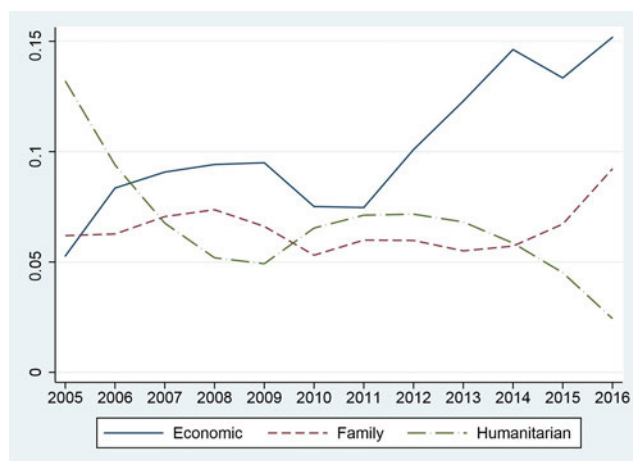
Figure 2: Former International Students' Share of New Permanent Residents by Broad Immigration Category, 2000–2016

Source: Immigration, Refugees, and Citizenship Canada; available on the Open Government Data Portal as "Admissions of Permanent Residents who have ever held a Study Permit by Intended Province/Territory of Destination and Immigration Category, 2005-October 2016."

In Figure 2, we use administrative data from Immigration, Refugees, and Citizenship Canada to plot the share of new permanent residents who had any point in the past held a study visa in Canada by broad immigration category. The FIS share of new permanent residents was stagnant at 6–7 percent between 2005 and 2010, but has been increasing steadily since, so that by 2016, 11 percent of all new immigrants were FISs. This increase appears to be entirely driven by economic class immigration because the FIS share of humanitarian immigration decreased over the period to below 5 percent, and the FIS share of family class immigration was relatively stable at between 6 percent and 9 percent. By 2016, 15 percent of economic class immigrants were FISs, which was twice as large as the FIS share 5 years earlier. This increase is entirely consistent with shifts in immigrant selection policy favouring FISs.

In Figure 3, we examine this increase further by considering through which economic class programs FISs are entering. The data reveal an important shift since 2005 away from the Federal Skilled Worker program toward both the Canadian Experience Class (CEC) and Provincial Nominee Programs (PNPs) so that by 2016, each of these three programs accounted for roughly one-third of FIS immigration (within the economic class stream). There is good reason to believe that the major immigration hurdle for FISs is satisfying Canadian work experience requirements. The challenge reflects, at least in part, employers' hesitancy to recruit workers with a precarious immigration status. In this respect, the Ontario and British Columbia PNPs are particularly attractive to international students because both waive the job offer requirement for those with a master's or doctoral degree

(although British Columbia requires the graduate degree be in a science, technology, engineering, or math field). According to our NGS data (described in the following section), roughly one-half of foreign students who graduated in 2010 and subsequently transitioned to permanent residency held graduate degrees. More generally, the PNP and CEC programs are attractive because the selection criteria are simplified, thereby reducing application costs and processing times. For example, both programs remove the requirement for an adaptability assessment by an immigration officer.

The increasing FIS share of immigration may not only reflect the increase in foreign students graduating from Canadian post-secondary institutions but could also reflect an increase in the probability that they transition to permanent residency. Certainly, as PNPs and the CEC program ease the transition to permanent residency, we would expect FIS transition rates to permanent residency to increase. In addition to the PNPs and CEC program, the federal government has since 2003 gradually increased the length of time that foreign students are permitted to remain in Canada after graduation, enabling them to acquire Canadian work experience. As of April 2008, the Post-Graduation Work Program provides open work permits for up to 3 years to all international students graduating from a recognized Canadian post-secondary institution,
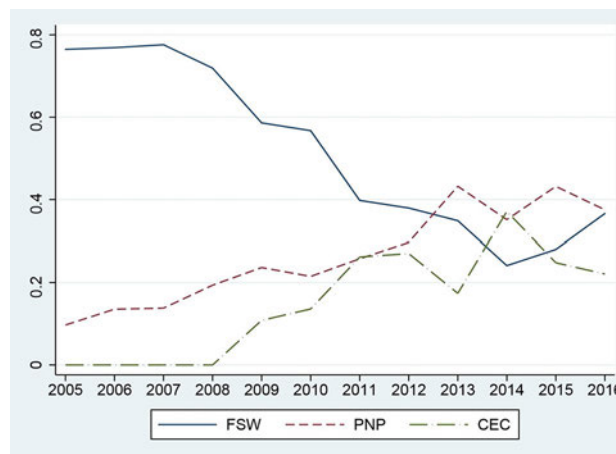
Figure 3: Economic Class Immigration Programs of FISs, 2005–2016

Notes: Shares do not sum to 1. A decreasing share (14% in 2005 to 4% in 2016) entered through other economic class programs, including business class programs, such as the investor program. CEC = Canadian Experience Class Program; FIS = former international students; FSW = Federal Skilled Worker program; PNP = Provincial Nominee Programs.

Source: Immigration, Refugees, and Citizenship Canada. Available on the Open Government Data Portal as "Admissions of Permanent Residents who have ever held a Study Permit by Intended Province/Territory of Destination and Immigration Category, 2005-October 2016."

with no restrictions on the type of employment obtained. Although the impact of extending the duration of permits on the labour market earnings of international students is theoretically ambiguous, the Post-Graduation Work Program should unambiguously increase the likelihood of transitions to permanent residency.[5]

To obtain evidence on the permanent residency transition rates of international students, Lu and Hou (2015) examine administrative immigration data linking temporary visas and permanent landing records. The results of their analysis suggest that 27 percent of foreign students who received their first study permit in the early 1990s had transitioned to permanent residency within the following 10 years. This transition rate was, in comparison, 20 percent for international students arriving in the late 1990s and 25 percent in the early 2000s. Combining our data on FIS graduates who were permanent residents at the time of being sampled in the NGS and PSIS data on total international student graduates (reported in Figure 1), we estimate that 44 percent, 25 percent, and 35 percent of the 2000, 2005, and 2010 post-secondary graduation cohorts, respectively, had transitioned to permanent residency by the time they were surveyed. However, although the 2000 and 2005 cohorts sampled individuals 2 years after graduation, the 2010 cohort sampled individuals 3 years after graduation, which could account for all of the increase for the most recent cohort. Therefore, both our data and those of Lu and Hou (2015) do not suggest that transition rates to permanent residency have been rising, which implies that all of the increase in FIS immigration reflects the large increase in the number of international students graduating from Canadian post-secondary institutions.

Data

The NGS is a nationally representative survey of post-secondary graduates from Canadian public post-secondary institutions. The 2002 and 2005 cycles of the NGS surveyed individuals who graduated in 2000; the 2007 cycle surveyed 2005 graduates; and the 2013 cycle surveyed 2009–2010 graduates. Critical to our analysis is that each of these cycles of the NGS asked all respondents who were not Canadian citizens at the time of registration in their academic program, "Were you ever a visa student (study permit holder) while pursuing post-secondary education in Canada?" To obtain our sample of FISs, we pool these four cycles of the NGS and extract the sample of respondents who answered "yes" to this question and reported being a landed immigrant when surveyed.[6] This provides samples of 1,824 male and 1,147 female FISs, who are observed 2, 3, or 5 years after graduation.

We compare the labour market outcomes of FISs to both CBE graduates and FBE immigrants. To obtain the CBE comparison group, we extracted the sample of individuals in the 2002, 2005, 2007, and 2013 NGS cycles who are Canadian born and finished their highest level of schooling in Canada.

This provides samples of 35,705 male and 51,682 female CBE post-secondary graduates. The NGS does not sample graduates of foreign post-secondary institutions. To obtain a sample of FBE immigrants, we instead rely on the LFS, which since January 2006 has identified not only the country of birth and current immigration status of all respondents, but also the country in which they obtained their highest level of schooling. We pool the LFS data in all months between 2006 and 2013 and extract the sample of individuals who are foreign born but were landed immigrants at the time that they were surveyed and whose highest level of schooling is a post-secondary diploma or degree obtained outside Canada. In addition, we include only FBE individuals who are observed between 17 and 78 months after landing in Canada, to match the range of months since program completion of the FIS and CBE samples. In this way, we are comparing Canadian- and foreign-educated immigrants who entered the Canadian labour market at similar times. Together, these restrictions result in samples of 8,998 male and 10,363 female FBE immigrants.[7]

Our analysis of labour market performance is based on 10 outcome variables: log hourly earnings; binary indicators of employment, unemployment, and part-time jobs (usual weekly hours under 30); occupation type; and two self-reported indicators of whether an individual's job matches his or her educational background in terms of the field and the level of academic program completed. The occupation variable groups occupations into one of four types: non-routine cognitive, routine cognitive, non-routine manual, and routine manual. The approach of distinguishing jobs by whether the tasks performed are primarily cognitive versus manual and routine versus non-routine is from Autor, Katz, and Kearney (2006). They argue that non-routine cognitive jobs experienced the greatest real wage growth through the 1990s, because these jobs are complementary with computerization, whereas jobs with routine tasks tend to be substitutes. In examining this variable, we consider whether FISs are more or less likely to be employed in cognitive non-routine occupations, which include management, professional occupations, and various technical occupations in engineering and computing, as opposed to routine jobs, and whether this has been changing over time.[8]

Table 1 reports the sample means of the variables used in our analysis separately for the FIS, CBE, and FBE samples. The Outcomes rows report the raw means of the 10 labour market outcome variables. The estimates reveal that male and female FISs have mean log hourly earnings that exceed that of FBE immigrants by roughly 30 log points. This is a substantial advantage, which is also evident in higher employment rates, lower unemployment rates, a lower incidence of part-time jobs, higher incidence of being employed in non-routine cognitive jobs, and a higher likelihood that jobs match the educational requirements of jobs in terms of level and field of study. Male FISs also have significantly

Table 1: Sample Means (and Standard Deviations) by Gender and Student Type

	Men			Women		
	FIS	CBE	FBE	FIS	CBE	FBE
Outcomes						
Log hourly earnings (2013$)	3.313 (0.030)	3.187 (0.005)	3.008 (0.008)	3.122 (0.036)	3.110 (0.004)	2.808 (0.007)
Employed	0.841 (0.018)	0.883 (0.003)	0.799 (0.005)	0.775 (0.026)	0.882 (0.003)	0.602 (0.006)
Unemployed	0.062 (0.010)	0.059 (0.002)	0.083 (0.004)	0.103 (0.021)	0.055 (0.002)	0.082 (0.003)
Part-time weekly hours	0.030 (0.004)	0.066 (0.003)	0.069 (0.003)	0.120 (0.022)	0.133 (0.003)	0.131 (0.004)
Non-routine cognitive	0.755 (0.029)	0.622 (0.006)	0.424 (0.007)	0.659 (0.037)	0.674 (0.004)	0.357 (0.007)
Routine cognitive	0.049 (0.013)	0.072 (0.003)	0.113 (0.004)	0.066 (0.019)	0.087 (0.003)	0.205 (0.006)
Non-routine manual	0.137 (0.025)	0.162 (0.005)	0.194 (0.006)	0.271 (0.036)	0.221 (0.004)	0.349 (0.007)
Routine manual	0.059 (0.017)	0.144 (0.004)	0.269 (0.006)	0.010 (0.002)	0.018 (0.001)	0.089 (0.004)
Education–field match	0.614 (0.028)	0.575 (0.006)	—	0.551 (0.036)	0.626 (0.005)	—
Education–level match	0.604 (0.027)	0.703 (0.005)	—	0.640 (0.034)	0.712 (0.004)	—
Controls						
Age	32.984 (0.362)	29.373 (0.066)	38.946 (0.109)	32.336 (0.477)	29.884 (0.060)	37.093 (0.101)
Mo since labour market entry	39.007 (0.612)	37.681 (0.155)	46.190 (0.234)	38.593 (0.860)	37.565 (0.127)	46.044 (0.217)
Unemployment rate at entry	7.045 (0.085)	6.729 (0.020)	6.210 (0.022)	6.211 (0.063)	6.226 (0.008)	5.802 (0.013)
Education level						
Below bachelor's	0.095 (0.021)	0.398 (0.005)	0.217 (0.005)	0.164 (0.027)	0.347 (0.004)	0.280 (0.005)
Bachelor's	0.300 (0.026)	0.439 (0.005)	0.475 (0.007)	0.368 (0.033)	0.487 (0.004)	0.485 (0.006)
Master's	0.426 (0.023)	0.148 (0.003)	0.308 (0.006)[a]	0.384 (0.031)	0.154 (0.003)	0.235 (0.005)[a]
PhD	0.178 (0.011)	0.016 (0.001)		0.084 (0.007)	0.012 (0.001)	
Field of study						
Education	0.021 (0.009)	0.058 (0.002)	—	0.045 (0.012)	0.130 (0.003)	—
Visual and performing arts	0.030 (0.012)	0.047 (0.002)	—	0.030 (0.007)	0.053 (0.002)	—
Humanities	0.027 (0.005)	0.066 (0.002)	—	0.101 (0.027)	0.078 (0.002)	—
Social sciences and law	0.083 (0.014)	0.118 (0.004)	—	0.117 (0.016)	0.186 (0.004)	—
Business	0.232 (0.026)	0.213 (0.005)	—	0.328 (0.035)	0.219 (0.004)	—
Physical and life sciences	0.077 (0.008)	0.055 (0.002)	—	0.073 (0.009)	0.050 (0.001)	—
Math and computer science	0.129 (0.012)	0.068 (0.002)	—	0.086 (0.013)	0.021 (0.001)	—
Engineering	0.324 (0.022)	0.225 (0.004)	—	0.085 (0.012)	0.034 (0.001)	—
Natural resources	0.038 (0.005)	0.033 (0.001)	—	0.024 (0.004)	0.017 (0.001)	—
Health	0.031 (0.007)	0.067 (0.003)	—	0.096 (0.018)	0.186 (0.003)	—
Services	0.008 (0.003)	0.043 (0.002)	—	0.003 (0.001)	0.021 (0.001)	—
Other	0.002 (0.001)	0.005 (0.001)	—	0.012 (0.007)	0.005 (0.001)	—
Region of origin						
South and Central America	0.080 (0.013)	—	0.099 (0.004)	0.099 (0.016)	—	0.096 (0.004)
Northern and Western Europe	0.053 (0.007)	—	0.040 (0.003)	0.080 (0.011)	—	0.032 (0.002)
Eastern Europe	0.027 (0.005)	—	0.090 (0.004)	0.057 (0.015)	—	0.107 (0.004)
Southern Europe	0.027 (0.011)	—	0.015 (0.002)	0.026 (0.007)	—	0.012 (0.001)
Africa	0.248 (0.020)	—	0.126 (0.004)	0.143 (0.027)	—	0.100 (0.004)
West and Central Asia	0.073 (0.010)	—	0.081 (0.004)	0.040 (0.011)	—	0.074 (0.003)
East Asia	0.257 (0.023)	—	0.167 (0.005)	0.358 (0.032)	—	0.189 (0.005)
US, UK, Australia, and NZ	0.039 (0.010)	—	0.039 (0.002)	0.087 (0.024)	—	0.029 (0.002)
Southeast Asia	0.034 (0.012)	—	0.120 (0.004)	0.044 (0.011)	—	0.164 (0.004)
South Asia	0.163 (0.018)	—	0.224 (0.006)	0.066 (0.014)	—	0.196 (0.005)
Sample size	1,824	35,705	8,998	1,147	51,682	10,363

(Continued)

Table 1: (Continued)

Notes: Standard errors are in parentheses. The social science and law field of study includes behavioural studies, such as psychology. The business field includes accounting and public administration. The science field includes physical and life sciences, as well as science technologies–technicians. The engineering field includes architecture and related technologies. The natural resources field includes conservation and agriculture. Finally, the services field of study includes personal, protective, and transportation services. Dashes indicate that those variables were not available in the Labour Force Survey data used to estimate the FBE means. CBE = Canadian born and educated; FBE = foreign born and educated; FIS = former international students.

[a] FBE immigrants have three levels of schooling (below bachelor's, bachelor's, and above bachelor's) rather than four because master's and PhD degrees are not distinguished in the Labour Force Survey data.

Source: National Graduates Survey and Labour Force Survey.

higher mean hourly earnings than CBE men, whereas the average hourly earnings of female FISs and CBE women are almost identical. This pattern is also evident in the occupation types, where male FISs are significantly more likely to have non-routine cognitive jobs, whereas female FISs appear similar to CBE women. The only remaining large difference worth noting is that among women the FIS unemployment rate is significantly higher (10.3 percent) than the CBE (5.5 percent) and FBE (8.2 percent) comparison groups. This is an unexpected result that disappears when we condition on the current year and the unemployment rate in the year of labour market entry.

The Controls rows of Table 1 compare sample means of the set of explanatory variables used to account for the differences in labour market outcomes. First, with regard to the large performance advantage of FISs over FBE immigrants, FISs are more likely to have graduate degrees than FBE immigrants. Specifically, 60 percent of male and 47 percent of female FISs have graduate degrees, compared with 31 percent of male and 24 percent of female FBE immigrants. They are, however, on average also younger and are observed for fewer months since labour market entry. In terms of regions of origin, FISs are more likely to come from Africa and East Asia and less likely to come from Eastern Europe and South Asia. With regard to the comparison with CBE graduates, the education advantage of FISs is even larger. Specifically, 90 percent of male and 84 percent of female FISs have university degrees, compared with 60 percent of male and 65 percent of female CBE post-secondary graduates. FISs are about 3 years older on average than CBE graduates. Finally, they are more likely to have studied mathematics and engineering and less likely to have diplomas and degrees in education, health, and other personal, protective, and transportation services.

Before turning to the estimation of relative labour market outcomes, Table 2 estimates the distribution of graduates across levels of post-secondary education by graduation cohort, as well as the estimated populations of FISs, CBE graduates, and FBE immigrants. Consistent with Figure 1, our population estimates of FISs and CBE individuals in the final column of Table 2 point to a significant increase in

Table 2: Education-Level Distribution by Gender, Student Type, and Graduation Cohort

Cohort	College	Bachelor's	Master's	PhD	Estimated Population
Men					
FIS					
2000	0.034	0.233	0.495	0.238	1,896
2005	0.061	0.329	0.474	0.137	2,700
2010	0.174	0.342	0.348	0.136	5,932
CBE					
2000	0.381	0.423	0.175	0.022	88,119
2005	0.403	0.455	0.131	0.010	95,248
2010	0.395	0.425	0.163	0.017	118,972
FBE					
2000	0.158	0.480	0.362[a]		1,992
2005	0.195	0.480	0.325[a]		21,262
2010	0.245	0.451	0.304[a]		23,702
Women					
FIS					
2000	0.167	0.376	0.361	0.096	1,804
2005	0.210	0.394	0.333	0.063	2,300
2010	0.132	0.363	0.421	0.084	5,075
CBE					
2000	0.341	0.473	0.173	0.013	132,716
2005	0.349	0.511	0.132	0.008	150,364
2010	0.331	0.469	0.183	0.016	182,309
FBE					
2000	0.272	0.457	0.271[a]		2,419
2005	0.267	0.492	0.241[a]		23,616
2010	0.280	0.479	0.241[a]		27,812

Notes: CBE = Canadian born and educated; FBE = foreign born and educated; FIS = former international students.

[a] FBE immigrants have three levels of schooling (below bachelor's, bachelor's, and above bachelor's) rather than four because master's and PhD degrees are not distinguished in the Labour Force Survey data.

Source: National Graduates Survey and Labour Force Survey.

the FIS share of Canadian post-secondary graduates from 1.6 percent in 2000, to 2.0 percent in 2005, to 3.5 percent in 2010. The increase is slightly larger for men (2.1 percent to 4.7 percent) than for women (1.3 percent to 2.7 percent). Table 2 also indicates that the growth in male FISs primarily reflects growth at the college and undergraduate levels; the share of male FISs with graduate degrees decreased from nearly 75 percent in 2000 to less than 50 percent by 2010. This pattern is not evident among the male CBE comparison group or among female FISs, where the growth, which has been roughly equivalent to the male FIS growth, is much more evenly spread across education levels. There is, however, evidence of a shift toward post-secondary diplomas below the university level among FBE male immigrants. Despite these shifts, both male and female FISs continue to be significantly more likely to have graduate degrees than either CBE post-secondary graduates or FBE immigrants. The difference among women is particularly large, as 51 percent of the most recent cohort of FISs have graduate degrees, compared with 20 percent of CBE post-secondary graduates and 24 percent of FBE immigrants with post-secondary educational credentials.

Methods

The primary objective of our regression analysis is to compare the labour market outcomes of FISs with those of CBE graduates and FBE immigrants who are observed at a similar time since labour market entry and are facing similar labour market conditions. However, we are also interested in knowing to what extent differences in outcomes reflect educational backgrounds and regions of origin. We therefore provide two sets of estimates for our analysis: (a) estimates that are unconditional on education level, field of study, and region of origin and (b) estimates that are conditional on these variables.

To make the estimated differences in labour market outcomes as transparent as possible, we begin by first estimating the following regression separately for men and women using only one of the comparison group samples (either CBE or FBE):

$$y_{it} = \beta_0 + \beta_1 age_{it} + \beta_2 age_{it}^2 + \beta_3 mse_{it} \\ + \beta_4 ur_i + y_t{'}\gamma + pr_{it}{'}\delta + x_{it}{'}\theta + \varepsilon_{it}, \tag{1}$$

where the dependent variable y_{it} is 1 of the 10 outcome variables defined earlier for individual i observed in year t; age_{it} is individual i's age in survey year t; mse_{it} is months since labour market entry (where $entry$ is defined as month of program completion for the CBE sample and month of landing for the FBE sample); ur_i is the national-level unemployment rate in individual i's month of labour market entry; pr_{it} is a set of province dummy variables indicating individual i's residence in year t; x_{it} is a vector of dummy variables indicating post-secondary education level, field of study (in the CBE case), and region of origin dummy (in

the FBE case); and ε_{it} is a random error with an expected value of zero and individual-specific variance σ_i^2, which is assumed to be uncorrelated with each of the explanatory variables on the right-hand side of Equation (1).[9] In all cases, the unconditional estimates exclude x_{it}, whereas the conditional estimates include x_{it}.[10]

Having estimated the parameters of Equation (1), we then predict individual-level outcomes for FISs using their observed values of the explanatory variables. The difference between their actual and predicted outcomes, that is $(y_{it} - \hat{y}_{it})$, are "unexplained" in the sense that these differences are unrelated to the set of explanatory variables. Many factors can potentially account for these unexplained differences. For example, we expect the average outcomes of FISs to exceed the average outcomes of observably similar FBE immigrants, because FISs are less likely to face credential recognition issues and have superior English or French language skills, even conditional on region of origin. Therefore, we expect the average unexplained difference $(y_{it} - \hat{y}_{it})$ in the sample of FISs to be positive in the FBE comparison case. However, we expect FISs to have weaker social networks in job search relative to CBE graduates. Consequently, we expect $(y_{it} - \hat{y}_{it})$ to be negative on average for FISs when Equation (1) is estimated using the CBE graduates.

To examine whether there is any evidence of deteriorating labour market outcomes for FISs, we define the variable $time_i$ for FISs as the year of program completion minus 1998 (year of program completion ranges from 1999 to 2010) and then regress $(y_{it} - \hat{y}_{it})$ on $time_i$ and an intercept. A negative coefficient on $time_i$ provides evidence of a deterioration in the average labour market outcomes of FISs relative to either CBE graduates or FBE immigrants, depending on which comparison the predicted outcomes $\hat{y}_{it}$ are based. This relative deterioration is consistent with post-secondary institutions and governments reaching deeper into foreign student pools to raise quantity without a commensurate increase in the supply of foreign students. It is not consistent with broader labour market factors, which adversely affect the labour market outcomes of all immigrants, such as increasing discrimination against applicants with foreign names, because these factors should influence all immigrants, including FBE immigrants from a common region of origin.

We conclude our analysis by extending it in two ways. First, we examine whether the unconditional and conditional unexplained differences in FIS labour market outcomes vary across the education levels, fields of study, and regions of origin of FISs. To do so, we regress the values of $(y_{it} - \hat{y}_{it})$ on x_{it} (and an intercept) separately for male and female FISs. Second, we examine whether the differences in the hourly earnings of FISs tend be larger at the upper or lower ends of the earnings distribution. To do this, we estimate Equation (1) by quantile regressions using the combined sample of FISs and either CBE or FBE individuals, but include a dummy variable indicating FISs.

Results

In Table 3, we report the mean predicted differences in labour market outcomes of FISs, that is the mean values of $(y_{it} - \hat{y}_{it})$, for each of the 10 outcome variables. When we do not condition on education level and field of study, FISs consistently outperform FBE immigrants and have outcomes that are roughly similar to those of CBE graduates. In fact, among men, mean log hourly earnings of FISs are indistinguishable from those of CBE graduates, whereas female FISs lag CBE graduates by 7 log points. Moreover, male FISs are less likely to be employed in part-time jobs, a 3.9 percentage point (ppt) difference. They are also more likely to have non-routine cognitive jobs (6.2 ppt difference). Male FISs are, however, substantially more likely to report being overqualified for their jobs (11.9 ppt difference), as are female FISs (9 ppt difference). Of course, we know from Table 1 that FISs have substantially higher post-secondary educational levels, on average, than FBE immigrants and CBE graduates. The question is to what extent their performance advantage over FBE immigrants and parity with CBE graduates (at least male FISs) reflects this educational advantage.

The conditional estimates in Table 3 indicate that both male and female FISs underperform Canadians graduating from similar programs across all 10 labour market outcomes. Most notably, the mean log hourly earnings of male and female FISs are 15 log points below that of CBE graduates. They are also significantly less likely to be employed (5 and 11 ppt differences for male and female FISs, respectively); less likely to be in non-routine cognitive jobs (6 and 10 ppt differences); more likely to be employed in routine cognitive jobs (4 and 8 ppt differences); less likely to report that their job matches their field of study (5 and 9 ppt differences), and more likely to report being overqualified for their job (15 and 8 ppt differences). Furthermore, female FISs, but not male FISs, are significantly more likely to be unemployed (4.7 ppt difference).

Conditioning on educational backgrounds or even region of origin does little to change the differences relative to FBE immigrants. The conditional estimates in Table 3 consistently point to substantial performance advantages of FISs over FBE immigrants. Mean log hourly earnings, for example, are nearly 30 log points higher for male and female FISs. In addition, employment rates are higher

Table 3: Unconditional and Conditional Mean FIS Difference in Labour Market Outcomes Relative to CBE and FBE Immigrants

	Men				Women			
	Unconditional		Conditional		Unconditional		Conditional	
Outcome Variables	CBE	FBE	CBE	FBE	CBE	FBE	CBE	FBE
Log hourly earnings	−0.012	0.352***	−0.146***	0.295***	−0.067*	0.353***	−0.148***	0.294***
	(0.030)	(0.036)	(0.030)	(0.035)	(0.037)	(0.036)	(0.032)	(0.034)
Employed	−0.055***	0.026	−0.054***	0.058***	−0.111***	0.215***	−0.109***	0.203***
	(0.018)	(0.020)	(0.017)	(0.021)	(0.028)	(0.028)	(0.028)	(0.028)
Unemployed	0.007	−0.009	0.007	−0.021*	0.048*	−0.037*	0.047**	−0.036
	(0.010)	(0.011)	(0.010)	(0.012)	(0.021)	(0.022)	(0.021)	(0.022)
Part-time weekly hours	−0.039***	−0.053***	−0.022***	−0.061***	−0.027	−0.076***	−0.008	−0.085***
	(0.005)	(0.006)	(0.005)	(0.006)	(0.023)	(0.024)	(0.023)	(0.024)
Non-routine cognitive	0.062**	0.352***	−0.059**	0.243***	−0.059*	0.340***	−0.096***	0.264***
	(0.030)	(0.031)	(0.027)	(0.028)	(0.035)	(0.040)	(0.030)	(0.036)
Routine cognitive	−0.002	−0.051*	0.037*	−0.045	0.077**	−0.116***	0.082***	−0.103***
	(0.025)	(0.028)	(0.021)	(0.029)	(0.033)	(0.038)	(0.028)	(0.038)
Non-routine manual	−0.012	−0.064***	0.024*	−0.033**	−0.009	−0.140***	0.020	−0.093***
	(0.012)	(0.015)	(0.013)	(0.015)	(0.021)	(0.021)	(0.020)	(0.022)
Routine manual	−0.041*	−0.229***	0.005	−0.157***	−0.008***	0.008	−0.005**	−0.068***
	(0.022)	(0.017)	(0.019)	(0.017)	(0.002)	(0.011)	(0.002)	(0.006)
Education–field match	0.010	—	−0.054*	—	−0.104***	—	−0.093***	—
	(0.030)		(0.029)		(0.033)		(0.032)	
Education–level match	−0.119***	—	−0.150***	—	−0.085**	—	−0.076**	—
	(0.029)		(0.029)		(0.038)		(0.038)	

Notes: Bootstrapped standard errors in parentheses. Dashes indicate that those variables were not available in the Labour Force Survey data used to estimate the FBE means. CBE = Canadian born and educated; FBE = foreign born and educated; FIS = former international students.

* $p = 0.1$; ** $p = 0.05$; *** $p = 0.01$.

Source: National Graduates Survey and Labour Force Survey.

(6 and 20 ppts higher for male and female FISs, respectively), unemployment rates are lower (2 and 4 ppt, although the female difference is not statistically significant), part-time job rates are lower (6 and 9 ppt differences), and FISs are more likely to be employed in non-routine cognitive jobs (24 and 26 ppt differences). A potential explanation for these substantial advantages are that FISs may have more Canadian work experience. Unfortunately, neither the NGS nor the LFS identify previous work experience. However, it is not obvious that this can account for the differences, because we are comparing FISs and FBE immigrants with similar years since labour market entry, where entry is defined as school completion for FISs and year of landing for FBE immigrants. It is unclear whether FISs graduating from Canadian post-secondary institutions in the 2000s were more likely to work in Canada before graduating than FBE immigrants were to work on temporary work permits before landing.

In Table 4, we present the results from regressing the FIS unexplained log hourly earnings differences ($y_{it} - \hat{y}_{it}$) on a linear time trend in the enrolment cohort of FISs (and an intercept). The results are reported graphically in Figures 4 and 5. Both the unconditional and conditional estimates imply deteriorating relative log hourly earnings of FISs. Moreover, this is true relative to both the CBE and FBE comparison groups. However, the magnitudes of the trends are modest and, for men, in all cases statistically insignificant at the $p = 0.1$. The imprecision of the estimates is evident in Figure 1, where we plot the mean values of ($y_{it} - \hat{y}_{it}$) and 95 percent confidence intervals (CIs) for the seven observed enrollment cohorts (1999, 2000, 2004, 2005, 2008, 2009, and 2010) and the estimated linear time trend. Although the 2008 and 2009 cohorts have particularly poor mean outcomes relative to both comparison groups, their sample sizes are small, leading to CIs that include values that do not suggest deterioration. The estimates for female FISs, however, are larger and, in the CBE comparison case, statistically significant at $p = 0.1$. Specifically, they suggest that the FIS earnings gap relative to CBE graduates grew by about 1–1.5 log points per year through the 2000s, while the earnings advantage relative to FBE immigrants declined by roughly the same amount.

In Table 5, we examine how the unexplained earnings gaps vary across FISs' education levels, fields of study, and countries of origin. In the CBE comparison case, the reference group is FISs with a PhD in the field of mathematics

Table 4: Time Trends in Unconditional and Conditional Differences in Mean Outcomes

| | Men | | | | Women | | | |
| | Unconditional | | Conditional | | Unconditional | | Conditional | |
Outcome Variables	CBE	FBE	CBE	FBE	CBE	FBE	CBE	FBE
Log hourly earnings	−0.007	−0.011	−0.004	−0.003	−0.015*	−0.013	−0.012*	−0.010
	(0.008)	(0.010)	(0.007)	(0.010)	(0.008)	(0.010)	(0.007)	(0.009)
Employed	0.003	0.004	0.002	0.008*	0.002	0.001	0.003	0.005
	(0.003)	(0.004)	(0.003)	(0.004)	(0.007)	(0.008)	(0.007)	(0.008)
Unemployed	0.000	−0.003	0.000	−0.004	0.004	0.003	0.003	0.001
	(0.002)	(0.003)	(0.002)	(0.003)	(0.006)	(0.006)	(0.006)	(0.006)
Part-time weekly hours	−0.003***	−0.007***	−0.002*	−0.008***	−0.001	−0.003	−0.002	−0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)	(0.006)	(0.005)	(0.006)
Non-routine cognitive	−0.003	−0.006	0.001	0.002	0.002	0.008	0.002	0.009
	(0.007)	(0.008)	(0.006)	(0.007)	(0.010)	(0.011)	(0.008)	(0.010)
Routine cognitive	0.005	0.004	0.000	0.003	−0.002	−0.010	−0.002	−0.012
	(0.006)	(0.007)	(0.005)	(0.007)	(0.009)	(0.011)	(0.008)	(0.011)
Non-routine manual	0.007**	0.005	0.008**	0.006	−0.002	−0.007*	−0.001	−0.004
	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Routine manual	−0.007*	−0.002	−0.007*	−0.009*	0.002**	0.009***	0.001	0.006***
	(0.004)	(0.005)	(0.004)	(0.005)	(0.001)	(0.001)	(0.001)	(0.001)
Education–field match	−0.010	—	−0.007	—	−0.007	—	−0.005	—
	(0.007)		(0.006)		(0.009)		(0.009)	
Education-level match	0.007	—	0.010	—	−0.014	—	−0.014	—
	(0.006)		(0.007)		(0.009)		(0.009)	

Notes: Bootstrapped standard errors in parentheses. Dashes indicate that those variables were not available in the Labour Force Survey data used to estimate the FBE means. CBE = Canadian born and educated; FBE = foreign born and educated; FIS = former international students.

* $p = 0.1$; ** $p = 0.05$; *** $p = 0.01$.

Source: National Graduates Survey and Labour Force Survey.

Figure 4: Time Trends in FIS–CBE Log Hourly Earnings Differentials

Notes: Dots indicate the mean values of the unexplained earnings difference ($y_{it} - \hat{y}_{it}$) across program completion cohorts of FISs. Bands indicate the 95% CIs of the sample means. The red line indicates the estimated linear time trends reported in Table 4. CBE = Canadian born and educated; FIS = former international students.

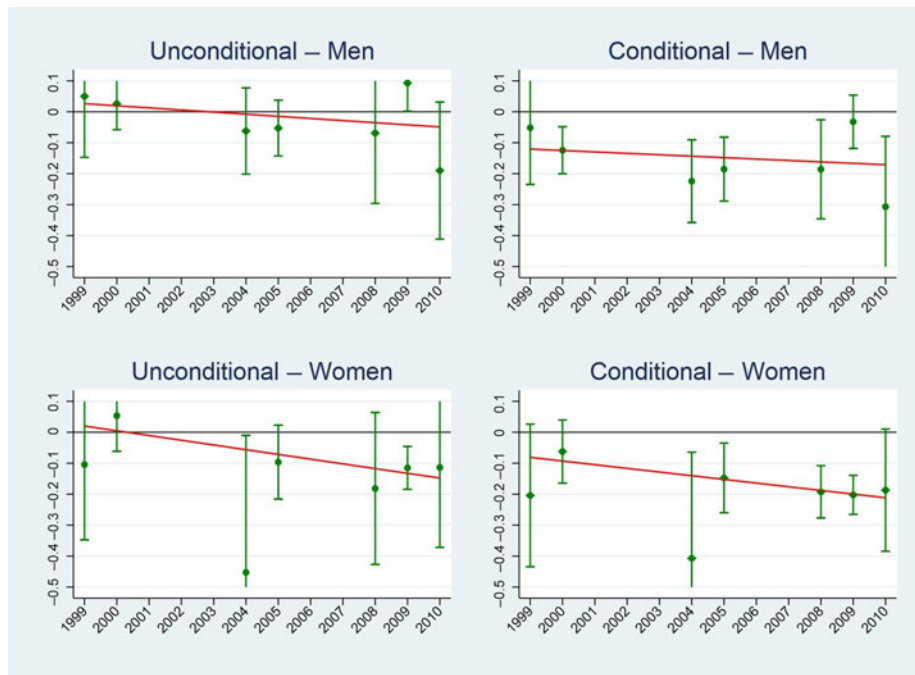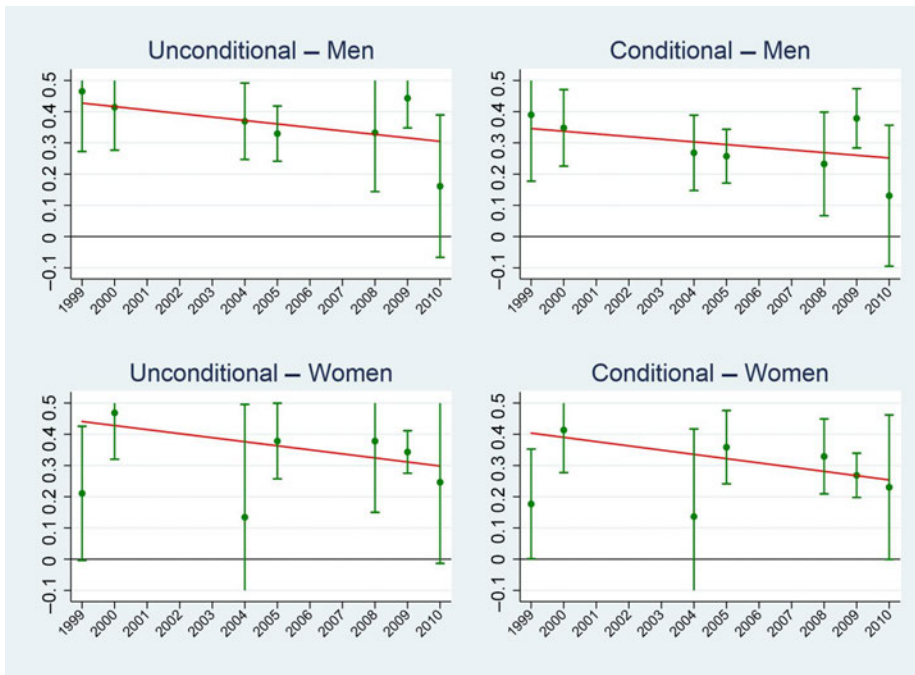Source: Authors' analysis of data from the National Graduates Survey.

Figure 5: Time Trends in FIS–FBE Log Hourly Earnings Differentials

Notes: Dots indicate the mean values of the unexplained earnings difference ($y_{it} - \hat{y}_{it}$) across program completion cohorts of FISs. Bands indicate the 95% CIs of the sample means. The red line indicates the estimated linear time trends reported in Table 4. FBE = foreign born and educated; FIS = former international students.

Source: Authors' analysis of data from the National Graduates Survey.

Table 5: Mean FIS–CBE Log Hourly Earnings Difference by Education, Major Field of Study, and Origin Region

	Men		Women	
	Unconditional	Conditional	Unconditional	Conditional
Education level (ref = PhD)				
Below bachelor's	−0.306*** (0.073)	0.065 (0.070)	−0.698*** (0.093)	−0.234** (0.093)
Bachelor's	−0.163*** (0.055)	0.031 (0.055)	−0.273*** (0.059)	−0.065 (0.058)
Master's	−0.062 (0.042)	0.005 (0.041)	−0.144*** (0.050)	−0.077 (0.048)
Field of study (ref = math)				
Education	−0.423** (0.172)	−0.356** (0.164)	−0.159 (0.125)	−0.137 (0.127)
Visual and performing arts	0.068 (0.221)	0.404* (0.219)	0.092 (0.322)	0.307 (0.329)
Humanities	−0.153 (0.110)	0.098 (0.105)	−0.209* (0.116)	−0.073 (0.110)
Social sciences and law	−0.172** (0.069)	−0.016 (0.069)	−0.171** (0.076)	−0.093 (0.074)
Business	−0.041 (0.084)	−0.042 (0.083)	−0.080 (0.071)	−0.105 (0.069)
Physical and life sciences	−0.343*** (0.072)	−0.102 (0.072)	−0.263*** (0.076)	−0.147* (0.076)
Engineering	−0.034 (0.056)	−0.087 (0.055)	−0.034 (0.071)	−0.160** (0.070)
Natural resources	−0.216** (0.093)	−0.088 (0.092)	−0.288*** (0.105)	−0.206** (0.102)
Health	−0.120 (0.105)	−0.025 (0.105)	−0.115 (0.1)	−0.209** (0.090)
Services	−0.236 (0.158)	−0.062 (0.150)	−0.428* (0.234)	−0.315 (0.228)
Other	−0.126 (0.135)	0.050 (0.130)	−0.519** (0.209)	−0.408** (0.199)
Region of origin (ref = East Asia)				
South and Central America	−0.133 (0.093)	−0.122 (0.089)	0.097 (0.096)	0.091 (0.087)
Northern and Western Europe	0.163*** (0.061)	0.166*** (0.062)	−0.112 (0.101)	−0.132 (0.101)
Eastern Europe	0.162** (0.078)	0.160** (0.079)	0.141 (0.111)	0.106 (0.101)
Southern Europe	0.332* (0.199)	0.328* (0.194)	0.086 (0.177)	0.088 (0.159)
Africa	−0.051 (0.056)	−0.044 (0.056)	−0.182** (0.077)	−0.176** (0.076)
West and Central Asia	0.193*** (0.059)	0.192*** (0.059)	−0.010 (0.161)	−0.009 (0.161)
US, UK, Australia, and NZ	−0.451 (0.302)	−0.450 (0.299)	0.088 (0.077)	0.069 (0.077)
Southeast Asia	−0.096 (0.256)	−0.100 (0.257)	0.057 (0.111)	0.059 (0.110)
South Asia	0.152** (0.071)	0.147** (0.071)	−0.258*** (0.100)	−0.259*** (0.099)
Constant	0.163*** (0.060)	−0.129** (0.059)	0.340*** (0.069)	0.074 (0.068)
R^2	0.164	0.116	0.275	0.149
n	1,295	1,295	764	764

Notes: Bootstrapped standard errors in parentheses. CBE = Canadian born and educated; FIS = former international students.

* p = 0.1; ** p = 0.05; *** p = 0.01.

who originate from East Asia (most are from China). Not surprisingly, when we do not condition on education in the first stage, FISs with lower education levels face larger earnings gaps relative to the average CBE graduate. The difference is particularly large among women, as female FISs with college diplomas have expected earnings that are 70 log points below female FISs with PhDs in similar fields of study from similar regions of origin. More interesting, when we condition on education in the first stage the FIS–CBE gaps do not vary significantly across education levels for men, but they do for women. In particular, the log hourly earnings gap of college-educated FISs is roughly 20 log points higher than for university-educated FISs. In other words, the FIS–CBE earnings gap for women is substantially larger when we compare FIS

college graduates with CBE college graduates than when compare FIS university graduates with CBE university graduates. This suggests that perhaps the deterioration in the labour market outcomes of female FISs over time, shown in Table 3, reflects a shift among female FISs toward more college graduates. However, the sample means in Table 2 indicate that this has not happened. In fact, the proportion of FISs who are college graduates, as opposed to university graduates, was lower for the 2010 graduation cohort than for the 2000 or 2005 cohorts (13.2 percent compared to 16.7 percent and 21.0 percent, respectively).[11]

With regard to fields of study, the unconditional results in Table 5 point to lower FIS–CBE earnings gaps for FISs graduating from all fields relative to mathematics (the sole exception is visual and performing arts, although

the estimates are very imprecise because of the small sample). Earnings appear particularly low in education, social sciences and law, sciences, agriculture, and services. In contrast, they appear relatively modest for business and engineering graduates. Of course, without controlling for education in the first stage, these results simply indicate which fields of study lead to higher earnings for all graduates. Indeed, the conditional estimates suggest much smaller earnings differences across fields. For men, none of the differences in the FIS–CBE gaps are statistically significant, with the exception of education, where FISs face large earnings gaps, and arts, where they face a large earnings advantage. However, for women, the FIS–CBE earnings gaps are significantly higher among science, engineering, agriculture, and health graduates. In fact, female FISs graduating from mathematics and computer science programs are the exception, because all other fields have substantially larger FIS–CBE earnings gaps (with the exception of visual and performing arts).

Finally, with regard to the region of origin differences, the unconditional and conditional estimates in Table 5 are virtually identical, because the first stage regression using the CBE sample does not control for region of origin (because CBE graduates are, by definition, all Canadian born). Relative to East Asian FISs (the reference group), male FISs from Europe, particularly Southern Europe, as well as West, Central, and South Asia face relatively modest FIS–CBE earnings gaps. For women, however, FISs from Africa and South Asia have significantly higher FIS–CBE gaps than their East Asian counterparts. The difference between South Asian men and women is particularly stark, but this is partially explained by the fact that the reference group for men (East Asian men with PhDs in mathematics) face a FIS–CBE earnings gap of 13 log points (see the estimate of the constant in the conditional model for men), whereas their female counterparts (East Asian women with PhDs in mathematics) face a FIS–CBE earnings advantage (7 log points, but statistically insignificant).

In Table 6, we present similar results to those in Table 5 but based on the comparison with FBE immigrants. Because we are unable to condition on field of study in the first stage (because the LFS does not provide this information), we do not include field of study in the second stage.[12] As in Table 6, the unconditional results largely capture returns to education, because FISs with graduate degrees face significantly larger earnings advantages relative to the average FBE immigrant than do FISs with college diplomas. When we condition on education level and region of origin in the first stage, there is once again little difference across education levels for men, but evidence of substantially smaller earnings advantages for college-educated than university-educated female FISs. This implies that the advantage of Canadian over foreign education for immigrants is substantially

Table 6: Mean FIS–FBE Log Hourly Earnings Difference by Education Level and Origin Region

	Men		Women	
	Unconditional	Conditional	Unconditional	Conditional
Education level (ref = master's & PhD)				
Below bachelor's	−0.330*** (0.061)	−0.090 (0.059)	−0.531*** (0.103)	−0.289*** (0.104)
Bachelor's	−0.139 (0.066)	−0.021 (0.065)	−0.153*** (0.056)	−0.024 (0.057)
Region of origin (ref = East Asia)				
South and Central America	−0.072 (0.093)	−0.183** (0.091)	0.136 (0.115)	0.053 (0.114)
Northern and Western Europe	0.192** (0.083)	−0.136 (0.084)	−0.009 (0.100)	−0.298*** (0.101)
Eastern Europe	0.128 (0.083)	−0.013 (0.082)	0.097 (0.076)	0.019 (0.072)
Southern Europe	0.226 (0.204)	0.036 (0.189)	0.259 (0.204)	0.176 (0.206)
Africa	−0.004 (0.058)	−0.064 (0.057)	−0.173** (0.078)	−0.244*** (0.082)
West and Central Asia	0.230*** (0.071)	0.163** (0.073)	0.054 (0.201)	−0.001 (0.189)
US, UK, Australia, and NZ	−0.509* (0.307)	−0.908*** (0.291)	0.096 (0.085)	−0.300*** (0.087)
Southeast Asia	−0.051 (0.234)	−0.069 (0.237)	0.128 (0.115)	0.104 (0.116)
South Asia	0.149* (0.078)	0.158** (0.078)	−0.229** (0.110)	−0.190* (0.109)
Constant	0.409*** (0.042)	0.359*** (0.041)	0.524*** (0.055)	0.444*** (0.054)
R^2	0.158	0.205	0.248	0.181
n	1,095	1,095	660	660

Notes: Bootstrapped standard errors in parentheses. CBE = Canadian born and educated; FBE = foreign born and educated; FIS = former international students.

* $p = 0.1$; ** $p = 0.05$; *** $p = 0.01$.

Source: National Graduates Survey and Labour Force Survey.

larger for university-educated than college-educated women.

In the final rows of Table 6, we compare the FIS–FBE earnings advantages across regions of origin. The unconditional results for men point to larger advantages for FISs from Northern and Western Europe, West and Central Asia, and South Asia. For women, however, the unconditional results indicate relatively small earnings advantages for FISs from Africa and South Asia. When we compare FISs and FBE immigrants with similar education levels and from similar regions (the conditional estimates), the results for men suggest relatively large advantages of Canadian over foreign education for immigrants from East Asia (virtually all of whom are from China), West and Central Asia, and South Asia. Male FISs from the United States, United Kingdom, Australia, and New Zealand, however, have exceptionally low earnings relative to their FBE counterparts. This likely reflects the selectivity of FISs from these countries rather than differences in education quality between Canada and these countries. For women, we also find small advantages of Canadian education (relative to the advantage for Chinese immigrants) among FISs from Northern and Western Europe; Africa; the United States, United Kingdom, Australia, and New Zealand; and South Asia.

We complete our analysis by estimating quantile regressions using the pooled sample of FISs and either CBE graduates or FBE immigrants. To identify conditional differences in FIS earnings across the earnings distribution, we include a dummy variable identifying FISs. Figures 6 and 7 plot the results for the CBE and FBE comparisons, respectively. For men, the results point to FIS–CBE earnings gaps, which decrease in magnitude as we move up the earning distribution. Below the 10th percentile, the unconditional gaps are roughly 5 log points and the conditional gaps are roughly 20 logs. In comparison, median earnings are roughly equivalent for FISs and CBE graduates when we do not condition on education (level and field) and are slightly bigger than 10 log points when we do. This changes little as we move from the 50th to the 99th percentile, because the unconditional gap is essentially constant and the conditional gap is slightly smaller than 10 log

Figure 6: FIS–CBE Differentials in Log Hourly Earnings Quantiles

Notes: Dots are the estimated differences in FIS log hourly earnings at the 5th–99th percentiles. Unconditional estimates are the coefficients on a FIS dummy variable in a conditional quantile regression, which includes controls for age, age squared, months since labour market entry, unemployment rate at entry, and survey year. Conditional estimates also include controls for education level and field of study in the CBE comparison case and education level and region of origin in the FBE comparison case. CBE = Canadian born and educated; FBE = foreign born and educated; FIS = former international students.

Source: Authors' analysis of data from the National Graduates Survey.

Figure 7: FIS–FBE Differentials in Log Hourly Earnings Quantiles

Notes: Dots are the estimated differences in FIS log hourly earnings at the 5th–99th percentiles. Unconditional estimates are the coefficients on a FIS dummy variable in a conditional quantile regression, which includes controls for age, age squared, months since labour market entry, unemployment rate at entry, and survey year. Conditional estimates also include controls for education level and field of study in the CBE comparison case and education level and region of origin in the FBE comparison case. CBE = Canadian born and educated; FBE = foreign born and educated; FIS = former international students.

Source: Authors' analysis of data from the National Graduates Survey.

points above the 90th percentile. The results for women in Figure 6 similarly point to declining FIS–CBE gaps as we move up the earnings distribution. The exception is below the 20th percentile, where the gaps are growing as we move up the distribution. In other words, female FISs face smaller FIS–CBE gaps at the 1st percentile than at the 20th percentile. This U-shaped pattern is particularly evident in the conditional earnings results. There is also some (weaker) evidence of increasing gaps at the very top end of the earnings distribution, particularly in the conditional estimates.

In Figure 7, we plot the quantile regression results based on the FBE comparison group. In all cases, the inverted U-shaped patterns imply smaller FIS–FBE earnings advantages in the tails of the distribution than in the middle of the distribution. In other words, the difference in FIS and FBE earnings at the 10th and 90th percentiles of their respective distributions are small relative to the differences in their median earnings.

Finally, we also tried estimating the quantile regressions allowing the FIS differential to vary across program completion cohorts (including an interaction of the international student dummy variable and the $time_i$ variable described in the Methods section). The results suggest that, if anything, the deterioration in the labour market outcomes of female FISs has been driven by changes at the upper end of the earnings distribution, not the lower end. That is, the relatively small FIS–CBE earnings gaps at the upper end of the earnings distribution in Figure 6 have tended to grow over time, whereas the relatively small FIS–FBE earnings advantages at the upper end of the distribution in Figure 7 have tended to become even smaller.[13]

Conclusions

Combining data from the NGS and LFS, we compare the labour market performance of FISs with that of both CBE graduates and FBE immigrants entering the Canadian labour market at the same time. The results of our analysis indicate that FISs clearly outperform their foreign-educated counterparts by substantial margins. The implied advantage of Canadian over foreign

post-secondary education is evident for both men and women and across education levels, although bigger at higher education levels and in the middle of the earnings distribution. These results suggest that the federal government's decision to give preference to Canadian-educated applicants in the EE system is justified, particularly for applicants with university degrees.

However, we also find that the labour market outcomes of FISs lag behind those of their CBE counterparts graduating from similar academic programs. The performance gaps we identify tend to be larger for college-educated women, in fields outside of math and computer science, among Chinese men and South Asian women, and at the lower end of the hourly earnings distribution than at the top. The critical question for policy-makers is to what extent these gaps reflect premarket differences in labour market productivity, such as English–French language disparities, as opposed to market challenges, resulting, for example, from weaker job search networks or employer discrimination. Although the driving factors have very different implications for policy, identifying their relative importance is extremely difficult. The fact that CBE gaps are largest at the lower end of the hourly earnings distribution suggests that something more than discrimination is playing a role, because we would expect immigrants with the weakest language skills to face the largest gaps. However, whether the effect of discrimination would vary across immigrants from a similar region of origin is unclear. More direct evidence is clearly needed. A potentially fruitful approach we are currently exploring is to examine whether there is evidence of productivity differences between foreign and domestic students, including English–French language skills, using data on the relative grades of international students enrolled in Canadian post-secondary institutions.

Finally, we find some evidence, particularly among women, that the relative labour market performance of FISs has tended to deteriorate over time. The fact that this deterioration is evident in the comparison with both CBE graduates and FBE immigrants suggests to us that it reflects something about FISs as opposed to changing labour market conditions, because there is no clear reason why CBE graduates or FBE immigrants would not have been similarly adversely affected by changing labour market conditions. The most obvious explanation for this deterioration, in our view, is a trade-off in the average labour market quality of foreign students as post-secondary institutions and governments have reached deeper into pools of prospective international students through the 2000s to meet their demands for students and new immigrants.

Acknowledgements

Notes

1 The number of foreign students enrolled in Canadian colleges and universities increased in every academic year between 1999–2000 and 2015–2016, from an initial level of 43,296 to 221,862 (see CANSIM Table 477–0031).

2 The decision not to differentially reward foreign and Canadian education in the EE point system, known as the Comprehensive Ranking System, was based on this evidence.

3 There is evidence that Australia experienced such a trade-off in immigrant quality after a 2000 policy revision favouring international students, which spurred the growth of a vocation education sector targeting foreign students with questionable quality standards, as well as compromised academic and progression standards in more select established institutions (Birrell, Hawthorne, and Richardson 2006; Hawthorne 2010).

4 The PSIS data are based on the administrative data of Canada's post-secondary institutions, which are provided to Statistics Canada. See CANSIM Tables 473–0031 and 473–0032.

5 Before 2003, foreign students were able to remain in Canada for 1 year after graduation. The impact of extending work permits on the wage rates of foreign students is theoretically ambiguous. It should increase reservation wages during job search because individuals have more time to obtain job offers, so that the likelihood of obtaining an offer exceeding a given reservation wage increases. However, it is also possible that the value of the option of returning to one's home country decreases with time in Canada if, for example, the psychological costs of returning home increase as deeper roots have been planted in Canada.

6 In addition to college and university graduates, the NGS samples individuals who have completed a trade or vocational degree. We exclude these individuals from our analysis. In addition, we restrict our sample to individuals who were aged younger than 65 years at the time of graduation.

7 To reduce sampling costs, the LFS resamples the same households for 6 consecutive months. To avoid the complications in variance estimation that this resampling creates, we restrict our sample of FBE immigrants to the first month in which individuals are observed in the LFS (the birth rotation).

8 For the mapping of occupation codes to occupation types, see Table A.1 in Cortes et al. (2014).

9 There are repeated observations for some individuals in FIS and CBE samples extracted from the NGS. We cluster standard errors by the individual identifier.

10 Appendix Table A.1 (CBE graduates) and Table A.2 (FBE immigrants) present the estimates from the first-stage regressions using log hourly earnings as the dependent variable. The first-stage regression results for the other nine dependent variables are available from the authors on request.

11 We also estimated the specifications in Tables 5 and 6 including the linear trend in year of program completion. The results suggest that the deterioration in female FIS outcomes is, by and large, not accounted for by compositional shifts between education levels, fields of study, and regions of origin. The only exception is there is some evidence of a significant increase in female FISs from South Asia, who,

the results in Table 5 indicate, have particularly poor earnings outcomes. This increase in the South Asian international student share is also evident in the administrative data used in Figure 1.

12 We could compare the FIS–FBE earnings differentials across fields, but they would capture the same broad earnings differences as the unconditional estimates in Table 5. For example, earnings are higher for all graduates from mathematics, business, and engineering programs.

13 These results are available from the authors on request.

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Appendix

Table A.1: First-Stage CBE Log Hourly Earnings Regressions

	Men		Women	
	Unconditional	Conditional	Unconditional	Conditional
Age	0.091*** (0.005)	0.064*** (0.005)	0.099*** (0.004)	0.060*** (0.004)
Age^2 /100	−0.098*** (0.007)	−0.066*** (0.007)	−0.113*** (0.005)	−0.065*** (0.005)
Mo since labour market entry	0.007*** (0.001)	0.004*** (0.001)	0.007*** (0.001)	0.003*** (0.001)
Unemployment rate at entry	0.002 (0.003)	−0.001 (0.003)	−0.012*** (0.004)	−0.009*** (0.003)
Survey year 2005	−0.155*** (0.053)	−0.048 (0.052)	−0.160*** (0.038)	−0.026 (0.037)
Survey year 2007	0.016 (0.013)	0.019 (0.012)	0.040*** (0.010)	0.037*** (0.010)
Survey year 2013	−0.053** (0.026)	0.001 (0.025)	−0.029 (0.020)	0.019 (0.019)
Below bachelor's		−0.420*** (0.022)		−0.529*** (0.035)
Bachelor's		−0.233*** (0.020)		−0.273*** (0.035)
Master's		−0.087*** (0.021)		−0.110*** (0.035)
Education		−0.047 (0.029)		0.017 (0.021)
Visual and performing arts		−0.337*** (0.028)		−0.200*** (0.024)
Humanities		−0.258*** (0.027)		−0.143*** (0.025)
Social sciences and law		−0.155*** (0.024)		−0.095*** (0.022)
Business		0.003 (0.021)		0.029 (0.021)
Physical and life sciences		−0.235*** (0.026)		−0.114*** (0.025)
Engineering		0.052*** (0.019)		0.124*** (0.025)
Natural resources		−0.124*** (0.023)		−0.067** (0.027)
Health		−0.082*** (0.027)		0.117*** (0.021)
Services		−0.065** (0.027)		−0.101*** (0.035)
Other		−0.164** (0.069)		−0.081 (0.051)
Constant	1.186*** (0.092)	2.119*** (0.104)	1.105*** (0.073)	2.226*** (0.085)
R^2	0.162	0.25	0.156	0.287
Sample size	27,527	27,527	40,753	40,753

Notes: Robust standard errors in parentheses. Both specifications also include province of residence dummies. CBE = Canadian born and educated.

** $p = 0.05$; *** $p = 0.01$.

Source: National Graduates Survey and Labour Force Survey.

Table A.2: First-Stage FBE Log Hourly Earnings Regressions

	Men		Women	
	Unconditional	Conditional	Unconditional	Conditional
Age	0.060*** (0.007)	0.052*** (0.007)	0.047*** (0.007)	0.040*** (0.007)
Age^2 / 100	−0.075*** (0.009)	−0.066*** (0.009)	−0.059*** (0.009)	−0.053*** (0.009)
Mo since labour market entry	0.004*** (0.001)	0.004*** (0.0004)	0.002*** (0.0004)	0.003*** (0.0004)
Unemployment rate at entry	−0.002 (0.007)	−0.001 (0.007)	−0.003 (0.008)	0.005 (0.008)
Survey year 2007	−0.021 (0.030)	−0.008 (0.029)	−0.037 (0.030)	−0.019 (0.029)
Survey year 2008	0.018 (0.031)	0.023 (0.029)	0.036 (0.030)	0.046 (0.029)
Survey year 2019	−0.001 (0.032)	−0.004 (0.031)	0.047 (0.030)	0.054 (0.029)
Survey year 2010	−0.022 (0.032)	−0.015 (0.030)	0.028 (0.030)	0.042 (0.029)
Survey year 2011	−0.034 (0.031)	−0.023 (0.030)	−0.018 (0.028)	−0.001 (0.027)
Survey year 2012	−0.019 (0.031)	−0.008 (0.030)	0.004 (0.028)	0.006 (0.027)
Survey year 2013	−0.014 (0.029)	−0.008 (0.028)	0.054 (0.028)	0.046 (0.026)
Below bachelor's		−0.256*** (0.021)		−0.266*** (0.020)
Bachelor's		−0.135*** (0.019)		−0.146*** (0.019)
South and Central America		0.129*** (0.032)		0.117*** (0.029)
Northern and Western Europe		0.366*** (0.040)		0.340*** (0.037)
Eastern Europe		0.139*** (0.032)		0.079*** (0.026)
Southern Europe		0.193*** (0.061)		0.123*** (0.057)
Africa		0.088*** (0.032)		0.121*** (0.030)
West and Central Asia		0.088** (0.038)		0.075** (0.037)
US, UK, Australia, and NZ		0.422*** (0.039)		0.402*** (0.049)
Southeast Asia		0.013 (0.027)		0.033 (0.022)
South Asia		−0.021 (0.026)		−0.045* (0.026)
Constant	1.705*** (0.152)	1.946*** (0.148)	1.817*** (0.145)	1.974*** (0.141)
R^2	0.063	0.144	0.034	0.123
Sample size	6,245	6,245	5,861	5,861

Note: Robust standard errors are in parentheses. FBE = foreign born and educated.

* $p = 0.1$; ** $p = 0.05$; *** $p = 0.01$.

Source: National Graduates Survey and Labour Force Survey.