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Does it matter if immigrants work in jobs related to their education?

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Abstract

A common finding throughout the Canadian immigration literature is that, despite having high levels of education, recent immigrants endure substantial earnings disadvantages upon arrival that persist throughout their working career. This paper investigates the role of "qualitative" education-job matches in explaining these poor labor market outcomes. Using a self-reported match measure, available in the Survey of Labour and Income Dynamics (SLID), the incidence and wage penalties associated with being mismatched are found to be higher among immigrants relative to Canadian-born workers. As a consequence, mismatches on the part of immigrants are a mechanism behind the immigrant wage disadvantages reported throughout the literature. Successful matching is also found to significantly improve the return to pre-migration education and work experience.

JEL Classification: I2, J3

Keywords: Immigrants, Returns, Education, Experience, Job match

1 Introduction

There exists a sizable literature on the economic assimilation of Canadian immigrants. The evidence clearly demonstrates that over the last four decades, immigrants endure substantial wage disadvantages upon arrival which persist over their entire working career (Aydemir and Skuterud 2005; Baker and Benjamin 1994; Bloom et al. 1994; Campolieti et al. 2013; Grant 1999; Hum and Simpson 2004; Picot and Sweetman 2005; Skuterud and Su 2012). These disadvantages are observed in tandem with high levels of education reflecting a culmination of over four decades of a point system targeting highly skilled immigrants. These unsettling observations have raised concerns about the effectiveness of the immigrant selection system and the labor market suitability and recognition of immigrants' human capital. In fact, the evidence reveals that foreign human capital, most notably foreign work experience, is discounted in the Canadian labor market (Aydemir and Skuterud 2005; Ferrer and Riddell 2008; Schaafsma and Sweetman 2001; Skuterud and Su 2012). This article examines the degree to which education-job mismatches are responsible for the wage and human capital return disparities between Canadian-born and immigrant workers.

The analysis employs an alternative self-reported match measure that captures the "qualitative" aspects of matching that are associated with skills acquired through formal education and those required in employment. In contrast, the mainstay of education-

job matching research focuses on estimating the effects of "quantitative" matching which compares a worker's observed level of schooling to the level required in a particular occupation[1]. Using quantitative matching, Sharaf (2013) shows there is a high incidence of over-education among Canadian immigrants and these mismatches are associated with significant wage penalties. In the USA, Chiswick and Miller (2008; 2009a, b) show that two thirds of the lower returns to immigrants' schooling is due to different payoffs to under- and over-education.

A shortcoming of quantitative matching is that it fails to capture whether education-related skills match those required in employment. A worker could have a similar level of schooling as his/her colleagues but may have acquired very different, possibly irrelevant, occupational skills. Alternatively, qualitative matching considers the amount of education-related skills being utilized by an employer. Through formal education, students acquire a bundle of general and specific skills. General skills are transferable across occupations, while specific skills are important only in particular occupations. Students, who acquire credentials in fields such as business administration, acquire relatively more general skills compared to students who acquire certificates in engineering or in the skilled trades. Similarly, the skill needs of employers can vary greatly; while some employers require more general skills such as those hiring a salesperson, others require more occupation-specific skills such as those of an electrician. A close match is where an employee is utilizing many of their education-related skills in employment, whether they are general or specific.

Qualitative mismatches can arise due to the extensive heterogeneity in workers and jobs, mentioned above, coupled with imperfect information and labor market frictions (Sattinger 2012). In a perfectly competitive labor market with complete information on the worker's skills and employer requirements, optimal sorting would immediately occur and no mismatching would persist. In reality, workers and firms need to engage in costly search efforts to learn about optimal jobs and employees, respectively. A close match is desirable as productivity and wages are higher when workers can effectively implement their education-related skills. As a consequence of the time and cost involved in searching, mismatches are an unavoidable characteristic of the labor market. Mismatches can also occur as a result of changes in the incentives behind acquiring formal education, such as changes in government subsidies, as this can change the distribution of the supply of skills. Furthermore, structural and cyclical changes in economic conditions can also affect the distribution of demand for skills by employers.

There are reasons to suspect that mismatches could be more prevalent among immigrant, relative to Canadian-born, workers. In response to many new economic challenges, the Liberal government made dramatic changes to immigration policy in 1995 (Green and Green 1999). Their new objective was to select immigrants based on their potential to contribute to the economy in the long run as opposed to the previous short-term tap-on/tap-off (absorptive capacity) approach that regulated the inflow based on specific occupational needs of the labor market. The immediate skill needs of the labor market were not a significant criterion used to evaluate an immigrant's potential contribution. As such, the point system assessed a candidate's education solely on their accumulated years of schooling, treating all credential fields equally. As a result, many immigrants could have been admitted with education-related skills not in high demand, further reducing their already limited employment opportunities upon arrival[2].

A notable exception to this long-term focus was the increased emphasis in the late 1990s on admitting IT professionals and engineers, but the IT bust in 2001 left many of these workers mismatched (Picot and Hou 2009). Similarly, sizable increases in provincial nominees and temporary foreign workers in the early 2000s affected the flow of immigrants in favor of those that have specific occupational skills (Lu and Hou 2017). In recent years, Canada's selection system has indeed become more favorable to immigrants with skills in high demand by employers[3]. Nonetheless, past immigration policies, to the extent that an economic penalty exists for unmatched workers, may have contributed in part to the poor immigrant outcomes observed in the literature.

The quality and relevancy of foreign-acquired education can vary across source country and can further contribute to immigrant mismatches (Friedberg 2000). Sharaf (2013) finds that the quality of foreign education is linked to the incidence of over-education and can explain a significant portion of immigrant-native wage gaps in Canada. Not only is education quality important, but also a portion of education-related skills could be irrelevant to Canadian employers (e.g., legal professions). Despite the in-equivalency of these credentials, immigrants dedicated many years in acquiring them and would have likely got the impression they were desirable as education is heavily weighted in the point system and a key reason for their admittance. Thus, if immigrants find themselves unable to utilize the very skills deemed important enough for admission, they would certainly consider themselves mismatched. In general, the more similar are the educational institutions, economic development, and labor market characteristics between a source and host country, the higher the likelihood that immigrants will find close matches.

Nevertheless, even if foreign education is not devalued by the above noted aspects, immigrant mismatches can arise because of imperfect information on the part of employers. Immigrants face an additional burden of proving the merits of foreign-acquired credentials in contrast to Canadian graduates. Moreover, immigrant professionals such as doctors, lawyers, and nurses cannot legally work in their fields unless their credentials are officially assessed and deemed creditable. A myriad of government agencies are available to assist immigrants in this regard, although their effectiveness is uncertain[4]. These services tend to focus their resources on the disproportionate share of immigrants who intend to work in regulated occupations[5]. Regardless of whether they are officially recognized or not, the decision to hire is ultimately made by employers who must themselves be convinced of its equivalency. Employer discrimination is also an obstacle as highlighted by Oreopoulos (2009) who found considerable discrimination against applicants with ethnic names and that when employers choose among candidates to interview, foreign education and experience is substantially devalued.

A close match is thought to be desirable as productivity and wages are higher when workers can effectively implement their education-related skills (Sattinger 2012). The wage of a worker is jointly influenced by the characteristics of their skills and those of their current job. The larger the discrepancy (i.e., the degree of mismatch), the greater is the potential for the worker to increase their wage by finding a match. Furthermore, collaboration among similarly educated colleagues may lead to a more stimulating work environment and lead to peer effects that can further enhance productivity. These notions are corroborated by the substantial wage effects found in Lemieux (2014) and Yuen (2010) for Canada and Robst (2007) for the USA using a similar self-reported measure as in this article. Furthermore, similar to that found in Lemieux (2014), there is no evidence

that these matching premiums are an artifact of unobserved ability bias. No study has examined the role of qualitative matching in the context of earnings differentials between native-born and immigrant workers.

The remainder of the paper is structured as follows. The subsequent section discusses the data and estimation sample. The third section explores the validity of using a self-reported job match measure. The fourth section outlines the empirical methodology. Section 5 contains the estimation results and begins by presenting some descriptive statistics on the wage effects, incidence, and transition of job matches. This section also reports results on the importance of mismatches in the context of economic assimilation and whether matching has an effect on the returns to foreign-acquired human capital. The final section concludes with a general discussion.

2 The data

The data are from the Survey of Labour and Income Dynamics (SLID) collected by Statistics Canada for the years 2001–2011. The SLID is a rich source of information on income, human capital, and labor market activity. It consists of 6-year panels that interview roughly 15,000 households. Since a new panel is introduced every 3 years, there are two concurrent samples of roughly 30,000 households available to researchers in each year. Respondents are interviewed twice a year in each of the panel's 6 years—once in January to collect labor information and once in May (near income tax time) to collect income information. In the event of a household split, all individuals are followed.

The estimation sample starts in 2001, the initial year of data collection on education-job match, through to the final year of data collection in 2011[6]. The sample is restricted to full-time, full-year, non-self-employed, male, and female workers aged 18–64 who had at least one post-secondary degree or diploma. Respondents without any post-secondary education were not included as secondary education is usually not associated with a field of study. A small number of respondents who acquired further schooling over the panel were also excluded. Child immigrants who migrated before 10 years of age are excluded given that they are typically well acculturated upon labor force entry and achieve comparable outcomes as natives (Schaafsma and Sweetman 2001). Immigrants with missing information on years since migration are also excluded.

The primary outcome variable is the composite hourly wage measure provided in the SLID. The wage measure includes tips, bonuses, and commissions and is imputed using earnings and information on hours, months, or weeks worked. In cases where the respondents directly reported their salary as an hourly amount, no imputation was made. For workers with multiple jobs, the measure is a weighted average based on the hours worked in each job. Wages are adjusted for inflation using the provincial all-items CPI for base year 2002.

3 The SLID self-reported match measure

The SLID collects information on how related a worker's current job is to their education. Immigrant and Canadian-born respondents, after providing information about their job, are asked, "How closely was this job related to your education?" The available responses encompass a range of matches—"not at all related," "somewhat related," or "closely related" to their education. Similar to Lemieux (2014) and Yuen (2010), I assume that respondents consider the qualitative aspects of their job when making an assessment of their

degree of match. Specifically, respondents consider their acquired skills and contemplate their degree of utilization at their current job, rather than make quantitative assessments based on, for example, discrepancies in their acquired years of schooling relative to the occupation norm.

The SLID contains detailed records on field of study and occupation which can be used to provide some external validity to my assertion that the self-reported measure captures qualitative assessments. I first select a sample of respondents with highly specialized degree and diploma fields (see Appendix Table 16) and then create a closely matched indicator variable for cases when there is an exact match between the observed field and occupation names[7].

The first panel of Appendix Table 17 shows the distribution of SLID's self-reported match measure when considering the subset of workers that are closely matched according to their field and occupation names. Across all fields of study categories, the vast majority of Canadian-born workers (95.6%) reported being closely matched (row 2, column 5). The final column further examines a subset of immigrant workers[8]. To the extent that immigrants have different perceptions than the Canadian-born on what constitutes a job match, the degree of job match could be systematically misreported rendering the subsequent analysis misleading. The immigrant figures are almost identical to those of the Canadian-born revealing that when both groups are truly matched (according to field of study and occupation), roughly 95% self-report being closely matched (row 2, columns 5 and 6). Thus, it does not appear that immigrants tend to overstate or understate their degree of match relative to the Canadian-born.

The second panel shows that roughly 61% (row 2, columns 5 and 6) of those not exactly matched according to their field-occupation names, regardless of immigrant status, self-report a close match. A close examination of the field-occupation pairs within this subset shows that many are in fact closely matched. For example, a large portion (roughly 25%) of the sample had studied to be a "Registered Nurse" or "Nurse Practitioner" and work in occupations that are clearly a close match[9]. These observations highlight the challenges of identifying matches based solely on occupation-field titles and were behind Statistics Canada's decision to use a self-reported measure (Lathe 1996; Yuen 2010)[10]. According to Statistics Canada, posing the question directly to respondents is conceptually superior as they themselves are best qualified to make an assessment of job match. It is respondents who fully understand the skill requirements of their job and what their program of study was designed to do (Yuen 2010). This notion is corroborated in Lemieux (2014) who assesses the self-reported match measure in Statistics Canada's National Graduates Survey (NGS) and asserts its effectiveness at capturing the degree of mismatch between worker skills and job.

To further corroborate that SLID's self-reported measure is based on qualitative, rather than quantitative, assessments, I constructed a quantitative-based match measure using the realized matches (RM) procedure (Chiswick and Miller 2008). This procedure compares workers' acquired years of schooling to a summary measure of the typical level within an occupation. If workers' years of schooling equals the mode of their occupation, they are deemed adequately matched[11]. Column 1 in Appendix Table 18 reports the distribution of quantitative matches (i.e., adequately matched, over-educated, and under-educated) for those that self-report being closely matched and also have exact occupation-field name. If the self-reported measure reflects quantitative matching, then

the vast majority of these truly matched workers should be categorized as adequately matched, but only 27% are categorized as such. The remaining columns are a cross-tabulation of the self-reported and quantitative measures of the entire estimation sample. The lack of association shown between these measures provide further evidence that the self-reported measure is based on qualitative assessments.

4 Empirical methodology

The analysis begins with a preliminary examination of the potential role of mismatches in explaining the observed immigrant-wage disadvantages. Descriptive statistics on mean wages by degree of job match are estimated to explore if mismatched workers suffer an economic penalty. The distribution of workers by job match is then examined with all estimates stratified by Canadian-born and immigrant workers. To the extent that immigrants are more mismatched and as a result have lower wages, qualitative matching may be an endogenous mechanism behind the poor labor market performance of immigrants and justifies a more complex multivariate analysis. It is reasonable to suspect a dynamic element to matching. New arrivals are probably not familiar with the intricacies associated with the Canadian labor market, such as resume writing and successful interview techniques, which could hinder their ability to secure related jobs. Further, their language skills may not yet allow them to effectively promote the relevancy of their skills and understand the skill requirements of employers. However, over time, their employment opportunities may improve as better job searching skills and social and professional networks are developed.

To assess the degree of mismatch over time while holding various determinants of matching constant, a series of ordered logit models are estimated. The respective specifications for the Canadian-born and immigrant samples are:

$$y^*_{it} = \beta_1 \text{exp}_{it} + \beta_2 \text{exp}^2_{it} + \beta_3 s_{it} + X_{it}\lambda + \epsilon_{it}, \text{and} \tag{1}$$

$$y^*_{it} = \beta_1 \text{exp}_{it} + \beta_2 \text{exp}^2_{it} + \beta_3 s_{it} + \beta_4 \text{ysm}_{it} + \beta_5 \text{ysm}^2_{it} + X_{it}\lambda + \epsilon_{it}, \tag{2}$$

where y^*_{it} represents a continuous (unobserved latent) variable capturing qualitative matches in time period t for individual i. The term exp is potential years of work experience (age − years of schooling − 6), s denotes years of schooling, ysm is years since migration, and X contains controls for field of study, socio-demographic variables—including indicators for marital status, non-English (Ontario and Québec) or non-French (Québec) mother tongue, region (British Columbia, Prairies, Ontario, Québec, Maritimes), and major cities (Toronto, Montréal, Vancouver)—and the panel and year observed[12]. Conditional probabilities of the SLID match categories are obtained by assuming ϵ is logistically distributed and estimated by maximum likelihood. Standard errors are adjusted for clustering at the individual level. A series of predicted probabilities are then obtained by varying Canadian experience (ysm for immigrants) from 1 to 25 years. Other variables are held constant at their mean values.

The standard empirical strategy used in estimating the relative economic performance of immigrants is based on a variant of the standard human-capital-corrected earnings function (Mincer 1974). The typical specification models earnings as a function of the standard human capital variables, schooling, and experience but additionally includes a quadratic in years since migration (Borjas 1999; Chiswick 1978). The estimation sample

combines natives and immigrant workers, and since time in the host country is conditioned on, the coefficient estimate on an immigrant indicator variable captures any wage disparities upon migration and is commonly referred to as an "entry effect."[13] Estimates of the quadratic terms in years since migration reveals the return to a year in the host country, commonly referred to as the "assimilation effect."

The standard immigrant assimilation model is first estimated to obtain the entry and assimilation effects experienced by Canadian immigrants. Subsequently, controls for the categories of job match are included and the proportion of the entry effect explained by immigrant mismatches is estimated. In other words, the aim here is to identify a possible endogenous mechanism that is responsible for immigrant-wage disadvantages and then subsequently estimate the degree to which an exogenous intervention can improve immigrant outcomes. The full empirical specification is:

$$\begin{aligned} ln\left(w_{it}\right) = {} & \beta_0 + \beta_1 \mathrm{exp}_{it} + \beta_2 \mathrm{exp}_{it}^2 + \beta_3 s_{it} + \beta_4 \mathrm{some}_{it} + \beta_5 \mathrm{close}_{it} \\ & + I_i \left(\alpha_0 + \alpha_1 \mathrm{ysm}_{it} + \alpha_2 \mathrm{ysm}_{it}^2 + \alpha_3 \mathrm{some}_{it} + \alpha_4 \mathrm{close}_{it}\right) + X_{it}\lambda + \epsilon_{it}, \end{aligned} \tag{3}$$

where w_{it} is an individual's composite wage in year t and exp and s are as defined above[14]. The letter I denotes an immigrant indicator variable. Qualitative matching is incorporated into the model with indicator variables, i.e., some is an indicator variable for respondents in a "somewhat related" job, while close is an indicator variable for respondents in a "closely related" job. The omitted category refers to those in a job "not at all related" to their education.

There is a significant degree of heterogeneity in the education fields acquired by immigrant and Canadian-born workers[15]. Consequently, the estimated impact of job matching will be misleading if the incidence of matching varies across fields and is not held constant in the regression analysis. The vector X additionally contains indicator variables for major field of study groups in order to mitigate any potential biases[16]. Due to the limited size of the immigrant sample, more detailed field of study controls cannot be included. However, the potential bias, due to variation in job match within the aggregated fields, has been shown by Lemieux (2014) to be inconsequential.

The estimated returns to matching could also be contaminated by unobserved heterogeneity bias. Consistent and unbiased estimates of the return to matching are guaranteed if the idiosyncratic error in (3) is not correlated with job match. Specifically, workers with higher innate ability and motivation may be more likely to obtain better matches which could impart an upward bias on the returns to matching. Standard fixed effects estimation offers a solution by removing unobserved time-invariant heterogeneity; however, this methodology does not permit identification of the immigrant time-invariant variables. Furthermore, it is entirely plausible that respondents make random errors in judgment when reporting their degree of match. It is well known that fixed effects estimation substantially exaggerates the attenuation bias when estimated on variables suffering from classical measurement error (Angrist and Krueger 1999). Parental level of education (available in the SLID) is a candidate for use as an instrumental variable; however, its correlation with matching is insignificant—a necessary condition of a valid instrument[17].

Nonetheless, potential biases can be mitigated if a proxy variable, a measure highly corrected with ability, is available (Wooldridge 2010). Lamo and Messina (2010) who

examined wage returns of a self-reported quantitative match measure found little evidence their results were tainted by unobserved ability bias. Nordin et al. (2010) using cognitive test scores and Lemieux (2014) using a worker's self-reported rank in their graduating class and enrollment in a co-op program as proxies for ability found they had little impact on the effect of matching when included in their wage regression. Although these proxies are not available in the SLID, data on whether a paid worker's job involved supervising the work of other employees is available. A profit maximizing firm certainly has an incentive to only give such responsibility to workers with high ability and/or motivation. Since it is reasonable to assume a high degree of correlation between supervisor responsibility and innate ability and motivation, the vector X additionally contains this proxy variable.

Estimates of Eq. (3) are obtained by pooling the individual data over time, and using OLS and the reported standard errors are adjusted for clustering at the individual level. The estimates of Eq. (3) are first used to predict the entry effects experienced by immigrants upon arrival. The predictions are calculated using the immigrant-native match disparities reported in Tables 3 and 4 (row 6 for Canadian-born; row 9 for immigrants, i.e., at ysm $= 0$). Then, the entry effect is predicted assuming immigrants had the same distribution of matches as the Canadian-born at arrival. The difference in these predicted entry effects reflect the extent to which the entry effects are due to the lower incidence of matching among immigrants when first entering Canada's labor market. These entry effects and their percentage change is reported. In addition, the estimates obtained from (3) are used to explore the consequences of job matching on the economic assimilation experience. Specifically, the years to earnings parity with natives is estimated for each category of job match[18].

As mentioned previously, Canadian studies have shown that an important contributor to the poor entry effects observed for immigrants is their lower returns to foreign human capital, most notably foreign work experience. It is plausible that foreign human capital has a complementary effect with better matches that can boost productivity. Employers who require many education-related skills may put more effort into researching the merits of an applicant's relevant pre-migration schooling and work experience. Following Friedberg (2000), Eq. (3) is reformulated with human capital variables decomposed into their foreign and Canadian components:

$$\begin{aligned} ln(w_{it}) = {} & \beta_0 + \beta_1 \text{canexp}_{it} + \beta_2 \text{cans}_{it} + \beta_3 \text{some}_{it} + \beta_4 \text{close}_{it} \\ & + I_i(\alpha_0 + \alpha_1 \text{canexp}_{it} + \alpha_2 \text{forexp}_i + \alpha_3 \text{cans} + \alpha_4 \text{fors}_i + \alpha_5 \text{some}_{it} + \alpha_6 \text{close}_{it} \\ & + \alpha_7 \text{fors}_i \times \text{some}_{it} + \alpha_8 \text{fors}_i \times \text{close}_{it} + \alpha_9 \text{forexp}_i \times \text{some}_{it} \\ & + \alpha_{10} \text{forexp}_i \times \text{close}_{it}) \\ & + X_{it}\lambda + \epsilon_{it}, \end{aligned} \tag{4}$$

where the foreign and Canadian components are identified using age at migration as commonly done in the literature (Aydemir and Skuterud 2005; Betts and Lofstrom 2000; Friedberg 2000). More specifically, it is assumed that there are no breaks in the acquisition of schooling which permits an estimate of the age when an immigrant started to work full-time (i.e., 6+ years of schooling). This age is used in conjunction with the age at migration to create foreign and Canadian measures of schooling and potential experience.

It has been shown that potential experience can understate (overstate) the returns to experience (education) when used in wage regressions (Regan and Oaxaca 2009). More precise foreign and Canadian human capital measures are created using unique information provided in the SLID on actual experience, an actual full-time work-starting age, and the age respondents received their credentials[19]. Estimates using the potential and actual experience measures are reported and compared. All foreign human capital variables are interacted with the degree of matching to ascertain if matching plays a role in boosting their returns in the labor market. Similar to Eq. (3), estimates are obtained from OLS on a sample of individual data pooled over time with standard errors adjusted for clustering.

The immigrant sample used in the analysis is stratified by traditional and non-traditional source regions. The former include those born in either the UK, USA, Europe, Australia, or New Zealand. The non-traditional group are those born in the Middle East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia, or Africa. Immigrants from the latter regions, who comprise a substantial portion of arrivals over the last couple of decades, can have vast cultural, institutional, and linguistic differences compared to those from traditional source regions and have been shown to experience greater difficulties integrating into western labor markets (Aydemir and Skuterud 2005; Ferrer and Riddell 2008; Friedberg 2000; Picot 2004; Skuterud and Su 2012).

5 Empirical results

5.1 Qualitative matching: wages, prevalence, and transition

Table 1 shows male and female mean hourly wages by immigrant status and degree of job match. There is clear pattern of increasing wages as the quality of job match improves for all groups (rows 1–3). The wage penalties (relative to a close match) for Canadian-born males are 4.8 and 27.2% for somewhat and closely related jobs, respectively. The comparable figures for females are higher, especially when par-

Table 1 Mean wages by immigrant status and job match

	Males			Females		
	Immigrants		Canadian-born	Immigrants		Canadian-born
	(1)	(2)	(3)	(1)	(2)	(3)
	Traditional	Non-traditional	All	Traditional	Non-traditional	All
Degree of job match						
(1) Not related to education	22.0	16.7	20.6	15.3	13.4	16.0
(2) Somewhat related	26.9	23.8	25.9	19.1	17.6	19.7
(3) Closely related	31.6	28.3	27.2	23.7	21.0	22.7
Wage penalties (%)						
(4) Somewhat vs. closely	14.9	15.9	4.8	19.4	16.2	13.2
(5) Unrelated vs. closely	30.4	41.0	24.3	35.4	36.2	29.5
N (person-years)	1691	2502	40,815	1474	2178	43,021
N (unique persons)	673	1009	15,418	605	936	16,744

Data are from the SLID and include panels 2-7 for the years 2001-2011. The estimation sample is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The sample contains Canadian-born and immigrant workers who arrived in Canada at 10 years or older. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Wages are adjusted for inflation using the provincial all-items CPI for base year 2002

tially matched, at 13.2 and 29.5% (column 3; rows 4, 5). All immigrant groups are found to endure significantly higher penalties than the Canadian-born with the largest penalties at 41.0 and 36.2% (column 2; row 3), respectively, for non-traditional males and females. These unadjusted figures imply that foreign-born workers may have more difficulties adapting to the labor market when unable to secure a close match.

Table 2 shows the unadjusted frequency distribution of qualitative matching by immigrant status. Among Canadian-born males, 61.3, 17.3, and 21.4% (column 3; rows 1–3) are in closely, somewhat, and unrelated jobs, respectively. The comparable frequencies for females suggest a slightly higher incidence of matching at 65.2, 16.2, and 18.7%. This pattern closely resembles the 2006 SLID estimates reported in Yuen (2010) and also the US tabulations reported by Robst (2007)[20]. In contrast to popular perceptions, on the whole, immigrants do not appear to be substantially mismatched relative to native-born workers. The largest disparities are among females from non-traditional source regions who are about 8.6 (columns 2–3; row 3) percentage points less likely to be closely matched. However, immigrants differ in terms of their geographic region, field of study, time in the host country, and human capital acquisition. The subsequent multivariate analysis reveals that immigrants do experience a sizable degree of mismatch relative to natives upon arrival in Canada.

Table 3 reports the multivariate estimates of Eqs. (1) and (2) for males. The predicted distribution of job match for the Canadian-born and for immigrants at various stages of assimilation are calculated at the means of the respective samples. Upon arrival, traditional and non-traditional male immigrants are more mismatched than natives with a disparity of 9.1 (61.8–52.7) and 14.9 (61.8–46.9) percentage points, respectively. The former group, however, are faster at securing close matches and catching up to comparably skilled natives. The slower transition for non-traditionals may reflect the higher burden and lengthy time required to prove the merits of their foreign education through formal recognition or acquiring complementary Canadian credentials. The degree of mismatch is much higher among female immigrants in Table 4 with the respective figures for traditionals and non-traditionals at 15.9 (66.6–50.7) and 22.3 (66.6–44.3). Furthermore, neither group catches up to natives in a reasonable time frame. Intermittent labor force participation as a result of child rearing and cultural differences in the role of females in the household could explain their lower incidence of, and transition into, closely matched jobs.

The statistics presented thus far imply that mismatches on the part of immigrants may be an important mechanism behind their poor labor market outcomes. Not only are immigrants more mismatched than natives, but they also face steeper wage penalties when mismatched. Thus, the immigrant assimilation experience is likely quite different depending on the degree of job match.

5.2 The role of matching on immigrant assimilation

Tables 5 and 6 contain estimates of the immigrant assimilation model (i.e., Eq. (3)) for males and females, respectively. The immigrant sample is stratified by traditional and non-traditional source regions. Consistent with related studies, the assimilation experience is worse among non-traditionals who earn much less upon arrival (columns 1; rows 1). The estimated assimilation profiles are similar to those reported by Hum and Simpson

Table 2 Frequency distribution of job match by immigrant status

	Males			Females		
	Immigrants		Canadian-born	Immigrants		Canadian-born
	(1)	(2)	(3)	(1)	(2)	(3)
Job match category	Traditional	Non-traditional	All	Traditional	Non-traditional	All
(1) Not related to education (%)	18.1	23.5	21.4	21.7	24.5	18.6
(2) Somewhat related (%)	16.6	17.2	17.3	17.9	18.9	16.2
(3) Closely related (%)	65.3	59.3	61.3	60.4	56.6	65.2
(4) *P* value[a]	0.0014	0.0413		0.0006	0.0000	
N (person-years)	1691	2502	40,815	1474	2178	43,021
N (unique persons)	673	1009	15,418	605	936	16,744

[a] *P*-value is from a Pearson's chi-square test of the null hypothesis that the frequency distribution is the same between immigrants and the Canadian-born. Data are from the SLID and include panels 2-7 for the years 2001-2011. The estimation sample is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The sample contains Canadian-born and immigrant workers who arrived in Canada at 10 years or older. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Wages are adjusted for inflation using the provincial all-items CPI for base year 2002

Table 3 Proportion in categories of job match by years since migration (male ordered logit results)

	Traditional immigrants			Non-traditional immigrants			Canadian-born		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	Closely	Somewhat	Not related	Closely	Somewhat	Not related	Closely	Somewhat	Not related
At means of covariates	0.668***	0.174***	0.158***	0.603***	0.185***	0.212***	0.618***	0.180***	0.202***
	(0.063)	(0.022)	(0.022)	(0.045)	(0.015)	(0.015)	(0.003)	(0.001)	(0.001)
Years since migration									
0.000	0.527 ***	0.220 ***	0.253 ***	0.469 ***	0.215 ***	0.317 ***	–	–	–
	(0.296)	(0.038)	(0.038)	(0.157)	(0.019)	(0.019)			
5.000	0.562 ***	0.211 ***	0.227 ***	0.511 ***	0.208 ***	0.282 ***	–	–	–
	(0.187)	(0.033)	(0.033)	(0.091)	(0.018)	(0.018)			
10.000	0.596 ***	0.200 ***	0.204 ***	0.553 ***	0.199 ***	0.249 ***	–	–	–
	(0.107)	(0.027)	(0.027)	(0.047)	(0.016)	(0.016)			
15.000	0.629 ***	0.189 ***	0.182 ***	0.594 ***	0.188 ***	0.219 ***	–	–	–
	(0.059)	(0.021)	(0.021)	(0.029)	(0.014)	(0.014)			
20.000	0.661 ***	0.177 ***	0.162 ***	0.634 ***	0.175 ***	0.191 ***	–	–	–
	(0.038)	(0.017)	(0.017)	(0.032)	(0.013)	(0.013)			
25.000	0.692 ***	0.164 ***	0.144 ***	0.672 ***	0.162 ***	0.167 ***	–	–	–
	(0.041)	(0.017)	(0.017)	(0.054)	(0.015)	(0.015)			
N (person-years)	1691			2502			40,815		

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Data are from the SLID and include panels 2-7 for the years 2001-2011. The estimation sample is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The immigrant sample is restricted to workers whose age at arrival was 10 years or older. The dependant variable is job-relatedness and the explanatory variables include years of schooling, potential experience, years since migration and other socio-demographic controls. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Standard errors, adjusted for clustering at the individual level, are in parentheses and have been multiplied by 100

Table 4 Proportion in categories of job match by years since migration (female ordered logit results)

	Traditional immigrants			Non-traditional immigrants			Canadian-born		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	Closely	Somewhat	Not related	Closely	Somewhat	Not related	Closely	Somewhat	Not related
At means of covariates	0.586***	0.204***	0.211***	0.593***	0.199***	0.208***	0.666***	0.168***	0.166***
	(0.087)	(0.029)	(0.029)	(0.050)	(0.017)	(0.017)	(0.003)	(0.001)	(0.001)
Years since migration									
0.000	0.507***	0.225***	0.269***	0.443***	0.232***	0.325***	–	–	–
	(0.345)	(0.044)	(0.044)	(0.165)	(0.019)	(0.019)			
5.000	0.532***	0.219***	0.249***	0.483***	0.226***	0.291***	–	–	–
	(0.220)	(0.040)	(0.040)	(0.097)	(0.019)	(0.019)			
10.000	0.558***	0.212***	0.230***	0.523***	0.218***	0.258***	–	–	–
	(0.129)	(0.034)	(0.034)	(0.051)	(0.017)	(0.017)			
15.000	0.583***	0.205***	0.213***	0.563***	0.208***	0.229***	–	–	–
	(0.072)	(0.028)	(0.028)	(0.031)	(0.015)	(0.015)			
20.000	0.608***	0.197***	0.196***	0.603***	0.196***	0.201***	–	–	–
	(0.049)	(0.025)	(0.025)	(0.037)	(0.015)	(0.015)			
25.000	0.632***	0.188***	0.180***	0.641***	0.183***	0.177***	–	–	–
	(0.055)	(0.024)	(0.024)	(0.063)	(0.018)	(0.018)			
N (person-years)	1474			2178			43,021		

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Data are from the SLID and include panels 2-7 for the years 2001-2011. The estimation sample is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The immigrant sample is restricted to workers whose age at arrival was 10 years or older. The dependant variable is job-relatedness and the explanatory variables include years of schooling, potential experience, years since migration and other socio-demographic controls. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Standard errors, adjusted for clustering at the individual level, are in parentheses and have been multiplied by 100

(2004) whose sample contained males of all education levels and estimated on SLID's first panel. A major distinction gleaned from the current analysis is that only slight differences exist in the assimilation profiles between genders when considering post-secondary graduates. Their finding of improved entry effects and worsening assimilation effects when actual, rather than potential, experience was corroborated using the more current SLID data. The estimated profiles, based on actual experience, are not reported in order to remain consistent with the majority of the literature and also because, when actual experience is used, any improvements in the entry effect are mostly offset by a fall in the assimilation effect. Thus, no matter which measure is used, the number of years it takes to reach parity with natives is similar.

Across all groups, qualitative matching has a significant effect on wages. A partial match yields roughly a 16% premium over an unrelated job (the excluded category), while a close match yields a premium of roughly 25 and 30% for males and females, respectively (Tables 5 and 6; rows 7 and 8; columns 2 for each group)[21]. These wage effects are consistent with the notion that productivity is higher when workers are able to use more of their education-related skills on the job. The immigrant interaction terms for partial and close matches reveal that there is no statistically significant difference in the returns between traditional and Canadian-born males (rows 9 and 10; columns 3). In contrast, non-traditional males receive higher returns than natives by 11 and 23 percentage points for partial and close matches, respectively. Thus, matching boosts their productivity more than both natives and traditionals but conversely face greater difficulties adapting in the labor market when not matched. Conceivably, since traditionals likely face less obstacles such as language difficulties and discrimination, their disadvantage when not matched is mitigated. The results reported in column 4 show that when supervisory responsibility (a proxy for innate ability and motivation) is conditioned on, the returns fall only slightly across all stratification groups (column 4; rows 7–11). Similar to that found in Nordin et al. (2010) and Lemieux (2014), there is little evidence that the estimated returns to job match are an artifact of higher ability workers (with higher earning potential) being more likely to secure a job match. The pattern of results for females is broadly similar except that both immigrant groups receive a premium for better matching compared to the Canadian-born (Table 6).

The amount of effort put into searching for more closely matched positions may differ systematically between graduates with general and specialized credentials. It is not clear which graduates would put more or less effort into the search process. If general-education graduates dedicate less effort relative to graduates with specialized credentials, then the matching estimates above may simply reflect employers' willingness to offer a premium for specialized skills. However, general-education graduates possess many important labor market skills such as problem-solving, communication, and on-the-job learning abilities which can provide them greater flexibility to move across industries and occupations (Giles and Drewes 2001; Heijke et al. 2003). Given the productive potential of their dynamic skill sets, those with general fields may put more effort into securing a match. Lin et al. (2003) show there is little difference in the perceived possession of relevant labor market skills between those with general and specialized education. Thus, the search effort among graduates with general skills may in fact not be very different from those with specialized skills.

Table 5 The effect of qualitative matching on wages (males)

	Traditional immigrants				Non-traditional immigrants			
Covariates	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(1) Immigrant	−0.224*	−0.190***	−0.216***	−0.203***	−0.408*	−0.384***	−0.519***	−0.475***
	(0.066)	(0.062)	(0.069)	(0.068)	(0.054)	(0.050)	(0.051)	(0.051)
(2) Experience	0.033***	0.033***	0.033***	0.030***	0.033***	0.033***	0.033***	0.030***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(3) (Experience)^2/100	−0.056***	−0.056***	−0.056***	−0.051***	−0.057***	−0.057***	−0.057***	−0.052***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
(4) Years of schooling	0.055***	0.048***	0.048***	0.046***	0.056 ***	0.049 ***	0.048 ***	0.046***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
(5) Years since migration	0.016***	0.013**	0.012**	0.011*	0.016**	0.016***	0.017***	0.016***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)
(6) (Years since migration)^2/100	−0.021	−0.016	−0.014	−0.014	−0.022	−0.025	−0.029*	−0.027*
	(0.013)	(0.012)	(0.012)	(0.012)	(0.017)	(0.016)	(0.016)	(0.016)
(7) Somewhat related	–	0.146***	0.147***	0.136***	–	0.154***	0.148***	0.137***
		(0.009)	(0.009)	(0.009)		(0.009)	(0.009)	(0.009)
(8) Closely related	–	0.213***	0.211***	0.200***	–	0.223***	0.210***	0.199***
		(0.008)	(0.008)	(0.008)		(0.008)	(0.008)	(0.008)
(9) Somewhat related × immigrant	–	–	−0.020	−0.026	–	–	0.100***	0.091**
			(0.047)	(0.046)			(0.038)	(0.037)
(10) Closely related × immigrant	–	–	0.059	0.050	–	–	0.204***	0.190***
			(0.043)	(0.042)			(0.030)	(0.029)

Table 5 The effect of qualitative matching on wages (males) *(Continued)*

	Traditional immigrants				Non-traditional immigrants			
Covariates	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(11) Supervisory responsibility	–	–		0.147***	–	–	–	0.148***
(*proxy for ability*)				(0.006)				(0.006)
N (Person-years)								
Canadian-born	40,815	40,815	40,815	40,815	40,815	40,815	40,815	40,815
Immigrant	1691	1691	1691	1691	2502	2502	2502	2502
R^2	0.276	0.309	0.309	0.334	0.271	0.307	0.309	0.334

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Pooled OLS estimates. The estimation sample spans panels 2-7 (2001-2011)and is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The immigrant sample is restricted to workers whose age at arrival was 10 years or older. The dependent variable is the natural logarithm of hourly wages. Wages are adjusted for inflation using the provincial all-items CPI for base year 2002. All regressions include a constant and controls for survey year, panel, marital status, no English or French mother tongue, region (British Columbia, Prairies, Ontario, Québec, Maritimes), Major Cities(Toronto, Montréal, Vancouver) and field of study. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Standard errors, adjusted for clustering at the individual level, are in parentheses and have been multiplied by 100

Table 6 Effect of qualitative matching on wages (females)

	Traditional immigrants				Non-traditional immigrants			
Covariates	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(1) Immigrant	−0.302*	−0.281***	−0.355***	−0.342***	−0.471*	−0.426***	−0.478***	−0.460***
	(0.065)	(0.060)	(0.068)	(0.069)	(0.046)	(0.043)	(0.045)	(0.045)
(2) Experience	0.029***	0.030***	0.030***	0.029***	0.030***	0.030***	0.030***	0.029***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(3) (Experience)^2/100	−0.053***	−0.055***	−0.055***	−0.052***	−0.054***	−0.055***	−0.055***	−0.053***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
(4) Years of schooling	0.072***	0.064***	0.064***	0.062***	0.071***	0.064***	0.064***	0.062***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
(5) Years since migration	0.011*	0.011*	0.011*	0.010*	0.014***	0.011**	0.010**	0.009*
	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
(6) (Years since migration)^2/100	−0.009	−0.012	−0.014	−0.012	−0.004	0.001	0.003	0.006
	(0.014)	(0.013)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)	(0.013)
(7) Somewhat related	–	0.153***	0.151***	0.146***	–	0.155***	0.151***	0.146***
		(0.009)	(0.009)	(0.009)		(0.009)	(0.009)	(0.009)
(8) Closely related	–	0.267***	0.263***	0.262***	–	0.269***	0.264***	0.262***
		(0.008)	(0.008)	(0.008)		(0.008)	(0.008)	(0.008)
(9) Somewhat related × immigrant	–	–	0.065	0.071	–	–	0.072**	0.083***
			(0.050)	(0.050)			(0.033)	(0.032)
(10) Closely related × immigrant	–	–	0.112**	0.110**	–	–	0.085***	0.086***
			(0.045)	(0.044)			(0.030)	(0.030)

Table 6 Effect of qualitative matching on wages (females) (*Continued*)

	Traditional immigrants				Non-traditional immigrants			
Covariates	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(11) Supervisory responsibility				0.114***				0.113 ***
(*proxy for ability*)				(0.006)				(0.006)
N (person-years)								
Canadian-born	43,021	43,021	43,021	43,021	43,021	43,021	43,021	43,021
Immigrant	1474	1474	1474	1474	2178	2178	2178	2178
R^2	0.305	0.354	0.355	0.369	0.307	0.357	0.358	0.372

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Pooled OLS estimates. The estimation sample spans panels 2-7 (2001-2011)and is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The immigrant sample is restricted to workers whose age at arrival was 10 years or older. The dependent variable is the natural logarithm of hourly wages. Wages are adjusted for inflation using the provincial all-items CPI for base year 2002. All regressions include a constant and controls for survey year, panel, marital status, no English or French mother tongue, region (British Columbia, Prairies, Ontario, Québec, Maritimes), Major Cities(Toronto, Montréal, Vancouver) and field of study. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Standard errors, adjusted for clustering at the individual level, are in parentheses and have been multiplied by 100

The ongoing analysis is further stratified into general and specialized fields and by college and university credentials[22]. The results are presented in Table 7 and focus on non-traditional immigrants as they comprise the majority of new arrivals in past decades. Regardless of having a general or specialized credential field, a close match is associated with substantial premiums for males and females (rows 7–10; columns 1 and 2 for each group). The returns to using university-acquired skills on the job are much higher, especially for non-traditional males, despite being less specific than those acquired in vocational institutions (rows 7–10; columns 3 and 4 for each group). If it were true that the returns to job match simply captured a premium for specialized skills, then one would expect little or no returns for those with general fields of study.

Tables 8, 9, and 10 highlight the role of mismatches in explaining the poor entry effects experienced by immigrants. The first column under each group reports an entry effect that is predicted at the relative degree of match faced by immigrants upon arrival using the match distributions reported in Tables 3 and 4.[23] In the second column, the predicted entry effect assumes that immigrants had the same degree of match upon arrival as their Canadian-born peers. To the extent that immigrants are more mismatched, the percentage change in these two figures, reported in column 3, reveals how much the initial wage disadvantages experienced by immigrants are due to being more mismatched than the Canadian-born. Table 8 reveals that mismatching is a mechanism behind the initial disadvantages experienced by all groups of immigrants. Among traditional males, mismatches explain about 9% of their negative entry effect, while the comparable figure for non-traditionals is 11%. Among females, mismatches explain a slightly higher percentage at 14 for traditionals and 12% for non-traditionals. The following Tables (9, 10, 11, 12) focus on non-traditional immigrants—a group that makes up the vast majority of arrivals over the last three decades. When further considering the importance of matching across education type and field category (Tables 9 and 10), between 10 and 13% of the entry effects are due to mismatches upon arrival.

Although mismatches explain a sizable portion of immigrants' initial wage disparity, the results do not point to systemic problems of highly educated immigrants working in low paying unrelated jobs. Indeed, as shown in Tables 3 and 4, the degree of relative mismatch upon arrival is not drastically lower for immigrants. This lends some support to the previous long-term goals of immigration policy that gave a low priority to matching the skill sets of newcomers with the immediate needs of the labor market. Nevertheless, recent changes to our point system favoring those with greater matching potential can go a long way at improving the assimilation experience because substantial consequences exist for unmatched immigrants as the next set of tables will highlight.

Tables 11 and 12 highlight important differences in the predicted assimilation profiles across the varying degrees of job match. The calculations are also based on the results reported in Tables 5 and 6 (column 4).[24] The entry effect and years to earnings equality with natives is reported for each group by degree of match. A clear pattern emerges in Table 11 across gender and immigrant group indicating that if an immigrant is unable to obtain at least a partial job match, economic assimilation is unattainable (row 1). The exception is for unmatched traditional males, but their estimated years to equality is almost 22 years. Traditional males who begin their Canadian career as partially matched

Table 7 The effect of qualitative matching on wages—field of study and level of education (non-traditional immigrants)

Covariates	Males				Females			
	General	Specialized	College	University	General	Specialized	College	University
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(1) Immigrant	−0.390***	−0.485***	−0.367***	−0.668***	−0.483***	−0.425***	−0.472***	−0.536***
	(0.102)	(0.059)	(0.080)	(0.062)	(0.056)	(0.070)	(0.060)	(0.064)
(2) Experience	0.032***	0.030***	0.030***	0.033***	0.031***	0.027***	0.027***	0.036***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
(3) (Experience)^2/100	−0.055***	−0.050***	−0.050***	−0.058***	−0.056***	−0.049***	−0.047***	−0.069***
	(0.006)	(0.003)	(0.003)	(0.005)	(0.004)	(0.003)	(0.003)	(0.004)
(4) Years of schooling	0.042***	0.047***	0.033***	0.021***	0.058***	0.062***	0.045***	0.026***
	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
(5) Years since migration	0.006	0.018***	0.011	0.023***	0.006	0.012*	0.009	0.016**
	(0.012)	(0.007)	(0.010)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
(6) (Years since migration)^2/100	0.003	−0.035*	−0.016	−0.037**	0.004	0.002	0.007	−0.016
	(0.029)	(0.018)	(0.026)	(0.016)	(0.019)	(0.018)	(0.016)	(0.022)
(7) Somewhat related	0.167***	0.127***	0.111***	0.176***	0.145***	0.161***	0.114***	0.209***
	(0.016)	(0.011)	(0.010)	(0.020)	(0.012)	(0.014)	(0.010)	(0.019)
(8) Closely related	0.220***	0.193***	0.175***	0.240***	0.225***	0.328***	0.212***	0.338***
	(0.016)	(0.009)	(0.008)	(0.020)	(0.012)	(0.012)	(0.009)	(0.018)

Table 7 The effect of qualitative matching on wages—field of study and level of education (non-traditional immigrants) (*Continued*)

Covariates	Males				Females			
	General	Specialized	College	University	General	Specialized	College	University
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(9) Somewhat related × immigrant	0.049	0.093**	0.013	0.150***	0.131***	0.006	0.071*	0.059
	(0.062)	(0.045)	(0.049)	(0.052)	(0.042)	(0.048)	(0.040)	(0.048)
(10) Closely related × immigrant	0.147***	0.199***	0.030	0.298***	0.108***	0.050	0.071*	0.056
	(0.053)	(0.037)	(0.038)	(0.043)	(0.039)	(0.046)	(0.038)	(0.044)
N (person-years)								
Canadian-born	10,969	29,097	27,800	13,015	18,175	23,381	27,613	15,408
Immigrant	748	1719	1000	1502	1009	1136	1093	1085
R^2	0.2898	0.313	0.2465	0.287	0.3086	0.368	0.2824	0.318

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Pooled OLS estimates. The estimation sample spans panels 2-7 (2001-2011)and is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The immigrant sample is restricted to workers whose age at arrival was 10 years or older. The dependent variable is the natural logarithm of hourly wages. Wages are adjusted for inflation using the provincial all-items CPI for base year 2002. All regressions include a constant and controls for survey year, panel, marital status, no English or French mother tongue, region (British Columbia, Prairies, Ontario, Québec, Maritimes), Major Cities(Toronto, Montréal, Vancouver) and field of study. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Standard errors, adjusted for clustering at the individual level, are in parentheses and have been multiplied by 100

Table 8 Percent of entry effect due to mismatch: traditional vs. non-traditional immigrants

	Traditional			Non-traditional		
	Mismatch *not* held constant (1)	Mismatch held constant (2)	Percent change (1) vs. (2) (3)	Mismatch *not* held constant (1)	Mismatch held constant (2)	Percent change (1) vs. (2) (3)
Male immigrants						
Entry effect	−0.178***	−0.162***	−8.90%***	−0.324***	−0.289***	−11.00%***
	(0.049)	(0.050)	(0.033)	(0.032)	(0.034)	(0.018)
Female immigrants						
Entry effect	−0.263***	−0.226***	−14.10%***	−0.364***	−0.322***	−11.70%***
	(0.043)	(0.046)	(0.036)	(0.027)	(0.029)	(0.018)

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Entry effects are predicted using the estimates reported in Tables 3 and 4 and are transformed using (e^b-1) as suggested by Halvorsen and Palmquist (1980). Standard errors are calculated using the delta method

have entry earnings similar to their Canadian-born peers, while the estimated years to assimilation is 13 for traditional females (row 2). Male and female traditional immigrants who can secure a closely related job upon arrival are not economically disadvantaged in the labor market (row 3).

The pattern of assimilation among non-traditional males and females improves slightly for those partially matched, but full assimilation requires at least 20 years. On a positive note, those able to secure a close match over their career can fully assimilate in 6 and 11 years for males and females, respectively. The predicated results for non-traditionals in Table 12 reveal a similar pattern of reduced entry effects with improved matches. Among those who have acquired a specialized field or a university degree, assimilation is unattainable in unrelated jobs but is expected in under 10 years if in a closely related job (rows 1 vs. 3). The impact of matching is less helpful at improving assimilation among college graduates and females with general degrees. Nevertheless, their entry effects are reduced by more than half when closely matched. The

Table 9 Percent of entry effect due to mismatch: general vs. specialized fields (non-traditional immigrants)

	General fields			Specialized fields		
	Mismatch *not* held constant (1)	Mismatch held constant (2)	Percent change (1) vs. (2) (3)	Mismatch *not* held constant (1)	Mismatch held constant (2)	Percent change (1) vs. (2) (3)
Male immigrants						
Entry effect	−0.297***	−0.257***	−13.20%***	−0.324***	−0.289***	−10.80%***
	(0.071)	(0.075)	(0.050)	(0.036)	(0.037)	(0.020)
Female immigrants						
Entry effect	−0.371***	−0.324***	−12.70%***	−0.369***	−0.320***	−13.30%***
	(0.034)	(0.038)	(0.026)	(0.041)	(0.044)	(0.029)

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Entry effects are predicted using the estimates reported in Tables 3 and 4 and are transformed using (e^b-1) as suggested by Halvorsen and Palmquist (1980). Standard errors are calculated using the delta method

Table 10 Percent of entry effect due to mismatch: college vs. university (non-traditional immigrants)

	College			University		
	Mismatch *not* held constant (1)	Mismatch held constant (2)	Percent change (1) vs. (2) (3)	Mismatch *not* held constant (1)	Mismatch held constant (2)	Percent change (1) vs. (2) (3)
Male immigrants						
Entry effect	−0.328***	−0.294***	−10.50%***	−0.400***	−0.349***	−13.00%***
	(0.053)	(0.056)	(0.032)	(0.033)	(0.036)	(0.021)
Female immigrants						
Entry effect	−0.378***	−0.340***	−10.00%***	−0.429***	−0.384***	−10.50%***
	(0.037)	(0.040)	(0.023)	(0.032)	(0.036)	(0.019)

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Entry effects are predicted using the estimates reported in Tables 3 and 4 and are transformed using (e^b-1) as suggested by Halvorsen and Palmquist (1980). Standard errors are calculated using the delta method

ability of immigrants to obtain higher returns to their foreign-acquired human capital when matched could potentially be behind the strong wage effects of matching reported here.

5.3 The role of matching and the returns to foreign human capital

Tables 13 and 14 contain estimates of Eq. (4), stratified by traditional and non-traditional immigrants, for males and females, respectively. Separate estimates, based on potential and actual measures of experience, are also reported. Consistent with the Canadian literature, foreign experience is virtually worthless regardless of an immigrant's source country or gender (columns 1, row 6)[25]. The return to a year of foreign schooling is also discounted but to a much lesser extent for males than females (columns 1, rows 4, 7). These findings are consistent to Census estimates from Pendakur and Pendakur (1998), who show there is a sizable earnings disadvantage for female immigrants with foreign education from Asia or Africa, but not for male immigrants from these same regions. Similar returns to foreign education based on SLID data are also reported by Skuterud and Su (2012). Similarly, Alboim et al. (2005) using the Survey of Literacy Skills find high returns to foreign education, and Buzdugan and Halli (2009) using the Ethnic Diversity Survey reveal that for recent arrivals, discounted foreign experience is the driving force behind immigrant-wage disadvantages regardless of the origin of education. Taken as a whole, the main culprit behind immigrant-native wage gaps is the complete lack of return to foreign experience.

The second column under each stratification group in Tables 13 and 14 interacts with the foreign human capital variables (based on potential experience) with the degree of qualitative match (i.e., somewhat and closely related). The estimated interactions suggest that, even if immigrants are successful at finding a better match, their accumulated foreign work experience seems to be irrelevant to employers (columns 2, rows 6, 8, 9). Alternatively, there is a clear pattern across immigrant group and gender of increasing returns to foreign education with better matching. Additionally, only those closely matched receive the sizable returns to foreign education observed in columns 1. The pattern of results here echo those of Goldmann et al. (2009) that successfully matched immigrants, in terms of their pre- and post-migration

Table 11 Entry earnings and assimilation by job match—traditional vs. non-traditional immigrants

Match category upon arrival	Males immigrants				Females immigrants			
	Traditional		Non-traditional		Traditional		Non-traditional	
	Entry effect (1)	Years to assimilation (2)	Entry effect (1)	Years to assimilation (2)	Entry effect (1)	Years to assimilation (2)	Entry effect (1)	Years to assimilation (2)
(1) Not related to education	−0.184*** (0.055)	22	−0.378*** (0.032)	ua	−0.290*** (0.049)	ua	−0.369*** (0.028)	ua
(2) Somewhat related	−0.089 (0.059)	n/a	−0.219*** (0.042)	18	−0.118** (0.057)	13	−0.206*** (0.038)	20
(3) Closely related	0.048 (0.064)	n/a	−0.082* (0.045)	6	0.030 (0.063)	n/a	−0.106*** (0.041)	11

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. n/a = not applicable. ua = unattainable. Entry effects are predicted using the estimates reported in Table 4 and are transformed using (e^b-1) as suggested by Halvorsen and Palmquist (1980). Standard errors are calculated using the delta method

Table 12 Entry earnings and assimilation by job match—general vs. specialized and college vs. university (non-traditionals)

Match category upon arrival	General		Specialized		College		University	
	Entry effect (1)	Years to assimilation (2)	Entry effect (1)	Years to assimilation (2)	Entry effect (1)	Years to assimilation (2)	Entry effect (1)	Years to assimilation (2)
Males:								
(1) Not related to education	−0.323*** (0.069)	ua	−0.384*** (0.036)	ua	−0.307*** (0.055)	ua	−0.487*** (0.032)	ua
(2) Somewhat related	−0.160* (0.094)	24	−0.233*** (0.047)	23	−0.216*** (0.069)	ua	−0.290*** (0.048)	18
(3) Closely related	−0.023 (0.103)	n/a	−0.089* (0.050)	6	−0.150** (0.069)	16	−0.122** (0.052)	6
Females:								
(1) Not related to education	−0.383*** (0.035)	ua	−0.346*** (0.046)	28	−0.376*** (0.037)	33	−0.415*** (0.037)	ua
(2) Somewhat related	−0.187*** (0.050)	26	−0.227*** (0.056)	18	−0.249*** (0.052)	24	−0.235*** (0.051)	18
(3) Closely related	−0.139*** (0.053)	20	−0.046 (0.065)	n/a	−0.172*** (0.054)	17	−0.132** (0.053)	9

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. n/a = not applicable. ua = unattainable. Entry effects are predicted using the estimates reported in Table 4 and are transformed using (e^{b}-1) as suggested by Halvorsen and Palmquist (1980). Standard errors are calculated using the delta method

Table 13 The effect of job match on the returns to foreign human capital (males)

Covariates	Traditional immigrants				Non-traditional immigrants			
	Potential experience		Actual experience		Potential experience		Actual experience	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(1) Immigrant	0.273**	0.414***	0.239**	0.335***	0.076	0.232**	−0.032	0.166*
	(0.117)	(0.114)	(0.116)	(0.111)	(0.107)	(0.098)	(0.097)	(0.090)
(2) Canadian experience	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
(3) Canadian experience × immigrant	0.001	0.000	0.001	0.001	0.000	−0.001	0.003	0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
(4) Canadian years of schooling	0.058***	0.058***	0.054***	0.054***	0.058***	0.058***	0.054***	0.054***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
(5) Canadian years of schooling × immigrant	−0.020**	−0.027***	−0.019***	−0.028***	−0.011	−0.019***	0.007	−0.007
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)
(6) Foreign experience	0.001	0.004	0.001	0.007	−0.006**	−0.006**	−0.001	−0.007**
	(0.003)	(0.005)	(0.003)	(0.006)	(0.003)	(0.003)	(0.003)	(0.003)
(7) Foreign years of schooling	0.042***	0.016**	0.042***	0.018**	0.048***	0.020***	0.048***	0.019***
	(0.006)	(0.008)	(0.007)	(0.008)	(0.005)	(0.005)	(0.006)	(0.006)
(8) Foreign experience × somewhat related		−0.007		−0.009		−0.002		0.003
		(0.006)		(0.006)		(0.004)		(0.006)
(9) Foreign experience × close related		0.000		−0.005		0.004		0.011**
		(0.006)		(0.007)		(0.003)		(0.005)

Table 13 The effect of job match on the returns to foreign human capital (males) (*Continued*)

Covariates	Traditional immigrants				Non-traditional immigrants			
	Potential experience		Actual experience		Potential experience		Actual experience	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(10) Foreign years of schooling × somewhat related		0.016***		0.017***		0.017***		0.017***
		(0.005)		(0.005)		(0.004)		(0.004)
(11) Foreign years of schooling × close related		0.022***		0.023***		0.025***		0.025***
		(0.004)		(0.004)		(0.003)		(0.003)
N (person-years)								
Canadian-born	40,815	40,815	40,815	40,815	40,815	40,815	40,815	40,815
Immigrant	1691	1691	1691	1691	2502	2502	2502	2502
R^2	0.255	0.258	0.264	0.266	0.251	0.259	0.259	0.268

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Pooled OLS estimates. The estimation sample spans panels 2-7 (2001-2011)and is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The immigrant sample is restricted to workers whose age at arrival was 10 years or older. The dependent variable is the natural logarithm of hourly wages. Wages are adjusted for inflation using the provincial all-items CPI for base year 2002. All regressions include a constant and controls for survey year, panel, marital status, no English or French mother tongue, region (British Columbia, Prairies, Ontario, Québec, Maritimes), Major Cities(Toronto, Montréal, Vancouver) and field of study. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Standard errors, adjusted for clustering at the individual level, are in parentheses and have been multiplied by 100

Table 14 The effect of job match on the returns to foreign human capital (females)

Covariates	Traditional immigrants				Non-traditional immigrants			
	Potential experience		Actual experience		Potential experience		Actual experience	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(1) Immigrant	0.389***	0.561***	0.525***	0.599***	0.263**	0.353***	0.386***	0.436***
	(0.142)	(0.132)	(0.131)	(0.122)	(0.112)	(0.103)	(0.101)	(0.095)
(2) Canadian experience	0.008***	0.008***	0.011***	0.011***	0.008***	0.008***	0.011***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
(3) Canadian experience × immigrant	−0.001	−0.003	−0.003	−0.005**	0.005**	0.003	0.004**	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
(4) Canadian years of schooling	0.075***	0.075***	0.068***	0.068***	0.075***	0.075***	0.069***	0.068***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
(5) Canadian years of schooling × immigrant	−0.023***	−0.031***	−0.007	−0.016**	−0.009	−0.015**	0.010	−0.001
	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)
(6) Foreign experience	−0.004	−0.003	0.003	0.011*	−0.002	0.001	0.002	−0.001
	(0.003)	(0.004)	(0.003)	(0.006)	(0.002)	(0.003)	(0.003)	(0.005)
(7) Foreign years of schooling	0.048***	0.021***	0.030***	0.007	0.040***	0.017***	0.026***	0.009
	(0.007)	(0.007)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)	(0.006)
(8) Foreign experience × somewhat related		−0.001		−0.006		−0.004		0.002
		(0.005)		(0.007)		(0.003)		(0.006)

Table 14 The effect of job match on the returns to foreign human capital (females) (*Continued*)

Covariates	Traditional immigrants				Non-traditional immigrants			
	Potential experience		Actual experience		Potential experience		Actual experience	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(9) Foreign experience × close related		0.003		−0.010		−0.001		0.003
		(0.006)		(0.007)		(0.003)		(0.006)
(10) Foreign years of schooling × somewhat related		0.015***		0.017***		0.018***		0.013***
		(0.004)		(0.005)		(0.003)		(0.003)
(11) Foreign years of schooling × close related		0.025***		0.029***		0.026***		0.023***
		(0.004)		(0.004)		(0.003)		(0.003)
N (person-years)								
Canadian-born	43,021	43,021	43,021	43,021	43,021	43,021	43,021	43,021
Immigrant	1474	1474	1474	1474	2178	2178	2178	2178
R^2	0.284	0.288	0.308	0.311	0.287	0.293	0.312	0.317

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Pooled OLS estimates. The estimation sample spans panels 2-7 (2001-2011)and is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The immigrant sample is restricted to workers whose age at arrival was 10 years or older. The dependent variable is the natural logarithm of hourly wages. Wages are adjusted for inflation using the provincial all-items CPI for base year 2002. All regressions include a constant and controls for survey year, panel, marital status, no English or French mother tongue, region (British Columbia, Prairies, Ontario, Québec, Maritimes), Major Cities(Toronto, Montréal, Vancouver) and field of study. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Standard errors, adjusted for clustering at the individual level, are in parentheses and have been multiplied by 100

occupations, increase the return to foreign schooling, but not to potential foreign experience.

The results from estimating Eq. (4), using more accurate measures of foreign human capital and based on actual years of work experience, are reported in Tables 13 and 14 (columns 3 and 4) and also in Table 15 which is stratified by college, university, and general and specialized fields. Across all genders, immigrant groups, and education types, those with better matches earn much higher returns to their foreign education (Tables 13, 14, 15; rows 10, 11). The effect tends to be moderated among college graduates which is consistent with the more modest effects of matching on assimilation presented in Table 12. However, some immigrant groups are now found to earn positive and significant returns to their foreign work experience. Traditional females are found to earn yearly returns of 1.1% regardless of job match (Table 14, row 6, column 4). Non-traditional males receive an 1.1 percentage point boast in their returns when closely matched, but those not closely matched earn negative, albeit small, returns to foreign experience. In contrast to Goldmann et al. (2009) and Warman (2007) who also find negative returns, this disadvantage is only experienced by unmatched immigrants whose unobservable motivation or willingness to adapt could be lower compared to older immigrants who have acquired more foreign experience[26]. If true, this negative correlation could be responsible for the negative returns as it would impart a downward bias on the estimates of foreign experience. When considering non-traditional males with specialized fields or university degrees, matching is also found to boost their returns to foreign experience (Table 15, row 9)

It is plausible that a portion of education-related skills have a complementary effect with work experience such that it boasts productivity. As well, employers who require many education-related skills may put more effort into exploring the merits of an applicant's pre-migration work experience. Some skilled immigrants may also cluster in certain field-occupation pairs where the productivity enhancing attributes of their foreign experience become widely known among employers. If clustering is less prevalent among traditional immigrants, this could explain why matching has little effect on the returns to their foreign experience. Further research based on a larger immigrant sample than that collected in the SLID could help resolve this issue and provide a more comprehensive picture.

6 Conclusions

Canadian immigration studies have repeatedly found that immigrant earnings are substantially below that of similarly skilled native-born workers. This article examined the role of qualitative education-job matching in explaining these poor labor market outcomes. Upon arrival, immigrants, especially females, are more likely than natives to be mismatched. Further, when immigrants are mismatched, they generally experience larger wage penalties compared to natives suggesting they have a greater difficulty adapting when not able to work in their field. As such, mismatches are an important mechanism behind the negative entry effects experienced by Canadian immigrants reported throughout the literature. On the whole, mismatches can explain in the range of 9 to 14% of the entry wage disadvantage experience by immigrants upon arrival. Among immigrants from non-traditional source regions, only those who are closely matched upon arrival can expect to reach parity with comparably skilled natives over their working career in Canada.

Table 15 The effect of job match on the returns to foreign human capital (non-traditional males and females)

Covariates	Males				Females			
	General	Specialized	College	University	General	Specialized	College	University
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(1) Immigrant	0.396*	0.131	0.200**	−0.174	0.432***	0.443***	0.246**	0.057
	(0.219)	(0.093)	(0.101)	(0.161)	(0.123)	(0.130)	(0.116)	(0.164)
(2) Canadian experience	0.011***	0.008***	0.009***	0.013***	0.012***	0.009***	0.011***	0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(3) Canadian experience × immigrant	0.001	0.001	−0.001	0.005*	−0.001	0.004**	0.004**	0.000
	(0.004)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)
(4) Canadian years of schooling	0.053***	0.054***	0.037***	0.022***	0.065***	0.070***	0.047***	0.026***
	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
(5) Canadian years of schooling × immigrant	−0.019	−0.004	−0.015	0.020**	0.002	−0.001	0.004	0.024**
	(0.014)	(0.006)	(0.010)	(0.008)	(0.010)	(0.010)	(0.012)	(0.011)
(6) Foreign experience	−0.003	−0.011**	−0.006	−0.013**	0.004	0.001	−0.007	0.002
	(0.004)	(0.005)	(0.004)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
(7) Foreign years of schooling	0.005	0.022***	0.006	0.000	0.007	0.008	0.004	−0.011
	(0.013)	(0.007)	(0.007)	(0.009)	(0.007)	(0.009)	(0.008)	(0.010)
(8) Foreign experience × somewhat related	0.009	0.002	−0.005	0.012	0.001	−0.005	−0.004	0.006
	(0.010)	(0.008)	(0.007)	(0.010)	(0.007)	(0.010)	(0.011)	(0.008)

Table 15 The effect of job match on the returns to foreign human capital (non-traditional males and females) (*Continued*)

Covariates	Males				Females			
	General	Specialized	College	University	General	Specialized	College	University
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(9) Foreign experience × close related	0.002	0.015**	0.007 0.017**	0.007	−0.002	0.001	0.003	
	(0.008)	(0.006)	(0.006)	(0.007)	(0.009)	(0.008)	(0.008)	(0.008)
(10) Foreign years of schooling × somewhat related	0.016**	0.016***	0.016***	0.015**	0.013***	0.014***	0.014***	0.011***
	(0.007)	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)	(0.004)
(11) Foreign years of schooling × close related	0.030***	0.022***	0.015***	0.027***	0.019***	0.028***	0.020***	0.023***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
N (person-years)								
Canadian-born	10,969	29,097	27,800	13,015	18,175	23,381	27,613	15,408
Immigrant	748	1719	1000	1502	1009	1136	1093	1085
R^2	0.250	0.272	0.205	0.260	0.286	0.299	0.259	0.259

Note: significance level: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Pooled OLS estimates. The estimation sample spans panels 2-7 (2001-2011)and is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The immigrant sample is restricted to workers whose age at arrival was 10 years or older. The dependent variable is the natural logarithm of hourly wages. Wages are adjusted for inflation using the provincial all-items CPI for base year 2002. All regressions include a constant and controls for survey year, panel, marital status, no English or French mother tongue, region (British Columbia, Prairies, Ontario, Québec, Maritimes), Major Cities(Toronto, Montréal, Vancouver) and field of study. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Standard errors, adjusted for clustering at the individual level, are in parentheses and have been multiplied by 100

An overarching theme in the immigration literature is that immigrants receive little to no returns to foreign experience. Consequently, this discounting is the main culprit behind immigrant-native wage disparities. The analysis here examined the effects of matching on the wage returns to foreign experience and education. Matching is associated with higher wage returns to foreign education and, in some cases, to foreign work experience with the estimated effect increasing with the degree of job match. Clearly, immigration policy aimed at increasing the share of immigrants who are able to work in their field of study can significantly reduce immigrant earnings disadvantages.

Endnotes

[1] Hartog (2000) provides a literature review on quantitative matching.

[2] Chiswick and Miller (2009b) suggest that point systems used to ration visas such as those in Canada and Australia could benefit more if additional points are added for pre-arranged employment or for having particular skills highly demanded in the labor market—criteria that could reduce the level of education-job mismatches.

[3] On July 1, 2012, as a result of changes to the Immigration and Refugee Protection Act, immigrants entering under the federal skilled worker program are now assessed based on similarities between their host-country occupation and occupations in Canada that are deemed to have a labor shortage.

[4] The most recent agency to be established is the Foreign Credential Recognition Program administered by Human Resources and Skills Development Canada. This is the first national agency created that works with provincial agencies to develop comprehensive policies and procedures to help immigrants gain recognition for their foreign credentials.

[5] According to data obtained from Citizenship and Immigration Canada between 1995 and 2006, the average percent of immigrants entering under the skilled worker class (the largest component of the economic class) who are principal applicants that self-identified themselves as being in regulated occupations is 31% at the national level.

[6] Access to the unrestricted micro-data file was provided through the Toronto Research Data Center (RDC).

[7] Occupations were classified according to the National Occupational Classification for Statistics 2006. Field of study was classified according to the Classification of Instructional Programs code (CIP Canada 2000).

[8] Due to confidentiality concerns raised by Statistics Canada, the "somewhat related" and "not at all related" categories of the SLID match variable are collapsed into one category in Appendix Table 18. For similar reasons, only the results for the entire sample are reported for immigrants.

[9] A frequency distribution of the occupations and fields of study for the subsets in panel 2 (rows 2 and 3) of Appendix Table 17 are not included in the manuscript due to their length and confidentiality concerns raised by Statistics Canada. However, the list of these occupation/field of study pairs without their associated frequency is available upon request from the author.

[10] Statistics Canada attempted to derive a match measure by linking the categories of the 1980 Standard Occupational Classification to the 1991 Census Major Field of Study classification (Lathe 1996).

[11] Two alternative statistics have been used to estimate the typical level of schooling within an occupation. Chiswick and Miller (2008), Cohn and Khan (1995), and Kiker et al. (1997)

prefer using modal years of schooling within an occupation while Verdugo and Verdugo (1989) deem workers fully matched if their years of schooling fall within one standard deviation above or below the occupation mean. Generally, empirical results are not overly sensitive to the measurement used (Hartog 2000)

[12] Appendix Table 19 contains summary statistics of the key variables employed in the multivariate analysis.

[13] It is common in the literature to include indicators for immigrant arrival cohorts. However, unlike the Census, the SLID only covers 2001–2007. When the immigrant indicator is replaced with indicators for arrival cohorts, I find a decline in cohort quality not consistent with Census-based studies. The reason for this discrepancy is that the sample does not have immigrant wages upon arrival for earlier cohorts. Thus, any estimates are based on an out-of-sample projection based on the assimilation experience of recent immigrants. As such, the sample is stratified by traditional and non-traditional immigrants with this latter group comprising the majority of the intake in recent decades.

[14] Although a measure of actual experience is available in SLID, the reported estimates are based on potential experience in order to report estimates consistent with the literature. Similar to Hum and Simpson (2004) when actual experience is used instead of potential experience, I find that the entry effects improve but the assimilation effect deteriorates. On the whole, despite which measure is employed, qualitative matches are found to be a significant mechanism behind the poor economic performance of immigrants.

[15] See Appendix Table 19.

[16] Field of study categories are aggregated according to the first two digits of the Classification of Instructional Programs code (CIP Canada 2000).

[17] See Card (1999) for a survey of studies who have used parental education as an instrumental variable in estimating the returns to education.

[18] Years to earnings parity is obtained by solving for the quadratic term in ysm in $\alpha_0 + \alpha_1 \text{ysm}_{it} + \alpha_2 \text{ysm}_{it}^2 = 0$ from Eq. (3).

[19] The actual foreign and Canadian experience variables are based on the proportions of potential experience acquired in the source country and Canada, respectively. For immigrants who received a credential after their migration age, its duration is correctly attributed to Canadian schooling rather than foreign schooling as is done in other studies that need to assume continuously acquired education. Likewise, this time in school is not incorrectly attributed to Canadian experience.

[20] Neither Yuen (2010) nor Robst (2007) include immigrants in their analysis.

[21] The reported figures are transformed using $(e^{\beta} - 1)$ as suggested by Halvorsen and Palmquist (1980) when interpreting indicator variables in a semi-log specification.

[22] General fields of study refer to those with the highest credential in Humanities, Social Sciences, Psychology, or Liberal Arts. Specialized fields of study refer to those with the highest credential in Sciences, Technology, Engineering, or Math.

[23] All of the predicted figures in Tables 8, 9, 10, 11, and 12 make use of the transformation $(e^{\beta} - 1)$ suggested by Halvorsen and Palmquist (1980) when interpreting indicator variables in a semi-log specification.

[24] Separate specifications were run (not shown) with interaction terms of ysm with the categories of match and were found to be statistically insignificant.

[25] See Green and Worswick (2010); Aydemir and Skuterud (2005); Schaafsma and Sweetman (2001); Skuterud and Su (2012); Goldmann et al. (2009); Warman (2007).

[26] Introducing age at migration into the model to capture these unobservable effects would introduce perfect collinearity with foreign experience and foreign years of schooling.

Appendix

Table 16 Specialized occupation and field of study matches

	Field of study code(s)		Corresponding NOC code(s)	
	Code	Field name	Code	Occupation name
Architects	4.0201	Architecture	C051	Architect
	4.0301	City/urban, community, and regional planning	C053	Urban and landuse planners
	4.0601	Landscape architecture	C052	Landscape architect
Education	13.0101	Education, general	E121	College and other vocational instructors
			E130	Elementary/secondary school teachers n.e.c.
			E131	Secondary school teachers
			E132	Elementary school and kindergarten teachers
			E111	University professors
			E112	Post-secondary teaching and research assistants
			E121	College and other vocational instructors
			E130	Elementary/secondary school teachers n.e.c.
			E131	Secondary school teachers
			E132	Elementary school and kindergarten teachers
			E133	Educational counsellors
			E214	Instructors and teachers of persons with disabilities
			E215	Other instructors
Engineering	14.0201	Aerospace, aeronautical, and astronautical engineering		
	14.0701	Chemical engineering		
	14.08	Civil engineering	C031	Civil engineer
	15.0201	Civil engineering technology/technician	C131	Civil engineering technologists and technicians
	14.0701	Chemical engineering	C034	Chemical engineers
	14.1901	Mechanical engineering	C032	Mechanical engineers
	14.09	Computer engineering	C047	Computer engineer (except software engineer)
	14.0903	Computer software engineering	C073	Software engineer
	14.3901	Geological/geophysical engineering	C044	Geological engineer

Table 16 Specialized occupation and field of study matches (*Continued*)

	Field of study code(s)		Corresponding NOC code(s)	
	Code	Field name	Code	Occupation name
Health	51.0401	Dentistry (DDS, DMD)	D013	Dentist
	51.0603	Dental laboratory technology/technician	D223	Dental technologists, technicians
	51.0602	Dental hygiene/hygienist	D222	Dental hygienists and therapists
	51.0601	Dental assisting/assistant	D311	Dental assistant
	51.0101	Chiropractic (DC)	D022	Chiropractor
	51.1201	Medicine (MD)	D012	General practitioners and family physicians
			D011	Specialist physician
			D023	Other professional occupations in health diagnosing and treating
	51.1701	Optometry (OD)	D021	Optometrists
	51.2001	Pharmacy (PharmD [USA], PharmD or BSc/BPharm [Canada])	D031	Pharmacists
	51.2401	Veterinary medicine (DVM)	D014	Veterinarians
	51.1601	Nursing/registered nurse (RN, ASN, BScN, MScN)	D112	Registered nurse
	51.1605	Family practice nurse/nurse practitioner	D233	Licensed practical nurses
	51.081	Emergency care attendant (EMT ambulance)	D234	Ambulance attendants and other paramedical occupations
Skilled Trades	46.0101	Masonry/mason	H131	Bricklayers
	46.0201	Carpentry/carpenter	H121	Carpenters
	46.0503	Plumbing technology/plumber	H111	Plumbers
	46.0502	Pipefitting/pipefitter and sprinkler fitter	H112	Steamfitters, pipefitters, and sprinkler system installers
	46.0302	Electrician	H211	Electricians (except industrial and power system)
			H212	Industrial electricians
	46.0303	Lineworker	H214	Electrical power line and cable workers
			H215	Telecommunications line and cable workers

Table 16 Specialized occupation and field of study matches (*Continued*)

Field of study code(s)		Corresponding NOC code(s)	
Code	Field name	Code	Occupation name
46.0402	Concrete finishing/concrete finisher	H132	Concrete finishers
48.0501	Machine tool technology/machinist	H311	Machinists and machining and tooling inspectors
48.0506	Sheet metal technology/sheetworking	H321	Sheet metal workers
48.0507	Tool and die technology/technician	H312	Tool and die makers
48.0508	Welding technology/welder	H326	Welders and related machine operators
48.0509	Ironworking/ironworker	H324	Ironworkers
48.0801	Boilermaking/boilermaker	H322	Boilermakers
48.0303	Upholstery/upholsterer	H511	Upholsterers
47.0201	Heating, air conditioning, ventilation, and refrigeration/technician (HAC, HACR, HVAC, HVACR)	H413	Refrigeration and air conditioning mechanics
47.0603	Autobody/collision and repair technology/technician	H422	Motor vehicle body repairers
47.0604	Automobile/automotive mechanics technology/technician	H421	Automotive service technicians, truck mechanics, and mechanical repairers
49.0102	Airline/commercial/professional pilot and flight crew	C171	Air pilots, flight engineers, and flying instructors
49.0108	Flight instructor		
49.0105	Air traffic controller	C172	Air traffic control and related occupations

Occupations were classified according to the National Occupational Classification for Statistics 2006. Field of study was classified according to the Classification of Instructional Programs code (CIP Canada 2000)

Table 17 SLID job match vs. occupational/field matches

	Canadian-born					Immigrants
	Education	Health	Engineering/architecture	Trades	All fields	All fields
SLID (self-reported) measure	(1)	(2)	(3)	(4)	(5)	(6)
Closely matched—occupation and field name						
(1) Not matched (%)	2.0	1.3	6.0	11.1	4.4	5.0
(2) Closely matched (%)	98.1	98.7	94.0	88.9	95.6	95.0
N (person-years)	1642	2249	285	1591	5767	304
Not matched by occupation and field name						
(1) Not matched (%)	37.9	24.4	34.4	49.3	39.0	39.5
(2) Closely matched (%)	62.1	75.6	65.7	50.7	61.1	60.5
N (person-years)	700	1933	1185	3314	7132	807

Appendix Table 16 outlines the specialized fields and occupations used to select this subsample. Due to confidentiality concerns raised by Statistics Canada the field of study categories for immigrants cannot be reported separately and were collapsed

Table 18 Distribution of quantitative match by self-reported SLID match variable (males and females)

	Workers closely matched (Occupation-field and SLID measure)	Workers in a closely related job (SLID measure)	Workers in a somewhat related job (SLID measure)	Workers in an unrelated job (SLID measure)
	(1)	(2)	(3)	(4)
(1) Adequately educated (%)	27.0	23.0	20.0	19.0
(2) Over-educated (%)	51.0	46.0	45.0	43.0
(3) Under-educated (%)	22.0	32.0	35.0	38.0
(4) Total (%)	100.0	101.0	100.0	100.0
N (person-years)	5767	57,781	15,417	18,484

Appendix Table 16 outlines the specialized fields and occupations used to select this subsample. Quantitative match categories are created using the Realized Matches (RM) proposed by Chiswick and Miller (2008). Adequately educated refers to workers whose level of schooling equals the modal level of their current occupation. Over- and under-educated capture the respective deviations from the mode. Due to confidentiality concerns figures have been rounded to the nearest whole number

Table 19 Means of key variables

	Males			Females		
	Immigrants		Canadian-born	Immigrants		Canadian-born
	(1)	(2)	(3)	(1)	(2)	(3)
	Traditional	Non-traditional	All	Traditional	Non-traditional	All
Demographic and human capital						
Age	48.8	45.1	41.9	47.2	44.2	41.4
Married (%)	80.9	85.3	63.2	71.2	73.0	56.4
Years of schooling	15.9	16.3	15.3	15.8	15.5	15.2
Canadian years (if > 0)	3.9	4.4	15.3	3.7	3.4	15.2
Foreign years	14.3	14.5	–	14.0	14.0	–
Work experience	25.4	17.2	20.2	19.4	15.6	17.3
Canadian years	17.7	10.2	20.3	13.2	9.7	17.0
Foreign years (if > 0)	8.0	6.8	–	5.9	5.4	–
Supervisor responsibility	50.9	39.8	45.4	35.0	26.6	33.1
Years since migration	22.0	16.2	–	21.4	16.4	–
Geographic location						
Toronto (%)	15.8	29.6	3.5	17.0	30.3	3.4
Montreal (%)	6.0	6.7	4.4	4.2	7.3	4.2
Vancouver (%)	7.0	10.2	2.5	6.9	11.2	2.3
Ontario (%)	48.3	48.3	27.9	48.6	49.1	26.6
Quebec (%)	9.4	9.1	21.8	7.1	8.8	20.5
Atlantic (%)	6.5	2.8	20.4	5.6	1.9	23.0
Prairies (%)	21.6	26.5	22.8	23.7	26.8	23.3
BC (%)	14.2	13.3	7.0	15.1	13.5	6.7
Mother tongue						
English (excl. Quebec %)	45.0	16.0	89.0	46.0	17.7	88.3
English (Quebec %)	9.4	2.6	4.3	10.6	18.8	3.5
French (excl. Quebec %)	2.3	0.8	6.8	1.7	0.9	7.3
French (Quebec %)	47.2	12.3	93.2	50.0	18.8	94.4

Table 19 Means of key variables (*Continued*)

	Males			Females		
	Immigrants		Canadian-born	Immigrants		Canadian-born
	(1)	(2)	(3)	(1)	(2)	(3)
	Traditional	Non-traditional	All	Traditional	Non-traditional	All
No English or French (excl. Quebec %)	52.7	83.2	4.2	52.3	81.4	4.3
No English (Quebec %)	43.4	85.0	2.5	39.4	62.3	2.0
Field of study						
Education, arts, humanities, and communications technologies (%)	12.4	7.1	10.7	18.9	16.5	18.1
Social and behavioral sciences and law (%)	6.3	6.2	8.1	14.7	10.8	13.0
Business, management, and public administration (%)	10.2	19.7	15.8	23.9	30.4	30.7
Physical and life sciences and technologies (%)	7.3	6.8	3.8	5.5	5.8	2.0
Mathematics, computer, and information sciences (%)	7.0	8.8	5.6	5.6	6.3	3.9
Architecture, engineering, and related technologies (%)	43.0	41.4	40.4	6.0	5.5	3.1
Agriculture, natural resources, conservation, personal, protective, and transportation services (%)	9.8	5.0	11.3	6.1	2.7	6.1
Health, parks, recreation, and fitness (%)	4.1	4.9	4.3	19.1	22.0	23.1
N (person-years)	1691	2502	40,815	1474	2178	43,021
N (unique persons)	673	1009	15,418	605	936	16,744

Data are from the SLID and include panels 2-7 for the years 2001-2011. The estimation sample is restricted to full-time full-year paid workers aged 18-64, with positive wages and who have at least one post-secondary education credential. The sample contains Canadian-born and immigrant workers who arrived in Canada at 10 years or older. Traditional immigrants include those born in the following countries/regions: United Kingdom, United States, Europe, Australia and New Zealand. Non-traditional immigrants include those born in the following countries/regions: Middle-East, Caribbean, Mexico and Central America, Southern America, Asia, Southeast Asia and Africa. Wages are adjusted for inflation using the provincial all-items CPI for base year 2002. Field of study categories are aggregated according to the first two digits of the Classification of Instructional Programs code (CIP Canada 2000)

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