Three Chapters on the Labour Market Assimilation of Canada's Immigrant Population

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

The three chapters of my dissertation examine immigrant assimilation in the Canadian labour market. Through three levels of analysis, which are distinguished by the sample restrictions that are employed, I investigate immigrant labour force and job dynamics, immigrant propensity for self-employment, and immigrant wage assimilation, respectively. In the first chapter, I exploit recently-introduced immigrant identifiers in the Canadian Labour Force Survey (LFS) and the longitudinal dimension of these data to compare the labor force and job dynamics of Canada's native-born and immigrant populations. I am particularly interested in the role of job, as opposed to worker, heterogeneity in driving immigrant wage disparities and in how the paths into and out of jobs of varying quality compares between immigrants and the native-born. The main finding is that the disparity in immigrant job quality, which does not appear to diminish with years since arrival, reflects a combination of relatively low transitions into high-wage jobs and high transitions out of these jobs. The former result appears about equally due to difficulties obtaining high-wage jobs directly out of unemployment and in using low-wage jobs as stepping-stones. I find little or no evidence, however, that immigrant jobseekers face barriers to low-wage jobs. We interpret these findings as emphasizing the empirical importance of the quintessential immigrant anecdote of a low-quality "survival job" becoming a "dead-end job".

The second chapter analyzes immigrant choice of self-employment versus paid employment. Using the Canadian Census public use microdata files from 1981 to 2006, I update the Canadian literature on immigrant self-employment by examining changes in the likelihood of self-employment across arrival cohorts of immigrants and how self-employment rates evolve in the years following migration to Canada. This study finds that new immigrants, who arrived between 1996 and 2005, turned to self-employment at a faster rate than the earlier cohorts and that immigrants become increasingly likely to be self-employed as they spend more time in Canada. More important, I examine immigrant earnings outcomes relative to the native-born, instead of within, sectors and thus explore the extent to which a comparative advantage in self-employment, captured by the difference in potential earnings between the self- and paid-employment sectors, can explain the tremendous shift toward self-employment in the immigrant population. The results show that the earnings advantage between the self- and the paid-employment sectors accounts for the higher likelihood of self-employment for traditional immigrants in the years following migration. However, the potential earnings difference cannot explain the reason that non-traditional immigrants are more likely to be self-employed as they consistently lose an earnings advantage in the self-employment sector relative to the paid-employment sector. My paper suggests that immigrants may face barriers to accessing paid-employment, or immigrants are attracted to self-employment by non-monetary benefits.

Lastly, in the third chapter, studies which estimate separate returns to foreign and host-country sources of human capital have burgeoned in the immigration literature in

recent years. In estimating separate returns, analysts are typically forced to make strong assumptions about the timing and exogeneity of human capital investments. Using a particularly rich longitudinal Canadian data source, I consider to what extent the findings of the Canadian literature may be driven by biases arising from errors in measuring foreign and host-country sources of human capital and the endogeneity of post-migration schooling and work experience. The main finding is that the results of the current literature by and large do not appear to be driven by the assumptions needed to estimate separate returns using the standard data sources available.

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Introduction

The term "immigrant assimilation" refers to the process in which immigrants integrate into a host country. Many theories have attempted to understand immigrant assimilation. The classic assimilation theory hypothesizes that immigrants will show greater similarities with native-born people in behaviors and characteristics over time, while the theory of ethnic disadvantage holds that immigrant assimilation is blocked due to discrimination and institutional barriers. Researchers with different backgrounds attach importance to different aspects of immigrant assimilation. Researchers in the economics literature have, for example, examined spatial concentration (Warman 2007); language attainment (Chiswick and Miller 2007); intermarriage (Meng and Gregory 2005); and measures of individual health (McDonald and Kennedy 2004). Spatial concentration measures assimilation of a particular ethnic group based on their duration and concentration in a particular geographic location. Language attainment tracks the increased ability to speak the host-country language and the loss of the individual's native tongue. Information on intermarriage between people of different ethnic groups provides evidence of assimilation, particularly as high rates of intermarriage restrict the intergenerational transmission of an ethnic culture. Finally, studies of health compare various health measures between immigrants and similarly-aged native-born individuals at the time of an immigrant's arrival and as the immigrant spends more time absorbed in the host-country culture.

The vast majority of the economics literature addresses immigrant labour market assimilation, that is the extent to which immigrants come to share common labour market behaviours and outcomes with their native counterparts. In particular, earnings and wages are the most common measures of immigrant labour market assimilation. Economists often infer immigrant assimilation from their returns to an immigrant's years since migration (YSM) and hence predict whether immigrant wages/earnings might catch up with that of native counterparts (e.g., Chiswick 1978; Borjas 1985). Based on the measures of wages and earnings, the immigrant sample is typically restricted to paid employees or employed workers with positive earnings. Nevertheless, the analysis by using a subset of the entire immigrant population leads to a very common problem in the economics literature, which is a sample selection bias as immigrants are unlikely to obtain employment or choose the paid-employment sector on a random basis.

The three chapters of my dissertation specifically examine immigrant assimilation in the Canadian labour market. Three levels of analysis are used and they are distinguished by the sample restrictions that are employed. The first chapter provides the broadest level of analysis by investigating the labour market dynamics of the entire immigrant population relative to the native-born individuals. Labour market dynamics are generally defined as transition probabilities across states of employment, unemployment and the out of labour force. It is argued that immigrants encounter barriers accessing employment and that this is especially prevalent for recent immigrants. The first chapter explores the longitudinal dimension of Labour Force Survey (LFS) data to compare the labor force dynamics of Canada's native-born and immigrant populations, and to examine the role of transitions among certain states in driving immigrant wage disparities.

The second level of analysis narrows the sample to employed Canadian-born and immigrant workers, thereby excluding unemployed individuals and those out of labour force. The second chapter is instead primarily concerned with the choice between working in the self- or the paid-employment sector. Self-employment accounts for a highly disproportionate share of the labour market activity of new Canadian immigrants. Several papers in the Canadian literature have suggested that self-employment rates have tended to increase with the arrival of new immigrants and they tended to diverge from those of the native-born when immigrants have been residing in Canada. Using a rich Canadian Census data, I am able to examine any changes in the likelihood of self-employment across arrival cohorts of immigrants, and how self-employment rates evolve in the years following migration to Canada, especially for immigrants who arrived in Canada between 1996 and 2005. More important, I attempt to examine the extent to which a comparative advantage (or productivity advantage) in self-employment, measured by the difference in potential earnings between the self-employment and paid-employment sectors, can explain the shift toward self-employment in the immigrant population.

The third chapter of my dissertation is the narrowest in scope, as it restricts the sample to paid employees. At this narrow level, the focus is on assimilation in earnings conditional on employment in the paid-employment sector. The third chapter attempts to estimate separate wage returns to foreign and host-country sources of human capital as suggested in the recent immigration literature. Using a particularly rich longitudinal Canadian data source, I examine the extent to which the previous findings of Canadian immigrant wage assimilation may be driven by biases arising from errors in measuring foreign and host-country sources of human capital and the endogeneity of post-migration schooling and work experience.

The study of immigrant labour market assimilation is very important in Canada because 20% of the entire Canadian population is comprised of individuals who were born outside Canada. The results on immigrant labour market assimilation provide valuable insights to inform immigrant selection and settlement policy. For example, the results of the first

chapter reveal that immigrants have difficulties obtaining high-wage jobs directly out of unemployment and in being able to successfully use low-wage jobs as stepping stones into high-wage jobs. They suggest that immigrant settlement policies directed exclusively at the unemployed will ultimately fall short in their attempt to facilitate the labour integration of Canada's newest immigrants.

In addition, research on immigrant self-employment may hold implications for revisions to settlement policy. If the relatively higher immigrant likelihood of self-employment is caused by comparative advantages (or productivity) in the self-employment sector or non-monetary benefits provided by self-employment, policy makers may enhance government schemes to encourage self-employment through guaranteed loans. In contrast, if the results suggest that the immigrant propensity for self-employment is caused by barriers to the paid-employment sector, policy makers will concentrate more on the employment legislation and local authority assistance for promoting job opportunities. An example is the foreign credential recognition program, which helps employers to evaluate foreign credentials. Similarly, a model for wage assimilation can predict which types of immigrants experience rapid wage growth in relation to observable human capital such as educational credentials and work experience. For example, the estimates in the third chapter suggest that immigrants with more foreign work experience not only start at lower initial wages compared with a similarly aged native-born worker, but also experience lower subsequent wage growth. In contrast, we find little evidence that foreign schooling either lowers relative wage outcomes at entry or affects subsequent growth. Therefore, the conclusions drawn from research on immigrant wage assimilation would have important implications on both immigrant selection and settlement policies.

Chapter 1

Immigrants and the Dynamics of High-wage Jobs: Evidence from the Canadian Labour Force Survey

1.1 Introduction

The deteriorating labor market performance of new immigrants to Canada, which occurred between the early 1970s up to at least the mid-1990s, is now well documented in the literature (see Baker and Benjamin 1994 for early evidence and Aydemir and Skuterud 2005 for more recent evidence). Concerns over how best to reverse this trend have over the past decade spawned a substantial literature informing the nature of the obstacles facing Canada's newest immigrants (see Picot and Sweetman 2005 for a review). Overwhelmingly, these studies have sought to identify sources of variation in worker productivity between immigrants and the Canadian-born with similar years of schooling and work experience. Aydemir and Skuterud (2005) and Green and Worswick (2010), for example, identify differential returns to foreign and host-country work experience; Sweetman (2004) examines differences in school quality; Ferrer, Green and Riddell (2006) examine literacy skills; and Ferrer and Riddell (2008) compare returns to education between immigrants and natives.

It is now widely recognized among economists that much of the wage dispersion observed in real-world labor markets exists independently of heterogeneity in worker productivity. Using matched employer-employee data, Abowd, Creecy, and Kramarz (2002) report that variation in how firms pay identical workers amounts to roughly 20% to 30% of overall wage dispersion. An important question is to what extent these types of wage differentials underlie the labor market challenges of Canadian immigrants. One possibility is that employers discriminate against immigrants on the basis of something other than their pro-

ductivity. The disparity in callback rates for Chinese and South-Asian minorities identified in the recent audit study by Oreopoulos (2009) provides some evidence of this, though it is difficult to know to what extent these differences in callback rates translate into wage differentials (Heckman 1998). The possibility that employers systematically undervalue equivalent foreign educational credentials (Bauder 2003) is also consistent with this type of variation, though it is not obvious why such behaviour would persist in competitive labor markets. A third possibility, which has come to dominate the theoretical economics literature seeking to explain wage dispersion across employers, is that immigrant wage disparities reflect heterogeneity in the productivity of firms, combined with frictions in the information workers have about which firms are hiring and the wages they are offering (Mortensen 2005). Suggestive of the role of firm heterogeneity in driving immigrant wage disparities, Aydemir and Skuterud (2008) find that the concentration of recent immigrant men from non-traditional source regions (Asia, Africa, and Eastern Europe) in low-wage firms within Canada's major urban centres can account for roughly three-quarters of the 19% average wage gap facing this group.

The role of the job search process in driving immigrant wage disparities has received remarkably little attention in the Canadian immigration literature. The reason for this gap reflects, at least in part, the scarcity of longitudinal data identifying the transitions of immigrants into and out of jobs of varying quality. A recent exception is Goel and Lang (2009) who use data from the Longitudinal Survey of Immigrants to Canada (LSIC) to study the initial job search durations of a representative sample of the 2002 immigrant arrival cohort.[1] An important shortcoming of these data, however, is that they contain no observations on native-born workers. As a result, it is difficult to know to what extent their findings reflect challenges common to all new labor market entrants. Further, they only tell us about unemployed job search. But evidence suggests that job search while employed produces higher job offer arrival rates (Blau and Robins 1990). This may be particularly true for transitions into high-wage jobs and for immigrants who, in the absence of host-country work experience, may lack the social networks needed to access high-wage jobs. Or alternatively, perhaps low-wage jobs are stepping stones for natives, but for immigrants they are "survival jobs" that become "dead-end jobs" as considerable anecdotal evidence suggests.[2] What is needed is a broader, more complete, picture that not only informs how the paths into high-wage jobs may be very different for immigrants and natives, but also to what extent immigrants may have greater difficulties retaining these jobs.

[1] Aydemir (2003) and Aydemir (2009) look at relative employment and labor force participation rates using cross-sectional data. But these studies are unable to tell us anything about the process of acquiring high-wage jobs and how that process might be different for immigrants.

[2] Canadian media reports of doctors and engineers being compelled to drive taxis in response to foreign credential issues has become a cliché in popular discussions of Canadian immigration. See for example "The crying shame of the taxi-driving surgeon, *Toronto Star*, March 2, 2009, pg. GT02; and "Credentials and access," *The Globe and Mail*, December 19, 2006, Pg.A22.

Beginning in January 2006, the regular monthly Canadian Labour Force Survey (LFS) began, for the first time, to identify the country of birth of all respondents, and for those born abroad, the year in which permanent residency was obtained. Pooling LFS files between January 2006 and December 2008, we identify 375,289 (404,733) and 42,004 (48,924) month-to-month observations on native-born and immigrant men (women) respectively, satisfying our sample restriction criteria. In order to identify heterogeneity in job quality, we begin by running a wage regression, using only the native-born sample, on a rich set of observable worker and job characteristics, including union status; firm and establishment size; and the interaction of a job-skill variable with four-digit industry codes. We then distinguish high- and low-wage jobs in the entire sample by using the estimates from this regression to determine whether an individual's job characteristics imply job quality above or below the median value in the native-born population. Predicted high-wage job rates between immigrants and natives are then analysed assuming transitions are determined by a stationary first-order Markov process between five discrete states: (i) high-wage jobs; (ii) low-wage jobs; (iii) self-employment; (iv) unemployment; and (v) nonparticipation. To our knowledge this paper is the first to take an exclusively dynamic approach to examining the well-documented labor market challenges facing Canada's immigrant population.

Our main finding is that the immigrant gap in the incidence of being employed in a high-wage job, when compared to similarly aged and educated native-born workers, is driven by a combination of lower transitions into and higher transitions out of high-wage jobs. With respect to flows into high-wage jobs, we find immigrant disparities in both transitions from unemployment and low-wage jobs, with the latter difference, but not the former, tending to grow with an immigrant's years since migration. We find little or no evidence, however, that immigrant jobseekers have any greater difficulties obtaining low-wage jobs. In fact for recently-arrived immigrant men, transition rates from unemployment to low-wage jobs are if anything slightly higher than for natives. Lastly, our results suggest that the moderate assimilation we see in the wage rates of Canadian immigrants, primarily reflects productivity gains, such as improvements in language skills, rather than a process of shopping for better jobs. Overall our results give an impression of immigrant job and labor force dynamics that are remarkably consistent with the popular perception of immigrants getting stuck in low-quality "survival jobs" that were intended to serve only as stepping stones to better jobs.

The remainder of the paper is organized as follows. In the following section we discuss the existing literature on search models of wage dispersion and their application to immigrant wage differentials. In Section 3 we present the data and our empirical strategies for defining high-wage jobs and for relating the relative job transition behavior of immigrants to their under-representation in high-wage jobs. The fourth section discusses the results and Section 5 concludes.

1.2 Existing Literature

The key mechanism underlying search models of wage dispersion is that job matches do not occur instantaneously or costlessly because job seekers, whether employed or unemployed, do not have full information about the jobs available. Mortensen (2005) argues that the search theoretic approach to wage dispersion is at least as important as the alternatives, including compensating differentials and efficiency wages, in driving wage dispersion across equally productive workers. Although it is theoretically possible to generate an equilibrium with a non-degenerate wage distribution in the absence of any worker or firm heterogeneity, whether on productivity dimensions or otherwise (Burdett and Judd 1983), it is well known that such models do a poor job of replicating real-world wage distributions. More important from our perspective, without any form of worker heterogeneity there is nothing in the model to distinguish immigrants from natives and thereby explain immigrant wage disparities.

To date, the main source of ex-ante worker heterogeneity to have received attention in the immigrant job search literature lies in immigrants' use of job search methods, and in particular in their access to social networks. Goel and Lang (2009) present a theoretical model in which the main effect of search networks is to raise the offer arrival rate, which in turn leads to lower wage outcomes, but shorter unemployment durations, for those who rely on these networks. Using Canadian longitudinal data on a single arrival cohort (described above) combined with Census data, they find network strength is associated with a higher probability of being employed six months after arrival, but also with a lower wage, particularly for recent immigrants, corroborating their theoretical predictions. Using a similar longitudinal data source from Australia, Mahuteau and Junankar (2008) also find that the beneficial effect of networks is in reducing initial unemployment durations of new arrivals, rather than in raising the quality (wages) of jobs obtained. Frijters, Shields and Price (2005) compare the relative search methods of unemployed immigrants and natives, and their relative effectiveness, exploiting the longitudinal dimension of the U.K. Quarterly Labour Force Survey (QLFS). Their results indicate substantially lower job-finding rates among immigrant men than among UK-born men, but find that the difference has virtually nothing to do with immigrants' choices of job search methods. Using an earnings frontier empirical methodology and U.S. Census data, Daneshvary *et al.* (1992) find little gap at entry in male immigrants' utilization of job search information and complete assimilation within 12 years of arrival.[3]

Unlike these papers, we do not exclusively consider unemployment durations, but rather document relative immigrant transition rates between jobs and labor force states. In this

[3]We are also aware of three studies using a purely cross-sectional approach to examining the relative unemployment risks of immigrants. Chiswick, Cohen and Zach (1997) use U.S. data; McDonald and Worswick (1997) examine Canadian data; and Arai and Vilhelmsson (2004) examine Swedish data.

regard, our paper is closest to the recent paper by Hansen and Loftstrom (2009), who analyze the relative transition rates of Swedish immigrants into and out of social assistance, unemployment, and employment, using the same dynamic multinomial logit model that we employ, but are also able to control for endogenous initial conditions and unobserved heterogeneity.[4] Their results indicate a significant amount of state dependence in social assistance use, particularly among refugees, pointing to the existence of a "welfare trap" in Sweden. Given that Canadian policy concerns have been dominated by the relatively poor wage outcomes of recent immigrants, as opposed to their welfare take-up rates, we focus instead on identifying the relative immigrant transitions and paths into and out of high-wage jobs.

Though the existing literature has almost exclusively focused on search methods, another possible search theoretic mechanism for driving wage heterogeneity independently of worker productivity are differences in reservation wages arising from heterogeneity in non-labor income or preferences for leisure time (see Albrecht and Axell (1984) for the baseline model with reservation wage heterogeneity). Immigrants, for example, may face different costs of search due to wealth constraints, which forces them to accept low-wage dead-end survival jobs. Or perhaps due to persistent cultural differences their preferences for leisure are weaker or stronger. Though we do not attempt to identify any of these alternative possibilities directly, the theoretical potential for immigrant wage disparities to be independent of ex-ante worker productivity is an important consideration that we think has not received enough attention in the immigration literature.

1.3 Methodology

1.3.1 Data

The Canadian Labour Force Survey (LFS) is a monthly nationally-representative survey of 53,500 households, involving nearly 100,000 individuals aged 15 years and over. The LFS data have three distinctive features enabling our analysis. First, though the survey's raison d'être is to provide cross-sectional snapshots in time, in order to save on data collection costs all respondents are (potentially) re-sampled for six consecutive months. By matching individuals across consecutive months, one can obtain large samples of observations tracking respondents as they transition between jobs and labor force states and make statistically meaningful comparisons of these transition between subgroups of the popula-

[4]Their administrative data tracks individuals over a 6-year period and contains essentially no sample attrition. They are, therefore, better able to separately disentangle the unobserved heterogeneity determining initial conditions and subsequent labor market transitions than we are with at best only 6-month panels.

tion.[5] Second, beginning in January 2006 the LFS began to identify the country of birth of all respondents, and for those born abroad their year of immigration. This allows us to distinguish between native-born individuals and immigrants, as well as to consider whether immigrants' job and labor force dynamics tend to assimilate to those of natives with time since migration. Lastly, in the first month surveyed an hourly wage rate is identified for all paid employees, as well as a rich set of job characteristic information, enabling us to empirically distinguish jobs of high and low quality.

1.3.2 Identifying high- and low-wage jobs

We begin by pooling the January 2006 to December 2008 LFS files and extracting the sample of individuals aged 25-54, in order to limit transitions involving school and retirement. Using the provided labor force activity and class of worker codes we can straightforwardly distinguish four discrete states: (i) paid-employment; (ii) self-employment; (iii) unemployment; and non-participation. But as discussed above, our primary objective is in documenting relative immigrant transitions in and out of jobs of varying quality, as well as the origin and destination states of these transitions. Using the wage data we therefore also distinguish individuals in paid-employment by whether or not they are employed in a relatively high- or low-wage job.

To distinguish high- and low-wage jobs we begin by estimating a log wage regression conditioning on individual worker and job characteristics. Since wage rates are only identified for all paid employees in the first month in which respondents are surveyed, we restrict the estimation to paid employees in the first month of their sample rotation so that there are no repeated observations on individuals. In addition, in order to avoid complications arising from differences in wage returns across immigrants and natives, due to lower schooling returns for example, we also exclude all immigrants. This leaves us with a sample size of 179,597 employees. The specification we estimate is given by:

$$\log(w_i) = \alpha + x_i\beta + z_i\theta + g_i\lambda + \gamma_1 t_i + \gamma_2 t_i^2 + \varepsilon_i \tag{1.1}$$

where w_i is the real hourly wage rate (adjusted for inflation using a provincial CPI) of worker i; x_i is a vector of individual worker characteristics; z_i is a vector of job characteristics; g_i is a set of geography characteristics; t_i is a time trend taking on 36 (12 months $\times$ 3 years) possible values; and ε_i is an iid error term. Worker characteristics include controls for age (and its square); highest level of educational attainment (8 categories); and married dummy. Job characteristics include controls for union membership;

[5] Matching is done using an individual identifier provided in the master files of the LFS. The identifier amounts to a concatenation of dwelling, household and individual-within-household identifiers. Since the LFS samples households, not individuals, false-positive matches are possible. We follow Madrian and Lefgren (1999) in using sex and age characteristics to limit the number of false-positives.

temporary (as opposed to permanent) job contract; whether paid on an hourly basis (as opposed to a salary); part-time (< 30) weekly hours; whether paid tips or commissions; an interaction of firm and establishment size (10 categories); and most significantly the interaction of a job-skill variable (5 categories) with four-digit industry, for which we identify 1,447 non-empty combinations in the sample.[6] Lastly, the geography controls include 10 province dummies (the territories are excluded from the LFS sampling frame) and a series of dummies indicating the degree of urbanization of the area of residence (5 categories). Since age and schooling returns are likely to vary substantially across gender, but the job characteristic effects are intended to capture heterogeneity that is independent of worker heterogeneity, all the variables in (1.1) except the job characteristic effects z_i are interacted with gender dummies. The results from this estimation are presented in Table A.1.

Having identified the 1,462-element job characteristic parameter vector θ in equation (1.1), we then predict "job quality" at the individual level for all paid employees in our entire sample using $z_i\hat{\theta}$, that is for both natives and immigrants and the repeated observations on individuals in which wage rates, but not job characteristics, are known to be measured with error.[7] Throughout the analysis we limit the immigrant sample to the foreign-born whose age at immigration was 15 or higher. Since it is possible that the skill-industry cell of observations not used in the estimation of (1.1) are empty in the estimating sample, the skill-industry fixed effects are not identified for some observations and so we are forced to drop them. Fortunately this affects less than 0.06% of the observations. A potentially more serious limitation of our approach to measuring job quality is that the identified variation across job characteristics is confounded by unobserved worker heterogeneity. Our view is that this would be a more significant problem if we were to estimate (1.1) including immigrants in the sample. This is true because we know that job characteristics z_i are correlated with immigrant status and lower human capital returns β for immigrants imply higher wage residuals ε_i. But when we restrict the estimation to native-born workers we think the interpretation of the identified variation as heterogeneity in jobs, as opposed to workers, is a reasonable approximation. Certainly there is a precedent in the literature

[6]The skill level of jobs variable is based on a concordance created by Human Resources and Skills Development Canada (HRSDC) using the 4-digit National Occupational Classification (NOCS-2006). The five categories are: (O) management occupations; (A) occupations usually requiring a university education; (B) occupations usually requiring a college education or apprenticeship training; (C) occupations usually requiring secondary school and/or occupation-specific training; and (D) occupation requiring no formal schooling. The concordance table is available here: http://www5.hrsdc.gc.ca/noc/English/NOC/2006/html/Matrix.html.

[7]Interestingly, when we also use the repeated observations on paid employees to estimate (1.1) we find a clear pattern of monotonically increasing residual wages across subsequent sample rotations. That is the coefficients on a set of dummies indicating the month of the respondent's sample rotation are significant and monotonically increasing from the second through the sixth month. This is consistent with within-job wage growth, which the LFS fails to capture by only updating wages in re-interviews when job changes have occurred.

for interpreting industry wage differentials as "premiums" (Krueger and Summers 1988, Kugler 2003). There is also good evidence that estimated returns to unionization largely reflect rents (Kuhn 1998).

In Table 1.1 we compare mean values of wage rates and our measure of job quality $z_i\hat{\theta}$ between immigrants and natives, both unconditionally and conditional on personal characteristics x_i, geography g_i, and the quadratic time trend t_i (the unconditional rates are shown in the bottom row). For both men and women, it appears that somewhere between one-third and one-half of the disparity in immigrant wage rates can be accounted for by their inferior job quality. For example, for immigrant men the conditional job quality gap is about 0.14 log points, compared to an overall gap of 0.29 log points in wage rates. This is consistent with the findings of Aydemir and Skuterud (2008), who find that a significant portion of observed immigrant wage differentials can be attributed to the concentration of immigrants among low-wage workplaces.

In Figure 1.1 we plot Kernel density estimates of our job quality measure separately for immigrants and natives. Consistent with the larger unconditional disparity in job quality for immigrant women in Table 1.1, the density function for native-born women, but not native-born men, first-order stochastically dominates the immigrant function. That is $\Pr(z_i\hat{\theta} > a|\text{immigrant}) > \Pr(z_i\hat{\theta} > a|\text{native})$ for all a. Consequently, for women, but not men, it does not matter what threshold level of job quality we use to define high-wage jobs – at all values the high-wage job rate of native-born women will exceed that of immigrant women. Moreover, the lower we set the threshold, the larger the gap in rates will be. For men, on the other hand, if the threshold is set sufficiently high, the high-wage job rate of immigrants will exceed that of natives (at least unconditionally).

In choosing a threshold we assume that what matters to immigrants is whether the quality of their job, implied by their job characteristics, is better than the median value in the population of native-born workers of the same gender. We, therefore, define the high-wage job state as $\mathbf{1}(z_i\hat{\theta} \geq \text{median}(z_i\hat{\theta}|\text{gender}_i))$, where $\mathbf{1}$ is an indicator function. Paid employees not in a high-wage job are defined as being in a low-wage job. The median values used are illustrated in Figure 1.1 by the dashed vertical lines. They reveal disparities in high-wage job rates for both immigrant men and women, though the difference is larger for women, reflecting in particular the over-representation of immigrant men in exceptionally high quality jobs apparent in the upper tail of the male distribution (top panel of Figure 1.1).

In Figure 1.1, the solid vertical line gives an example of the job quality of immigrant taxi drivers in order to illustrate how we derive the job quality and define high- or low-wage jobs. When we estimate the job quality, we do not use the immigrants' wages since the log wage regression limits to only Canadian-born paid employees. With the returns of job characteristics obtained from Canadian-born workers conditional on age, marital status, education and geography, we estimate that the job quality of immigrant taxi drivers is

-0.429, which is completely implied by its job characteristics, as opposed to workers. In addition, the predicted job quality is below the medians in the native-born population so that taxi driver is classified as low-wage jobs in immigrant population.

In order to get some sense of what types of jobs may be driving the differences in Figure 1.1, in Table 1.2 we identify the skill-industry cells of the five most common high- and low-wage jobs separately for immigrants and natives. We think there are two particularly noteworthy results. First, for immigrant men the five most common high-wage jobs account for 9.3% of all immigrant jobs compared to 8.2% for native-born men. Moreover, the most common immigrant jobs – the top two of which are jobs requiring a university degree in computer systems design (NAICS 5415) and architectural and engineering services (NAICS 5413) – tend to be of higher quality than the most common native-born high-wage jobs – university-educated school teachers and non-university educated building equipment contractors and city workers. This difference becomes even more salient when we consider the 10 most common jobs (for the sake of brevity we only report the top five). The pattern, however, looks quite different for women. Here the most common high-wage jobs, for both natives and immigrants, are more likely to be in the public sector, but the top five account for a much lower proportion of immigrant than native jobs (top five account for 14.8% of all native jobs, but only 7.9% of immigrant jobs). Clearly this concentration of immigrant men, but not women, in high-wage jobs plays an important role in moderating the wage disparities of immigrant men, but not women.

The second striking feature of Table 1.2 is the relative concentration of immigrant men and women in a small number of low-wage jobs. For immigrant men, the five most common low-wage jobs – restaurant cooks, truckers, unskilled factory workers, and security guards – account for 6.8% of all immigrant jobs, compared to 4.5% for natives. Similarly, for immigrant women, the five most common low-wage jobs – unskilled jobs in nursing homes, daycares, banks, fast-food restaurants, and cleaning staff in building and dwellings – account for 10.1% of all jobs, compared to 7.5% for native women.

1.3.3 Dynamic model

Our empirical methodology for analysing wage dynamics closely follows the approach of Kuhn and Schuetze (2001) in their analysis of secular trends in Canadian self-employment rates. We begin by assuming that the dynamics of immigrants and natives between five job and labor market states – high-wage jobs (H); low-wage jobs (L); self-employment (S); unemployment (U); and nonparticipation (N) – can be approximated by a first-order Markov process. That is, the probability of being in any particular state in month $t+1$ (the destination state), which we call j, depends only on the state of the individual in month t (the origin state), which we write k. The entire stochastic system can therefore be described in a single 5x5 transition matrix $\mathbf{P}$ with elements p_{jk}. Moreover, the elements

can be estimated unconditionally or by five separate multinomial logit (MNL) models, which in each case restrict the sample to individuals who are observed in the origin state j in month t and predict the probabilities of being in each of the five destination states k in period $t+1$, conditional on set of period t observable characteristics.

Since we ultimately want to compare the transitions of natives and immigrants and the difference in rates of being employed in a high-wage job, in all cases we include an immigrate dummy to allow for "unexplained" immigrant deviations in p_{jk} conditional on observables. Then, we evaluate the statistical significance of p_{jk} between immigrants and natives by using the standard errors of the marginal effect of immigrant dummy. The marginal effect is the discrete change of p_{jk} as the immigrant dummy variable changes from 0 to 1 and the standard error of marginal effect is estimated by taking a first-order Taylor-series expansion around the true values of parameters.[8] Moreover, we assume that the stochastic Markov process, given by $\mathbf{P}$, is in a steady-state. That is, the proportion of workers in each state in any given month is time invariant. Since the recent U.S. financial crisis did not begin to spill over to the Canadian labor market in a significant way until 2009, this assumption appears reasonable over the 2006-2008 period our data cover.[9] We therefore assume that the Markov process $\mathbf{P}$ has an ergodic (or stationary) distribution q, which is given by the eigenvector of $\mathbf{P}$ associated with the unit eigenvalue, that is:

$$\mathbf{P}q = q. \tag{1.2}$$

The restriction that the elements q sum to one insures a unique solution. Judd (1998) shows that a direct way to solve for q is obtained by expressing equation (1.2) as the linear system $(\mathbf{P}-1)q = 0$, which after imposing $\sum q_i = 1$ amounts to:

$$q = \begin{pmatrix} p_{11}-1 & \cdots & p_{14} & 1 \\ \vdots & \ddots & \vdots & \vdots \\ p_{41} & \cdots & p_{44}-1 & 1 \\ p_{51} & \cdots & p_{54} & 1 \end{pmatrix}^{-1} \begin{pmatrix} 0 \\ \vdots \\ 0 \\ 1 \end{pmatrix}.$$

Defining the first state as a high-wage job, the first element of the vector q then tells us the proportion of the population in a high-wage job. Since we are primarily interested in relative immigrant access to good jobs, as opposed to differences in labor market attachment, we define the high-wage job rate as the proportion of the labor force $\sum(H+L+S+U)$ in a high-wage job.

[8] The command of "margeff" in Stata software analytically estimates average marginal effects and their standard errors using the delta method.(See "Estimation of marginal effects using margeff" in the Stata Journal (2005) 5, Number 3, pp.309-329 for details.)

[9] We have tried estimating all of our transition matrices dropping the data before August 2008 and the results are very similar. We would be surprised, however, if this were the case with the 2009, to which we did not have access when writing this paper.

In judging their own labor market performance, we believe that what matters to immigrants is how their access to high-wage jobs compares to similarly aged and educated native-born workers in their geographic vicinity. Our starting point is therefore to compare the transition matrices $\mathbf{P}$ of immigrants and natives conditional on the vector of individual characteristics x_i and geography g_i in equation (1.1). In order to gain insight into the nature of the immigrant disparities in access to high-wage jobs, we then produce two types of counterfactual immigrant high-wage job rates. First, to identify the relative importance of the individual elements of the transition matrix $\mathbf{P}$, we compute counterfactual high-wage job rates by replacing particular elements of the immigrant matrices with their corresponding native-born values.[10] The question of interest is to what extent the counterfactual immigrant high-wage rates approach the high-wage rates of natives and in particular, which transitions go the furthest in reducing the immigrant gaps.

Second, we add a set of covariates that, unlike the elements of x_i and g_i, are specific to an origin state. Hence, for individuals in either a high- or low-wage job in period t the MNL model that predicts their destination state includes (in addition to x_i, g_i and an immigrant dummy) the same union, temporary job, hourly-paid, and firm/establishment size variables used in (1.1), as well as controls for industry (21 categories); occupation (25 categories); voluntary/involuntary part-time work; and months of job tenure (quadratic). For individuals who are self-employed in period t, the MNL model adds controls for industry, occupation, voluntary/involuntary part-time, and job tenure. For the unemployed, the model adds indicators for search methods used (7 possible methods); the number of methods used; indicators of whether the individual has a future job start or is on a temporary layoff; and the duration of unemployment (quadratic). Lastly non-participants, we condition on an indicator of whether the individual has ever worked; whether the individual is a discouraged worker; and the duration of joblessness (quadratic). The question of interest to us is to what extent this richer set of covariates can account for the unexplained gaps we observe in immigrant high-wage job rates when we only condition on age, education and geography. We are particularly interested in the effect of adding tenure, unemployment, and nonparticipation durations since it is likely that hazard rates out of all five states are duration dependent, and in the case of job tenure in particular, we know that immigrants' limited time in Canada necessarily implies lower average job tenure.

[10] Since the columns of $\mathbf{P}$ must sum to one, changing any particular element requires adjusting the remaining four. In doing so we follow Kuhn and Schuetze (2001) and adjust the remaining four transition probabilities so as to maintain their relative proportions. For example, if the elements of a particular column are $[0.2, 0.2, 0.2, 0.2, 0.2]$ and we replace the first element with 0.5, all the remaining elements become 0.125.

1.3.4 Limitations of the LFS

Two potentially serious limitations of the LFS data in studying labor market or job dynamics are (i) non-random sample attrition; and (ii) reporting error due to high reliance on household proxy responses (on average 55% of all responses). Similar to the Current Population Survey (CPS) monthly sample attrition rates are typically about 3% in our sample and tend to decrease slightly between months two and six. Of greater concern is that the rates tend to be slightly higher for immigrants. So, for example, the attrition rate between the first and the second month of the rotation is 5.5% for immigrant men compared to 3.4% for native-born men. An important part of this difference, perhaps all of it, likely reflects more international migration among immigrants, which any longitudinal data source will fail to capture (and we probably do not want to capture). To gauge the potential effects of attrition, we began by using the approach of Manski (1989) to put nonparametric bounds on the transition rates in $\mathbf{P}$. In most cases, though not all, the attrition rates are high enough that the native and immigrant bounds overlap nullifying unambiguous rankings.

The effect of proxy response on reporting errors in the Canadian LFS data, and similar surveys in many other countries, is known, though arguably not well recognized by analysts using these data (a notable exception is Poterba and Summers 1995). Lemaitre (1988) examines data from a quality assurance program of the Canadian LFS, which reinterviews approximately 2% of the original sample in the week following the survey week. These data offer two key insights. First, inconsistent reporting between the original interview and reinterview is only slightly higher for multicategorical variables than binary variables, but significantly higher for quasicontinuous variables, such as hours of work. This provides further support for our approach of focusing on transitions in job characteristics, as opposed to changes in wage rates. Second, inconsistencies are substantially higher when only one response is nonproxy than when either both responses are nonproxy or both are by the same proxy respondent (typically the spouse). As further evidence of this, we find implausibly large transition rates between high- and low-wage jobs (typically twice as high), when all transitions are used than when we limit the sample to observations in which the respondent in months t and $t+1$ are the same person, whether proxy or nonproxy. To limit this bias, we therefore exclude all observations in which the household respondent in month t and $t+1$ is not the same individual, which also has the effect of removing all attrition in the sample, since in these cases there is no respondent in $t+1$.

The important question is whether this restriction, which excludes 42% (40%) of the original male (female) sample, compromises the external validity of our results. In other words, are job and labor market dynamics substantively different in the attrition sample or where the household survey respondent changes across months. Unfortunately, there is no straightforward way to know this since the destination states of dropped observations are either unobserved or not trusted. Table 2 of the Appendix A (Table A.2) reports means in

observable characteristics (in period t) across three disjoint samples: (i) observations with a common respondent in period t and $t+1$; (ii) observations with a different respondent in period t and $t+1$; and (iii) observations that attrite in period $t+1$. Stars in the "different respondent" and "attrition" samples indicate whether the means are statistically different than in the "same respondent" sample. In almost all cases the attrition sample appears to be the outlier. They are younger, lower paid, less educated, more urban, and more likely to be foreign born. The differences between the two matched samples, however, appear quite modest (though usually statistically significant reflecting the large samples). The most salient difference is that individuals in our "same respondent" sample are less likely to be married, presumably reflecting the fact that the likelihood of a different adult respondent answering the telephone goes up as the number of adults in the household increases. Otherwise, the samples look similar. Though informative, similarity on observables does not, however, rule out important unobservable differences. One could imagine that factors driving attrition, or geographic mobility more specifically, are particularly likely to be latent in nature.

In order to gauge to what extent the high-wage job rates based on the transitions of our preferred "same-respondent" sample may be unrepresentative, we need a benchmark. Taking the pooled sample of all individuals in the first month of their sample rotation, we can estimate a cross-sectional high-wage job rate that is not only nationally-representative and free of any attrition bias, but also, to our knowledge, not biased in any particular direction as a result of systematic proxy reporting error. We can therefore compare our high-wage job rates based exclusively on the transition data (and the ergodic distributional assumption) to the cross-sectional rates to determine whether or not our approach produces reasonably representative estimates of high-wage job rates in the population. Since the cross-sectional estimates are restricted to first interviews, whereas the dynamic estimates are based entirely on transitions, they are based on entirely independent sources of data. Besides sampling error, which should be minimal given our sample sizes, and the validity of the steady-state assumption, any differences in these estimates should reflect the consequences of sample attrition and spurious job transitions arising from reporting errors.

The results from this comparison, reported in Table 1.3, reveal remarkably similar high-wage job rates, as well as low-wage job, unemployment, self-employment, and non-participation rates, using the cross-sectional and longitudinal data. This suggests not only that the stationarity assumption is a reasonable approximation over our sample period, but also that attrition and our "same-respondent" sample restriction do not tend to bias the estimates in any particular direction. Although the differences between the rates are somewhat larger for immigrant men, which we might expect given the higher rates of sample attrition in this group, they are still modest (in all cases less than 3 percentage points). We, therefore, think that our approach of using these ergodic rates, and their underlying

job and labor market transitions, to shed some light on the the nature of the challenges Canadian immigrants face in accessing high-wage jobs is worthwhile.

1.4 Results

As described above, we begin by comparing predicted monthly transition rates between immigrants and natives from five MNL models holding characteristics (age, education, marital status, and geography) constant at the native-born mean values, but setting the immigrant dummy equal to 0 for natives and 1 for immigrants. These rates are presented in Table 1.4 in 5x5 matrices separately for men and women. The most striking differences are in transitions into high-wage jobs directly from unemployment. For men, the native rate is twice the magnitude of the immigrant rate (5.3% compared to 2.6%), while for women it is four times as large (4.6% compared to only 1.0% for immigrant women). Assuming a first-order Markov process, the hazard rate out of unemployment is necessarily constant and expected unemployment durations are simply $1/(1-[U_t, U_{t+1}])$, where $[U_t, U_{t+1}]$ is the likelihood of remaining in the unemployed state. Despite difficulties accessing high-wage jobs directly from unemployment, the estimates imply only slightly higher (and statistically insignificant) average unemployment durations for immigrant men – 2.92 months compared to 2.73 for natives – and virtually identical durations for women – 2.54 compared to 2.53 months. The reason is not only that immigrant jobseekers are much more likely to leave the labor force in any given month (this appears particularly true for women where more than one-fifth of jobseekers are expected to be nonparticipants in the following month compared to one-in-seven native-born jobseekers), but also that they appear to have no comparable difficulties accessing low-wage jobs. In fact, among men the immigrant-native difference in transition rates from unemployment to low-wage jobs is statistically insignificant.

Having obtained a low-wage job, is there any evidence that immigrants are better able to use these jobs as stepping stones to high-wage jobs? The estimates in Table 1.4 suggest not. Among both men and women, the low- to high-wage job transition rate is significantly lower for immigrants than natives. Among men the rate is 1.4% for natives compared to 1.1% for immigrants, while among women it is 1.2% compared to 0.8%. Although the magnitude of these differences appear small (relative to the unemployment transitions), they are based on substantially larger stocks, so that they imply large differences in levels of worker flows. An important question is to what extent the lower immigrant low- to high-wage transition rates reflect a disparity in job search effectiveness, in job offer arrival rates for example, as opposed to lower job search activity. Unfortunately, in the absence of information on the search activities of employed workers in the LFS data, we are unable to provide direct evidence on this. A possible explanation on immigrant lower transition rate from low- to high-wage jobs is that immigrants and natives may be in very different

low-wage jobs. For example, relatively low skilled immigrants may end up in jobs with prospect of promotion or advancement due to poor language skills or the lack of links to the larger job market. However, the results in Table 1.2 show that the low-wage jobs are very similar between immigrants and natives. In particular, both immigrant and native women tend to work in unskilled jobs in nurses, banks and daycare. Moreover, given what we know about immigrant job dissatisfaction, in particular about greater skill mismatch in immigrants' jobs (Galarneau and Morissette 2004), it seems more likely to us it reflects search effectiveness. Our finding, therefore, appears to provide some empirical support for the popular perception of immigrants getting stuck in low-quality "survival" jobs.

Differences in the flows out of high-wage jobs between immigrants and natives appear similarly small in magnitude, but again are based on much larger stocks. The higher outflows for immigrants suggest significantly shorter immigrant durations in high-wage jobs. For men, this appears driven by a combination of higher transitions into both low-wage jobs, self-employment and unemployment, whereas for women there is also evidence of greater transitions into nonparticipation. Unfortunately, the LFS data tell us nothings about the nature of the transitions into low-wage jobs and self-employment, since reasons for job separations are only identified in subsequent months when the destination state is unemployment. Regardless, the results in Table 1.4 suggest that the under-representation of immigrants in high-wage jobs reflects not only difficulties in obtaining these jobs, but also differences in retention.

Below the transition matrices in Table 1.4 we compute the high-wage job rates implied by these transitions and the ergodic distributional assumption in equation (1.2). In comparison to the unconditional rates in Table 1.3, the immigrant-native gaps when we condition on age, education, marital status and geography are substantially larger. For men the gap in the incidence of being employed in a high-wage job increases from 4.2 (0.374-0.332) to 16.3 (0.380-0.217) percentage points when we assign immigrants native characteristics. For women the increase is even larger – 22.3 (0.401-0.178) compared to 10.3 (0.380-0.217) percentage points. In what follows we examine which individual transition rates p_{jk} are driving these large gaps and whether a richer set of covariates can explain them away.

In Table 1.5, we present counterfactual immigrant high-wage job rates obtained by replacing individual elements of the immigrant transition matrices with the corresponding values from the native-born matrices. In parentheses we indicate what percentage of the conditional gap is closed as a result (negative values in parentheses imply that the gap widens). In addition, we report the counterfactual rates when all the entry or exit flow elements are replaced. For example, the high-wage job rates reported in the row "Entry to: high wage job" are obtained by replacing all the off-diagonal elements of the first row of the immigrant transition matrices, whereas the rates labeled "Exit from: high-wage job" are obtained by replacing all the off-diagonal elements in the first column of the immigrant

transition matrix.[11]

The main result from Table 1.5 is that the under-representation of immigrants in high-wage jobs reflects a combination of relatively low flows into high-wage jobs and high flows out of these jobs. For women, the challenge appears to have more to do with accessing high-wage jobs, particularly from low-wage jobs and unemployment. Together these two transitions can account for nearly half of the overall gap in high-wage jobs for immigrant women (23.8%+20.4%). For men transitions out of high-wage jobs, particularly into low-wage jobs and self-employment, play a larger role. In fact, two-thirds (68.5%) of the gap for immigrant men is closed when we assign them the high-wage job exit rates of native-born men. We think that this result probably does more to challenge conventional wisdom than the finding of low flows into high-wage jobs. Unfortunately, as noted above, the data do not allow us to say much about the nature of the transitions out of high-wage jobs. The exceptionally high transitions from high-wage jobs to self-employment for immigrant men are, however, consistent with cross-sectional analyses of Canadian Census data identifying a tendency for immigrant self-employment rates to diverge relative to natives with years since migration (Frenette 2004; Schuetze 2010).

Lastly, in Table 1.6 we add a richer covariate set to the MNL models predicting transitions and consider to what extent assigning immigrants the mean native values of these covariates can eliminate the high-wage job gaps they face. Since predicting the full 5x5 transition matrix involves five separate MNL models (one for each origin state), we can assign the natives values across all five origin states simultaneously (the results are reported in the column labeled "All") or we can limit it to a single origin state, so that only a single column of the immigrant transition matrix is changed (these results are reported in the remaining five columns). The first row of Table 1.6 reports immigrant high-wage rates when no native values are assigned and the immigrant dummy is 1, which are essentially predicted unconditional immigrant rates. These rates are 34.9% for men and 25.5% for women. The final row of Table 1.6 reports the results when all native values are assigned and the immigrant dummy is 0, which are essentially predicted unconditional rates for natives. These rates are 39.1% for men and 39.5% for women.

The immigrant gaps in these unconditional rates in Table 1.6 are substantially smaller than the conditional rates in Table 1.4, particularly for men. The results in the second through fifth rows of Table 1.6 reveal that the age, education, marital status, and geography of immigrants all contribute to moderating the immigrant disparity in high-wage jobs, but their higher education levels are by far the most important. This is particularly true for immigrant men, whose high-wage job rate decreases from 34.9% to 25.9% when they are assigned natives' mean education levels. The MNL estimates (not reported for the sake

[11] As usual we must maintain the condition that the columns sum to one. In the case of exits, this simply means replacing the entire column. In the case of entries, the values of the remaining four elements of each column are changed so as to maintain their relative proportionality.

of brevity) reveal that the reason is that post-secondary schooling, particularly university degrees, substantially reduce transition rates from high- to low-wage jobs. The question is to what extent the job characteristics of immigrants, including industry and occupation, or duration dependence in hazard rates into and out of high-wage jobs can account for the fact that in comparing similarly-educated immigrants and natives, immigrants are so much less likely to be employed in a high-wage job.

The results in Table 1.6 reveal that we are by and large unable to explain the shortfalls in high-wage job rates of immigrant women. In no case does the counterfactual rate exceed the unconditional rate of 25.5% by more than 1.1 percentage points. Even when we simultaneously assign immigrant women the industry mix, tenure levels, job search methods, and incidence of having a future start or being on layoff, of native-born women – all the covariates that imply greater high-wage job rates for immigrant women in Table 1.6 – we still predict a high-wage job rate of only 27.9%, far below the native rate of 39.5%. For men, on the other hand, whose unconditional gap is substantially smaller to begin with, assigning native values of covariates does in some cases, especially job tenure and the search methods of the unemployed, bring the immigrant high-wage job rate very close to that of native-born men (in the case of both tenure and search methods, 36.5% for immigrants compared to 39.1% for natives). We think that the search methods result is particularly noteworthy as it reflects relatively high immigrant use of passive search methods, specifically "checked with friends or relatives"; "looked at job ads"; and "answered job ads"; all of which are associated with significantly lower transitions of jobseekers directly into high-wage jobs. If we simultaneously assign immigrant men native values of all the covariates that imply a shortfall in their high-wage job rates – union status; temporary job status; industry mix; tenure; search methods; and duration of unemployment – but allow them to keep their own values for all the remaining covariates, most notably their higher education levels, we predict a high-wage job rate of 40.1%, which is slightly higher than the native-born rate of 39.1%. In some sense then, we are able to account for the complete gap in the high-wage job rate of immigrant men. But, of course, we are still unable to explain why in comparing similarly aged and educated immigrants and natives with common job characteristics and durations in their current jobs and in unemployment and joblessness, immigrant men still face a disadvantage in high-wage jobs, and in particular in transition rates from high- to low-wage jobs.

Arguably, the under-representation of immigrants in high-wage jobs is of less concern if the rates tend to converge to those of natives with an immigrant's years since migration, than if the gaps are persistent over immigrants' careers. We, therefore, complete our analysis by considering how the relative transition matrices of immigrants, and their implied "ergodic" high-wage job rates, vary with age and an immigrant's years since migration. To do this we re-estimate the MNL models that condition on age, education, marital status, and geography (Table 1.4), but add quadratic "age at migration" and "years since migra-

tion" controls. All of the predicted rates shown in the bottom two panels of Figure 1.2 are obtained at the mean values of the native or immigrant covariates, except the age at migration variable, which is held constant in the immigrant profile at age 24. The results indicate that although job quality does tend to rise for both immigrant and native workers over time, there is little (for men) or no (for women) narrowing of the immigrant gap in the years following migration. This is perhaps surprising given evidence elsewhere of immigrant assimilation (although modest) in overall wage rates (e.g., Baker and Benjamin 1994). A shortcoming of our data is that we are unable to simultaneously control for cohort (i.e, year of migration) effects, which could contaminate the estimated assimilation effects (Borjas 1985). However, the Canadian evidence suggests deteriorating immigrant "quality" across arrival cohorts, which if anything should produce an upward bias in returns to years since migration. In addition, when we estimate the same assimilation model using the overall wage rate data in the LFS, we do find evidence of assimilation in overall wage rates (we present the results in the top two panels of Figure 1.2). We are therefore doubtful that unobserved heterogeneity across cohorts is driving our results. Rather we interpret our results as evidence that the limited wage assimilation of Canadian immigrants is primarily driven by improvements in individual productivity, rather than in job quality.

Although there is no evidence of assimilation in the overall high-wage job rates, there may be assimilation in particular transition rates. In Figures 1.3 (men) and 1.4 (women) we plot the age profiles for each of the 25 transitions in the usual 5x5 matrices. Perhaps most interesting are the unemployment transitions, which for men show virtually identical immigrant and native transition rates into low-wage jobs at arrival in Canada, but substantially lower transitions into high-wage jobs. However, high-wage transition rates subsequently increase for immigrants while they tend to decline slightly for natives. And low-wage transition rates from unemployment decrease for both immigrants and natives, but considerably more quickly for immigrants. The convergence evident in the decreasing high- to low-wage job transition rates for both immigrant men and women, similarly serves to reduce the immigrant disparity in high-wage jobs. For men, in fact, the higher immigrant high- to low-wage job transition rate upon entry has almost entirely disappeared twenty years after arrival.

More generally, there is much greater evidence of assimilation in transition rates across the 25 possible transitions, than there is of diverging rates. This is particularly evident in the relative flows of immigrant women out of the labor force, which tend to be much higher at entry, but tend to decline to the rates of natives very quickly. Why then do the high-wage job rates of immigrants not converge? The answer lies in both the low- to high-wage transitions ($L_t H_{t+1}$) and the high-wage to self-employment transitions ($H_t S_{t+1}$). For both immigrant men and women these rates tend to diverge with years since migration and serve to increase the gaps in immigrant high-wage job rates. The welfare implications of increasing self-employment transitions are, however, unclear. And it is similarly not

obvious why the likelihood of making successful transition from low- to high-wage jobs tends to decline more quickly with age for immigrants than natives. The patterns of the low- to high-wage transition profiles for both immigrant men and women – that is, relatively high rates of successful transitions soon after arrival which subsequently fall off very quickly – are, however, entirely consistent with the popular perception of immigrants getting stuck in low-quality jobs.

1.5 Conclusion

We exploit recently-introduced immigrant identifiers in the Canadian Labour Force Survey (LFS) to examine the relative job and labor force dynamics of Canadian immigrants. We are, in particular, interested in the role of job, as opposed to worker, heterogeneity in driving the well-documented earnings disparities of Canada's foreign-born population. Our findings suggest that up to one-half of the shortfall in the average wage of immigrants, when compared to similarly aged and educated native-born workers, can be accounted for by the inferior quality of their jobs. Moreover, the data provide no evidence that this gap in job quality closes with time since migration. This suggests to us that the modest assimilation we see in the wage rates of Canadian immigrants, in both our data and elsewhere, primarily reflects individual productivity gains, such as improvements in language skills or accreditation of foreign educational credentials, as opposed to a process of job shopping. It also suggests to us that policy initiatives that influence the quality of immigrants' jobs may have the greatest potential to advance the integration of immigrants into Canadian labor markets.

What explains the under-representation of immigrants in high-wage jobs? Our main finding is that the gap appears to reflect a combination of relatively low immigrant transitions into high-wage jobs and high transitions out of these jobs, with the former difference being relatively more important for immigrant women and the latter for immigrant men. We suspect that the finding of relatively high outflows does more to challenge popular wisdom. Unfortunately, we are unable to say much about the nature or welfare implications of the relative outflows. Certainly the difference in transition rates from high- to low-wage primarily reflects transitions into low-wage jobs and self-employment and is substantially moderated by the higher educational levels of immigrant men. However, in the absence of information on the reasons for job separation, the relative importance of involuntary displacement, as opposed to quits, in these transitions is unclear. Further analysis of immigrant job retention data may be a fruitful area of future research.

With regard to the evidence on flows into high-wage jobs, we find that the differences reflect both difficulties obtaining high-wage jobs directly out of unemployment and in being able to successfully use low-wage jobs as stepping stones into high-wage jobs. The

disparity in low- to high-wage job transitions appears particularly acute for immigrant women and does not tend to diminish, unlike transitions directly from unemployment, with years since migration. We do not, however, find any evidence of immigrant disparities in unemployment transitions into low-wage jobs. In fact, for recently-arrived immigrant men, unemployment to low-wage job transition rates are if anything slightly higher than those of similarly aged and educated native-born men. Our results are therefore entirely consistent with the notion of immigrants with low reservation wages, perhaps as a result of inadequate income supports, getting stuck in low-quality "survival jobs". They also suggest to us that immigrant settlement policies directed exclusively at the unemployed (or underemployed) will ultimately fall short in their attempt to further the labor integration of Canada's newest immigrants.[12]

[12] As an example, the main employment service of the Ontario Ministry of Training, Colleges and Universities – Employment Ontario – explicitly limits eligibility (except in special cases) to their "assisted service" components – job search, job matching, placement and incentives – to individuals who are unemployed and not participating in full-time training or education. This program plays a particularly important role in providing employment services to the province's immigrant population through, for example, the Newcomer Employment Centres of the YMCA located in cities throughout the province.

Table 1.1: Immigrant differentials in mean log wage and job quality.

	Men		Women	
	Log wage	Job quality	Log wage	Job quality
Immigrant	-0.2915***	-0.1410***	-0.3013***	-0.1564***
	(0.0062)	(0.0036)	(0.0056)	(0.0037)
Age	0.0463***	0.0137***	0.0395***	0.0135***
	(0.0021)	(0.0012)	(0.0020)	(0.0013)
Age squared	-0.0460***	-0.0133***	-0.0388***	-0.0127***
	(0.0026)	(0.0016)	(0.0025)	(0.0016)
(Elementary school)				
High school incomplete	0.0337**	0.0295***	0.0364**	0.0161
	(0.0128)	(0.0071)	(0.0140)	(0.0089)
High school graduate	0.1392***	0.0845***	0.2069***	0.1211***
	(0.0124)	(0.0069)	(0.0129)	(0.0084)
Some post-secondary	0.1730***	0.1175***	0.2938***	0.1773***
	(0.0135)	(0.0077)	(0.0141)	(0.0092)
Trade or college credential	0.2718***	0.1793***	0.3832***	0.2426***
	(0.0121)	(0.0067)	(0.0127)	(0.0083)
University below Bachelor's	0.3640***	0.2620***	0.5479***	0.3558***
	(0.0164)	(0.0097)	(0.0155)	(0.0101)
Bachelor's degree	0.4759***	0.3391***	0.6611***	0.4377***
	(0.0129)	(0.0072)	(0.0131)	(0.0085)
Graduate degree	0.5937***	0.4094***	0.8108***	0.5159***
	(0.0145)	(0.0077)	(0.0143)	(0.0090)
Married	0.1197***	0.0670***	0.0423***	0.0194***
	(0.0040)	(0.0024)	(0.0037)	(0.0024)
Time trend	0.0012	0.0001	0.0010	-0.0003
	(0.0007)	(0.0004)	(0.0006)	(0.0004)
Time trend squared	0.0005	0.0002	0.0010	0.0013
	(0.0018)	(0.0010)	(0.0017)	(0.0011)
R-squared	0.2358	0.2299	0.2791	0.2625
Number of observations	97,709	97,709	101,490	101,490
(Unconditional differential)	-0.1351***	-0.0573***	-0.1916***	-0.1045***
	(0.0065)	(0.0038)	(0.0059)	(0.0038)

Note: Regressions also include province and four rural/urban indicators. Samples are restricted to paid employees observed in the first month of their 6-month sample rotation. Standard errors are reported in parentheses. * indicates significance at the 5% level.

Table 1.2: High- and low-wage jobs with largest native-born and immigrant employment shares.

High-wage jobs					
Native-born men	(1)	(2)	Immigrant men	(1)	(2)
(A) Elementary and secondary schools	0.023	0.330	(A) Computer systems design and related	0.033	0.388
(B) Building equipment contractors	0.020	0.212	(A) Architectural and engineering services	0.021	0.346
(B) Local public administration	0.018	0.272	(A) Universities	0.018	0.248
(A) Computer systems design and related	0.012	0.384	(A) Depository credit intermediation	0.012	0.363
(B) Electric power generation and distribution	0.009	0.374	(B) Building equipment contractors	0.009	0.212
Native-born women	(1)	(2)	Immigrant women	(1)	(2)
(A) Elementary and secondary schools	0.065	0.313	(A) Hospitals	0.027	0.404
(A) Hospitals	0.043	0.412	(A) Elementary and secondary schools	0.019	0.288
(B) Hospitals	0.020	0.205	(A) Universities	0.012	0.223
(A) Federal public administration	0.010	0.437	(A) Computer systems design and related	0.011	0.397
(A) Individual family services	0.010	0.266	(A) Depository credit intermediation	0.010	0.355
Low-wage jobs					
Native-born men	(1)	(2)	Immigrant men	(1)	(2)
(C) General freight trucking	0.014	-0.136	(B) Full-service restaurants	0.020	-0.405
(B) Automotive repair and maintenance	0.010	-0.089	(C) General freight trucking	0.015	-0.150
(B) Residential building construction	0.008	-0.0001	(C) Motor vehicle parts manufacturing	0.014	-0.052
(B) Building equipment contractors	0.007	0.052	(C) Plastic product manufacturing	0.010	-0.133
(B) Building finishing contractors	0.006	-0.023	(D) Investigation and security services	0.009	-0.395
Native-born women	(1)	(2)	Immigrant women	(1)	(2)
(C) Nursing and residential care services	0.016	-0.129	(C) Nursing and residential care	0.026	-0.121
(B) Child daycare services	0.016	-0.158	(B) Child daycare services	0.023	-0.176
(C) Elementary and secondary schools	0.015	-0.098	(D) Limited-service eating places	0.018	-0.625
(C) Depository credit intermediation	0.015	-0.125	(C) Depository credit intermediation	0.018	-0.098
(C) Full-service restaurants	0.013	-0.365	(D) Services to buildings and dwellings	0.016	-0.347

Column (1): Share of total employment; Column (2): Mean job quality
Job-skill codes: (A) University educated; (B) College or apprenticeship; (C) Trained on-the-job; (D) Unskilled

Notes: High-wage (low-wage) jobs are defined as job quality greater (less) than gender-specific median job quality in the native-born population.

Table 1.3: Unconditional high-wage job rates based on longitudinal and cross-sectional data.

	Longitudinal	Cross-sectional		Longituidnal	Cross-sectional	
	Ergodic	Full sample	Same respondent	Ergodic	Full sample	Same respondent
		Native-born men			Immigrant men	
High-wage job rate	0.374	0.384	0.387	0.332	0.303	0.306
Low-wage job rate	0.405	0.394	0.391	0.414	0.429	0.420
Self-employment rate	0.173	0.170	0.175	0.194	0.203	0.211
Unemployment rate	0.047	0.051	0.047	0.060	0.065	0.063
Nonparticipation rate	0.080	0.085	0.081	0.085	0.090	0.087
		Native-born women			Immigrant women	
High-wage job rate	0.432	0.422	0.425	0.288	0.280	0.284
Low-wage job rate	0.422	0.425	0.418	0.527	0.529	0.519
Self-employment rate	0.106	0.111	0.114	0.108	0.111	0.116
Unemployment rate	0.040	0.043	0.042	0.078	0.080	0.080
Nonparticipation rate	0.154	0.160	0.161	0.257	0.265	0.266

Note: The ergodic distribution rates are based on the unconditional transition probabilities (not shown). The cross-sectional rates are based on either: (i) the pooled sample of all observations from the January 2006 to December 2008 LFS files; or (ii) the subset of observations with a common survey respondent in periods *t* and *t+1*.

Table 1.4: Transition probabilities conditional on age, education, marital status and geography and implied high-wage job rate.

	Men									
	Native-born					Immigrants				
	H_t	L_t	S_t	U_t	O_t	H_t	L_t	S_t	U_t	O_t
H_{t+1}	0.970	0.014	0.014	0.053	0.010	0.948*	0.011*	0.014	0.026*	0.005*
L_{t+1}	0.013	0.952	0.018	0.181	0.037	0.024*	0.939*	0.026*	0.156	0.051*
S_{t+1}	0.005	0.007	0.959	0.018	0.012	0.012*	0.008	0.947*	0.012*	0.013
U_{t+1}	0.007	0.016	0.003	0.634	0.077	0.010*	0.023*	0.004	0.658	0.107*
O_{t+1}	0.005	0.010	0.006	0.115	0.863	0.006	0.019*	0.008	0.148*	0.823*
High-wage job rate			0.380					0.217		
	Women									
	Native-born					Immigrants				
	H_t	L_t	S_t	U_t	O_t	H_t	L_t	S_t	U_t	O_t
H_{t+1}	0.974	0.012	0.012	0.046	0.008	0.954*	0.008*	0.011	0.010*	0.003*
L_{t+1}	0.011	0.953	0.017	0.194	0.032	0.022*	0.945*	0.026*	0.153*	0.032
S_{t+1}	0.002	0.004	0.952	0.014	0.010	0.005*	0.004	0.928*	0.009	0.009
U_{t+1}	0.005	0.014	0.003	0.604	0.042	0.008*	0.017*	0.006*	0.606	0.062*
O_{t+1}	0.008	0.017	0.017	0.143	0.908	0.011*	0.027*	0.028*	0.222*	0.895*
High-wage job rate			0.401					0.178		

Notes: Native-born transition probabilities are predictions from five separate multinomial logit regressions (one for each origin state). All predictions are made at the native mean values of the covariates conditioning the sample on the origin state. The immigrant transition probabilities differ only by the "unexplained" immigrant effect (the coefficient on the immigrant dummy). * indicates if this difference is statistically significant at the 5% level.

Table 1.5: Counterfactual immigrant high-wage job rates using native-born transition probabilities.

	Men					Women				
	H_t	L_t	S_t	U_t	O_t	H_t	L_t	S_t	U_t	O_t
H_{t+1}	0.327	0.237	0.215	0.249	0.227	0.276	0.223	0.179	0.231	0.215
	(67.8)	(12.2)	(-0.8)	(19.6)	(6.4)	(44.2)	(20.4)	(0.5)	(23.8)	(16.8)
L_{t+1}	0.262	0.190	0.218	0.214	0.219	0.222	0.161	0.178	0.175	0.178
	(27.8)	(-16.5)	(0.6)	(-1.8)	(1.5)	(20.0)	(-7.6)	(0.5)	(-1.2)	(0.04)
S_{t+1}	0.240	0.217	0.206	0.216	0.217	0.184	0.178	0.169	0.178	0.178
	(14.5)	(-0.02)	(-6.9)	(-0.3)	(0.09)	(2.8)	(0.06)	(-3.9)	(0.01)	(-0.01)
U_{t+1}	0.227	0.214	0.217	0.218	0.217	0.187	0.177	0.178	0.178	0.181
	(6.5)	(-1.6)	(-0.06)	(0.8)	(0.2)	(3.9)	(-0.3)	(0.06)	(0.05)	(1.3)
O_{t+1}	0.219	0.213	0.216	0.217	0.217	0.190	0.174	0.178	0.177	0.178
	(1.4)	(-2.5)	(-0.1)	(0.3)	(0)	(5.5)	(-1.7)	(0.07)	(-0.5)	(0)
Entry to:										
High-wage job			0.274	(35.5)				0.302	(55.6)	
Low-wage job			0.262	(28.0)				0.220	(19.1)	
Self-employment			0.240	(14.3)				0.184	(2.9)	
Unemployment			0.225	(5.0)				0.189	(5.0)	
Non-participation			0.215	(-0.9)				0.185	(3.4)	
Exit from:										
High-wage job			0.328	(68.5)				0.277	(44.4)	
Low-wage job			0.230	(8.1)				0.220	(19.1)	
Self-employment			0.215	(-0.9)				0.180	(1.1)	
Unemployment			0.244	(16.6)				0.224	(20.9)	
Non-participation			0.233	(10.2)				0.222	(19.9)	

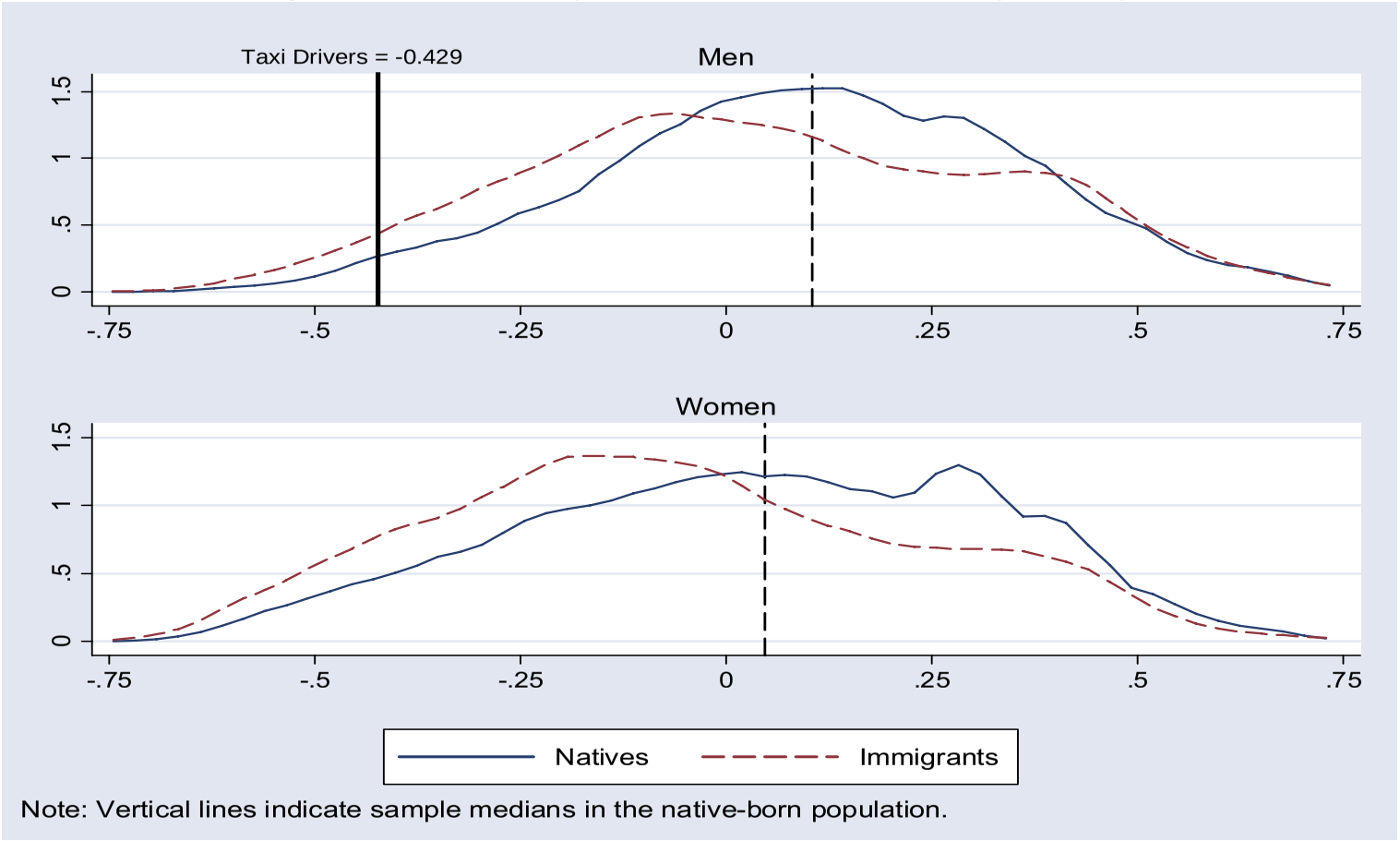
Notes: Numbers in parentheses indicate the percentage of the immigrant-native gap in conditional high-wage job rates (see Table 1.4) that is closed when immigrants are assigned the corresponding native-born transition probabilities.

Table 1.6: Counterfactual immigrant high-wage job rates using native-born characteristics.

	Men						Women					
	H_t	L_t	S_t	U_t	O_t	All	H_t	L_t	S_t	U_t	O_t	All
None	0.349	0.349	0.349	0.349	0.349	0.349	0.255	0.255	0.255	0.255	0.255	0.255
Age	0.348	0.349	0.350	0.349	0.349	0.345	0.253	0.257	0.257	0.255	0.256	0.250
Education	0.294	0.350	0.344	0.340	0.344	0.259	0.234	0.242	0.254	0.249	0.249	0.208
Married	0.341	0.331	0.349	0.347	0.348	0.336	0.255	0.257	0.256	0.255	0.255	0.255
Province	0.348	0.346	0.347	0.347	0.348	0.342	0.261	0.251	0.254	0.254	0.254	0.252
Urban/rural	0.351	0.341	0.341	0.349	0.348	0.334	0.247	0.246	0.253	0.255	0.255	0.234
Union	0.350	0.351				0.351	0.254	0.257				0.255
Temporary job	0.353	0.349				0.353	0.256	0.254				0.255
Hourly paid	0.348	0.349				0.348	0.254	0.255				0.254
Firm/establishment size	0.349	0.349				0.349	0.255	0.254				0.253
Industry	0.353	0.352	0.351			0.359	0.264	0.256	0.255			0.265
Occupation	0.335	0.349	0.345			0.332	0.246	0.266	0.258			0.259
Part-time (voluntary/inv.)	0.349	0.347	0.349			0.347	0.254	0.258	0.256			0.258
Tenure	0.368	0.346	0.349			0.365	0.267	0.254	0.255			0.266
Search methods				0.365		0.365				0.256		0.256
Number of methods				0.349		0.349				0.255		0.255
Future start or layoff				0.352		0.352				0.258		0.258
Duration of unemployment				0.350		0.350				0.256		0.256
Ever worked					0.349	0.349					0.259	0.259
Discouraged worker					0.349	0.349					0.255	0.255
Duration of joblessness					0.348	0.348					0.249	0.249
All native characteristics	0.301	0.321	0.336	0.341	0.343	0.248	0.234	0.243	0.254	0.250	0.245	0.205
All and immigrant dummy = 0	0.417	0.333	0.333	0.350	0.352	0.391	0.350	0.271	0.254	0.278	0.267	0.395

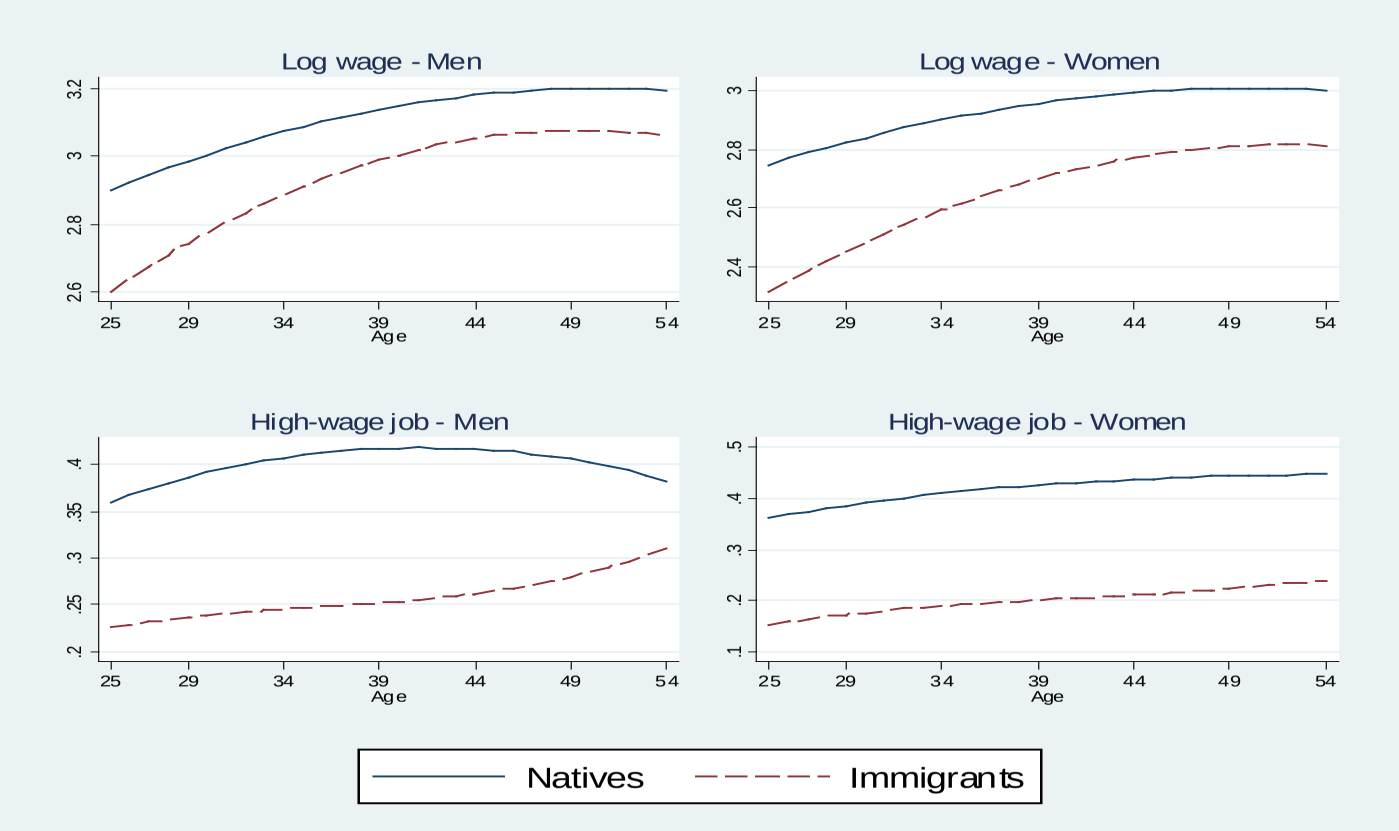
Notes: Counterfactual rates are in all cases obtained by predicting immigrant transition matrices using the native mean values of the covariates.

Figure 1.1: Kernel density estimates of the distribution of job quality.



Note: Vertical lines indicate sample medians in the native-born population.

Figure 1.2: Predicted high-wage rates across age and years since migration.



Note: Predictions are from either an OLS regression (top two panels) or multinomial logit model (bottom two panels) that includes controls for age (quadratic); education; marital status; geography; a time trend (quadratic); an immigrant dummy; age at migration (quadratic); and years since migration (quadratic). The immigrant profiles are for an immigrant who arrived at age 24.

Figure 1.3: Predicted transition probabilities across age and years since migration, men.

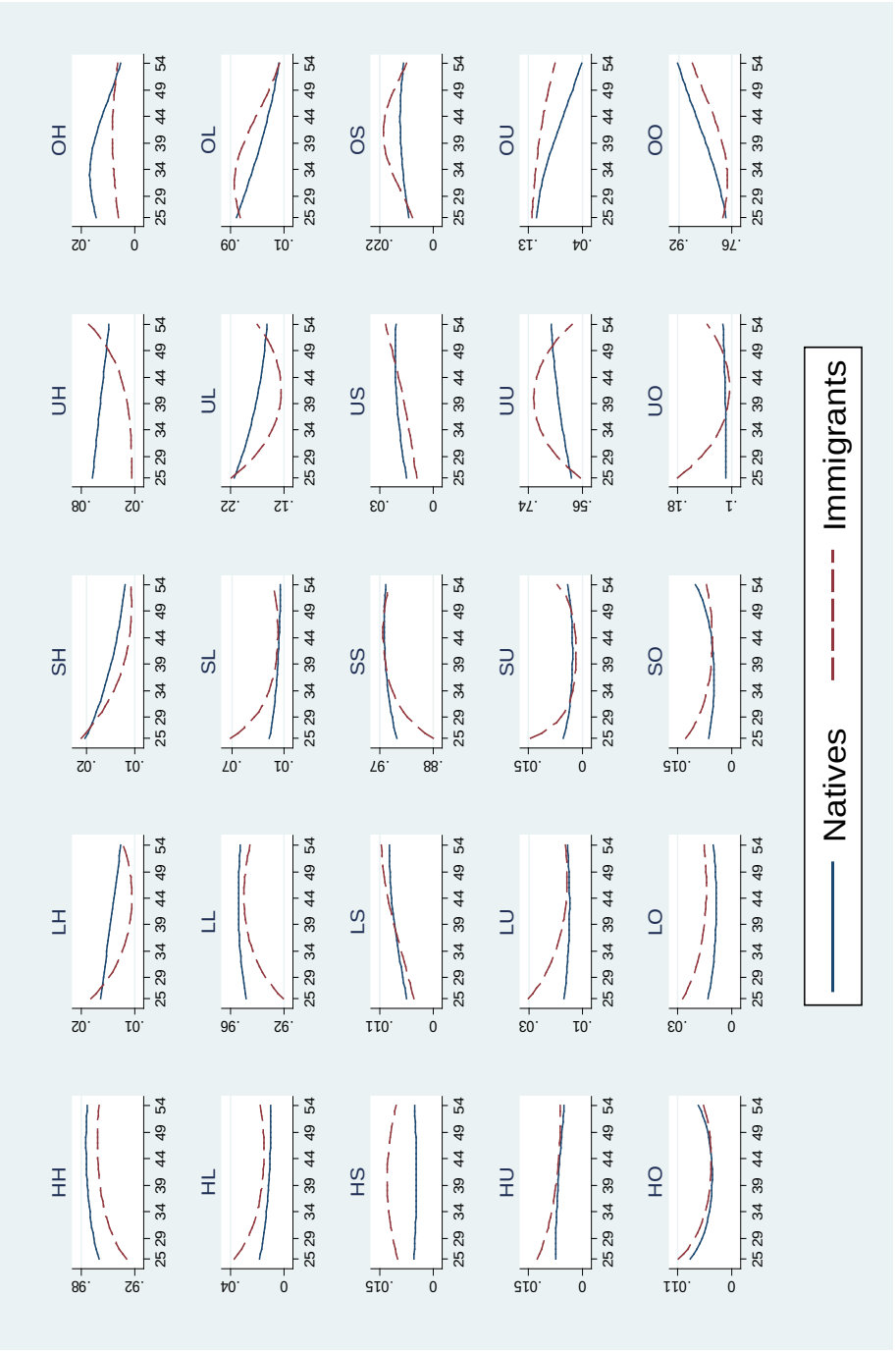
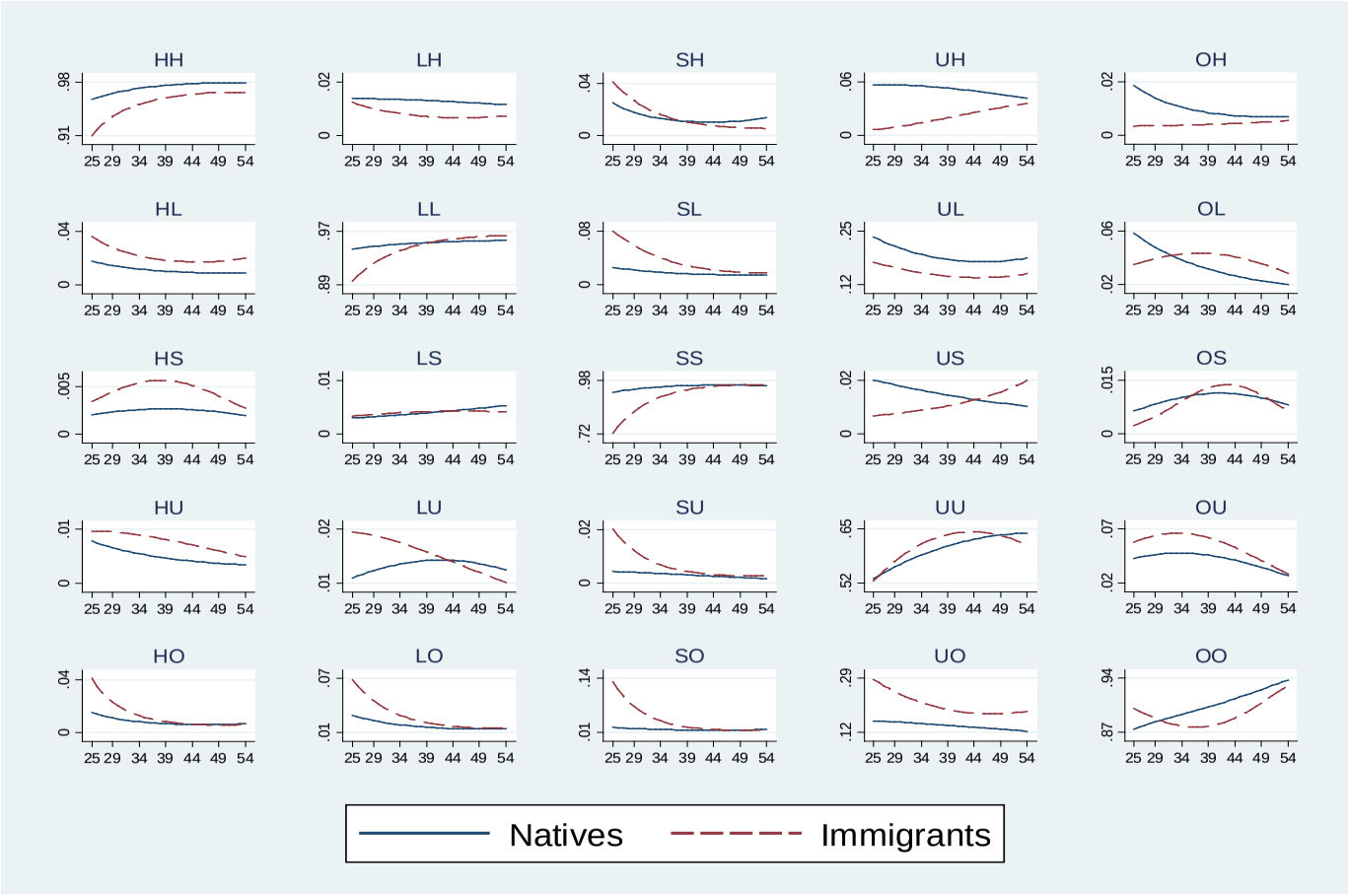


Figure 1.4: Predicted transition probabilities across age and years since migration, women.



Chapter 2

Can A Comparative Earnings Advantage Account for the High Self-Employment Rates of Canada's Immigrants?

2.1 Introduction

Self-employment accounts for a disproportionate share of the labour market activity of new Canadian immigrants. The 2006 Census data show that 14% of prime-aged immigrants were self-employed, compared to 12% among Canadian-born workers. Statistics Canada, however, recently released the self-employment rate of new immigrants – those who arrived in Canada less than 5 years ago – from 1981 to 1996, showing that the proportion of recent immigrants who were self-employed doubled from 8% to 14% in that period. In contrast, the proportion of self-employed Canadian-born workers remained at 13% over the same period. From 1996 to 2005 immigrants continued to exhibit relatively high rates of self-employment, although it decreased slightly after peaking in 1995 at 16%.

The current literature examining the determinants of immigrant self-employment primarily looks at the static choice of the self- versus the paid-employment and focused on the different propensities for self-employment between immigrants and native-born workers. However, relatively few papers study the tendencies for immigrants to become self-employed upon their arrival and over subsequent years following migration. Li (2001) and Frenette (2004) use Canadian data to estimate standard assimilation-type models of immigrant self-employment rates. They demonstrate that recent cohorts of immigrants are more likely to opt for self-employment shortly after arrival than were earlier cohorts of im-

migrants. Moreover, unlike wages in the paid employment sector, which tend to converge to that of the native-born over time, immigrant self-employment rates tend to increase progressively in subsequent years and diverge from those of similarly-aged Canadian-born workers. A limitation of these papers, however, is that they make no attempt to examine why self-employment rates of new immigrants have tended to increase over time or why they tend to diverge from those of Canadian-born workers in the years following migration.

A number of studies, all of them focusing on countries other than Canada, have attempted to explain relatively high immigrant propensities for self-employment. A common explanation is that immigrants are attracted to self-employment by a comparative advantage in this sector. These papers point to possible immigrant-endowed abilities for self-employment; their lack of fluency in the host country language; and the existence of ethnic enclaves. Proponents of this view argue that ethnic enclaves provide a protected market for immigrants to engage in self-employment, particularly when there is rapid growth in the immigrant population, and hence concentration within a specific geographical location. Immigrant entrepreneurs enjoy an advantage over potential competitors in seeking the preferences of consumers in the enclave. Aldrich et al. (1985) argue that immigrants are able to provide better ethnic goods and services, since they are aware of their own culture's specific tastes and have the skills and knowledge for their provision. For example, certain immigrant groups are more productive in providing food, restaurant services and approaches to medical treatment. In addition, immigrant entrepreneurs exhibit a competitive advantage because they offer comfort and security by conducting transactions in their own language. Some immigrants groups are linguistically distinct and thus they are limited to jobs with lower incomes compared to workers who are fluent in the host country language. The immigrant entrepreneurs from these groups, however, can be more profitable in self-employment when they provide goods or services to co-ethnics who share the same language. Using Australian data, Evans (1989) suggests that minorities with a greater proportion of individuals who are not fluent in the English language will be more likely to be business owners. Further, Lofstrom (2002) finds some evidence that the presence and size of ethnic enclaves positively affect the probability of immigrants becoming self-employed and that self-employed high-skilled immigrants do relatively better in the U.S. labour market than immigrants working in the paid-employment sector.

The comparative advantage exhibited by immigrants in self-employment may give rise to higher profits or economic returns, which are at least equivalent to those obtained from the paid-employment sector. In order to test the effect of comparative advantage, several papers in the existing literature empirically measure it as the earnings differentials between self- and paid-employment. Rees and Shah (1986) simultaneously estimate a binary choice model of self- versus paid-employment and earnings functions for each sector with a correction for selectivity. From the estimates of this model, they are able to predict potential earnings differentials between the self- and the paid-employment sectors at the level of the

individual worker. Using British data, they find evidence confirming that the probability of self-employment depends positively on the potential earnings difference between the two sectors. Using a similar approach, Taylor (1996) examines the role of this potential earnings difference on the probability of becoming self-employed using British longitudinal data. His results similarly show that the earnings advantage in self-employment is a major attraction for individuals to self-employment.

This paper contributes to the current literature in two ways. First, using a much larger and richer dataset than Li (2001) and Frenette (2004), I extend previous studies by examining changes in the likelihood of self-employment across arrival cohorts of immigrants and how self-employment rates evolve in the years following migration to Canada, and by estimating the potential earnings difference between the self- and the paid-employment sectors. Compared to Frenette (2004), I analyze immigrant earnings outcomes relative to the native-born across, instead of within, sectors. As a result, I am able to correct for the selectivity issues associated with the choice of sectors. Second, this study is the first in the Canadian literature to study the impact of an earnings advantage on immigrant propensities for self-employment, both upon arrival and in the years following migration. In other words, I explore the implications of the patterns of a comparative earnings advantage on the choice of self-employment in the immigrant population.

Pooling Canadian Census Public Use Microdata Files (PUMFs) between 1981 and 2006, I identify 100,767 and 433,435 observations on immigrants and the native-born, respectively, after restricting the sample to men ranging in age from 25 to 54 who worked on a full-year and full-time basis in the calendar year preceding the Census. In order to estimate the likelihood of self-employment, I begin by examining the unconditional self-employment rates, relative to the native-born, through time for each arrival cohort. I then estimate the predicted self-employment probabilities according to a probit model, which is run on a wide set of personal demographic and family characteristics, including age and its square, educational credentials, marital status, the presence of children, the number of children, the wife's total income and a series of industry, geography and year dummies.

Subsequently, I examine the extent to which a comparative advantage in self-employment, captured by the difference in potential earnings between the self- and paid-employment sectors, can account for the tremendous shift toward self-employment observed in Canada's immigrant population. Immigrants from Canada's traditional immigrant source regions – the U.S., U.K., Europe, Caribbean and Oceania – are distinguished from non-traditional source regions – Asia and Africa. Generally, traditional immigrants are English-speakers. Thus we can reasonably expect that their language proficiency make it easier for them to find a wage job than the non-traditional immigrants who lack language skills. Also, traditional immigrants tend not to be visible minorities so we expect them to face less employer discrimination in the labour market. As a result, these two types of immigrants may experience very different earnings profiles and they are accordingly distinguished in

the estimation of the earnings functions. Following the approach of Taylor (1996), I am able to obtain predicted potential earnings in both the self- and paid-employment sectors for each individual observed in the data and correct for the selectivity. Then, a structural probit model, including the predicted difference in log earnings between the two sectors as regressor, is used to investigate how the potential earnings difference affects immigrants' likelihood of self-employment. Finally, I predict the earnings difference for each arrival cohort of traditional and non-traditional immigrants and present the key implications of the differences in the patterns of an earnings advantage on the choice of self-employment, for both traditional and non-traditional immigrants.

My findings indicate that Canada's most recent immigrants, who arrived between 1996 and 2005, are more likely to turn to self-employment than earlier cohorts of immigrants. In addition, self-employment rates of all cohorts of immigrants tend to rise relative to observably-identical Canadian-born workers as immigrants have been residing in Canada. Although both types of immigrants show a higher likelihood of self-employment with the increase of predicted self-employment earnings relative to paid earnings, this earnings difference appears to more significantly affect the choice of becoming self-employed in the non-traditional immigrant population. More important, there is an earnings advantage in self-employment for traditional immigrants, which has tended to increase within immigrant cohorts. Therefore, the tendency of increasing self-employment rates over time for traditional immigrants can be explained by the comparative earnings advantage in terms of a more rapid growth of self-employment earnings. Once this earnings advantage is controlled for, the tendency for self-employment in the years following migration disappears. However, the earnings difference cannot explain the reason non-traditional immigrants become increasingly likely to be self-employed as they consistently lose an earnings advantage over time in the self-employment sector relative to the paid-employment sector. For recent non-traditional immigrants who arrived between 1996 and 2005, the higher self-employment rates at entry relative to the native born can be explained by higher levels of self-employment earnings by working more hours in this sector. Finally, I find some evidence that immigrants have barriers accessing paid-employment and hence self-employment is their "option of last resort". However, my findings can not exclude the possibility that the higher likelihood of self-employment is either affected by an attraction such as independence and freedom, or by the host-country culture related to propensity for self-employment.

The remainder of the paper is organized as follows. In the following section I discuss the current literature on the self-employment experiences of immigrants arriving in Canada and on the impact of a comparative advantage in self-employment on the choice of self-employment. I describe the empirical strategies to identify the incidence of self-employment and estimate the earnings difference between the self- and the paid-employment sectors in Section 3. Section 4 describes the data and Section 5 discusses the results. Finally, Section

6 concludes the paper.

2.2 Literature Review

To date, relatively few papers emerge in the current literature that explore the process of entry and assimilation into self-employment experienced by Canadian immigrants. Li (2002) examines data from the Longitudinal Immigration Data Base (IMDB) in Canada from 1980 to 1995, which contain information on immigrants' landing year, age, gender, class of admission, country of last permanent residence, educational credentials at landing and language ability. Li presents a descriptive analysis to show how immigrant propensities for self-employment vary across entry cohorts and over time. He further demonstrates how self-employment rates vary by characteristics of immigrants in subsequent years after migration. Finally, a logistic regression model is employed to identify which immigrant characteristics contribute to the likelihood of being self-employed. The results show that the likelihood of participation in self-employment is higher as immigrants reside in Canada longer and that new cohorts of immigrants who arrived in the 1990s were more likely to engage in self-employment than earlier cohorts of immigrants. The logistic regression model further demonstrates that immigration during good economic conditions, older age and higher educational qualifications enhance the incidence of self-employment in Canada. The shortcoming of these data is that they contain no observations on native-born workers, which is often used as the benchmark group in the analysis of immigrant self-employment rates. Without a base group, there is no way of determining if changes observed over time are common to all workers or specific to immigrants. Therefore, we can eliminate the secular trend common to all workers by netting of the changes that occurred in the native-born.

Frenette (2004) uses Canadian Census data between 1981 and 1996, which include observations on both immigrants and the native-born to study the likelihood of self-employment and relative earnings for immigrants in both paid- and self-employment sectors. He finds that the proportion of self-employed male immigrants has grown in successive cohorts and that immigrants in the early 1990s have higher propensity for self-employment than the cohorts of immigrants who arrived in the late 1970s. In addition, immigrant self-employment rates are increasing in years after migration. He then examines the earnings of immigrants in both sectors, demonstrating that the more recent cohorts of immigrants have fared poorly relative to the native-born in the paid-employment sector while the earnings gap between immigrants and the native-born remains quite stable in the self-employment sector. His study concentrates on the earnings of immigrants within each sector relative to the native-born rather than the impact of the potential earnings difference between the two sectors on the entry to self-employment, as is the focus of this chapter.

The most recent Canadian research in this area is by Schuetze (2010) who examines immigrant self-employment in both the U.S. and Canada. His findings suggest that in both countries there has been positive and statistically significant growth in the self-employment rates of new arrival cohorts and that immigrant self-employment rates tend to increase in subsequent years after arrival. Furthermore, the relative intra-cohort growth of self-employment rates tend to occur in the first ten to fifteen years after migration for those who arrived after 1970, while previous cohorts experienced increases in self-employment rates at a later time. This result roughly coincided with changes in Canadian immigration policy, which introduced the points system in the late 1960s. Meanwhile, the findings show that more recent immigrant cohorts, upon entry, have self-employment rates closer to Canadian-born entrepreneurs while previous cohorts enter Canada with lower self-employment rates than the native-born. In particular, the gap between self-employment rates of immigrants at time of entry and the native-born fell substantially in the period between 1986 and 1996. This is consistent with the creation of the "business" class of immigrants in the early 1980s.

Taylor (1996) examines how self-employment in England is driven by three main considerations: the potential earnings difference between the self- and the paid-employment sectors; independence; and unemployment. When estimating the potential earnings difference, he employs a similar approach to Rees and Shah (1986). The benefit of independence offered by self-employment is non-pecuniary. The classic example is "being your own boss": individuals attach intrinsic value to independence since they can derive more utility from working for themselves than working for others. The unemployment level represents an important macro-economic factor and may impact the choice of self-employment, although its influence is inconclusive in the literature. For example, Audretsch and Evans (1994) suggest that high unemployment levels lead to fewer jobs being offered in the paid-employment sector and result in higher propensity for self-employment as a substitute. Conversely, Oswald (1991a) finds evidence that low unemployment rates may attract individuals to self-employment since they know it is easy to find a paid job even if they fail in their own business. Taylor (1996) suggests that independence attracts individuals to self-employment as does the potential earnings advantage in the self-employment sector, while high unemployment levels do not impact the choice of self-employment.

Using the American Survey of Income and Program Participation, covering a period from 1983 to 1986, Hamilton (2000) attempts to explain the earnings difference between the self- and the paid-employment sectors. His findings show that individuals tend to persist in the self-employment sector despite lower initial earnings and lower earnings growth than paid employees with the same observed characteristics. The earnings differentials cannot be explained by the selection of low-ability workers into self-employment since the average earnings of paid employees are less than the predicted earnings of entrepreneurs had they been the paid employees. However, Hamilton concludes that the self-employment earnings differential reflects individuals' willingness to sacrifice substantial earnings in exchange for

freedom or independence.

Lastly, Clark and Drinkwater (2002) explore the higher propensity for self-employment among ethnic minorities in England and Wales by examining both pull and push factors. They argue that ethnic minorities are either forced into self-employment by employer discrimination (a push factor), or are attracted toward self-employment by push factors such as positive attitude toward self-employment related to religion and a comparative advantage (or productivity) in the provision of ethnic goods and services to the customers in the enclave. They outline a theoretical model incorporating the potential earnings difference between the two sectors and other variables, including proxies for religion and ethnic enclaves. The results indicate that the difference of predicted earnings between the self- and the paid-employment sectors exerts a powerful influence on the likelihood of self-employment.

2.3 Methodology

Analysis is performed relative to native-born counterparts, given that the estimates will be biased when unobserved economic conditions change over the twenty-five year period. A common solution in the literature is to adjust immigrant outcomes with a base group. For example, Borjas (1986) normalized the immigrant incidence of self-employment by using the native-born as a benchmark. This section begins with the discussion of the binary probit model used to estimate the probability of being self-employed and then turns to an endogenous switching model used to address the sample selection bias in the estimation of earnings in both sectors. Finally, a structural probit model will be described as it examines the earnings differential effect on the decision of self-employment.

Since each individual has two choices in the labour market – to become a paid employee or self-employed worker – the self-employment probability can be estimated through a binary probit model. I employ a standard empirical assimilation-type approach in the literature based on the work of Chiswick (1978) and Borjas (1985). This model is primarily used in studies of immigrant wage assimilation and typically includes a set of arrival cohort dummies and a function of YSM to identify immigrant entry earnings and assimilation processes, respectively. Correspondingly, I apply this approach into binary probit model to estimate immigrant self-employment rates for each arrival cohort of immigrants and their change with the accumulation of YSM. In particular, previous studies have suggested that immigrants become increasingly likely to choose self-employment as they have been residing in Canada. Hence, a quadratic function of YSM is included to capture the tendency of immigrant self-employment rates in the years following migration. As a result, the binary probit model is given by:

$$\begin{aligned}\Pr(Y=1) &= \Phi\big[\beta_0+\beta_1 AGE+\beta_2 AGE^2+\beta X+\gamma Z+m\cdot(\delta_0+\\ &\quad \sum_{2}^{k}\delta_j C_j+\alpha_1 AGE+\alpha_2 AGE^2+\alpha_3 YSM+\alpha_4 YSM^2)\big]+\mu \qquad (2.1)\end{aligned}$$

where $\Pr(Y=1)$ is the probability of being self-employed; AGE is the age of respondent at the reference year; C_j are 7 cohort dummies identifying the period of arrival; YSM is years since migration; m is immigrant dummy variable; and μ is an identically distributed error term. The cohort dummies and YSM are always equal to zero for the native-born. In addition, X represents other typical variables which may affect the self-employment choice and Z are instrumental variables, which also affect the propensity for self-employment, but not earnings. Specifically, variables in X include marital status, industry indicator variables, geography indicators and years dummies. Variables in Z include the wife's total income, the presence of a child and the number of children.

Estimating equation (2.1) on a pooled sample of immigrants and natives, we can interpret the estimates of C_j as the self-employment entry rate of cohort j relative to the earliest cohort, after controlling for X and Z. The quadratic term of YSM provides evidence of the extent to which immigrant self-employment rates evolve with more years spent in the host country labour market. The quadratic function of age is included as I expect the older workers may be more capable to invest a business due to the accumulated wealth and stronger interpersonal relationship, compared to the younger workers. By interacting the age and immigrant dummy variable, it allows for different changes to age for immigrants and natives as an immigrant may have different preference on the choice of self-employment compared with a similarly-aged native-born worker.

The second key focus of this paper is to estimate the earnings of immigrants in the self- and paid-employment sectors and then examine the impact of potential earnings difference between the two sectors on the choice of self-employment. The earnings equation, which is estimated separately in each sector, is given by:

$$\begin{aligned}\log(W) &= \gamma_0+\gamma_1 AGE+\gamma_2 AGE^2+\gamma X+\ m\cdot(\theta_0+\sum_{2}^{k}\theta_j C_j+\\ &\quad \omega_1 AGE+\omega_2 AGE^2+\omega_3 YSM+\omega_4 YSM^2)+\varepsilon \qquad (2.2)\end{aligned}$$

where $log(w)$ is the log of weekly earnings and all other variables in equation (2.2) have the same definition as equation (2.1). Similarly, I can interpret the coefficients of C_j as the entry earnings of cohort j relative to the earliest cohort. The quadratic function of YSM reveals the extent to which immigrants assimilate into host country labour market in terms

of earnings. In the earnings equation, age is the proxy of potential working experience and its quadratic function can capture the diminishing returns to experience. By interacting the age and immigrant dummy variable, it allows for different returns to age for immigrants and natives. Since foreign experience of immigrants may not be equally transferred into the Canadian labour market, I would expect immigrants to have smaller returns to age profile than the native-born.

The econometric problem faced here is that an individual can only be observed in one of the two sectors and thus their earnings in the other sector are not available. Moreover, men who choose to be a paid-employee or self-employed are unlikely to have made the choice on a random basis and thus there is a selection bias. The common way of overcoming the selectivity problem is to use the Heckman (1979) two-stage selection model, which includes the sample selectivity term (inverse Mills' ratio) in the earnings equations. However, this method is not efficient and the derivation of consistent standard error is computationally burdensome. I will implement the full information maximum likelihood method (FIML) to simultaneously estimate the probit and earnings equations in order to yield consistent standard errors. This approach is called Endogenous Switching Regression (ESR), which sorts individuals over two different states with one regime observed.

With the method of ESR, the identification of the earnings equations depends on exclusion restrictions, that is, omitting at least one variable that appear in equation (2.1). I dropped the variables in Z, which are assumed to only affect the choice of self-employment but do not determine earnings in any sector. In practice, I include the presence of a child, the number of children; and the wife's total income as the instruments. The first two variables have been used in other studies estimating a similar type of model (Taylor 1996; Dolton and Makepeace 1990), which argue that parents with more children need more flexible time to care for their children.

The results of earnings equations could be sensitive to the choice of instruments. Hence, I tried some other instrumental variables. For example, some papers use home equity since it could capture the amount of assets and indicate the ability to obtain a loan. However, the Census data only provides information on the house value and not home equity. I attempted to substitute the house value for home equity and the estimates suggest that individuals in possession of more expensive homes are reluctant to enter the self-employment sector. The results contradict my expectation, and in actuality, the house value cannot capture the original implication indicated by home equity. Further, I compared the results with and without the use of house value. The negligible changes in the estimates of other variables suggest that results are not sensitive to this variable.

On the other hand, I use the wife's total income as instrumental variable. The definition of wife's total income is conditional on the status of census family. For a male spouse or common-law partner, the wife's total income is derived by subtracting the husband's total income from the family's total income. However, for a man who is single, lone par-

ent or non-family person, the wife's total income is always equal to zero.[1] I expect that the wife's total income is able to influence the husband's participation in self-employment sector by providing an alternative source of wealth to start a business. Or alternatively, a significantly high level of spousal total income sufficiently secure the family's basic sustenance so that men are capable of making more risky and ambitious career endeavours in the self-employment sector. Moreover, the descriptive results in Table 2.1 show that wives of both groups of immigrants earn significantly higher income compared with those of the native-born, which may, to some extent, explain why immigrant men are more likely to be self-employed. On the other hand, I expect that the incomes of wives do not determine the levels of husbands' earnings in any employment sector in my sample. Some papers argue that the individual may not participate in the labour force or reduce the hours of work with the increase of the spouse's income. However, my sample is restricted to men working on a full-time and full-year basis, which excludes the consideration of family labour supply. Consequently, the wife's total income has nothing with the husband's earnings and it can be eliminated from the earnings equations.

These exclusion restrictions enable me to obtain the predicted earnings in both the paid- and self-employment sectors for each individual observed in the data. The final step is to assess the impact of the predicted earnings differentials on the choice of self-employment and the structural probit model with the earnings difference included, is given by:

$$\begin{aligned}\Pr(Y=1) \;=\; & \Phi\big[\vartheta_0(\widehat{log(W_s)} - \widehat{log(W_p)}) + \beta_0 + \beta_1 AGE + \beta_2 AGE^2 + \\ & \beta X^{'} + \gamma Z + m \cdot (\vartheta_1(\widehat{log(W_s)} - \widehat{log(W_p)}) + \delta_0 + \\ & \sum_{2}^{k} \delta_j C_j + \alpha_1 AGE + \alpha_2 AGE^2 + \alpha_3 YSM + \alpha_4 YSM^2)\big] + \mu \quad (2.3)\end{aligned}$$

where $\widehat{log(W_s)} - \widehat{log(W_p)}$ is the difference of predicted log earnings between two forms of employment and $X^{'}$ are the same covariance sector as X except a series of industry dummies. In other words, industry indicator dummies, which enter in the probit model and the earnings equations, are omitted from the structural probit model, for the identification purpose. More important, the coefficient of the predicted earnings difference (ϑ_0) indicates the impact of an earnings advantage on the native-born determination of choosing self-employment. The magnitude is $(\vartheta_0 + \vartheta_1)$ in the immigrant decision affected by an earnings advantage.

[1] In my model, I include the log of wife's total income in the model. Since many wives do not work and have zero income, I assign zero value to the log of wife's total income. As a result, this manipulation will decrease the means of log of wife's total income, compared with the log of the means of wife's total income, as shown in Table 2.1.

2.4 Data

The data used in this study are drawn from the Canadian Census Public Use Microdata Files (PUMFs) conducted in 1981, 1986, 1991, 1996, 2001, and 2006. These data provide a sufficient sample size of immigrants to distinguish differences across arrival cohorts and between traditional and non-traditional source countries. In addition, these data provide the necessary information on sources of the income in both the paid- and the self-employment sectors, which allows me to identify the class of worker in the calendar year preceding the year of the Census.

The sample consists of male permanent residents, between 25 and 54 years of age, who worked for a full-year, on a full-time basis in the calendar year preceding the year of the Census. More specifically, the male workers must have worked 30 hours or more per week for at least 48 weeks in one year. These restrictions can effectively exclude the labour supply considerations as much as possible and concentrate on workers with a strong attachment to the labour market.

Immigrants are identified by their country of birth. Any individual born outside of Canada is defined as an immigrant. In order to identify the entry effect, immigrants are also categorized into cohorts by arrival time in Canada. For the purpose of this study, the earliest cohort of immigrants is those who arrived before 1971 and another seven cohorts are examined, which are 1971-1975, 1976-1980, 1981-1985, 1986-1990, 1991-1995, 1996-2000 and 2001-2005. Moreover, a significant shift in the source regions of immigrants occurred during the past fifty years, which may affect the likelihood of self-employment across cohorts and over time. Specifically, the proportions of immigrants coming from the traditional source regions are 80%, 46%, 38%, 28%, 21%, 21%, 25% and 23% across the eight arrival cohorts, respectively.

It is important to take class of immigrant admission into account when examining immigrants' likelihood of self-employment and their earnings in this sector. The immigrants who enter under the business class including investor, entrepreneur and self-employed categories, directly influence the self-employment rates given that many of the business immigrants are required to maintain a business of some form upon entry to Canada. For example, immigrants entering under the investor stream are required to make an investment to develop economy and create jobs.

The Longitudinal Immigration Data Base (IMDB) used by Li (2002) contain information on class of admission. In contrast, the census data do not distinguish immigrants into different categories. However, I plot the the change of business immigration from 1980 to 2006 in Figure 2.1 from the published data from Citizenship and Immigration Canada. Between 1980 and 1994, the proportion of business class immigrants steadily increased from 3.6% to 13.3%. Thus, there was substantial growth in the representation of business

immigrants over this period and I expect that this led to increases in self-employment propensities among immigrants. However, the proportion of business class immigrants declined from 9.8% to 5.1% from 1995 to 2006. The rapid decrease may be caused by the sudden increase of immigrants under the provincial nominee programs (PNPs) introduced in the late of 1990s. This program also includes a large portion of business immigrants. The dashed line indicates the summation of immigrants under both business class and PNPs. For instance, it shows that the percentage of immigrants under these two classes reach 10.8% of total immigrants in 2006. The increasing pattern from 1999 to 2006 suggests that immigrant self-employment rates may remain at a relatively high level on average due to the composition of immigrants admitted by business class and PNPs during this period.

In general, the literature has two ways to define self-employment, either by respondents' self-identification or by sources of income. Although the respondents are directly asked whether they are a paid-employee or self-employed in their primary job in the Census reference week, they are not required to report any earnings for that week. This paper will examine not only the immigrant probabilities of being self-employed relative to Canadian-born, but also the earnings in both sectors. Consequently, self-employment is defined by the sources of income in the previous year.

I follow the approach of Frenette (2004) to define self-employment. Specifically, any male worker who has self-employment income of at least 80 percent of the total market earnings (the sum of the paid- and self-employed earnings) is classified as self-employed in this study, given that self-employed earnings are positive. Similarly, a worker is considered to be a paid-employee if the earnings derived from the paid employment are at least 80 percent of the total market earnings. As a result, the intermediate group who spent considerable amounts of time in both types of employment were eliminated. However, this limitation is not costly as only 1.6% of observations fell into the intermediate category. This left me with 100,767 immigrants and 433,435 Canadian-born.[2]

Aside from immigrant and self-employment dummy variables, other demographic and economic variables typically used in the previous research on the determinants of self-employment are also included. In this study, the determinants are: age as quadratic; indicator variables for the highest level of education completed; indicator variable for marital status; and a series of dummy variables for the industry and geography.

Age acts as a proxy for work experience to capture the diminishing return to experience in the earnings equation. Educational attainment is also important as it may provide the

[2]The sample size includes the child immigrants, who arrived in Canada before the age of 12. I did not delete these observations due to the inconsistent age categories on the definition of age at migration in the 2006 Census PUMF. Moreover, I tried to eliminate the immigrants who arrived in Canada before the age of 12 surveyed between 1981 and 2001, and the immigrants who migrated in Canada before the age of 14 observed in the 2006 Census. The results on the propensity for self-employment and the tendency of predicted earnings difference over time are not sensitive to this sample limitation.

necessary skills to succeed and it determines the return to earnings. Thus a set of dummy variables for educational credentials are included. Previous research has found that individuals in married families are more inclined to choose self-employment since the other adult members can help to take better care of a family business. In addition, 14 groups of industry, based on the 1980 standard industry classification, are included. They are primary industry, manufacturing, construction, transportation, communication/utilities, wholesale trade, retail trade, finance/insurance, educational service, business services, government services, accommodation/food and other services. Finally, a series of regional and year dummy variables are used to proxy the economic conditions that may influence the choice of self-employment and the earnings of those who participate in this sector. Specifically, regional dummies include the Atlantic provinces, Montreal and other parts of Quebec, Toronto and other parts of Ontario, Manitoba, Saskatchewan, Calgary and other parts of Alberta, Vancouver, and other parts of British Columbia.

The means of these variables are shown in Table 2.1. Since much of the analysis that follows focuses on the outcomes of two types of immigrants, relative to the native-born, the descriptive statistics are presented for traditional immigrants, non-traditional immigrants and the native-born, respectively. My sample consists of 9.2% traditional immigrants and 9.6% non-traditional immigrants. Compared with the native-born, both types of immigrants are more educated, more concentrated in Toronto and Vancouver, and considerably more likely to work in manufacturing, business services, and accommodation/food industries. Furthermore, immigrants have higher rates of marriage and have more children and their wives have more total income than those of the native-born. If these demographic and family characteristics impact the decision on self-employment, the comparison between immigrants and the native-born should account for these differences.

Table 2.1 demonstrates some meaningful labour market outcomes. First, both types of immigrants have higher self-employment rates than the native-born. On average, the traditional and non-traditional immigrants, who choose self-employment, are 9.4% and 8.6%, respectively, while only 7.9% of the natives work for themselves. Second, traditional immigrants have the highest earnings in both the paid- and self-employment sectors. The logs of weekly paid earnings and self-employed earnings are 6.88 and 6.42, which are slightly higher than the Canadian-born whose means in two sectors are 6.83 and 6.39, respectively. Comparatively, non-traditional immigrants experience considerably lower earnings in both sectors, which are only 6.64 and 6.28, respectively. This distinct difference in the earnings gives evidence that it is important to control for the types of immigrants in the earnings equations. Third, both groups of immigrants and native workers have on average an earnings disadvantage in the self-employment sector due to the negative values of the earnings difference between two sectors. In other words, everyone earn less in the self-employment sector compared to the paid employment sector on average. However, non-traditional immigrants have the smallest earnings difference, followed by the native-born

and traditional immigrants. Consequently, the non-traditional immigrants have an earnings advantage in the self-employment sector relative to Canadian-born workers. It implies that non-traditional immigrants may be attracted to self-employment by a comparative earnings advantages in this sector.

2.5 Results

2.5.1 The relative incidence of immigrant self-employment

The descriptive results on the unconditional relative probabilities of self-employment are presented in Figure 2.2.[3] The vertical axis represents the observed difference in the likelihood of self-employment among immigrants and the native-born. Positive values indicate higher self-employment rates for immigrants than the native-born, and vice-versa for negative values.

In Figure 2.2, we can see that there are substantial differences in self-employment levels for immigrants and the native-born. Since most differences are positive, it shows that immigrants, in general, are more likely to be self-employed. In addition, the entry effect can be observed by comparing new immigrants, who have lived in Canada for less than 5 years. The first bar of each cohort represents new immigrants' self-employment rates relative to their native counterparts with the exception of the 1971-75 cohort. Due to data limitations, we cannot observe the entry effect for this cohort and its first bar shows the relative self-employment probability when this cohort stayed more than five years, but less than 10 years, in the Canadian labour market. Figure 2.2 illustrates that the first bars become more positive across successive cohorts, excepting that new immigrants of the 1986-90 cohort are less likely to enter the self-employment sector than the earlier cohorts. This trend demonstrates recent cohorts of immigrants are more apt to choose self-employment upon arrival in Canada. The assimilation effect can be ascertained by following the bars within a given cohort. It suggests that immigrants become more likely to turn to self-employment after residing for a time in Canada.

Considering that immigrants exhibit different demographic and family characteristics from the native-born, it is important to control for these factors. Equation (2.1) is able to estimate the probability of self-employment for seven cohorts of immigrants, relative to the native-born. A typical approach is to evaluate this difference at the same values

[3]I did not separate traditional immigrants from non-traditional immigrants in Figure 2.2 and Figure 2.3 in order to make these results comparable with those of Frenette (2004). More important, I estimate the likelihood of self-employment for both types of immigrants, as shown in Table 2.2 and the results suggest that both category of immigrants exhibit similar tendencies to self-employment across arrival cohorts and over time.

of independent variables, represented by X and Z in equation (2.1), for both immigrants and natives. Accordingly, I assign the average characteristics of immigrants to the native-born except the YSM variable. The native-born always have the zero value of YSM, while immigrants have the different YSM across arrival cohorts and over time. More succinctly, the YSM is equal to the sample means of YSM for a certain cohort at a given year.

The predicted probabilities of being self-employed, relative to the native-born is illustrated in Figure 2.3. This graph illustrates similar results as Figure 2.2. First, it indicates that immigrants have, on average, higher levels of self-employment rates relative to the native-born since most bars are positively labelled. In particular, the three most recent cohorts (1991-95, 1996-00 and 2000-05) of new immigrants always possess positive gaps, implying that recent cohorts of immigrants are more likely to be self-employed upon arrival in Canada compared to earlier cohorts.

With respect to the entry effect, we can see that the first bars become more positive with the arrival of new immigrants. Within the first five years of arrival, the 1976-80 cohort has the biggest negative gap, indicating that early cohorts of immigrants were less likely to be self-employed upon entry. By 1990, however, the 1991-95 cohort begins to have a positive value, showing that they have higher self-employment rates than the native-born during the first five years in Canada. Furthermore, this tendency is strengthened by the more recent cohorts of immigrants. New immigrants who arrive in Canada between 1996 and 2005 demonstrate a strong propensity for self-employment upon entry with higher relative self-employment rates. With respect to the assimilation effect, the bars within any cohort rise moderately through time. This pattern shows that immigrants exhibit an unambiguous increase in self-employment rates relative to the native-born with more time spent in Canada.

With respect to the metropolitan effect, Toronto has higher self-employment rates than other big cities such as Montreal, Vancouver and Calgary. Meanwhile, there are higher probabilities of self-employment in Manitoba and Saskatchewan than in other provinces. Compared to Figure 2.2, the results that self-employment rates have tended to increase with the arrival of new immigrants and they subsequently tend to diverge from those of Canadian-born workers consistently hold. Thus, I infer that the relatively higher immigrant propensities for self-employment are not driven by immigrant demographic characteristics.

As mentioned, when I estimate the conational relative immigrant self-employment rates with equation (2.1), I control for the YSM variable and its square. An alternative approach is to specify cohort and survey specific intercepts as Borjas' original study of immigrants' assimilation, which excludes YSM variable from the model. I also take this approach to estimate the conditional self-employment rates for both immigrants and natives. This approach also suggests that the self-employment rates tend to rise across arrival cohorts of immigrants and with years since migration. Therefore, the results on immigrant relative self-employment rates are robust and do not vary with different approaches.

2.5.2 Immigrant earnings outcomes in two forms of employment

In this section, traditional immigrants and non-traditional immigrants are distinguished because they experience much different entry earnings and earnings growth. Therefore, a series of traditional and non-traditional cohort dummies are included in the earnings equations. The approach of ESR simultaneously estimates the likelihood of self-employment and earnings equations, with results shown separately in Table 2.2 and Table 2.3.

Table 2.2 reports the coefficients of reduced-form probit model as well as their marginal probabilities.[4] While the magnitudes of coefficients in the probit model are not very meaningful, the marginal effect is interpreted as the change in the probability for an infinitesimal change in continuous variables or the discrete change in the probability for dummy variables. These results coincide with those presented in Figure 2.3. Specifically, the gradually increased magnitudes of marginal probabilities across a set of cohort dummies show that self-employment rates for both types of immigrants tend to increase with arrival of new immigrants. Also, the significantly positive marginal probabilities of YSM for both groups of immigrants indicate that immigrant likelihood of self-employment increases as YSM accumulates.

As expected, the results also reveal that age has a diminishing positive effect on the probability of self-employment along with accumulated entrepreneurial abilities and capital for investment. In addition, the log of wife's total income has a significant and positive effect on the choice of self-employment. If the wife's total income is enhanced by 1%, the probability of the husband's choice of self-employment is expected to increase by 0.1%. Simultaneously, individuals with a child are less likely to be self-employed than those without a child. However, individuals with two or more children in the family are more inclined to enter the self-employment sector.

Table 2.3 shows the results of earnings equations in both sectors, corrected for selectivity. Non-traditional immigrants show a sudden decline in the self-employment sector across consecutive cohorts, which is even bigger than the decrease in the paid earnings. On the other hand, earnings in both sectors slightly increased for the earlier cohorts of traditional immigrants, but dropped quickly for recent cohorts. Traditional immigrants also experience more decrease of entry earnings in the self-employment sector relative to the paid employment sector.

The earnings equations also suggest that there is an earnings growth for both types of immigrants, due to their significant and positive estimates of YSM in the two sectors. In particular, self-employed earnings for traditional immigrants grow more quickly

[4]Since quadratic functions of age and YSM and their interaction terms are included in the probit model, the marginal effects for these variables and the standard errors have been computed taking these nonlinearities into account. Specifically, I use additional programming in STATA with the command "predictnl".

than paid earnings with the accumulation of YSM. This outcome suggests an comparative earnings advantage in the self-employment sector, which may explain why traditional immigrants have an increasing trend toward self-employment in the years following migration. Conversely, non-traditional immigrants experience slightly higher growth of paid earnings than self-employment earnings. Yet, these results cannot explain the observation that non-traditional immigrants are more likely to be self-employed with more time spent in Canada. This contradiction implies that non-traditional immigrants may not be attracted to the self-employment sector by earnings superiority, but choose self-employment of necessity.

Finally, the last row in Table 2.3 shows the effect of unmeasured characteristics, reported by the coefficient of correlation (rho). It provides insight on the relationship between the error terms in the probit model and earnings equations. The error terms in the earnings equation contain the unobserved worker quality, which contribute to measured earnings. For example, individuals may possess positive attitudes toward work, which, in turn, lead them to obtain higher earnings in any sector. Simultaneously, the error terms in the choice of self-employment may include workers' exceptional confidence and ambition for success. The significant and positive coefficients of correlation suggest that individuals with more ambition may work harder and thus they have higher earnings in the self-employment sector. Therefore, there is selection bias on the choice of employment sectors.

2.5.3 The impact of earnings difference on the choice of self-employment

Given that the earnings equations predict earnings in both sectors for each individual, the potential earnings difference between the two sectors is derived from the predicted log of self-employed earnings subtracted by the predicted log of paid earnings. In this section, I begin with elaborating on the patterns of the earnings difference and afterward show how these patterns affect the decision of self-employment for each category of immigrants.

Table 2.4 shows the most important and interesting results of this chapter, that is the earnings difference between two sectors for both groups of immigrants and native workers. Specifically, the upper panel in Table 2.4 displays the earnings difference between the self- and the paid-employment sectors for each group of immigrants across consecutive arrival cohorts over a period of twenty-five years (DD_M). The middle panel shows the earnings difference of observably-identical native workers (DD_N). The lower panel refers to the earnings difference of immigrants, relative to the native-born (DD_M-DD_N).

The values of DD_M and DD_N are computed at the same demographic characteristics for all workers,[5] based on the results of Table 2.3. Table 2.4 suggests that everyone earns

[5]In this estimation, YSM are different for the native-born and workers. The native-born always have

less in the self-employment sector compared to the paid employment sector as all values of DD_M and DD_N are negative, regardless of YSM and year. In other words, both groups of immigrants and native workers have an earnings disadvantage in the self-employment sector. However, the non-traditional immigrants' earnings disadvantage is smallest in the self-employment sector on average in that their gaps are comparatively smaller than those of traditional immigrants and the native-born. These results suggest that non-traditional immigrants, generally, have higher likelihood of self-employment than natives and traditional immigrants.

The tendency of an earnings difference over time also have the implications on the decision of self-employment for each type of immigrants. By following the potential earnings difference of traditional immigrants, we can see that the earnings differences become more negative through time, although the gaps in 1991 and 2001 are smaller than those in 1986 and 1996, respectively. The earnings difference of the native-born exhibits the same pattern as traditional immigrants, but they experience a bigger decline through time. For example, the earnings difference across sectors drops 0.307 log point (0.691-0.384) for the 1971-75 cohort of traditional immigrants from 1981 to 2006, while the decline of the earnings difference for native workers is 0.371 log point (0.643-0.272) over the same period. It suggests that traditional immigrants seem to gain a comparative earnings advantage with the accumulation of YSM over time, relative to the native-born. However, non-traditional immigrants experience a monotonic and rapid decrease in the earnings difference over time. For instance, the earnings difference for the 1971-75 cohort of non-traditional immigrants decreases is 0.582 log point (0.712-0.130) over 25 years. It indicates that non-traditional immigrants face a slower increase in self-employed earnings relative to paid earnings than their native counterparts as YSM adds.

In general, self-employed workers report lower earnings than paid employees as they report self-employed earnings net of costs. Some of these cost deductions may include a room in a house and transportation costs, which would have been incurred regardless of whether the individual was self-employed or not. In such cases, 1 dollar of self-employed earnings would be superior to 1 dollar of paid earnings. Therefore, it is not surprising that all predicted earnings difference (DD_M and DD_N) are negative for both immigrants and the native-born. As a result, I focus on the earnings difference of immigrants relative to the earnings difference of the native-born (DD_M-DD_N), which excludes the common effect of underestimated self-employed earnings. In addition, the difference on the potential earnings differentials among immigrants and the native-born (DD_M-DD_N) eliminates time effects since time effects are measured by the estimates of year dummies contained in the earnings equation, which are constant for immigrants and the native-born. Consequently, the difference between DD_M and DD_N are determined by the estimates of the

the zero value of YSM, while immigrants accumulate YSM over time, that is equal to sample means of YSM for a certain cohort at a given year.

cohort dummies (traditional or non-traditional cohorts), YSM (and its square) and their interaction terms.

The levels of the relative potential earnings difference and their tendency over time are two ways that potential earnings difference (relative to the native-born) can affect immigrant choice of becoming self-employed. The results reported in the lower panel of Table 2.4 show that non-traditional immigrants start with a strong comparative earnings advantage over traditional immigrants, relative to the native-born, in the self-employment sector when they first come to Canada in that their relative earnings difference (DD_M-DD_N) is positive and even remains so for a while. For example, the 1976-80 cohort of non-traditional immigrants has the biggest relative earnings advantage at 0.238 in 1981 and it remains positive until 2001. This indicates that the 1976-80 cohort of non-traditional immigrants who are self-employed earns, on average, 0.238 more than similarly-aged paid employees when they have resided in Canada for less than 5 years and they keep a comparative earnings advantage in the self-employment sector for some time, although the levels of the earnings advantage reduce over time. The non-traditional immigrants' earnings advantage relative to the native-born suggest that earlier cohorts of non-traditional immigrants who arrived between 1971 to 1995 may have higher likelihood of self-employment than the native counterparts upon entry, and subsequently, they continue to exhibit higher levels of self-employment rates than natives until the earnings advantage disappears.

In contrast, all cohorts of traditional immigrants start with negative values of earnings differences upon entry, relative to the native-born, and maintain the earnings disadvantage in the years after arrival. For instance, the 1976-80 cohort of traditional immigrants has a relative earnings disadvantage of -0.135 in 1981, indicating that self-employed workers in this cohort earn 0.135 less than paid employees at entry, relative to the native-born. This pattern suggests that traditional immigrants have lower likelihood of self-employment than the native workers upon entry and the lower self-employment rates last after their arrival in Canada.

In summary, relative to native-born workers, the non-traditional immigrants experience a lower average potential wage "penalty" from working in the self-employment sector while traditional immigrants experience a larger one. As a result, non-traditional immigrants, in particular of earlier cohorts, have higher self-employment rates than the native-born at entry, while the traditional immigrants are expected to have relatively low self-employment rates. Given that traditional immigrants dominate the non-traditional immigrants in the population observed in earlier cohorts, these findings may explain why immigrants who arrived between 1971 and 1990 have lower entry self-employment rates, relative to the native-born and remain them negative for certain years. (See Figure 2.3 for details).

Subsequently, I investigate the trends of the relative earnings difference over time. Table 2.4 shows that both groups of immigrants experience a decline in the gap relative to the natives with the accumulation of YSM. However, this pattern have distinct influences

on the choice of being self-employed for traditional and non-traditional immigrants. As non-traditional immigrants spend more years in Canada, they lose their earnings advantage relative to native-born while the traditional immigrants seem to gain a comparative earnings advantage with gains of YSM.

Specifically, the 1976-80 cohort of non-traditional immigrants has an earnings advantage at 0.238 and 0.183 in 1981 and 1986, respectively. Then the earnings premium is narrowed to 0.038 during the next 15-year period in Canada and it eventually becomes an earnings disadvantage after 30 years since migration. Similarly, the other example of an earlier cohort of non-traditional immigrants, who arrived in Canada from 1981 to 1985, clearly mimics the reduction of the potential earnings advantage over time. They begin with an earnings premium at 0.142 upon entry, but it ultimately turns into an disadvantage in the self-employment sector, where non-traditional immigrants earn 0.073 less than observably-identical paid employees after 20 years since migration. This tendency also applies to recent cohorts of non-traditional immigrants. For instance, the relative earnings difference decreases from -0.049 (in 2001) to -0.125 (in 2006) for the 1996-00 cohort. This pattern indicates that non-traditional immigrants experience slower earnings growth in the self-employment sector compared with the paid employment sector. This finding, however, cannot explain the previously observed assimilation effect that non-traditional immigrants are more likely to become self-employed in the years following migration, as shown in Table 2.2.

Conversely, by following each cohort of traditional immigrants, I find that the relative earnings disadvantage decreases when they remain living in Canada. For example, the 1976-80 cohort of traditional immigrants has a relative earnings disadvantage of -0.135 in 1981 at entry and then the relative earnings difference declines to -0.097 with additional five years spent in Canada. By 2006, self-employed workers in this cohort earn only 0.029 less than those with paid jobs. These results also display that the relative gap of earnings difference between two sectors reduces from -0.182 to -0.079 when 1981-85 cohort of traditional immigrants lives another 20 years in Canada. This trend is also reflected by recent cohorts of traditional immigrants. Of the traditional immigrants who arrived in Canada between 1996 and 2000, self-employed men earn 0.222 less than paid employees in their first five years in Canada. In the following five years, the relative earnings difference drops to 0.179. This tendency of narrowing earnings disadvantage over time implies that traditional immigrants experience more rapid growth of self-employed earnings, which gives rise to an earnings advantage in the self-employment sector and, in turn, explains why traditional immigrants are more likely to become self-employed with gains of YSM. This outcome is consistent with the positive and significant estimate of YSM for traditional immigrants, as reported in Table 2.1.

When examining the earnings differences across cohorts, I find that the diagonal numbers become more negative for both categories of immigrants. These values represent

the earnings difference, relative to natives upon their entry in Canada. For instance, the 1976-80 cohort of traditional immigrants has an earnings disadvantage at -0.135, while the 1981-85 cohort faces a bigger gap at -0.182. The earnings disadvantage at entry for the next three successive cohorts are -0.172, -0.206, and -0.222, respectively. The most recent 2001-05 cohort even obtains a substantial negative gap of -0.440, which may be skewed by a comparatively small sample size as fewer recent immigrants come from the traditional source regions during that period. Similarly, for non-traditional immigrants, new immigrants of the 1976-80 cohort have an earnings advantage of 0.238, while the 1981-85 cohort almost has a half of the earnings premium of the 1976-80 cohort (0.142). The entry earnings advantages continuously decline across the subsequent four cohorts. Overall, the pattern of larger negative gaps suggests that new immigrants are experiencing the inferior entry earnings in the self-employment sector relative to the paid employment sector, which can not explain the tendency that recent cohorts of immigrants are more likely to turn to self-employment than previous cohorts.

The final concern of this study is to examine the impact of the earnings difference on the choice of self-employment through the structural probit model. The estimation results are shown in Table 2.5. Five specifications of the structural probit model are used to give more insights on the impact caused by earnings difference. The first specification includes only the predicted earnings difference between the two sectors (dd). The significantly positive estimate of this variable suggests that the probability of being self-employed increases when expected self-employed earnings is higher than paid earnings. Meanwhile, the estimates of YSM and its square, for traditional immigrants, are insignificant. This is the key result in this chapter: the outcome emphasizes that traditional immigrants do not typically choose self-employment in the years after arrival once the earnings advantage in self-employment sector is controlled for. This finding further implies that traditional immigrants are attracted to the self-employment sector because of the earnings advantage. Nonetheless, for the non-traditional immigrants, their higher propensity for self-employment with more years since migration does not disappear after controlling for the earnings difference in consideration of the significant and positive estimate of YSM. This is a reasonable result given that non-traditional immigrants lose their advantage relative to native-born with the accumulation of YSM.

The second and third specifications supplement the first specification. The second adds one more variable, which is the interaction term between earnings difference and immigrant dummy variable; its estimate shows that the earnings advantage is more influential in the immigrant decision to choose self-employment. Further, the third specification includes another variable, which is the interaction term between earnings difference and years since migration. It suggests that the earning advantage not only has more influence on immigrants, but also its impact becomes stronger in the years following migration to Canada.

Finally, another two specifications of structural probit model are also estimated. These

distinguish traditional immigrants from non-traditional immigrants so as to examine specific impacts of earnings difference on each group of immigrants. Generally speaking, the earnings advantage has more attraction to non-traditional immigrants than to traditional immigrants, and the earnings advantage almost plays the same role in determining the choice of self-employment in the years after migration for both categories of immigrants.

2.5.4 Discussion

My findings have shown that both traditional and non-traditional immigrant groups have a high propensity for choosing self-employment, both upon entry and in the years subsequent to arrival. A comparative earnings advantage, which grows within cohort of immigrants, explains the tendency of increasing self-employment rates over time in traditional immigrant population. However, the reduction of a potential earnings advantage over time cannot explain the tendency of increasing likelihood of self-employment over time among non-traditional immigrant population. Moreover, the absence of an earnings advantage cannot account for new immigrants' higher propensity for self-employment relative to the native-born and previous cohorts of immigrants. This suggests that there are factors other than the earnings advantage that lead more recent immigrants to enter self-employment sector.

Why are non-traditional immigrants more likely to turn to self-employment when they are losing an earnings advantage over time? Why do recent cohorts of immigrants choose self-employment in the absence of an earnings advantage? One explanation is that immigrants have difficulties to find a paid job, particularly a decently paid job. Wong and Ng (2002) argued that the disadvantages faced by immigrants in the paid employment sector force them to choose the self-employment sector. Especially in Canada, a great proportion of recent immigrants comes from the non-traditional source regions, who lack language capacity, recognized work experience and educational credentials. This hypothesis is supported to some extent by findings in the first chapter. In Figure 1.3 shown in the first chapter, we plot the age profiles for transitions, showing the predicted transition probabilities among different labour force status across age and years of migration.

Beginning with the transition probabilities from unemployment to a paid job, the first two panels in the fourth column present the transitions from unemployment to high-wage and low-wage jobs, respectively. Specifically, the biggest gap of the transition probability from unemployment to high-wage jobs (U_tH_{t+1}) occurs at the age of 25, when immigrants are assumed to have arrived in Canada. Although the probability to find high-wage jobs gradually increases over time, immigrants, on average, have comparatively lower transition rates into high-wage jobs and it takes around 27 years for immigrants to catch up with their native counterparts. This result demonstrates that it is extremely difficult for new

immigrants to find a high-wage job, even with accumulated work experience and skills in the host country.

Furthermore, the transition from unemployment to low-wage jobs (U_tL_{t+1}) shows that immigrants begin with similar opportunities to find low-wage jobs upon arrival in Canada, and then this transition probability declines with more years since migration. I think recent immigrants tend to resist taking in the low-wage employment sector, even when such employment is not difficult to gain upon entry. When immigrants arrive in Canada, they must often use the low-wage jobs as a stepping stone since high-wage jobs are difficult to secure. With increased years since migration, immigrants still find little opportunity to get a high-wage job, and by then, many of them have left low-wage jobs. In these instances, the only option is to resort self-employment.

The transitions to self-employment from unemployment (U_tS_{t+1}) or low-wage jobs (L_tS_{t+1}) provide some evidence of this explanation as well. Both transition probabilities display a similar pattern where immigrants experience lower transition probabilities upon migration to Canada and subsequently tend to have higher transition rates into self-employment with more years since migration, eventually surpassing the native-born. Their relatively low transition probabilities upon entry may be caused by the lack of money and difficulties to obtain a loan. As a result, it is hard for them to establish a business just after arrival. However, with the establishment of credit histories and the accumulation of wealth, immigrants are more likely to become self-employed in the years subsequent to migration.

Subsequently, I employ the Canadian Census data to test this hypothesis that immigrant higher likelihood of self-employment is caused by barriers to accessing paid-employment. The sample used in the previous analysis in this chapter is restricted to male workers who work for a full-year and full-time basis in the reference calendar year. As a result, the variation in log weekly earnings is driven primarily by differences in hourly wages, rather than differences in hours of work. In examining a possible comparative advantage (or productivity advantage) or a potential earnings difference between two sectors are exactly what we want to focus on. But, it may be that the advantage of self-employment for non-traditional immigrants lies in relative barriers to entering paid-employment sector. In such cases, part-time or part-year workers are included in the sample to obtain a substantial variation in hours of work, and thereby to estimate the effect of easier accessing self-employment. Accordingly, I relax the sample restriction and generate a complete sample which contains all observations with positive earnings in at least one of the two sectors. I follow the same approach and predict the difference of the log annually earnings between two sectors for the complete sample, as shown in Table 2.6.

The levels of the predicted earnings difference for both groups of immigrants are enhanced when I don't restrict the analysis to full-year full-time workers. In particular, non-traditional immigrants have more increase in the magnitudes of predicted earnings

difference. For example, the predicted relative earnings difference between two sectors for the 1976-80 cohort of non-traditional immigrants is 0.427 in 1981, compared to 0.238 as shown in Table 2.4. These results make sense, since more paid employees working on a part-time and part-year basis are observed in the complete sample and they earn less than full-time paid employees. Therefore, the predicted earnings differences between two sectors tend to rise due to the decline in the average paid earnings observed in the complete sample. I am particularly interested in the earnings difference for the most two recent cohorts of non-traditional immigrants. They have the earnings differences in the log annually earnings between two sectors upon entry are 0.083 and 0.023, respectively. The positive levels of relative earnings differences indicate that new non-traditional immigrants earn more in the self-employment sector by working more hours in this sector than in the paid employment sector, and thus the higher level of self-employed earnings attract them to self-employment at entry relative to the natives. It provides some evidence that new immigrants who arrived in Canada between 1996 and 2005 have higher propensity for self-employment than the native-born in levels, given that most immigrants come from the non-traditional source countries in that period.

Nonetheless, the tendency on the difference of the log annually earnings between two sectors does not change for non-traditional immigrants. Specifically, the predicted relative earnings difference narrows with gains of YSM, suggesting that non-traditional immigrants earn less in the self-employment sector relative to the paid employment sector over time. In addition, the numbers in the diagonal are becoming smaller across arrival cohorts. This pattern suggests that new immigrants from non-traditional source countries experience slower increase of self-employed earnings compared to previous cohorts, even if self-employment allows them to work as many hours as they like in this sector. Consequently, these results do not support the hypothesis that non-traditional immigrant higher likelihood of self-employment contributes to the higher self-employed earnings by working more hours.

Another answer to these questions on immigrant higher propensity for self-employment in the reduction or absence of an earnings advantage may lie in the culture related to the country of origins or non-monetary benefits of self-employment. Several papers point out that the culture and demographics of source countries influence the choice for self-employment. Rafiq (1992) argued that culture determines the attitudes of individuals toward entrepreneurship and certain cultural institutions may facilitate entry into entrepreneurship. Therefore, certain immigrant groups look favourably upon self-employment and a higher self-employment rate is observed in the source country. The self-employment rate in the source country is computed as the percentage of self-employed in the total labour force in the country of origin. This information is obtained from the International Labour Office (ILO) and refers to the year of 2007. Most countries in Asia have relatively high self-employment rates. For instance, the self-employment rate in Korea is 29% and Iran has a self-employment rate at 36%. Indonesia, Lebanon, Philippines, Sri Lanka and

Thailand all exhibit a self-employment rate above 30%. China and Japan have relatively low self-employment rates in Asia, which are 11% and 12%, respectively. In contrast, the United States and the United Kingdom, two main traditional source regions, have self-employment rates of 8% and 16.4%. In addition, the self-employment rate in Germany, Italy and France is 12.9%, 25.6% and 12.7%, respectively. These figures[6] suggest that individuals in non-traditional source regions may have preference to enter the self-employment sector, which may positively affect their likelihood of self-employment while residing in Canada.

Given that self-employment can provide independence and freedom, some individuals specifically opt to "be their own boss". Immigrants possibly derive more utilities from working for themselves than working for others. This hypothesis may be strengthened by the transition from high-wage to self-employed jobs (H_tS_{t+1}) which is displayed in the first panel, third row of Figure 1.3. It illustrates that transition probability from high-wage jobs to self-employment (H_tS_{t+1}) for immigrants originated from a higher level, and further, it tends to diverge from that of the native-born with more years subsequent to migration. In other words, immigrants who already find high-wage jobs are more inclined to be self-employed when they have been residing in Canada. These elite may have accumulated substantial wealth and established interpersonal communications, which are valuable assets for starting a business. There is no doubt that not all immigrants hold the higher earnings of self-employment as the first priority. Instead, some immigrants may be indifferent to earnings and attach more importance to independence since they do not only value outcomes, but also the conditions leading to these outcomes. A proportion of immigrants thus sacrifice part of their earnings potential for emotional well-being. As a result, we can observe a higher propensity for self-employment without expected increase of self-employed earnings relative to paid earnings.

Some may argue to the contrary, that the high transition probability from high-wage jobs to self-employment (H_tS_{t+1}) is caused by the difficulties to keep the high-wage job. The actual cause remains unclear. However, if this argument is true, it will further reinforce my first answer that immigrants have difficulties finding high-wage jobs. These explanations suggest that immigrants not only encounter barriers to high-wage jobs, but also have difficulties holding their job even if they are lucky to have gained high-wage jobs. Under these circumstance, self-employment is the "option of last resort" for immigrants as they have no other choice but to work for themselves.

[6]These statistics are not measured in a consistent way across countries and therefore should be interpreted with some caution.These figures intend to provide some ideas on self-employment rates of representative countries.

2.6 Conclusion

This study is the first in the Canadian literature to examine the impact of an earnings advantage on immigrant propensity for self-employment. This paper contributes to the past findings by examining the dynamics of the self-employment versus the paid-employment with an updated dataset and by analyzing relative immigrant earnings outcomes across sectors instead of within sector with the control for the selectivity. Further, it examines the extent to which the potential earnings difference between the self- and paid-employment sectors can explain the increasing tendency toward self-employment observed in Canada.

Pooling Canadian Census Public Use Microdata Files (PUMFs) between 1981 and 2006, I find that Canada's recent immigrants, who arrived between 1991 to 2005, have higher self-employment rates than observably-identical Canadian-born workers. In contrast, immigrants that arrived prior to 1991 have lower self-employment rates than the native counterparts upon entry. In addition, immigrant likelihood of self-employment tend to rise as immigrants have been residing in Canada. The results also suggest that the predicted earnings difference between the self- and the paid-employment sectors positively affect immigrants' self-employment rates. Moreover, I find the difference in the patterns of potential earnings difference among traditional and non-traditional immigrants. As traditional immigrants experience a more rapid growth of self-employed earnings relative to the paid earnings with time since migration, the earnings premium in the self-employment sector can explain their tendency of increasing propensity for the self-employment over time. Once this earnings premium is controlled for, the self-employment rates do not tend to grow with gains of YSM in the traditional immigrant population. However, non-traditional immigrants experience the reduction of an earnings advantage in the self-employment sector over time, which can not account for their increasing likelihood of self-employment with the accumulation of YSM. There is some evidence that immigrants, in particular of non-traditional immigrants, have difficulties accessing paid-employment. Finally, the culture related to religion and non-monetary benefits provided by self-employment such as independence and freedom may attract immigrants to self-employment as well.

In the discussion section, I illustrate the rates of self-employment in several source countries, but these figures are measured in a inconsistent way across countries. In my future research, I will carefully explore self-employment rates in the source countries with better information and then investigate if the self-employment rates are more prominent in Asia and Africa relative to the U.S., the U.K., Europe, Caribbean and Oceania. In particular, I will examine differences in trends of the self-employment rates over time across these sets of countries and whether differences in tendency affect the propensities for self-employment in the host country for two types of immigrants. In addition, I mention that ethnic enclaves can provide a comparative advantage by concentrating in a particular geographic location. Further, I would like to measure the concentration of immigrants

from the same source country in the self-employment sector, and hence I can estimate the extent to which an immigrant choice of self-employment is influenced by the measure of concentration. In other words, I will explore whether a greater proportion of immigrants from the same source country who are already self-employed in a specific region affects the likelihood of becoming self-employed of an individual who migrated from the same source country and currently resides in the same region in Canada.

Table 2.1: Descriptive statistics.

	Traditional immigrants	Non-traditional immigrants	Natives
Age	42.049*	40.201*	39.148
No high school	0.232*	0.185*	0.222
High school	0.159*	0.187*	0.223
College or trade certificate	0.354*	0.252*	0.337
University diploma below bachelor	0.027*	0.048*	0.024
Bachelor's degree	0.114*	0.187*	0.129
University diploma above bachelor	0.024*	0.027*	0.019
Graduate degree	0.089*	0.111*	0.048
Married	0.823*	0.826*	0.697
Number of children	1.435*	1.491*	1.238
The presence of a child	0.710*	0.727*	0.629
The wife's total income	20,861*	19,545*	18,124
Log of wife's total income	6.882*	6.950*	6.437
Toronto	0.326*	0.463*	0.105
Vancouver	0.088*	0.141*	0.051
Calgary	0.038*	0.045*	0.035
Montreal	0.112	0.118	0.121
Atlantic provinces	0.007*	0.003*	0.068
Quebec (outside Montreal)	0.020*	0.009*	0.156
Ontario (outside Toronto)	0.257*	0.113*	0.249
Manitoba	0.026*	0.029*	0.041
Saskatchewan	0.010*	0.007*	0.037
Albert (outside Calgary)	0.055*	0.048*	0.076
British Columbia (outside Vancouver)	0.061	0.023*	0.060
Primary Industry	0.034*	0.015*	0.062
Manufacturing	0.253*	0.285*	0.209
Construction	0.103*	0.044*	0.072
Transportation	0.056*	0.063*	0.073
Communication and utilities	0.036*	0.035*	0.053
Wholesale trade	0.060*	0.066*	0.071
Retail trade	0.081*	0.097*	0.092
Finance, insurance and real estate	0.049	0.060*	0.047
Educational services	0.063*	0.034*	0.054
Health and social services	0.032*	0.043*	0.036
Business services	0.085*	0.101*	0.071
Government services	0.056*	0.039*	0.100
Accommodation, food and beverage	0.037*	0.068*	0.019
Other services	0.053*	0.050*	0.041

Log weekly earnings	6.833*	6.606*	6.790
Log weekly earning in SE sector	6.420*	6.277*	6.386
Log weekly paid earning in paid sector	6.876*	6.637*	6.826
Earnings difference between two sectors	-0.456	-0.360	-0.440
Share (%)	9.21	9.66	81.14
Number of observations	49,189	51,578	433,435
S.E. rate	0.094*	0.086*	0.079
Employment rate*	0.930	0.866*	0.925

Note: The sample consists of men between 25 to 54 years of age who worked on a full- time and full-year basis. Traditional immigrants migrant from Canada's traditional immigrant source regions – the U.S., U.K., Europe, Caribbean and Oceania; Non-traditional immigrants come from non-traditional source regions -- Asia and Africa. The earnings difference between two sectors is the difference of the means of the log weekly earnings between the self-employment and paid-employment sectors. * indicates traditional (non-traditional) immigrants are significantly different from the native-born at the 5% level.

Table 2.2: Reduced-form binary probit model.

Variable	Coefficients	Marginal probabilities
Age	0.059*** (0.004)	0.006(0.0004)
Age^2/100	-0.063*** (0.005)	-0.006***(0.0005)
Married	0.008(0.007)	0.0008(0.001)
The presence of child	-0.061*** (0.004)	-0.008***(0.001)
Number of children	0.035*** (0.003)	0.008***(0.004)
Log of wife's total income	0.037*** (0.001)	0.001***(0.00001)
Traditional cohort effect		
Traditional immigrant dummy	-0.119 (0.241)	-0.005(0.025)
1971-75	0.012 (0.025)	0.001(0.003)
1976-80	0.027 (0.031)	0.005(0.004)
1981-85	0.145*** (0.040)	0.016***(0.006)
1986-90	0.121*** (0.043)	0.016***(0.006)
1991-95	0.127*** (0.048)	0.025***(0.008)
1996-00	0.167 ***(0.055)	0.027***(0.009)
2001-05	0.250*** (0.069)	0.042***(0.012)
Non-traditional cohort effect		
Non-traditional immigrant dummy	-0.003(0.235)	0.008(0.029)
1971-75	0.001 (0.030)	0.001(0.003)
1976-80	0.063 (0.032)	0.010***(0.004)
1981-85	0.111 **(0.031)	0.018***(0.005)
1986-90	0.188*** (0.034)	0.026***(0.005)
1991-95	0.249 ***(0.036)	0.041***(0.007)
1996-00	0.272*** (0.043)	0.049***(0.008)
2001-05	0.302*** (0.050)	0.051***(0.010)
Traditional immigrant interaction		
Age	-0.005 (0.012)	-0.001(0.001)
Age^2/100	0.004 (0.014)	0.001(0.002)
YSM	0.015*** (0.003)	0.001***(0.0004)
YSM^2/100	-0.021*** (0.006)	-0.002***(0.0006)
Non-traditional immigrant interaction		
Age	-0.025** (0.012)	-0.002*(0.001)
Age^2/100	0.029** (0.014)	0.003*(0.001)
YSM	0.040*** (0.003)	0.003***(0.0003)
YSM^2/100	-0.068*** (0.008)	-0.006***(0.001)
Constant	-2.363***(0.074)	
Number of observations	534,206	

Note: The dependent variable is binary, equaling to 1 if self-employed and 0 if a paid-employed. Independent variables include educational credentials, industry, geography and year dummies. * indicates significance at the 10% level; ** indicates significance at the 5% level; and *** indicates significance at the 1% level.

Table 2.3: Earnings Equations in both the self- and the paid-employment sectors.

Variable	Self-employment	Paid employment
Age	0.074*** (0.007)	0.073 ***(0.001)
Age^2/100	-0.083*** (0.008)	-0.075 ***(0.002)
Married	0.169*** (0.011)	0.146*** (0.002)
Traditional cohort effect		
Non-traditional immigrant dummy	0.075(0.447)	-0.004 (0.084)
1971-75	-0.053 (0.044)	0.023** (0.009)
1976-80	-0.010 (0.054)	0.052*** (0.011)
1981-85	-0.002 (0.070)	0.080*** (0.015)
1986-90	-0.040 (0.073)	0.037** (0.016)
1991-95	-0.104 (0.082)	0.005 (0.018)
1996-00	-0.197** (0.096)	-0.080*** (0.021)
2001-05	-0.418*** (0.116)	-0.230***(0.018)
Non-traditional cohort effect		
Non-traditional immigrant dummy	1.246*** (0.438)	0.232*** (0.080)
1971-75	-0.123 **(0.053)	-0.067*** (0.011)
1976-80	-0.086 (0.057)	-0.086*** (0.011)
1981-85	-0.188*** (0.061)	-0.099*** (0.012)
1986-90	-0.237 ***(0.061)	-0.114*** (0.012)
1991-95	-0.332 ***(0.065)	-0.158*** (0.013)
1996-00	-0.386 ***(0.077)	-0.138*** (0.016)
2001-05	-0.536*** (0.092)	-0.230*** (0.018)
Traditional immigrant interaction		
Age	-0.017 (0.022)	-0.009**(0.004)
Age^2/100	0.013 (0.026)	0.008 (0.005)
YSM	0.023*** (0.006)	0.010*** (0.001)
YSM^2/100	-0.032*** (0.011)	-0.009*** (0.002)
Non-traditional immigrant interaction		
Age	-0.070 ***(0.022)	-0.029***(0.004)
Age^2/100	0.073*** (0.026)	0.025*** (0.005)
YSM	0.025*** (0.006)	0.031*** (0.001)
YSM^2/100	-0.045*** (0.015)	-0.045*** (0.003)
Constant	4.361*** (0.143)	5.369*** (0.024)
Number of observations	44,347	489,859
Rho	0.448 (0.015)	0.868 (0.001)

Note: The dependent variable is log weekly earnings and standard errors are in parentheses. Independent variables include educational credentials, industry, geography and year dummies. * indicates significance at the 10% level; ** indicates significance at the 5% level; and *** indicates significance at the 1% level.

Table 2.4: Difference in the predicted log weekly earnings between two sectors across arrival cohorts and years .

	1981	1986	1991	1996	2001	2006
			DD_M			
Traditional Immigrant cohort						
71-75	-0.384	-0.464	-0.420	-0.517	-0.471	-0.691
76-80	-0.408	-0.482	-0.429	-0.518	-0.463	-0.672
81-85		-0.566	-0.506	-0.585	- 0.523	-0.722
86-90			-0.536	-0.609	-0.536	-0.724
91-95				-0.679	-0.600	-0.776
96-00					-0.653	-0.822
01-05						-1.083
Non-traditional immigrant cohort						
71-75	-0.130	-0.299	-0.324	-0.476	-0.468	-0.712
76-80	-0.035	-0.202	-0.234	-0.393	-0.393	-0.647
81-85		-0.242	-0.280	-0.447	-0.453	-0.716
86-90			-0.264	-0.437	-0.452	-0.722
91-95				-0.446	-0.465	-0.746
96-00					-0.480	-0.768
01-05						-0.768
			DD_N			
Natives	-0.272	-0.385	-0.364	-0.473	-0.431	-0.643
			DD_M-DD_N			
Traditional Immigrant cohort						
71-75	-0.112	-0.079	-0.056	-0.043	-0.040	-0.048
76-80	-0.135	-0.097	-0.066	-0.044	-0.032	-0.029
81-85		-0.182	-0.142	-0.112	-0.093	-0.079
86-90			-0.172	-0.135	-0.105	-0.081
91-95				-0.206	-0.169	-0.134
96-00					-0.222	-0.179
01-05						-0.440
Non-traditional Immigrant cohort						
71-75	0.143	0.085	0.039	-0.003	-0.037	-0.070
76-80	0.238	0.183	0.130	0.081	0.038	-0.004
81-85		0.142	0.084	0.026	-0.022	-0.073
86-90			0.099	0.036	-0.021	-0.079
91-95				0.027	-0.034	-0.103
96-00					-0.049	-0.125
01-05						-0.126

Note: DD_M is the predicted earnings difference between the self- and the paid-employment sectors for immigrants and DD_N is the predicted earnings difference between two sectors for the native-born.

Table 2.5: Structural probit model.

Variable	Specification 1	Specification 2	Specification 3	Specification 4	Specification 5
dd	0.345*** (0.011)	0.274*** (0.012)	0.274*** (0.012)	0.274*** (0.012)	0.274*** (0.012)
*dd**immigrant dummy		0.372*** (0.024)	0.119*** (0.043)		
*dd**YSM			0.013*** (0.002)		
*dd**traditional immigrant dummy				0.306*** (0.033)	-0.045 (0.069)
*dd**non-traditional immigrant dummy				0.435*** (0.030)	0.170***(0.056)
*dd**traditional immigrant YSM					0.015*** (0.003)
*dd**non-traditional immigrant YSM					0.016*** (0.003)
Age	0.043*** (0.004)	0.042*** (0.004)	0.042*** (0.004)	0.042*** (0.004)	0.042*** (0.004)
Age^2/100	-0.036*** (0.005)	-0.036*** (0.005)	-0.036*** (0.005)	-0.036*** (0.005)	-0.036*** (0.005)
Married	0.006 (0.008)	0.007 (0.008)	0.007 (0.008)	0.007 (0.008)	0.006 (0.008)
The presence of child	-0.131*** (0.009)	-0.132*** (0.009)	-0.132*** (0.009)	-0.132*** (0.003)	-0.132*** (0.003)
Number of children	0.105*** (0.003)	0.105*** (0.003)	0.105*** (0.003)	0.105*** (0.003)	0.105*** (0.003)
Log of wife's total income	0.008*** (0.001)	0.008*** (0.001)	0.008*** (0.001)	0.008*** (0.001)	0.008*** (0.001)
Traditional cohort effect					
Traditional immigrant dummy	-0.215 (0.248)	-0.373 (0.251)	-0.351 (0.251)	-0.342 (0.250)	-0.294 (0.250)
1971-75	0.049 (0.025)	0.105*** (0.026)	0.118*** (0.026)	0.095*** (0.026)	0.103*** (0.026)
1976-80	0.118*** (0.031)	0.198*** (0.032)	0.208*** (0.032)	0.183*** (0.032)	0.184*** (0.032)
1981-85	0.210*** (0.041)	0.322*** (0.042)	0.321*** (0.042)	0.301*** (0.042)	0.284*** (0.042)
1986-90	0.260*** (0.045)	0.384*** (0.046)	0.373*** (0.046)	0.361*** (0.046)	0.332*** (0.047)
1991-95	0.297*** (0.049)	0.453*** (0.051)	0.424*** (0.051)	0.424*** (0.051)	0.368*** (0.052)
1996-00	0.305*** (0.057)	0.487*** (0.059)	0.440*** (0.059)	0.453*** (0.060)	0.372*** (0.061)
2001-05	0.503*** (0.070)	0.788*** (0.073)	0.661*** (0.075)	0.732*** (0.075)	0.539*** (0.082)

Non-traditional cohort effect					
Non-traditional immigrant dummy	-0.520** (0.242)	-0.972*** (0.247)	-0.859***(0.247)	-1.063*** (0.249)	-0.093*** (0.250)
1971-75	0.042 (0.174)	0.095*** (0.031)	0.107*** (0.031)	0.105*** (0.031)	0.127*** (0.031)
1976-80	0.091*** (0.174)	0.158*** (0.033)	0.171*** (0.033)	0.171*** (0.033)	0.196*** (0.033)
1981-85	0.184 ***(0.174)	0.302*** (0.036)	0.307*** (0.036)	0.324*** (0.036)	0.348*** (0.037)
1986-90	0.274*** (0.173)	0.436*** (0.037)	0.423*** (0.037)	0.466*** (0.038)	0.474*** (0.038)
1991-95	0.379*** (0.173)	0.586*** (0.040)	0.551*** (0.040)	0.626*** (0.041)	0.613*** (0.042)
1996-00	0.465*** (0.173)	0.715*** (0.048)	0.653*** (0.048)	0.762*** (0.049)	0.722*** (0.049)
2001-05	0.514*** (0.176)	0.827*** (0.056)	0.718*** (0.056)	0.886*** (0.058)	0.797*** (0.060)
Traditional immigrant interaction					
Age	0.006 (0.012)	0.012 (0.012)	0.006 (0.012)	0.011 (0.012)	0.003 (0.012)
Age^2/100	-0.006 (0.015)	-0.009 (0.015)	-0.002 (0.015)	-0.009 (0.015)	0.001 (0.015)
YSM	0.004 (0.003)	0.006 (0.004)	0.008** (0.004)	0.006 (0.004)	0.008** (0.003)
YSM^2/100	-0.002 (0.006)	0.0004 (0.006)	0.008 (0.006)	-0.0001 (0.006)	0.008 (0.006)
Non-traditional immigrant interaction					
Age	-0.0002 (0.012)	0.014 (0.012)	0.008 (0.012)	0.017 (0.012)	0.011 (0.012)
Age^2/100	0.0003 (0.015)	-0.014 (0.015)	-0.007 (0.015)	-0.016 (0.015)	-0.010 (0.015)
YSM	0.031*** (0.004)	0.043*** (0.004)	0.041*** (0.004)	0.045*** (0.004)	0.044*** (0.004)
YSM^2/100	-0.043*** (0.009)	-0.053*** (0.009)	-0.039*** (0.009)	-0.055*** (0.009)	-0.039*** (0.010)
Constant	-2.582*** (0.074)	-2.577*** (0.074)	-2.578*** (0.074)	-2.577*** (0.074)	-2.577*** (0.074)

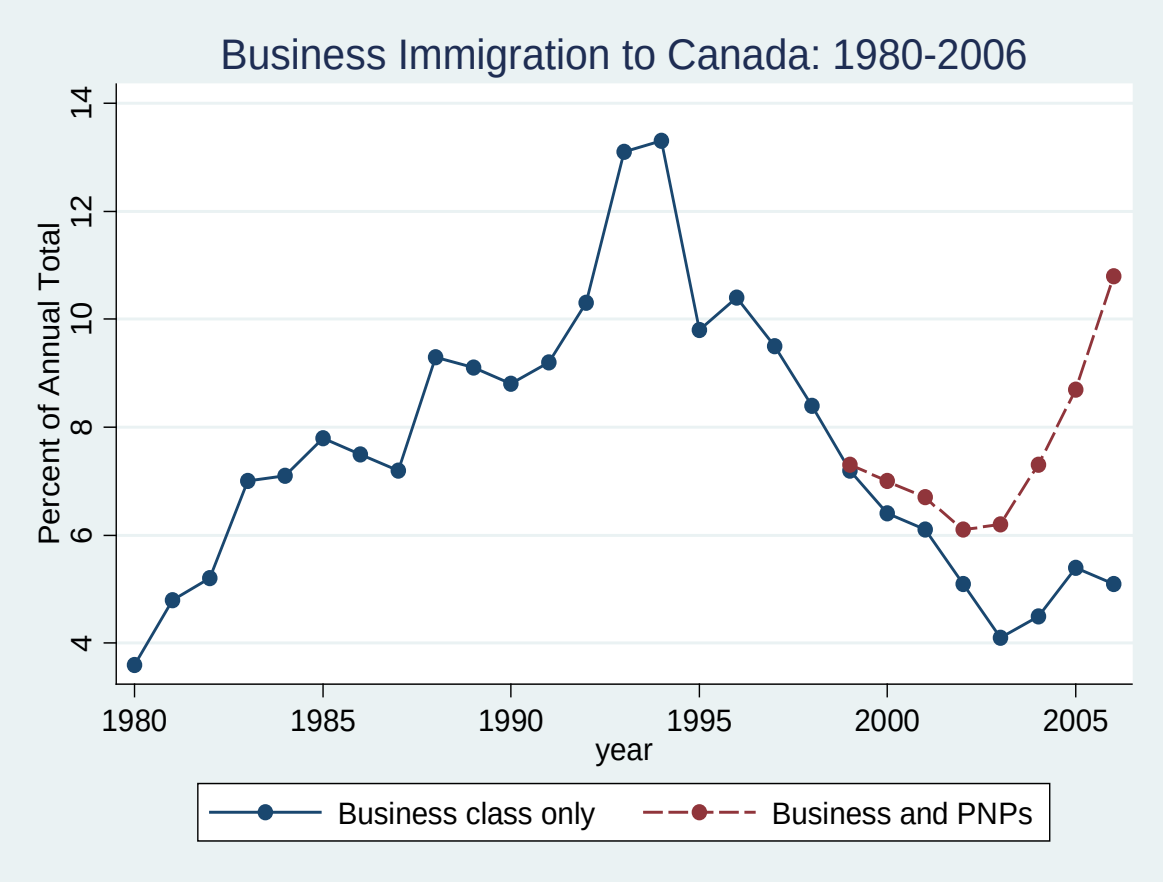
Note: *dd* is earnings difference between two sectors, equalling to the predicted log of self-employed earnings subtracted by the predicted log of paid earnings. Independent variables include educational credentials, geography and year dummies, but a set of industry dummies are excluded from this model. * indicates significance at the 10% level; ** indicates significance at the 5% level and *** indicates significance at the 1% level.

Table 2.6: Difference in the predicted log annually earnings between two sectors across arrival cohorts and years, for the complete sample .

	1981	1986	1991	1996	2001	2006
			DD_M-DD_N			
Traditional Immigrant cohort						
71-75	-0.100	-0.073	-0.057	-0.052	-0.058	-0.078
76-80	-0.126	-0.090	-0.065	-0.051	-0.047	-0.055
81-85		-0.132	-0.097	-0.079	-0.060	-0.054
86-90			-0.070	-0.040	-0.175	-0.002
91-95				-0.187	-0.157	-0.132
96-00					-0.225	-0.189
01-05						-0.366
Non-traditional Immigrant cohort						
71-75	0.249	0.135	0.054	-0.008	-0.045	-0.057
76-80	0.427	0.291	0.181	0.094	0.033	-0.008
81-85		0.375	0.229	0.113	0.029	-0.041
86-90			0.299	0.145	0.029	-0.069
91-95				0.192	0.048	-0.082
96-00					0.083	-0.099
01-05						0.023

Note: The complete sample includes all male workers who have positive earnings in at least one of the two sectors, regardless of whether they work full time and full year in the reference calendar year.

Figure 2.1: Business immigration to Canada: 1980-2006.



Note: These figures are derived from published numbers in Employment and Immigration Canada, "Immigration Statistics" Cat. No. mp 22-1 (various years) and Citizenship and Immigration Canada (various years) "Facts and Figures - Immigration Overview: Permanent and Temporary Residents".

Figure 2.2: Difference in the unconditional self-employment rate between immigrants and the native-born.

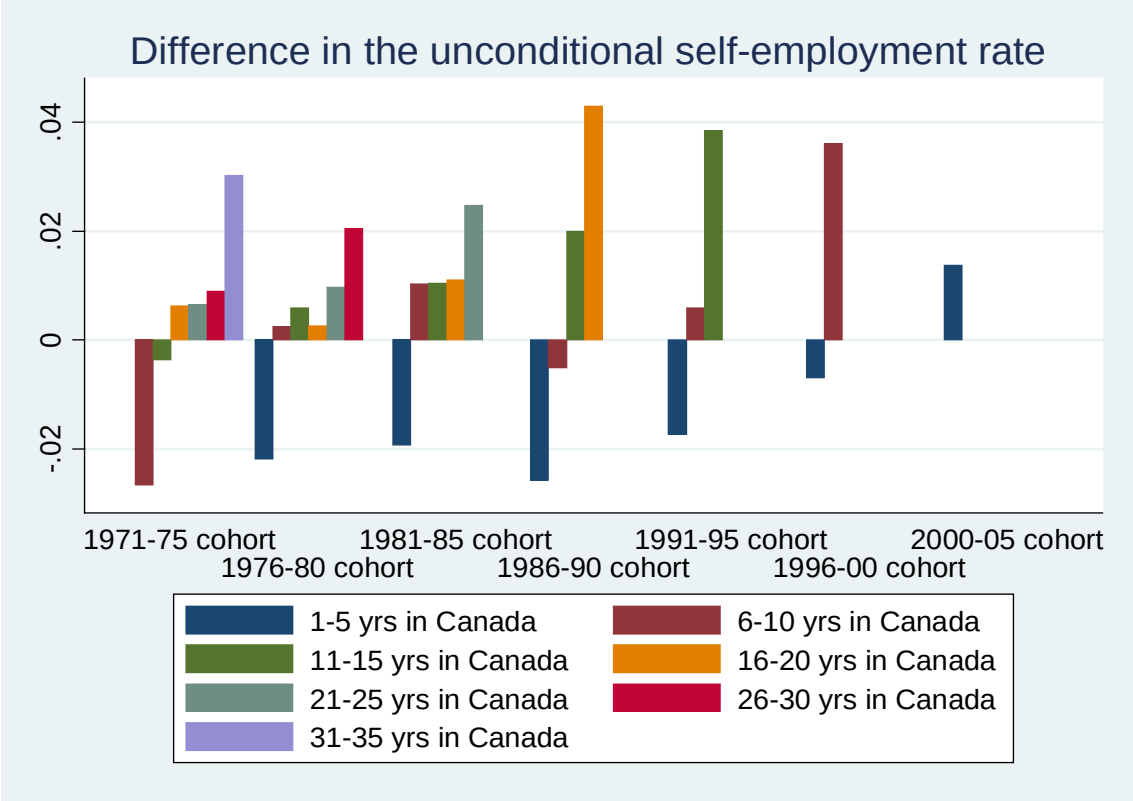
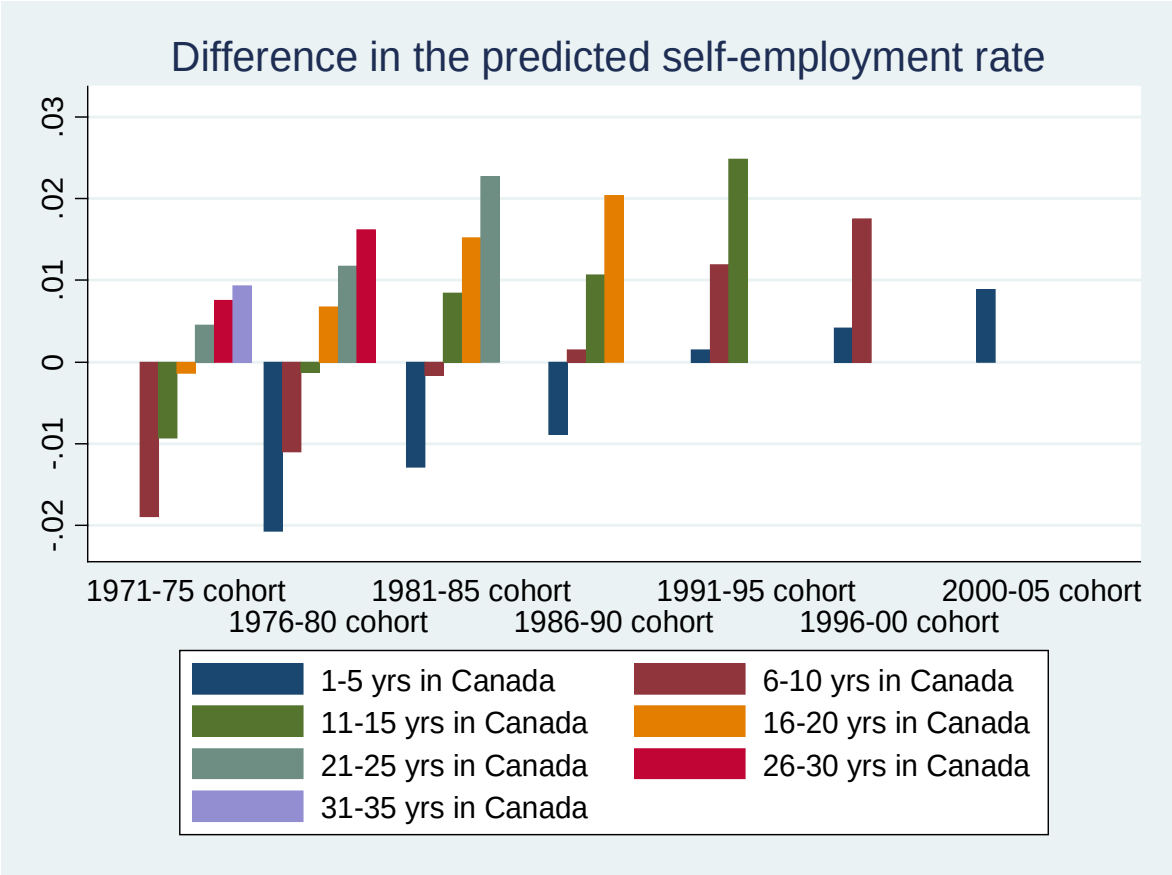


Figure 2.3: Difference in the conditional self-employment rate between immigrants and the native-born.



Chapter 3

The Influence of Measurement Error and Unobserved Heterogeneity in Estimating Immigrant Returns to Foreign and Host-Country Sources of Human Capital

3.1 Introduction

In the textbook model of immigrant wage assimilation immigrants experience wage disparities on arrival in a host country, relative to similarly aged and educated native-born workers, but with time since migration the gaps close. In his seminal study of immigrant earnings, Chiswick (1978) argued that this pattern arises from discounting by host-country employers of foreign sources of human capital combined with immigrant accumulation of host-country-specific knowledge and skills following migration. To capture these ideas empirically, Chiswick began by positing a process generating wage outcomes for immigrants with separate returns to foreign and host-country sources of training, though this is not what he estimated. Instead, he imposed parameter restrictions on the data generating process (DGP) he had in mind, which amounted to allowing an intercept shift for immigrants – to capture the discounting of their foreign human capital – and estimating a quadratic return to an immigrant's years since migration (YSM) – to capture the assimilation process. This approach spawned a large literature, which has come to cover many countries (see Borjas 1999 for a review).

From a policy perspective, however, direct evidence on the differential returns to foreign

and host-country sources of human capital, provides a much richer set of insights than does an overall return to YSM. For a country such as Canada, struggling to address a deterioration in the labour market performance of more recent immigrant arrival cohorts (Aydemir and Skuterud 2005), these insights are invaluable. For example, the potential dependence of immigrant wages at entry and subsequent wage growth on the schooling and work experience immigrants bring with them directly informs the criteria which the government uses to select immigrants. Their decision in 2008, for example, to increase the value of Canadian work experience in their selection criteria appears to have been, in large part, motivated by growing evidence of a significant disparity between immigrant returns to foreign and host-country work experience. Evidence on the relative wage returns to host-country schooling and experience, on the other hand, informs the efficacy of alternative immigrant settlement policies, such as Canada's Enhanced Language Training programs introduced in 2004 to provide occupation-specific language training to recent immigrants.

To directly estimate returns to foreign and host-country sources of schooling and experience we need measures of where immigrants' years of schooling and work experience were obtained. Unfortunately, the source country of schooling is typically unobserved in available data sources, while work experience is nearly always measured as a residual given a worker's age and years of schooling. We are aware of no study using direct information on the source country of immigrants' work experience and four studies using direct information on the source of schooling in the literature estimating separate foreign and host-country human capital returns (Borjas 1982; Kossoudji 1989; Alboim, Finnie and Meng 2005; and Ferrer, Green and Riddell 2006).[1] However, in all four cases, the data come from single cross-sectional surveys, so that they are unable to empirically distinguish the effects of time-since-arrival from cohort effects. Instead, studies estimating separate returns in a complete assimilation model with cohort effects, which have burgeoned in Canada over the past decade, have distinguished foreign from host-country sources by assuming all schooling is strictly continuous from age 5 and one year of labour market experience is accumulated in every year after schooling is complete (Stewart and Hyclak 1985; Friedberg 2000; Schaafsma and Sweetman 2001; Bratsberg and Ragan 2002; Green and Worswick 2002; Aydemir and Skuterud 2005, 2008; and Ferrer and Riddell 2008). But to the extent that immigrants with foreign work experience return to school or experience periods of nonemployment following migration, this approach introduces measurement error, the

[1]We are also aware of three additional studies comparing host-country and foreign schooling returns using direct information on the source of schooling, but in each case the analysis is narrower than the average population returns of interest in our paper (Wiers-Jenssen and Try (2005) compare Norwegian nationals studying abroad to Norwegians with host-country credentials; Clark and Jaeger (2006) compare GED returns between U.S. immigrants and natives; and Hartog and Zorlu (2009) look at returns to foreign education among Dutch refugees.) There is also a literature concerned with the determinants of post-migration schooling that uses direct measures of host-country schooling (Chiswick and Miller 1994; Khan 1997; Hum and Simpson 2003; Cobb-Clark, Connolly and Worswick 2005; Van Tubergen and Werfhorst 2007).

consequences of which are far from straightforward. Moreover, though never explicitly acknowledged in the literature (to our knowledge), the key advantage of the YSM approach to modeling immigrant wage outcomes (besides its limited data requirements) is that conditional on arrival cohort, and ignoring compositional effects in pseudo-panel data due to outmigration or age at migration effects, YSM is exogenous in the sense that it captures an aging process that is not a choice variable. The decision of whether to begin accumulating work experience or host-country schooling following migration might, in contrast, be highly correlated with immigrant wage levels or anticipated future wage growth, thereby complicating inferences regarding wage assimilation. Just as the current literature has tended to overlook the consequences of measurement error, we are aware of no attempt in the literature estimating separate foreign/host-country returns to address the potential endogeneity of the post-migration work/schooling decision.

Using a particularly rich Canadian data source – the Survey of Labour and Income Dynamics (SLID) – which identifies the age of school completion and when full-time work began, and is longitudinal allowing us to control for individual fixed effects, we examine to what extent the results of the current literature may be driven by biases arising from measurement error and the endogeneity of post-migration human capital investments. We are particularly interested in the sensitivity of two key findings on which the current literature is almost universally consistent: (i) essentially no return to foreign work experience; and (ii) a modest advantage in the return to host-country over foreign schooling. Assuming these findings have played some role in motivating recent changes in Canadian immigration policy, which seems likely, we think this sensitivity analysis is needed.

Our main finding is that the estimates in the current literature by and large do not appear to be driven by biases arising from either the assumptions necessary to distinguish foreign from host-country human capital or from unobserved heterogeneity. Using our more accurate measures of foreign and host-country human capital, we obtain somewhat larger, and in some cases statistically significant, returns to foreign work experience, though they remain substantially smaller than the returns to host-country experience for either immigrants or natives. Controlling for individual fixed effects in order to account for both the possible endogeneity of schooling and work experience and errors in distinguishing the foreign and host-country quantities of these variables (since within-panel changes in schooling and experience are necessarily host-country) does even less to influence the estimated returns to foreign experience. As for education returns, we continue to find relatively modest differences in immigrant returns to foreign and host-country schooling using our improved measures. Furthermore, adding fixed effects, if anything, suggests even smaller advantages of host-country over foreign schooling for immigrants.

An important advantage of estimating foreign and host-country returns is that entry effects and subsequent wage growth depend directly on the stocks of foreign human capital immigrants bring and their post-migration schooling and work decisions. Not only does this

serve to control for age at migration, thereby overcoming a source of bias inherent in the YSM approach, but it also offers a much richer set of counterfactual predictions to identify what types of immigrants and post-migration behaviour produce better wage outcomes. Consistent with results in Green and Worswick (2002) and Aydemir and Skuterud (2005), after accounting for measurement errors and unobserved heterogeneity we continue to find that immigrants with more foreign experience not only start at lower initial wages (relative to a comparably aged native), but also experience lower subsequent wage growth. In fact, controlling for individual fixed effect makes the latter result even stronger. In contrast, we find little evidence that foreign schooling either lowers relative wage outcomes at entry or affects subsequent wage growth. These results provide valuable insights to inform immigrant selection and settlement policy.

The remainder of the paper is organized as follows. In the following section we briefly make the case for the "separate returns model" over the more standard YSM approach to modeling relative immigrant wage outcomes. We then consider the potential consequences of measurement error and unobserved heterogeneity that arise in estimating separate returns using standard data sources. In the fourth section we describe our data, our approach to distinguishing foreign from host-country sources of schooling and experience, and the specifications we estimate. Section 5 presents the results. We conclude by summarizing our main findings.

3.2 The Missing Parameters Problem

We have argued above that estimating separate foreign and host-country returns offers policymakers a much richer set of policy inferences to guide immigrant selection and settlement policy. In addition, by conditioning on years of foreign schooling and work experience the model implicitly controls for age at migration, thereby overcoming a shortcoming implicit in the standard YSM approach that predominates the literature. Notwithstanding these advantages, however, in our view the more compelling reason for preferring the separate returns model lies in the potential of the YSM model to produce misleading inferences regarding the capacity of immigrant wage outcomes to assimilate to those of their native-born counterparts in a world with separate foreign and host-country returns.

To see the nature of the bias inherent in the YSM approach, assume for the sake of simplicity that the true (latent) data generating process (DGP) determining wage outcomes in the population of immigrants and natives is given by:

$$w_i = \alpha_0 + \alpha_1 exph_i + \alpha_2 expf_i + \varepsilon_i \tag{3.1}$$

where $exph_i$ and $expf_i$ are years of host-country and foreign experience, respectively; $\alpha_1 > \alpha_2$; $cov(exph_i, expf_i) < 0$ in the immigrant population; and ε_i is some random influence.

Do immigrants assimilate in this world? Since immigrants and natives share a constant linear return to host-country experience, the answer is no. But consider what happens if we estimate the basic YSM model found in Chiswick's (1978) seminal paper, which ignoring schooling returns (as well as any year or cohort effects) is simply given by:

$$w_i = \beta_0 + \beta_1 exp_i + m_i \cdot (\beta_2 + \beta_3 ysm_i) + e_i \tag{3.2}$$

where m_i is an immigrant dummy variable; $exp_i = exph_i + expf_i$; $ysm_i = exph_i$; and $\beta_3 > 0$ is evidence of assimilation. Given the DGP in (3.1), it is straightforward to show that the probability limit of estimated assimilation is:

$$\text{plim } \hat{\beta}_3 = (\alpha_1 - \hat{\beta}_1) + \frac{(\alpha_2 - \hat{\beta}_1)\text{cov}(exph_i, expf_i)}{\text{var}(exph_i)} \tag{3.3}$$

which is necessarily positive, implying discrimination when in fact there is none (see Appendix). Borjas (1999, p.1721) and Friedberg (2000, footnote 16) claim that the correct interpretation of the positive return to YSM in estimating (3.2) is, holding total experience constant, immigrants with less of the foreign variety face a relative wage advantage. The result in (3.3) reveals that the estimated YSM return, in fact, depends not just on the relative advantage of host-country experience, but also on the correlation in the data between host-country and foreign experience. Given a large enough positive correlation, the estimated return could, in fact, imply *dissimilation*, even if host-country experience is more valued.[2] But since individuals (or at least their working careers) are finite lived, the correlation will tend to be negative leading us to infer assimilation when in fact there is no assimilation in the actual data.

The nature of the bias in (3.3) is essentially a missing parameters problem. This can be overcome in this case by adding a separate experience return for immigrants, that is by estimating the extended YSM model:

$$w_i = \beta_0 + \beta_1 exp_i + m_i \cdot (\beta_2 + \beta_3 exp_i + \beta_4 ysm_i) + e_i. \tag{3.4}$$

where now immigrants assimilate to natives if $\beta_3 + \beta_4 > 0$. Given the data come from the DGP in (3.1), this produces $\hat{\beta}_1 = \alpha_1$; $\hat{\beta}_3 = \alpha_2 - \alpha_1$; and $\hat{\beta}_4 = \alpha_1 - \alpha_2$, which now correctly implies no assimilation (since $\hat{\beta}_3 + \hat{\beta}_4 = 0$).[3] But estimated assimilation from this extended YSM model is again potentially biased if the process determining wage outcomes in the

[2]The bias is a bit more complicated than equation (3.3) suggests since $\hat{\beta}_1$ itself depends on the sample moments of the distribution. Setting $\alpha_1 = 0.05$; $\alpha_2 = 0.01$; $\bar{m} = 0.2$; $\overline{exph}_i = 17$; $\overline{expf}_i = 6$; $\text{var}(exph_i) = 64$; and $\text{var}(expf_i) = 25$ in a Monte Carlo simulation, $\hat{\beta}_3$ becomes positive as $\text{corr}(exph_i, expf_i) > 0.1$. All of our analytical results in this section and the next have been confirmed by simulations. The programming code for these are available upon request.

[3]To see this simply replace exp_i in (3.4) with $exph_i + expf_i$ and ysm_i with $exph_i$.

labour market also depends on unequal returns to host-country and foreign schooling. To see this, suppose the DGP is given by:

$$w_i = \alpha_0 + \alpha_1 exph_i + \alpha_2 sh_i + \alpha_3 expf_i + \alpha_4 sf_i + \varepsilon_i \tag{3.5}$$

where sh_i and sf_i are host-country and foreign years of schooling respectively, and we estimate:

$$w_i = \beta_0 + \beta_1 exp_i + \beta_2 s_i + m_i \cdot (\beta_3 + \beta_4 exp_i + \beta_5 s_i + \beta_6 ysm_i) + e_i \tag{3.6}$$

where now $ysm_i = exph_i + sh_i$. Again, immigrants do not assimilate in this DGP, since host-country returns are linear and equal for immigrants and natives. But what does estimation of (3.6) imply? It can be shown that in this case $\hat{\beta}_6$ is estimated as a weighted average of the host-country (over foreign) advantage in work experience ($\alpha_1 - \alpha_3$) and schooling ($\alpha_2 - \alpha_4$), where the weighting depends on the relative magnitudes of var($exph_i + expf_i$) and var($sh_i + sf_i$), as well as the covariances of $exph_i$, sh_i, $expf_i$, and sf_i (see Appendix B). What does this imply for estimates of assimilation? Suppose, for example, that the advantage of host-country sources is larger in schooling than experience ($\alpha_2 - \alpha_4 > \alpha_1 - \alpha_3$) and var($s_i$) is large relative to var(exp_i). Then the estimate of β_6 will tend to exceed the estimate of β_4 (in absolute value), implying assimilation relative to natives (assuming the immigrant works following migration), when there is in fact no assimilation in the underlying DGP. In real world data, however, the variance in experience tends to exceed the variance in schooling, so that the estimated return to YSM will be weighted towards the host-country advantage in experience. But because the model does not distinguish whether the immigrant's YSM are spent in work or school, the model's estimates regarding assimilation are potentially misleading.

Again the nature of the bias in the YSM model is essentially a missing parameters problem, which can only be avoided by directly estimating separate host-country and foreign returns to schooling and experience. In this respect, and because separate foreign and host-country returns offer a much richer set of counterfactual predictions to inform immigrant selection and settlement policy, the separate returns model is preferred to the predominant YSM approach. But, of course, there are obstacles to estimating the separate returns model using the standard data sources available, which presumably explains the predominance of YSM models in the literature. In the following section we consider the potential biases introduced in overcoming these obstacles.

3.3 Potential Biases of the Separate Returns Model

3.3.1 Measurement error

The practical challenge in estimating separate foreign and host-country returns to schooling and experience is these quantities are typically unobserved in available data sources. As mentioned earlier, the approach taken in the current literature estimating separate returns is to assume all schooling is strictly continuous from age 5 and one year of labour market experience is accumulated in every year after schooling is completed . One need then only observe three variables: (i) current age; (ii) age at immigration; and (iii) total years of schooling, to uniquely distinguish schooling and experience obtained abroad from that obtained in the host-country.

This set of assumptions introduces three forms of measurement error, the consequences of which are far from straightforward. First, the assumption of strictly continuous schooling implies an individual cannot hold both foreign labour market experience and host-country schooling, that is $expf_i > 0 \Rightarrow sh_i = 0$. To the extent that immigrants with foreign work experience return to school after migrating, host-country schooling will be under measured by exactly the same amount as foreign schooling is over measured. Furthermore, foreign (host-country) potential experience will be over measured (under measured) by that same amount. Second, temporary work permits and student visas make it possible for immigrants to obtain host-country schooling or experience prior to obtaining permanent residence status. The use of age at immigration (or the date that permanent residence status was obtained) instead of age at migration (the date of arrival in the host-country) will have a similar effect as assuming continuous schooling: host-country schooling (potential experience) will be under measured (over measured) by exactly the same amount that foreign schooling (potential experience) is over measured (under measured). Third, potential experience may be a poor measure of actual labour market experience. The difference is likely to be particularly important for immigrants whose migration decisions may be motivated by nonemployment or who may experience periods of nonemployment following migration.

Analytically it is difficult to say much about the nature of the biases arising from these measurement errors. To the extent that the errors are correlated with the true values of the observables or with unobservables, this is particularly the case. Assuming that the measurement error that results from using potential instead of actual experience is purely random, we know that the estimated experience returns will tend to be attenuated (note that this does not depend on the mean of the measurement error being zero). To the extent that this error affects foreign experience measures more than host-country experience, this could account for the particularly low estimated returns to foreign experience.

The measurement error resulting from assuming strictly continuous schooling and using

dates of immigration instead of dates of arrival is, however, more complex. Nonetheless, it is worthwhile considering one especially simple case, which offers a useful insight. Assume the process generating wage outcomes in the population is given by:

$$w_i = \beta_1 exph_i^* + \beta_2 expf_i^* + \varepsilon_i \tag{3.7}$$

where all variables are now expressed as deviations from their means. It can then be shown that using the observed values $exph_i$ and $expf_i$, where $exph_i = exph_i^* + u_i$; $expf_i = expf_i^* - u_i$; $u_i \sim iid[0, \sigma_u^2]$; $E(u_i \varepsilon_i) = 0$; and $E(expj_i^* \varepsilon_i) = 0$ for $j \epsilon [h, f]$, gives:

$$\text{plim } \hat{\beta} = \beta - \left[Q^* + \Sigma_{uu}\right]^{-1} \Sigma_{uu} \beta \tag{3.8}$$

where $\beta = [\beta_1, \beta_2]'$; Q is a 2x2 matrix containing elements $q_{jj}^* = \text{plim}(1/n) \sum expj_i^* expj_i^*$ for $j \epsilon [h, f]$; and $\Sigma_{uu} = \sigma_u^2 ee'$, where $e = [1, -1]$ (see Greene (2008), equation (12-16)). Assuming foreign and host-country experience are uncorrelated ($q_{hf}^* = 0$), this amounts to:

$$\text{plim} \begin{bmatrix} \hat{\beta}_1 \\ \hat{\beta}_2 \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \beta_2 \end{bmatrix} - \frac{\sigma_u^2}{q_{hh}^* q_{ff}^* + \sigma_u^2 (q_{hh}^* + q_{ff}^*)} \begin{bmatrix} (\beta_1 - \beta_2) q_{ff}^* \\ (\beta_2 - \beta_1) q_{hh}^* \end{bmatrix}. \tag{3.9}$$

Hence, to the extent that the true returns to foreign and host-country experience are identical ($\beta_1 = \beta_2$), the measurement error in distinguishing foreign from host-country quantities has no effect on the consistency of the estimator (though it does reduce its efficiency). In fact, this is true even if the measurement error is non-random. The intuition is that the measurement error in the two variables simply cancels out in the error term. Our expectation, however, is that the host-country return dominates ($\beta_1 > \beta_2$), in which case (3.9) implies that the return to foreign (host-country) experience is unambiguously overestimated (underestimated). Measurement error does not then appear responsible for the low estimated returns to foreign experience in the literature. However, this is no longer necessarily true if foreign and host-country experience are negatively correlated ($q_{hf}^* < 0$), as we argued in the previous section they likely are. If $\beta_1 > \beta_2$, $q_{ff}^* > q_{hh}^*$, and q_{hf}^* is sufficiently negative, the measurement error that results from assuming strictly continuous schooling and dates of immigration can simultaneously produce downward biases in the estimated returns to both foreign and host-country experience.[4] The useful insight to take from this, however, is that the consequences of measurement error in the separate returns model may be negligible even if the measurement error is substantial.

3.3.2 Unobserved heterogeneity

It is widely recognized in the immigrant assimilation literature that non-random outmigration contaminates estimated returns to YSM if immigrant entry cohorts are followed

[4]This is easiest to show using a Monte Carlo simulation. The programming code are available upon request.

across repeated cross-sections of data. There now exist a handful of studies using longitudinal microdata to examine the sensitivity of estimated assimilation rates to compositional changes in immigrant cohorts. Duleep and Regets (1997), Hu (2000), Duleep and Dowhan (2002) and most recently Lubotsky (2007) examine U.S. survey data, in a number of cases combined with Social Security records, while Edin, Lalonde and Åslund (2000) use Swedish Census data matched with tax records, and Hum and Simpson (2004) use the same Canadian longitudinal survey data examined in the present study. With the exception of the papers by Duleep and coauthors, a consistent finding in these studies is substantially lower immigrant wage growth when selective outmigration is accounted for. This is consistent with a higher propensity of outmigration among workers with relatively low earnings (conditional on observables).

To date, all the research using longitudinal data has inferred assimilation from estimated returns to YSM.[5] In directly estimating foreign and host-country returns, we introduce a second channel through which unobserved worker heterogeneity can bias estimates. As noted above, unlike YSM, which is necessarily exogenous (conditional on cohort and ignoring any non-random sample attrition), particular post-migration schooling and experience investments reflect choices made by immigrants (and employers) and are therefore potentially correlated with unobservables. Inferring assimilation from an immigrant's relative return to host-country work experience would be problematic, for example, if immigrants' propensity to accumulate host-country work experience is correlated with their unobserved ability or career motivation. As a result, in estimating separate returns, it is even more critical to in some way account for the unobservable heterogeneity of workers that may, in part, determine wage outcomes. We are not aware of any attempt in the existing literature to do so.

Just as distinguishing post-migration activities complicates the estimation of post-migration wage growth, distinguishing immigrants by their stock of foreign schooling and experience within entry cohorts, complicates the estimation of immigrant entry effects. The reason is, again, that pre-migration human capital investments, or more generally the age when immigrants migrate, reflect choices made by immigrants, and could conceivably be correlated with unobservables. For example, it may be that as adults age their reasons for migrating have increasingly less to do with personal career ambitions and more to do with efforts to leave behind undesirable environments or to improve the lifetime welfare of children. To the extent that these different motivations lead to different host-country wage outcomes, estimated returns to foreign experience will tend to be biased (and underestimated if career ambitions of migrants tend to decline with age at migration). Nonetheless,

[5]Two exceptions are Chiswick, Lee and Miller (2005) and Akresh (2007) in that they distinguish host-country schooling and actual labour market experience. Their samples, however, contain no native-born workers and immigrants are observed in the former case at arrival and 3.5 years later and in the latter case one year following migration. As a result, their inferences regarding immigrants' capacity to obtain comparable wages to natives is severely limited.

from the perspective of a policymaker deciding on the optimal immigrant selection criteria, this is not the return of interest. Regardless of what the low return to foreign experience captures, what matters to the policymaker determining selection criteria is the usefulness of the observable signal in predicting success in the host-country's labour markets. In contrast, in estimating host-country returns what is important is whether influencing the post-migration schooling and work activities of immigrants through settlement policies can be expected to produce better outcomes. Fortunately, because host-country, but not foreign, quantities of schooling and experience are time-varying, controlling for unobserved fixed effects is feasible in the estimation of the host-country, but not foreign, returns.

3.4 Methods

3.4.1 The Separate Returns Model

To our knowledge, Stewart and Hyclak (1985) and Kossoudji (1989) are the first studies to estimate a separate returns model of immigrant earnings. Although both papers use a single cross-section of data, subsequent papers have estimated separate returns using repeated cross-sections. In this case, the model can be written:

$$\begin{aligned} w_{it} &= y_t + f_x(exph_{it}) + f_s(sh_{it}) + m_i \cdot [cohort_i + g_{xf}(expf_{it}) + \\ &\quad g_{xh}(exph_{it}) + g_{xhf}(expf_{it} \cdot exph_{it}) + g_{sf}(sf_{it}) + g_{sh}(sh_{it})] + e_{it} \end{aligned} \tag{3.10}$$

where w_{it} is the log hourly wage of worker i observed in year t; y_t is a vector of year dummies; $expf_i$ and $exph_i$ are years of foreign and host-country labour market experience respectively; sf_{it} and sh_{it} are years of foreign and host-country schooling respectively; m_i is an immigrant dummy; $cohort_i$ is a vector of dummies indicating year of migration; and the experience (f_x, g_{xf}, g_{xh}) and schooling (f_s, g_{sf}, g_{sh}) functions are typically taken to be quadratic and linear respectively. If the return to experience is nonlinear, the return to host-country experience must depend on the stock of foreign experience held.[6] The interaction of foreign and host-country experience function (g_{xhf}) captures this dependence.

We begin by estimating (3.10) without individual fixed effects comparing the estimates between more and less accurate measures of foreign and host-country schooling and experience, in order to gauge the importance of measurement error in driving the results of the existing literature (the alternative variable definitions are described in subsection

[6]For example, if the experience profile is quadratic, that is $\beta_1 exp_i + \beta_2 exp_2^2$, and foreign and host-country experience are equivalent, then substituting $exp_i = expf_i + exph_i$ the return to post-migration experience is given by $\beta_1 + 2\beta_2 exph_i + 2\beta_2 expf_i$, where the last term captures the dependence of the host-country return on the stock of foreign experience held.

3.4.3 below). Murphy and Welch (1990), and more recently Lemieux (2006), show that the standard quadratic experience profile substantially understates early career wages and overstates mid-career wage growth. In all cases we, therefore, estimate quartic functions in host-country experience (f_x), but quadratic functions in foreign experience (g_{xf}) and immigrant-specific host-country experience (g_{xh}), and linear functions in schooling (f_s, g_{sf} and g_{sh}) and the interaction of foreign and host-country experience (g_{xhf}).

We then extend the separate returns model in equation (3.10) in three ways. First, with information on actual years of work experience we are able to identify idle years, that is time spent outside of school and work. By not controlling for idle years we are assuming that this time has either no direct wage effect, through for example skill atrophy, or that it is uncorrelated with years of schooling and experience. If both assumptions are unsatisfied, the estimated schooling and experience returns will suffer from omitted variable bias. Both assumptions, however, seem problematic, particularly for immigrants who are likely to have higher values of total idle time and are likely to use this in improving language skills and developing social networks. We, therefore, add host-country and foreign years of idle time to the model. Second, the assumption that host-country and foreign schooling are additively separable in producing wage outcomes assumes that there are no complementarities between foreign and host-country schooling. Again, for immigrants this assumption seems unreasonable. Friedberg (2000), for example, argues that immigrants arriving with more schooling may experience more occupational downgrading upon arrival and greater subsequent earnings growth. Using U.S. Census data, Bratsberg and Ragan (2002) find evidence that the return to host-country schooling is increasing in the stock of foreign schooling held. And Ferrer, Green and Riddell (2006) find evidence using Canadian data that the return to foreign experience is decreasing in the quantity of foreign education held. The potential to identify these complementarities is a key advantage of the separate returns model. In order to capture these complementarities, we add interaction terms between foreign and host-country sources of schooling, experience, and idle years.

The final extension we make is to address the possible endogeneity of the post-migration schooling/work decision. If we were only concerned about selective outmigration we could simply condition samples of immigrant cohorts on reaching some level of YSM and examine wage growth over this period. This is the approach of Edin, Lalonde and Åslund (2000), Hu (2000) and Lubotsky (2007). Due to the short and unbalanced nature of the panels in our data, and our interest in identifying post-migration returns to schooling, experience and idle years, our preferred strategy is to account for individual fixed effects (FE) in estimating the separate returns model. This approach has the advantage that we capture the wage growth of all immigrants and not just immigrants who remain in the host country for some specified duration. To the extent that FE purge the data of correlation between unobserved individual effects and both emigration and changes in post-migration work and schooling decisions, our approach produces consistent estimates of immigrant wage growth

conditional on post-migration behaviour. It continues, however, to produce inconsistent estimates if emigration or levels of host-country experience, schooling or idle years are not strictly exogenous (conditional on the FE). This would be the case if, for example, emigration is more likely among workers who correctly anticipate relatively low future wage growth or if the incidence of obtaining additional schooling upon arrival is higher among workers that, even in the absence of additional schooling, would have experienced above average post-migration wage growth.[7]

In adding individual fixed effects to equation (3.10) two complications arise. First, since all the foreign human capital variables are strictly time-invariant, their returns are no longer identified (though the interactions of foreign and host-country variables are). As a result, we can no longer predict an immigrant wage level upon arrival and therefore cannot infer assimilation. Our solution is to identify returns to the time-invariant regressors in a second stage regression, which is estimated at the individual level (see Polachek and Kim 1994 for details). The second stage is estimated by either OLS or GLS exploiting information on the diagonal elements of the residual covariance matrix from the first stage. Second, since the year-to-year change in host-country schooling, experience and idle years must sum to 1 ($\Delta exph_{it} + \Delta sh_{it} + \Delta idleh_{it} = 1$), the year effects, y_t, are no longer identified in the fixed effects estimation. We, therefore, use the annual provincial unemployment rate (and its interaction with the immigrant dummy) to identify period effects.[8]

3.4.2 Data

The Survey of Income and Labour Dynamics (SLID) is a nationally representative longitudinal survey of the Canadian population. An oft-cited limitation of the SLID data is that individuals are followed for only 6 years. The advantage of this short-panel design, however, is that new overlapping panels are sampled every 3 years, thereby substantially increasing the number of immigrants sampled. In constructing our sample, we pool the 4 existing panels collected between 1993 and 2004 (the fourth panel contains only 3 years). When we extract all individuals aged 18-64 with full-time work experience and a valid wage and covariate set we are left with 5,951 immigrants and 55,491 native-born workers

[7]Two others sources of endogenous selection of concern – besides selective emigration – are non-random sample attrition and selection into wage employment. The latter is more of a problem here than in papers focusing on earnings. In the absence of suitable instruments to identify these selection processes, we are limited to controlling for unobserved FE.

[8]We tried using various detrended unemployment rates in the hope of isolating cyclical fluctuations, but found that since there is a substantial trend in unemployment rates (and our estimated year effects) over our data period, the resulting experience returns appear to overstate wage growth. Our preference is therefore to use unadjusted unemployment rates.

who are, on average, observed for 3.7 and 3.9 years, respectively.[9] In order to estimate returns with meangingful precision, we pool men and women. We have tried estimating all specifications separately for men and women and none of our main findings substantively change.

In addition to providing a reasonably large longitudinal sample of immigrants, the SLID questionnaire is exceptionally rich in content, providing three key pieces of information. First, the SLID collects information on total years of schooling separately for elementary and secondary; non-university postsecondary; and university postsecondary, as well as all credentials received and the age when the final non-university and/or university credential was obtained. By comparing the age when credentials were obtained to the age at immigration, we are better able to distinguish foreign from host-country sources of schooling than is possible in the standard data sources available. Of course, data sources with direct information on the source country of schooling now exist, such as the International Adults Literacy Survey (IALS) and the Longitudinal Immigrant Database (IMDB), but these are strictly cross-sectional or do not identify post-migration schooling investments. Second, the SLID identifies the age when full-time work began and the years of actual labour market experience subsequently accumulated. Lastly, the survey collects information on remuneration and hours of work in all jobs over the previous calendar year allowing for the construction of an hourly wage reflecting a weighted average of all paid work done in the reference year. The assimilation patterns we identify are therefore less likely to reflect labour supply adjustments than if earnings data – the usual outcome variable in this literature – were used.

3.4.3 Variable definitions

In order to obtain evidence on the consequences of measurement error, we begin by considering three alternative definitions of foreign and host-country schooling, which we combine with the implied quantities of foreign and host-country potential experience. We then take our preferred definition of foreign and host-country schooling and combine it with three alternative definitions of foreign and host-country actual experience. This gives us a total of six variable sets to estimate equation (3.10).

As noted above, in the absence of direct information on the source of schooling, the standard approach is to assume strictly continuous schooling. We refer to this approach, which

[9] We know from Census data that immigrants comprise roughly 20% of the Canadian population. They are under-represented in the SLID data because they are heavily concentrated in Canada's urban centres where the sampling frame undersamples all individuals. Sampling weights are used, however, throughout the analysis and are pooled and unadjusted just as is typically done when cross-sections of data are pooled. The sample is, therefore, representative of some weighted average of the Canadian populations between 1993 and 2004.

tends to overmeasure (undermeasure) foreign (host-country) schooling, as "left-continuous schooling". Alternatively, we can assume that elementary and secondary school years are again strictly continuous from age 5, but all postsecondary schooling years are strictly continuous up to the age of school completion.[10] We refer to this approach, which tends to over measure (under measure) host-country (foreign) schooling, as "right-continuous schooling". Lastly, we define intermediate values between these two extremes by assuming again that elementary and secondary school years are continuous from age 5, but only the duration of the final educational stint (which we define using information on years of non-university and university schooling and credentials obtained) is continuous up to the age of school completion. All remaining postsecondary school years are instead assumed to be uniformly distributed in the years between the age when elementary or secondary schooling was completed (or when full-time work began) and the age when the final educational stint began. For example, someone with a four-year undergraduate degree who finished high school at age 18 and began a PhD at age 26 would be assigned 0.5 $(4/(26-18))$ years of schooling in each years between age 18 and 26. We refer to this intermediate definition as "uniformly-distributed schooling." Since we believe schooling is not continuous for many individuals, particularly for immigrants, this is our preferred definition of schooling.

Table 3.1 shows the means of the schooling and potential experience variables. Given our definitions, it is necessarily true at the level of the individual observations, that left-continuous foreign schooling is greater than or equal to uniformly-distributed foreign schooling, which in turn must be at least as large as right-continuous foreign schooling (opposite weak inequalities for host-country schooling). The difference between the two extreme definitions is about 0.7 years for schooling and not much more than 0.6 years for potential experience. The reason is that for the majority of observations the difference between the school completion age and total years of schooling plus 5 is small – less than 3 years for 52.8% of immigrants and 57.8% of natives. Nonetheless, little can be said about the relative estimated returns to these variables. If the advantage in host-country sources is very different in experience than schooling or the measurement error is highly non-random, these small differences could impact estimated returns in a meaningful way.

Less clear is how to split actual years of experience into its foreign and host-country components. Our approach begins by defining "potential working years" as the difference between current age and the age when full-time work began, net of any post-work school years. If actual years of experience equals potential working years, the problem is simple: we assume a single year of experience attained in every year spent outside of school after work began. However, to the extent that actual experience is less than potential working

[10]Note that roughly 20% of the sample with postsecondary school years does not have a postsecondary credential. To assure ourselves this is not a peculiarity of the SLID data, we have confirmed this result in Canadian Census data. For these individuals we assume the age of school completion is the minimum of current age and 35.

years, it is ambiguous whether the idle years occurred before or after migration. Our approach to this problem is similar to that used in defining the schooling variables. At one extreme we err on the side of overmeasuring (undermeasuring) foreign (host-country) experience by assuming total actual years of experience are continuous from the age when full-time work began. We refer to this as "left-continuous actual experience." At the other extreme we err on the side of overmeasuring (undermeasuring) host-country (foreign) experience by assuming that total actual years of experience are continuous up to the current age. We refer to this as "right-continuous actual experience." Lastly, we define an intermediate case in which total actual years of experience are uniformly distributed between the current age and the age full-time work began. This definition is referred to as "uniformly-distributed actual experience".[11] In all cases we use uniformly-distributed schooling to define foreign and host-country potential working years.

Table 3.1 shows the means of the actual experience variables. As one might expect, given the challenges that immigrants are likely to experience finding employment in the host-country, idle years are substantially larger for immigrants than natives (6.9 years compared to 4.1).[12] The differences in foreign and host-country quantities between the alternative variable definitions are, however, once again small – roughly one full year in the case of actual experience and slightly less for potential experience. But again, since little can be said about the relative distribution of measurement error in each variable definition, we have no priors about the relative estimated returns based on the alternative definitions.

The SLID data allow us to produce more accurate measures of foreign/host-country schooling and experience than is possible using the standard data sources available. But some measurement errors almost certainly remain. For example, treating the SLID data as cross-sections, individual-level foreign quantities of schooling and experience are not strictly time-invariant over the panels in our data, which we know they should be (assuming individuals are not working abroad for partial years). In order to make the results comparable to those in the literature, we begin by defining the variables first ignoring the longitudinal dimension of the data. However, when we introduce the individual fixed effects we redefine the variables restricting all changes in schooling, actual experience, and idle years to increase only the host-country quantities. Since the fixed effects model identifies the host-country returns exclusively off these within-panel changes, in the case of the fixed effects estimates all biases arising from errors in distinguishing foreign from host-country

[11] Since individuals can accumulate school years while working full time, it is possible actual experience exceeds potential working years. In this case, the difference is assumed to be all foreign, in the left-continuous case, or all host-country, in the right-continuous case. In the case of uniformly-distributed actual experience, no additional assumption is necessary, since the number of years of actual experience accumulated in each calendar year are constant and greater than one.

[12] Note that mean idle years exceed the difference between mean potential and actual experience by a small margin. The reason is idle years are restricted to be non-negative.

quantities are thereby effectively eliminated.

3.5 Results

Table 3.2 reports the results from using the three alternative definitions of foreign and host-country schooling and actual labour market experience (first three columns assume potential experience; last three assume uniformly-distributed schooling). The estimates assuming left-continuous schooling are similar to those reported elsewhere and, if anything, tend to be slightly smaller, perhaps reflecting our use of an hourly wage, as opposed to earnings. The return to host-country schooling for both natives and immigrants exceeds the return to foreign schooling, though the differences are small (0.064 and 0.055 respectively, compared to 0.052). The estimated return to foreign experience is very close to zero and statistically insignificant. Also consistent with estimates found elsewhere, the relative host-country experience return for immigrants (the g_{xh} function) is negative, but increasing (it becomes positive at 29 years of host-country experience). This negative return is expected since immigrants, on average, arrive with some foreign experience so their host-country return captures a flatter part of their overall experience profile.

What happens to these estimated returns when we use our more accurate measures of foreign and host-country schooling? The foreign experience return clearly tends to increase as more schooling is defined as host-country. Comparing the two extreme definitions – left- and right-continuous schooling – the linear term doubles in magnitude and becomes statistically significant. The quadratic term, however, also becomes larger (in absolute value). Twenty years of foreign experience, in the case of right-continuous schooling, implies a 0.1 log point wage increment, compared to 0.05 log points in the case of left-continuous or uniformly-distributed schooling. Measurement error resulting from assuming continuous schooling, therefore, appears to contribute to the low estimated returns to foreign experience in the literature, though even under the most extreme assumptions the return is small. The returns to both foreign and host-country schooling also become larger, though the differences here are also small. Lastly, the immigrant return to host-country experience tends to decrease. The results, overall, suggest that the consequences of assuming strictly continuous schooling in the absence of better data are modest. Why is this true? Across definitions there is a considerable advantage of host-country over foreign sources of experience, implying the difference between β_1 and β_2 in equation (3.9) is substantial. The differences in means across alternative definitions in Table 3.1, in contrast, appear quite small, suggesting the robustness of the estimates probably has more to do with a small amount of measurement error, than the nature of the measurement error problem.

Replacing the potential experience measures with actual experience, shown in the remaining columns of Table 3.2, tends to further increase the estimated returns to foreign

experience, at least up to 10 years or so. In the left-continuous case, the linear return is now close to 0.02 log points and statistically significant. Nonetheless, in all cases the foreign returns continue to be small relative to the return to host-country experience for either immigrants or natives. As for schooling, using actual experience in all cases tends to decrease the estimated returns and imply an even smaller advantage of host-country over foreign schooling. In the uniformly-distributed case, for example, the immigrant return to foreign schooling is 0.046 log points, compared to 0.048 log points for host-country schooling.

Having estimated the separate returns model, in Figure 3.1 we compare the implications for assimilation of using the standard and our preferred measures of foreign/host-country schooling and experience (uniformly-distributed schooling and actual experience). In both cases we predict entry log wages for a recent immigrant (arrival cohort 1990-2002) arriving with the sample mean years of foreign schooling (9.77) and work experience (5.98). We then compare subsequent predicted wage growth to a similarly aged native-born worker assuming both accumulate one year of host-country labour market experience in every subsequent year. Assuming schooling begins at age 5 and no idle years, both representative workers are initially $5+9.77+5.98 = 20.75$ years of age. To simplify the results, the vertical axis plots the difference between the predicted immigrant and native log wage. The results indicate identical entry effects in the two cases. The only apparent different between the two profiles is subsequent wage growth is slightly higher in the first 10 years following migration using our preferred variable definitions, but then flattens out more quickly. Specifically, using the preferred definitions, the initial gap of 0.29 log points is more than halved after only 8 years, but remains virtually unchanged at 0.09 log points between year 13 and 25. In comparison, using the standard definitions, the initial gap of 0.29 log points is halved within ten years and in the following 10 and 20 years it closes by an additional 0.05 and 0.02 log points, respectively. When one thinks about language acquisition or acculturation processes, this pattern of strong decreasing relative returns to host-experience using our preferred definitions would appear to better capture reality. In this respect, the relative wage profile of the separate returns model seems more reasonable, though the differences are small.[13]

[13] A less compelling feature of the preferred definitions is the strong convexity of the profile beginning at about age 46 (though less apparent, this is also a feature of the profile using the standard definitions). What explains it? It turns out both the immigrant and native host-country experience profiles eventually reach a point of sharply decreasing returns, but natives reach the point of decreasing returns earlier than immigrants, resulting in the convexity. When actual years of experience is used, the point of decreasing returns occurs earlier, so the convexity kicks in earlier. Because actual experience levels tend to be lower and our starting point is a native who already has 6 years experience, less than 5% of both the native and immigrant observations have host-country experience beyond the point when the convexity kicks in. By the end of the 35-year period we are essentially making out-of-sample predictions. One would, therefore, not want to give the convexity any economic interpretation.

In Table 3.3 we extend the separate returns model allowing all the host-country returns to depend on the foreign human capital stock and controlling for idle years. To allow for the possibility that the relative returns to foreign and host-country sources of schooling and experience may vary widely across immigrants from different parts of the world, we also fully interact the immigrant-specific component of equation (3.10) with a dummy variable distinguishing immigrants from Canada's traditional immigrant source countries – the U.S., U.K., and Northern, Western and Southern Europe – from those from non-traditional source regions – Eastern Europe, Africa, and Asia. The results from the pooled sample suggest a very small positive return to idle years for immigrants (and natives), whether it is foreign or host-country. This is, however, no longer true when we distinguish between immigrants from traditional and non-traditional source countries. In particular, the return to host-country idle years is significant and close to 0.02 (0.002+0.017) log points for immigrants coming from countries where language and cultural differences are likely greatest. The interactions of host-country idle years with foreign experience and foreign schooling are, however, also more negative. Therefore, for adult immigrants from non-traditional source countries, but not child immigrants, the return to host-country idle years appears to be, if anything, negative.

With few exceptions, the interaction terms in Table 3.3 suggest modest complementarities between foreign and host-country sources of human capital. In the pooled sample, arriving with additional foreign experience has almost exactly a nil effect on the host-country experience profile. Additional foreign schooling appears to reduce the return to host-country experience, though the effect is again small (but statistically significant). For example, arriving with 16 years of foreign schooling (relative to none) reduces the linear return to host-country experience by only 0.006 log points. We also find little evidence here, for either traditional or non-traditional source country immigrants, that foreign schooling returns are higher for immigrants with more host-country schooling – the interaction of foreign and host-country schooling term is 0.0002 compared to 0.001 in Friedberg (2000, Table 6) using Israeli data. This difference is not explained by our richer information on the source of schooling – we get exactly the same result using the standard variable definitions. One wonders if the difference reflects credential recognition issues, which have over the past decade been the focus of much discussion surrounding Canada's immigrant settlement policies. To the extent that foreign-trained professionals opt to train for entirely new careers following migration in the absence of a system for recognizing foreign training, and the skills involved are not complementary, we would expect this interaction term to be zero.

In Figure 3.2 we plot predicted log wages separately for natives and immigrants based on the estimates in Table 3.3. Adding idle years and interaction terms does essentially nothing to change the level or slope of the native wage profile. Distinguishing immigrants from traditional and non-traditional source countries suggests a substantially lower entry

wage for non-traditional immigrants – 0.115 log points – primarily reflecting an overall differential (a cohort effect) as opposed to lower returns to foreign schooling or experience. Subsequent wage growth, however, is virtually identical over the following 35-year period for the two immigrant types. Though the sharp change in the slope of the profiles around the tenth year gives the illusion that the traditional-immigrant profile is steeper, the rate of assimilation is at all ages slightly higher for non-traditional immigrants.[14]

In Table 3.4 we present the FE results. Since we are ultimately interested in the sensitivity of the results to the inclusion of individual fixed effects, we also report estimates from pooled OLS. To capture the main differences, we then predict log wage profiles using exactly the same approach as in Figures 3.1 and 3.2, assuming a constant unemployment rate of 7.5% (the mean level in the data). Figure 3.3 indicates that estimation by FE does little to change the results. In terms of the age-experience simulation (for the sake of brevity we only show the GLS case), the entry effect from FE is 0.229 log points compared to 0.221 from pooled OLS. This is perhaps not surprising, given that entry wages are identified exclusively off time-invariant foreign stocks of human capital, and therefore include all unobserved individual heterogeneity (as argued above, in informing selection policy we do not want to purge entry wages of unobserved heterogeneity). Subsequent relative immigrant wage growth, however, also changes little. Over the full 35-year period, native wages now grow slightly more (0.343 log points compared to 0.327), while immigrant wages grow slightly less (0.631 log points compared to 0.677). As a result, the "average" immigrant considered now reaches wage parity with the comparable native roughly ten years later (age 46, instead of 36).

What explains the fact that our FE estimates do not imply substantially lower immigrant wage growth as the U.S. literature has tended to find (e.g., Lubotsky 2007)? It turns out, it is not because we are identifying wage growth off a return to host-country experience, whereas other studies identify off YSM – we get a similar differences between pooled OLS and FE when we estimate the using either the base or extended YSM model described in Section 3.2. We can think of two other reasons, however, that may explain the difference. First, it may be that this result is unique to Canada. Indeed, there is reason to believe that the nature of emigration is different in Canada. In particular, immigration to Canada may serve as a stepping stone for onward migration to the U.S.. This onward migration may be most common among highly able, highly motivated workers, so that in the Canadian data, YSM is less positively correlated with high unobserved individual effects. Alternatively, even if the nature of selective emigration is similar in Canada and the U.S., if the propensity to emigrate in both countries is increasing in individuals' post-migration

[14]It turns out this result is somewhat sensitive to variable definitions. Using standard variable definitions – left-continuous schooling and potential experience – suggests both a lower entry effect for traditional source country immigrants and a higher subsequent assimilation rate. For the sake of brevity we do not show these results. They are, however, available upon request.

wage growth, then excluding emigrants from the sample, as the existing U.S. studies do will imply lower wage growth. But controlling for individual fixed effects will not. Lower wage growth from longitudinal estimates does not then reflect selective emigration of workers with low wage levels, as has been interpreted in these studies.

We have argued that an important advantage of the separate returns model is that it offers a richer set of counterfactual predictions to inform immigrant selection and settlement policy. In Figures 3.4 and 3.5 we perform two such simulations. In Figure 3.4 we compare predicted log wage profiles for immigrants arriving with 16 years of foreign schooling, but different quantities of foreign experience, and compare to a native with the same total schooling and experience. In Figure 3.5 we compare host-country wage growth across three immigrants, each arriving with 5 years of foreign experience, but with varying quantities of foreign schooling. In the first case, the immigrant arrives at age 30 with 20 years of schooling and accumulates one year of host-country experience in each subsequent year. In the second case, the immigrant arrives at age 26 with 16 years of schooling, but then completes an additional 4 years of schooling, before beginning to accumulate host-country experience. In the last case, the immigrant arrives with 16 years of foreign schooling, but accumulates 4 idle years before beginning to accumulate host-country experience.[15] These profiles are, again, compared to a similarly-aged native, who initially (age 26) has 16 years of schooling and 5 years experience.

A return to potential foreign work experience close to zero is a standard result in the literature. Though using actual experience increases the return slightly (Table 3.2), controlling for individual FE does not (Table 3.4). At least over the first 8 years, the FE foreign experience returns are, if anything, slightly smaller (though still significant). This is captured in Figure 3.4 in the very modest improvements in entry wage rates across immigrants arriving with very different amounts of work experience. What is arguably more interesting in Figure 3.4, however, is that not only does additional foreign experience do essentially nothing to improve entry wages, it also appears to reduce subsequent wage growth. For example, over the first 5 years wages grow by 0.264 log points for the immigrant with 5 years foreign experience, compared to 0.254 log points for the immigrant with 15 years of foreign experience. This difference, which is statistically significant, is driven by the negative foreign/host-country experience interaction term. In fact, with enough YSM, the host-country experience return is lower for the immigrant arriving with 15, compared to 5, years of foreign experience, even conditioning on age. As a result, after age 51 the dashed and dotted profiles are diverging.

Recent years have seen a shift in Canadian immigrant selection criteria towards greater emphasis on host-country educational credentials. The evidence in Figure 3.5 does not

[15] In all cases we assume that the immigrant has some foreign experience to reflect the reality of the Canadian skilled immigrant selection criteria, which essentially disqualifies applicants with no foreign work experience.

suggest that this emphasis is well founded. In particular, providing immigrants with four additional years of schooling (20 instead of 16 years) has almost exactly the same effect on wage levels and wage growth whether the additional four years were obtained in Canada or abroad. It is, of course, possible that the advantage of host-country credentials lies primarily in improving employment prospects, though as long as reservation wages are decreasing in unemployment durations, we would expect this to show up in wage outcomes.

3.6 Summary

We argue that directly estimating foreign and host-country human capital returns is advantageous in terms of both avoiding biases inherent in the more standard YSM approach and in terms of its policy relevance. The problem with estimating separate returns, however, is twofold. First, unlike YSM models, it requires that the source country of immigrants' schooling and experience be identified in the data, which it is typically not. Second, in distinguishing post-migration schooling and work decisions, the separate returns model introduces an additional source of endogeneity, which complicates inferences made regarding immigrant wage growth and assimilation. We posit that these challenges explain the predominance of the YSM approach in the assimilation literature. The question we ask is how substantial are these potential biases in the Canadian data, where estimation of the separate returns model has become increasingly common in recent years.

Using a particularly rich longitudinal dataset on roughly 6,000 immigrants, we find that that the biases inherent in estimating foreign and host-country returns directly using standard data sources appear modest. In particularly, using more accurate measures of foreign and host-country sources of schooling and experience and controlling for individual fixed effects does little to alter the main findings of the existing Canadian literature. In particular, we continue to find low returns to immigrant foreign experience and little advantage of host-country over foreign schooling returns for immigrants. In addition, we find additional foreign work experience not only does essentially nothing to raise immigrant wage outcomes at entry, but also lowers subsequent returns to host-country work experience. The return to foreign schooling for immigrants from both traditional and non-traditional source countries is, in contrast, virtually identical to their return to host-country schooling, raising questions about recent efforts to attach greater weight to host-country educational credentials in Canadian immigrant selection policy.

Table 3.1: Weighted sample means.

	Immigrants				Natives	
	Foreign		Host-country			
Log hourly wage	2.781	(0.500)			2.757	(0.501)
Years of schooling:						
Left continuous	9.774	(6.208)	4.192	(6.168)	13.874	(3.310)
Uniform	9.338	(5.855)	4.628	(6.006)	13.874	(3.310)
Right continuous	9.115	(5.681)	4.851	(6.006)	13.874	(3.310)
Potential experience:						
Left continuous	5.976	(7.619)	17.251	(10.677)	19.083	(11.880)
Uniform	6.398	(7.631)	16.830	(10.686)	19.083	(11.880)
Right continuous	6.597	(7.702)	16.642	(10.767)	19.083	(11.880)
Actual experience:						
Left continuous	2.927	(5.545)	13.381	(10.176)	14.972	(10.845)
Uniform	2.302	(5.180)	14.006	(10.299)	14.972	(10.845)
Right continuous	2.008	(4.869)	14.300	(10.302)	14.972	(10.845)
Idle years:						
Left continuous	3.856	(6.119)	3.544	(5.319)	4.464	(6.270)
Uniform	4.174	(6.164)	3.256	(5.213)	4.464	(6.270)
Right continuous	4.414	(6.236)	3.072	(5.190)	4.464	(6.270)
Cohort <1960	0.112	(0.316)			—	
Cohort 1960-1969	0.169	(0.374)			—	
Cohort 1970-1979	0.254	(0.435)			—	
Cohort 1980-1989	0.251	(0.433)			—	
Cohort 1990-2002	0.214	(0.410)			—	
Female	0.476	(0.499)			0.470	(0.499)
Rural	0.028	(0.165)			0.130	(0.336)
Small	0.084	(0.277)			0.249	(0.432)
Medium	0.133	(0.340)			0.189	(0.392)
Large	0.755	(0.430)			0.432	(0.495)
Ontario	0.560	(0.496)			0.327	(0.469)
Atlantic	0.014	(0.116)			0.097	(0.297)
Quebec	0.115	(0.319)			0.277	(0.448)
Prairies	0.040	(0.196)			0.076	(0.266)
Alberta	0.099	(0.299)			0.106	(0.308)
British Columbia	0.173	(0.378)			0.116	(0.320)
Number of observations	22,098				214,286	

Table 3.2: Pooled OLS estimation of separate returns model using alternative definitions of foreign and host-country sources of schooling and experience.

	Schooling measure:			Actual experience measure:		
	Left continuous	Uniform	Right continuous	Left continuous	Uniform	Right continuous
Host-country experience (*exph*)	0.0815*	0.0810*	0.0797*	0.0820*	0.0831*	0.0831*
	(0.0023)	(0.0023)	(0.0023)	(0.0021)	(0.0021)	(0.0021)
Host-country experience^2/10^2	-0.3108*	-0.3065*	-0.2953*	-0.4118*	-0.4235*	-0.4241*
	(0.0209)	(0.0209)	(0.0209)	(0.0225)	(0.0222)	(0.0223)
Host-country experience^3/10^3	0.0524*	0.0510*	0.0476*	0.1023*	0.1065*	0.1067*
	(0.0067)	(0.0067)	(0.0067)	(0.0083)	(0.0082)	(0.0082)
Host-country experience^4/10^4	-0.0033*	-0.0031*	-0.0028*	-0.0099*	-0.0104*	-0.0104*
	(0.0007)	(0.0007)	(0.0007)	(0.0010)	(0.0010)	(0.0010)
Host-country schooling (*sh*)	0.0640*	0.0640*	0.0640*	0.0522*	0.0522*	0.0522*
	(0.0009)	(0.0009)	(0.0009)	(0.0008)	(0.0008)	(0.0008)
Immigrant interactions terms:						
Foreign experience (*expf*)	0.0043	0.0055	0.0096*	0.0173*	0.0101	0.0088
	(0.0035)	(0.0035)	(0.0034)	(0.0045)	(0.0051)	(0.0057)
Foreign experience^2/10^2	-0.0091	-0.0142	-0.0232*	-0.0651*	-0.0456*	-0.0433*
	(0.0099)	(0.0101)	(0.0101)	(0.0155)	(0.0171)	(0.0188)
Host-country experience (*exph*)	-0.0093*	-0.0104*	-0.0121*	-0.0122*	-0.0110*	-0.0119*
	(0.0027)	(0.0027)	(0.0027)	(0.0023)	(0.0022)	(0.0022)
Host-country experience^2/10^2	0.0166*	0.0183*	0.0236*	0.0261*	0.0234*	0.0244*
	(0.0059)	(0.0060)	(0.0059)	(0.0062)	(0.0059)	(0.0059)
Host*Foreign experience/10^2	-0.0047	-0.0047	-0.0136	-0.0159	0.0005	0.0049
	(0.0108)	(0.0109)	(0.0109)	(0.0165)	(0.0183)	(0.0197)
Foreign schooling (*sf*)	0.0515*	0.0523*	0.0529*	0.0462*	0.0458*	0.0454*
	(0.0020)	(0.0020)	(0.0021)	(0.0019)	(0.0019)	(0.0019)
Host-country schooling (*sh*)	-0.0094*	-0.0088*	-0.0071*	-0.0033	-0.0038	-0.0043
	(0.0028)	(0.0027)	(0.0027)	(0.0020)	(0.0021)	(0.0021)
R-squared	0.3693	0.3691	0.3688	0.3736	0.3732	0.3732
Number of observations	236,384	236,384	236,384	236,384	236,384	236,384

Note: First three columns assume left-continuous potential experience. Following three columns assume uniformly distributed schooling. All regressions also include controls for immigrant arrival cohort (5 categories); city size (4 categories); region (6 categories); a full set of fixed year effects (12 categories); and a female dummy and its interaction with the immigrant dummy. Standard errors, shown in parentheses, are clustered allowing for correlations between observations of the same individual. * indicates significance at the 5% level.

Table 3.3: Pooled OLS estimation of separate returns model with idle years and interaction terms.

	Traditional		Non-traditional		Pooled	
Host-country experience (*exph*)	0.0819*	(0.0021)			0.0820*	(0.0021)
Host-country experience^2/10^2	-0.4122*	(0.0226)			-0.4135*	(0.0225)
Host-country experience^3/10^3	0.1029*	(0.0083)			0.1035*	(0.0083)
Host-country experience^4/10^4	-0.0100*	(0.0010)			-0.0101*	(0.0010)
Host-country schooling (*sh*)	0.0535*	(0.0009)			0.0535*	(0.0009)
Host-country idle years (*idleh*)	0.0019*	(0.0004)			0.0019*	(0.0004)
Immigrant interaction terms:						
Foreign experience (*expf*)	0.0139	(0.0075)	0.0148	(0.0090)	0.0126*	(0.0059)
Foreign experience^2/10^2	-0.0592*	(0.0213)	-0.0557	(0.0330)	-0.0541*	(0.0190)
Host-country experience (*exph*)	-0.0067*	(0.0032)	-0.0080	(0.0048)	-0.0070*	(0.0026)
Host-country experience^2/10^2	0.0215*	(0.0071)	0.0217	(0.0135)	0.0244*	(0.0061)
Foreign schooling (*sf*)	0.0513*	(0.0054)	0.0567*	(0.0049)	0.0518*	(0.0035)
Host-country schooling (*sh*)	-0.0079*	(0.0040)	0.0004	(0.0049)	-0.0058	(0.0031)
Foreign idle years (*idlef*)	0.0063	(0.0034)	-0.0009	(0.0028)	0.0004	(0.0022)
Host-country idle years (*idleh*)	-0.0031	(0.0029)	0.0166*	(0.0050)	0.0003	(0.0025)
Foreign experience*Host experience	-0.00007	(0.0002)	0.00002	(0.0003)	0.00003	(0.0002)
Foreign experience*Host schooling	-0.0017	(0.0013)	-0.0016	(0.0019)	-0.0016	(0.0011)
Foreign experience*Host idle years	-0.0013	(0.0010)	-0.0049	(0.0027)	-0.0018	(0.0009)
Foreign schooling*Host experience	-0.0004*	(0.0002)	-0.0002	(0.0003)	-0.0004*	(0.0001)
Foreign schooling*Host schooling	-0.0002	(0.0004)	0.0007	(0.0005)	0.0002	(0.0003)
Foreign schooling*Host idle years	-0.0002	(0.0003)	-0.0012*	(0.0005)	-0.0003	(0.0002)
Foreign idle years*Host experience	-0.0004*	(0.0002)	-0.00005	(0.0002)	-0.0002	(0.0001)
Foreign idle years*Host schooling	0.0001	(0.0013)	0.0002	(0.0011)	0.0004	(0.0009)
Foreign idle years*Host idle years	0.000001	(0.0003)	0.0003	(0.0003)	0.0003	(0.0002)
R-squared		0.3757				0.3744
Number of observations	13,989	214,286	8,109			236,384

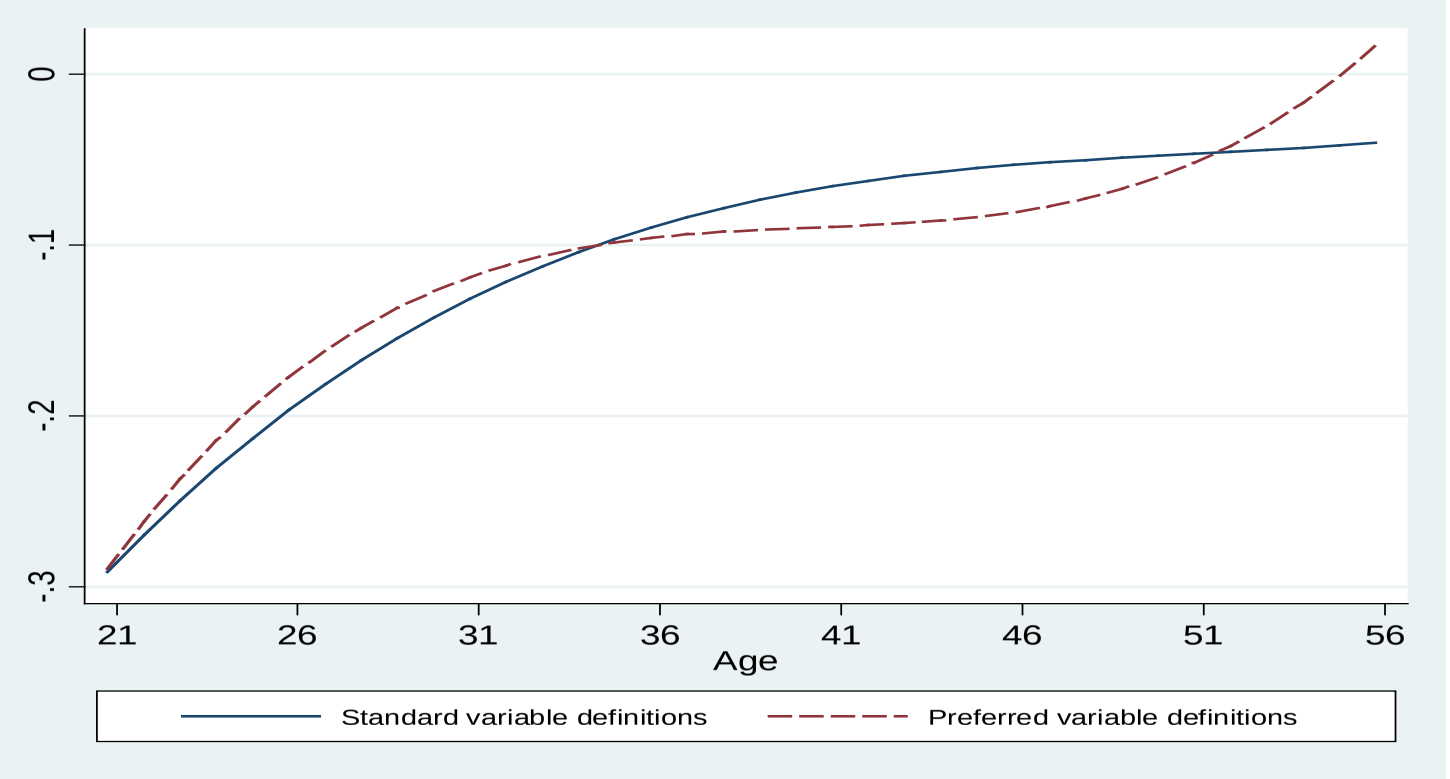
Note: Both regressions assume uniformly distributed schooling and actual experience. All regressions also include controls for city size (4 categories); region (6 categories); a full set of fixed year effects (12 categories); and a female dummy and its interaction with the immigrant dummy. Traditional immigrants include those born in the U.S., U.K., Western Europe, Northern Europe, Southern Europe, Caribbean, Mexico and Central America, South America, Australia, New Zealand, and Pacific Islands. Non-traditional immigrants are those born in Eastern Europe, the Middle East, Asia, and Africa.

Table 3.4: Pooled OLS and two-stage fixed effects estimation of separate returns model with unemployment rate.

	OLS		Fixed Effects			
			Two stage FE – OLS		Two-stage FE – GLS	
Host-country experience (*exph*)	0.0791*	(0.0016)	0.0727*	(0.0018)		
Host-country experience^2/10^2	-0.3943*	(0.0165)	-0.3452*	(0.0178)		
Host-country experience^3/10^3	0.0986*	(0.0061)	0.0835*	(0.0067)		
Host-country experience^4/10^4	-0.0097*	(0.0007)	-0.0080*	(0.0008)		
Host-country schooling (*sh*)	0.0547*	(0.0007)	0.0368*	(0.0023)		
Host-country idle years (*idleh*)	0.0024*	(0.0003)	0.0083*	(0.0017)		
Unemployment rate	-0.2506*	(0.0820)	-0.3871*	(0.0976)		
Immigrant interaction terms:						
Foreign experience (*expf*)	0.0145*	(0.0042)	0.0109*	(0.0026)	0.0125*	(0.0028)
Foreign experience^2/10^2	-0.0515*	(0.0140)	-0.0280*	(0.0112)	-0.0392*	(0.0125)
Host-country experience (*exph*)	-0.0032	(0.0022)	0.0022	(0.0044)		
Host-country experience^2/10^2	0.0188*	(0.0049)	0.0077	(0.0081)		
Foreign schooling (*sf*)	0.0503*	(0.0028)	0.0345*	(0.0011)	0.0369*	(0.0014)
Host-country schooling (*sh*)	-0.0075*	(0.0026)	-0.0181	(0.0112)		
Foreign idle years (*idlef*)	-0.0025	(0.0017)	-0.0040*	(0.0009)	-0.0020	(0.0011)
Host-country idle years (*idleh*)	0.0013	(0.0021)	0.0097	(0.0095)		
Unemployment rate	0.5308	(0.2880)	-0.4465	(0.3188)		
Foreign experience*Host experience	-0.0002	(0.0001)	-0.0008*	(0.0003)		
Foreign experience*Host schooling	-0.0016	(0.0010)	0.0008	(0.0038)		
Foreign experience*Host idle years	-0.0020*	(0.0008)	0.0009	(0.0012)		
Foreign schooling*Host experience	-0.0004*	(0.0001)	-0.0002	(0.0003)		
Foreign schooling*Host schooling	0.000003	(0.0003)	0.0003	(0.0017)		
Foreign schooling*Host idle years	-0.0003	(0.0002)	-0.0018	(0.0009)		
Foreign idle years*Host experience	-0.0001	(0.0001)	-0.0012*	(0.0002)		
Foreign idle years*Host schooling	0.0012	(0.0008)	0.0030	(0.0025)		
Foreign idle years*Host idle years	0.0006*	(0.0002)	0.0017*	(0.0009)		

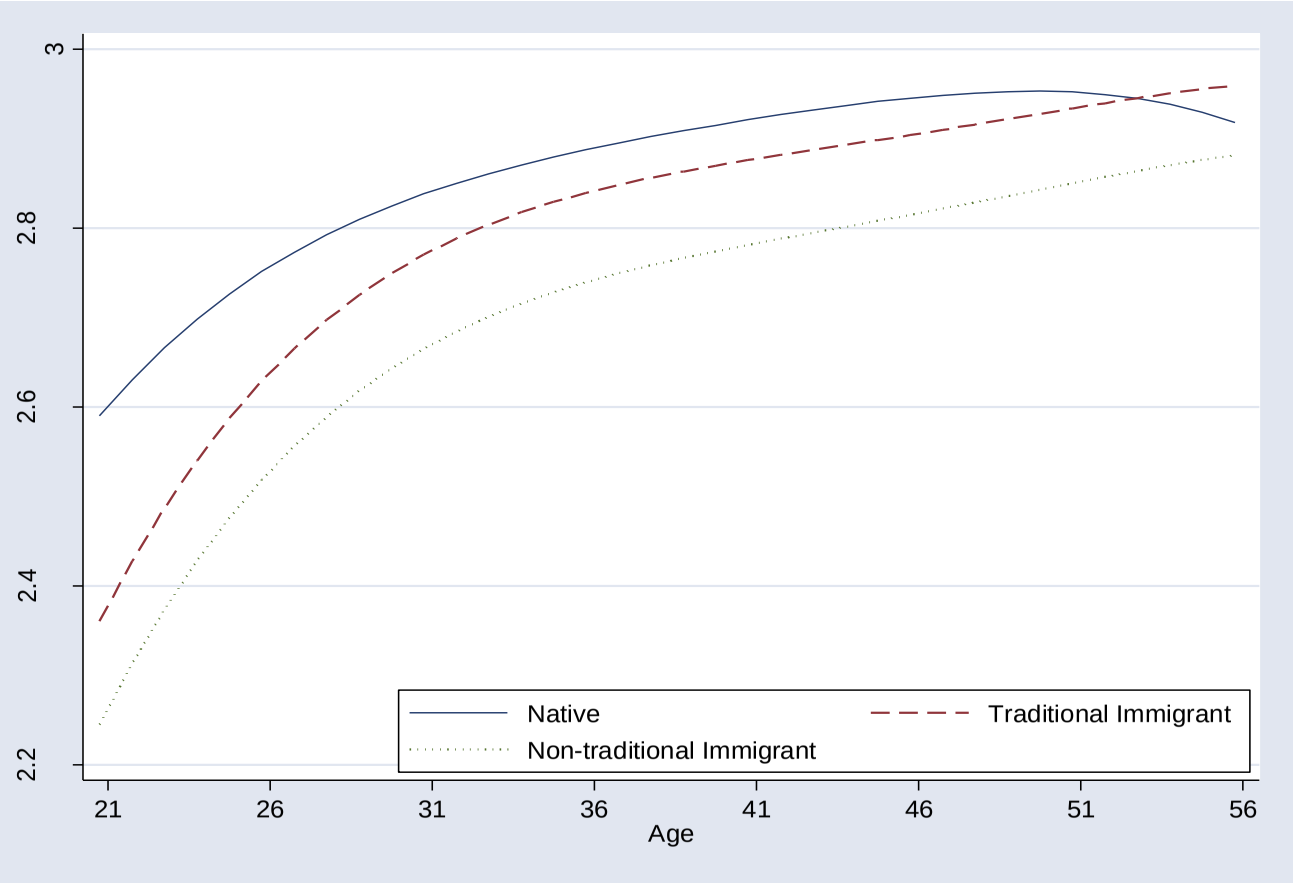
Note: All regressions also include controls for city size (4 categories); region (6 categories); a full set of fixed year effects (12 categories); and a female dummy and its interaction with the immigrant dummy. Foreign and host-country years of actual experience and schooling are based on the uniformly-distributed definition. Standard errors, shown in parentheses, are clustered allowing for correlations between observations of the same individual. * indicates significance at the 5% level.

Figure 3.1: Predicted relative immigrant log wage using standard and preferred variable definitions.



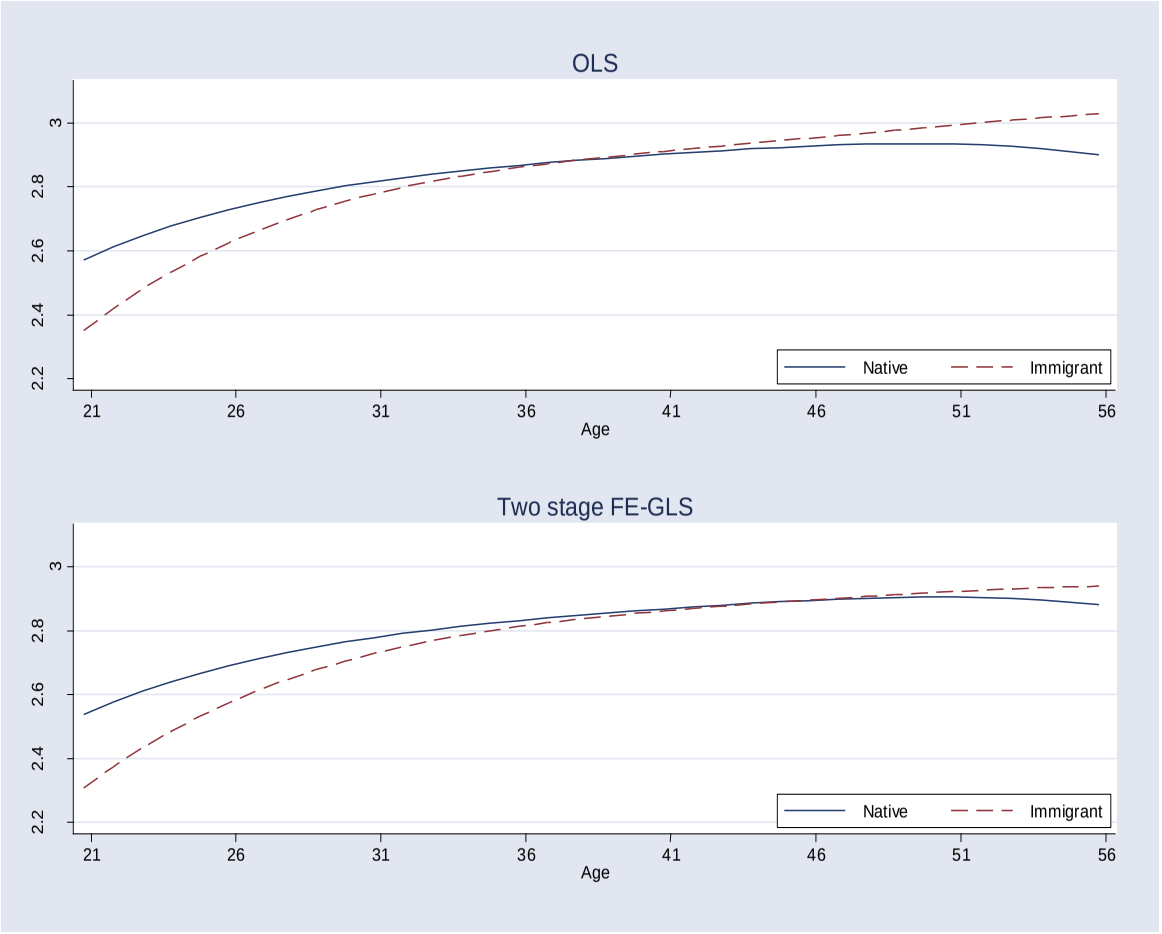
Note: Predictions based on estimates in Table 3.2. Immigrant predictions are for a foreign-born worker arriving in Canada between 1990 and 2002 with 9.77 years of foreign schooling and 5.98 years of foreign experience, who accumulates one year of host-country experience in every year since migration. The native predictions are for a comparable native-born worker. Standard variable definitions are left-continuous schooling and potential experience. Preferred variable definitions are uniformly-distributed schooling and actual experience.

Figure 3.2: Predicted log wages of immigrants from traditional and non-traditional source countries.



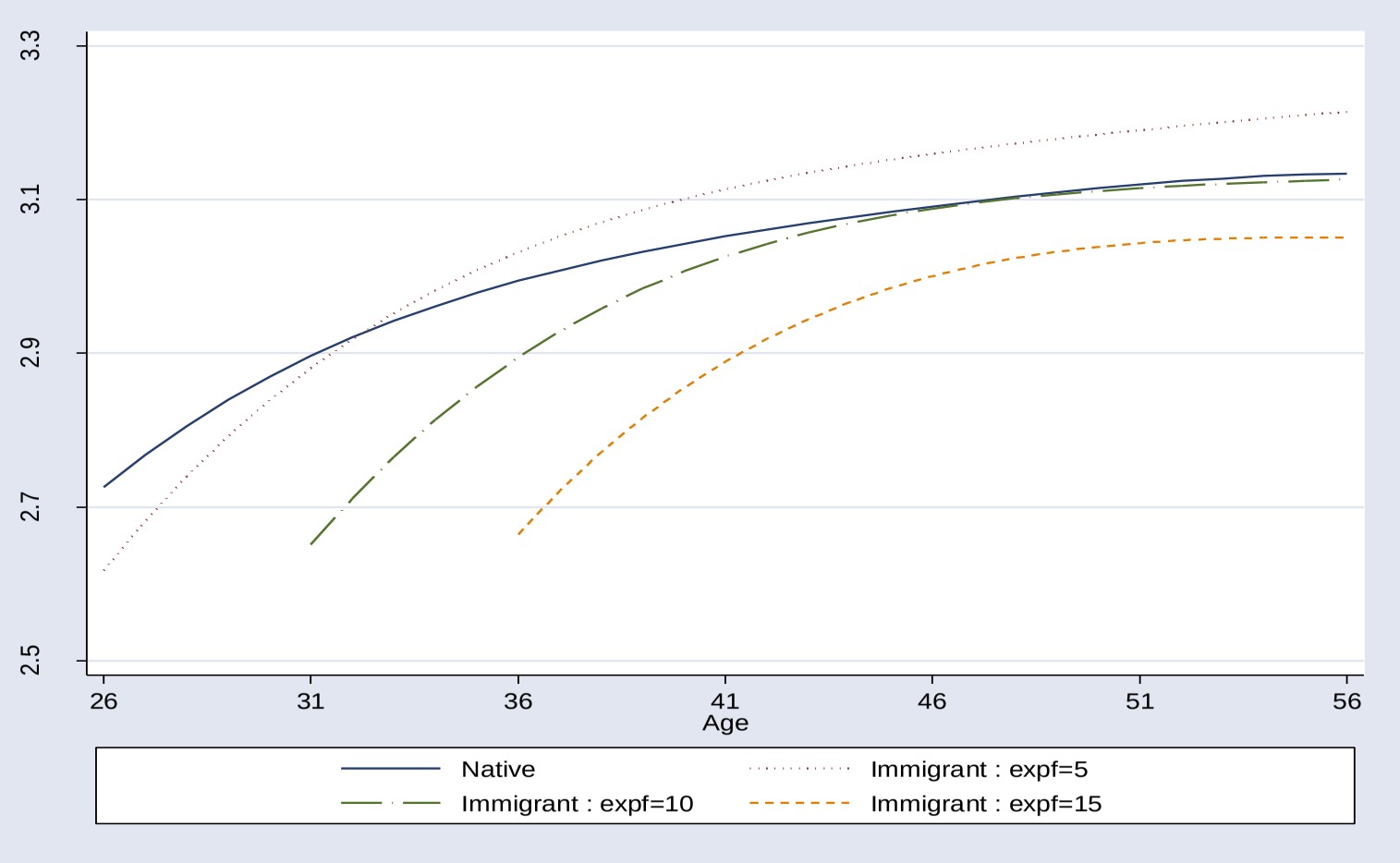
Note: Predictions based on estimates in Table 3.3. Immigrant predictions are for a foreign-born worker arriving in Canada between 1990 and 2002 with 9.77 years of foreign schooling and 5.98 years of foreign experience, who accumulates one year of host-country experience in every year since migration. The native predictions are for a similarly-aged native-born worker. Traditional immigrants include those born in the U.S., U.K., Western Europe, Northern Europe, Southern Europe, Caribbean, Mexico and Central America, South America, Australia, New Zealand, and Pacific Islands. Non-traditional immigrants are those born in Eastern Europe, the Middle East, Asia, and Africa. All predictions are for a male, residing in Ontario, in 2004, in a city with at least 500,000 inhabitants.

Figure 3.3: Predicted log wages with and without individual fixed effects.



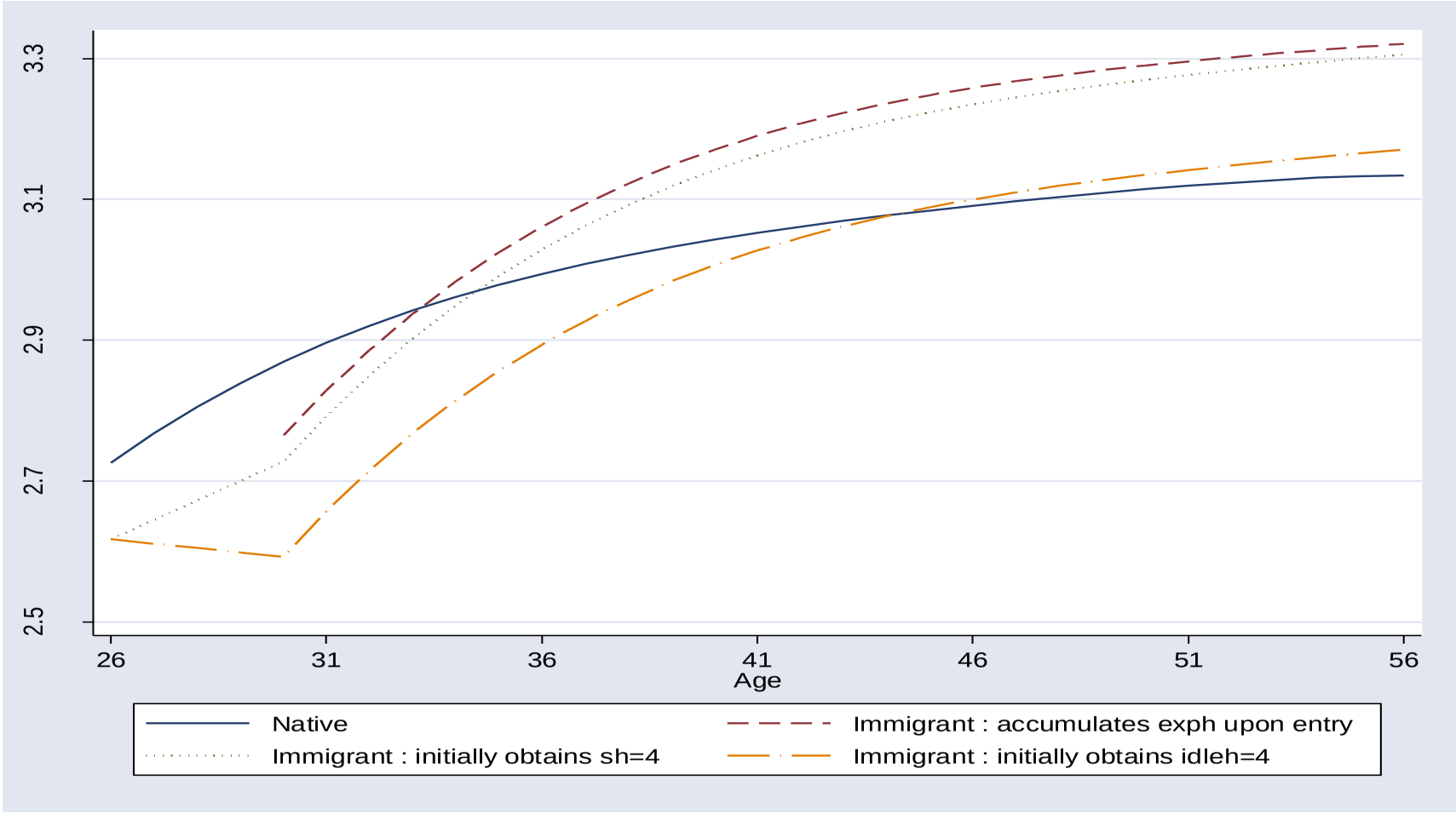
Note: Predictions based on estimates in Table 3.4. Immigrant predictions are for a foreign-born worker arriving in Canada between 1990 and 2002 with 9.77 years of foreign schooling and 5.98 years of foreign experience, who accumulates one year of host-country experience in every year since migration. The native predictions are for a similarly-aged native-born worker. All predictions are for a male, residing in Ontario, in 2004, in a city with at least 500,000 inhabitants, facing an unemployment rate of 7.5%.

Figure 3.4: Effect of foreign experience on predicted log wage profiles.



Note: Predictions based on fixed effects (GLS) estimates in Table 3.4. Immigrant predictions are for a foreign-born worker arriving in Canada between 1990 and 2002 with 16 years of foreign schooling and various quantities of foreign experience. In all cases, immigrants accumulate one year of host-country experience in every year since migration. The native predictions are for a similarly-aged native-born worker. All predictions are for a male, residing in Ontario, in 2004, in a city with at least 500,000 inhabitants, facing an unemployment rate of 7.5%.

Figure 3.5: Effect of host-country schooling relative to foreign schooling on the predicted log wage profiles.



Note: Predictions based on fixed effects (GLS) estimates in Table 3.4. Immigrant predictions are for a foreign-born worker arriving in Canada between 1990 and 2002 with either 16 or 20 years of foreign schooling 5 years of foreign experience. The native predictions are for a similarly-aged native-born worker. All predictions are for a male, residing in Ontario, in 2004, in a city with at least 500,000 inhabitants, facing an unemployment rate of 7.5%.

Conclusion

The three chapters of my dissertation examine immigrant assimilation in the Canadian labour market, in the hope of providing valuable insights to inform immigrant selection and settlement policy. I employ different sample restrictions in the three chapters, which produce three scopes of analysis. The first chapter provides the broadest level of analysis by investigating the labour market dynamics of the entire immigrant population relative to the native-born workers. I exploit recently-introduced immigrant identifiers in the Canadian Labour Force Survey (LFS) and the longitudinal dimension of these data to compare the labor force and job dynamics of Canada's native-born and immigrant populations. I am particularly interested in the role of job, as opposed to worker, heterogeneity in driving immigrant wage disparities and in how the paths into and out of jobs of varying quality compares between immigrants and the native-born.

The second level of analysis narrows the sample to employed Canadian-born and immigrant workers, thereby excluding unemployed individuals and those out of labour force. This chapter is instead primarily concerned with the choice between working in the self- or the paid-employment sector. With the newly available data from the 2006 Canadian Census, I extend the previous studies by examining changes in the likelihood of self-employment across arrival cohorts of immigrants and how self-employment rates evolve in the years following migration to Canada, and by estimating the potential earnings difference between the self- and the paid employment sectors. As a result, I am able to explore the implications of the difference in the patterns of a comparative earnings advantage on the choice of self-employment among traditional and non-traditional immigrant populations.

The third chapter is the narrowest in scope, as it restricts the sample to paid employees. At this narrow level, the focus is on assimilation in earnings conditional on employment in the paid-employment sector. It attempts to estimate separate wage returns to foreign and host-country sources of human capital. Using a particularly rich longitudinal Canadian data source, I examine the extent to which the previous findings of Canadian immigrant wage assimilation may be driven by biases arising from errors in measuring foreign and host-country sources of human capital and the endogeneity of post-migration schooling and work experience.

To analyze the labor force and job dynamics of Canada's native-born and immigrant populations, I identify five states in the labour market including both the paid- and the self-employment sector. Therefore, the important transition probabilities among high-wage jobs, low-wage jobs and self-employment cast insights on immigrant choice between the self- and the paid-employment sectors. Specifically, the main findings are that the disparity in immigrant job quality, which does not appear to diminish with years since arrival, reflects a combination of relatively low transitions into high-wage jobs and high transitions out of these jobs. The former result appears about equally due to difficulties obtaining high-wage jobs directly out of unemployment and in using low-wage jobs as stepping-stones. I find little or no evidence, however, that immigrant jobseekers face barriers to low-wage jobs. In turn, these findings provide some evidence that immigrants have difficulties accessing paid-employment sector so that they are forced to enter the self-employment sector, which can explain why immigrants turn to self-employment at a faster rate than earlier cohorts, in particular of new immigrants who arrived between 1996 and 2005, in the absence of an earnings advantage in this sector.

In the analysis of the labor force and job dynamics, I focus on immigrant earnings outcomes relative to the native-born within sector. However, the second chapter explores immigrant potential earnings difference relative to the native-born across, instead of within, sectors. My findings show that the earnings advantage between the self- and the paid-employment sectors accounts for the tendency of increasing self-employment rates with more years following migration, observed in the traditional immigrant population. However, the reduction of a potential earnings advantage in the self-employment sector, relative to the paid-employment sector, provides no evidence that non-traditional immigrants become increasingly likely to be self-employed upon entry and over time. Besides the possible explanation of barriers accessing paid-employment, immigrants may either be attracted to the self-employment sector by non-monetary benefits, or by the higher propensity for self-employment exhibited in the source country.

In the first two chapters, I employ a standard assimilation-type approach, which infers the assimilation process by estimating the return to an immigrant's years since migration (YSM). Evidence on the relative wage returns to host-country schooling and experience, on the other hand, provide the implications on immigrant selectivity and settlement policies. We find that the biases inherent in estimating foreign and host-country returns directly using standard data sources appear modest. In particular, using more accurate measures of foreign and host-country sources of schooling and experience and controlling for individual fixed effects does little to alter the main findings of the existing Canadian literature. Therefore, this suggests that the estimates in the first two chapters do not appear to be driven by biases arising from either the assumptions necessary to distinguish foreign from host-country human capital or from unobserved heterogeneity. Finally, we find additional foreign work experience not only does essentially nothing to raise immigrant wage out-

comes at entry, but also lowers subsequent returns to host-country work experience. The return to foreign schooling for immigrants from both traditional and non-traditional source countries is, in contrast, virtually identical to their return to host-country schooling.

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APPENDICES

Appendix A

The Appendix for Chapter 1

Table A.1: Fixed effects log hourly wage regression used to identify job quality heterogeneity.

	Men		Women	
Age	0.0294***	(0.0015)	0.0249***	(0.0014)
Age squared	-0.0277***	(0.0018)	-0.0244***	(0.0017)
Elementary school				
High school incomplete	0.0210	(0.0117)	0.0334*	(0.0160)
High school graduate	0.0706***	(0.0114)	0.0288	(0.0191)
Some post-secondary	0.0656***	(0.0122)	0.1261***	(0.0160)
Trade or college credential	0.1085***	(0.0113)	0.1529***	(0.0154)
University below Bachelor's	0.1313***	(0.0149)	0.2054***	(0.0171)
Bachelor's degree	0.1579***	(0.0122)	0.2470***	(0.0159)
Graduate degree	0.2046***	(0.0140)	0.3231***	(0.0168)
Married	0.0563***	(0.0032)	0.0292***	(0.0030)
Time trend	0.0014**	(0.0005)	0.0014**	(0.0005)
Time trend squared	-0.0006	(0.0013)	-0.0001	(0.0012)
Newfoundland				
Prince Edward Island	-0.0634***	(0.0090)	0.0346***	(0.0075)
Nova Scotia	0.0078	(0.0078)	0.0313***	(0.0065)
New Brunswick	-0.0142	(0.0076)	0.0175**	(0.0066)
Quebec	0.0919***	(0.0069)	0.1180***	(0.0059)
Ontario	0.1834***	(0.0068)	0.1890***	(0.0058)
Saskatchewan	0.0765***	(0.0076)	0.0979***	(0.0065)
Manitoba	0.1137***	(0.0076)	0.1063***	(0.0063)
Alberta	0.2341***	(0.0076)	0.1891***	(0.0065)
British Columbia	0.2142***	(0.0074)	0.2127***	(0.0065)
CMA urban				
CA urban	-0.0170***	(0.0037)	-0.0273***	(0.0034)
Non-CA urban	-0.0254***	(0.0045)	-0.0416***	(0.0042)
Urban fringe	0.0131	(0.0081)	-0.0019	(0.0081)
Rural	-0.0015	(0.0036)	-0.0244***	(0.0033)
Union	0.0923***	(0.0027)		
Part-time	-0.0484***	(0.0037)		
Hourly-paid	-0.1218***	(0.0027)		
Paid commission/tips	0.0791***	(0.0055)		
Temporary contract	-0.0766***	(0.0039)		
Establishment less than 20				
Firm less than 20				
Firm 20 to 99	0.0355***	(0.0069)		
Firm 100 to 500	0.0662***	(0.0065)		
Firm more than 500	0.0743***	(0.0046)		
Establishment 20 to 99				
Firm 20 to 99	0.0803***	(0.0038)		
Firm 100 to 500	0.1093***	(0.0054)		
Firm more than 500	0.1224***	(0.0040)		
Establishment 100 to 500				
Firm 100 to 500	0.1397***	(0.0046)		
Firm more than 500	0.1656***	(0.0041)		
Establishment more than 500				
Firm more than 500	0.1958***	(0.0045)		
Female	-0.0403	(0.0455)		
Constant	1.9758***	(0.0326)		
R-squared	0.5670			

Number of observations	179,597

Notes: Sample restricted to native-born workers in the first month of their sample rotation. Regression also includes 1,447 job-skill/industry fixed effects. The R-squared statistic in the equivalent regression with no job characteristics is 0.2937, so the marginal explanatory power of the job characteristics is 0.5670-0.2937=0.2733.

Table A.2: Mean values of personal and job characteristics across samples.

	Men			Women		
	Same respondent	Different respondent	Attrition	Same respondent	Different respondent	Attrition
Log hourly wage[a]	3.064	3.051*	2.975*	2.885	2.864*	2.809*
Job quality[a]	0.086	0.080*	0.038*	0.022	0.010*	-0.022*
High-wage rate[a]	0.486	0.479*	0.415*	0.481	0.464*	0.420*
Immigrant	0.163	0.175*	0.249*	0.180	0.200*	0.272*
Age	40.352	39.787*	38.650*	40.296	39.948*	38.797*
Married	0.656	0.728*	0.536*	0.692	0.784*	0.595*
Elementary	0.029	0.032*	0.037*	0.023	0.028*	0.039*
High school incomplete	0.098	0.101*	0.119*	0.072	0.076*	0.095*
High school graduate	0.193	0.204*	0.222*	0.198	0.205*	0.211*
Some post-secondary	0.066	0.068*	0.086*	0.063	0.064	0.077*
Trade or college credential	0.347	0.337*	0.292*	0.347	0.338*	0.297*
University below Bachelor's	0.025	0.025	0.020*	0.030	0.029*	0.025*
Bachelor's degree	0.164	0.157*	0.152*	0.193	0.191	0.190
Graduate degree	0.079	0.075*	0.072*	0.073	0.070*	0.067*
CMA urban	0.601	0.595*	0.668*	0.605	0.599*	0.666*
CA urban	0.116	0.118	0.124*	0.116	0.116	0.117
Non-CA urban	0.064	0.064	0.057*	0.065	0.064	0.060*
Urban fringe	0.024	0.024	0.019*	0.026	0.025*	0.020*
Rural	0.195	0.199*	0.133*	0.188	0.196*	0.137*
Union[a]	0.348	0.341*	0.299*	0.363	0.355*	0.317*
Part-time[b]	0.044	0.049*	0.060*	0.192	0.195*	0.176*
Hourly-paid[a]	0.588	0.593*	0.637*	0.599	0.613*	0.633*
Paid commission/tips[a]	0.067	0.067	0.067	0.061	0.062	0.077*
Temporary contract[a]	0.078	0.084*	0.107*	0.096	0.099*	0.112*
Number of observations	417,142	273,495	22,475	453,486	279,262	20,897

Notes: [a]Conditional on being a paid employee. [b]Conditional on being employed. * indicates that the mean is statistically significantly different than the same-respondent mean at the 5% level.

Appendix B

The Appendix for Chapter 3

Proof of bias in basic YSM model: As long as $0 < \bar{m} < 1$, we know that $\alpha_2 < \hat{\beta}_1 < \alpha_1$. Given $\hat{\beta}_0$ and $\hat{\beta}_1$, the estimates of β_2 and β_3 can then be thought of as coming from the restricted least squares regression:

$$w_i = \hat{\beta}_0 + \hat{\beta}_1(exph_i + expf_i) + m_i \cdot (\beta_2 + \beta_3 exph_i) + e_i. \tag{B.1}$$

which amounts to estimating the term in parentheses in (3.2) using only the sample of immigrants and the adjusted dependent variable:

$$\tilde{w}_i = (\alpha_0 - \hat{\beta}_0) + (\alpha_1 - \hat{\beta}_1)exph_i + (\alpha_2 - \hat{\beta}_1)expf_i + \varepsilon_i. \tag{B.2}$$

The standard omitted variable bias result then implies the probability limit given in equation (3.3).

Proof of bias in extended YSM model: If $(\alpha_1 - \alpha_3) = (\alpha_2 - \alpha_4) \equiv \theta$, then least squares produces $\hat{\beta}_1 = \alpha_1$; $\hat{\beta}_2 = \alpha_2$; $\hat{\beta}_4 = \hat{\beta}_5 = -\theta$; and $\hat{\beta}_6 = \theta$, and the estimates correctly predict no assimilation (since $\hat{\beta}_4 + \hat{\beta}_6 = 0$ and $\hat{\beta}_5 + \hat{\beta}_6 = 0$). In general, however, $(\alpha_1 - \alpha_3) \neq (\alpha_2 - \alpha_4)$. In this case, $\hat{\beta}_6$ is estimated as a weighted average of the two differences. Defining $\theta_1 \equiv (\alpha_1 - \alpha_3)$ and $\theta_2 \equiv (\alpha_2 - \alpha_4)$, the problem amounts to estimating a single linear return θ when the DGP is given by:

$$y_i = \theta_0 + \theta_1 exp_i + \theta_2 s_i + \mu_i. \tag{B.3}$$

We then know:

$$\text{plim } \hat{\theta} = \frac{\theta_1 \text{var}(exp_i) + \theta_2 \text{var}(s_i) + (\theta_1 + \theta_2)\text{cov}(exp_i, s_i)}{\text{var}(exp_i) + \text{var}(s_i) + 2\text{cov}(exp_i, s_i)} \tag{B.4}$$

which is bounded by θ_1 and θ_2. This tells us that the return to YSM in the unrestricted model is a weighted average of the advantage in host-country sources of schooling and experience (over foreign sources), where the weighting depends on the relative magnitudes of $\text{var}(exph_i + expf_i)$ and $\text{var}(sh_i + sf_i)$, as well as the covariances of $exph_i$, sh_i, $expf_i$, and sf_i. It does not depend on the levels (means) of these variables; this is captured by β_3 in (3.6).