Immigrant Earnings Profiles in the Presence of Human Capital Investment: Measuring Cohort and Macro Effects

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We argue that when immigrant earnings are considered in the context of post-arrival human capital investment: cohort quality should be defined in terms of the present value of the whole earnings profile; and, an appropriate definition of "macro" effects is obtained using the earnings profile of the native born cohort entering the labour market at the same time as an immigrant cohort. We illustrate this using Canadian immigrant earnings, where there were large cross-cohort earnings declines in the 1980s and 1990s. We find that changes affecting all new entrants play an important role in understanding immigrant earnings. In contrast, earlier approaches imply that "macro" events explain little of immigrant earnings patterns.

JEL Codes: J61 (Immigrant Workers); J31 (Wage Differentials)

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There is considerable concern in a number of countries over large declines in earnings just after arrival for immigrants arriving in recent decades relative to those who arrived earlier. Studies in the US (e.g., Borjas(1995)) and Canada (e.g. Baker and Benjamin (1994)) document substantial declines in entry earnings for immigrants arriving in the 1980s relative to earlier immigrant cohorts. In a recent paper, Borjas and Friedberg (2009) document an improvement in the earnings of recent immigrants who arrived in the US in the latter half of the 1990s. However, evidence from CPS data indicates that the decline in earnings of new immigrants to the US continued after 2000. Aydemir and Skuterud (2005) show that the decline in entry earnings for immigrants to Canada continued into the 1990s. These cross cohort declines in earnings have often been interpreted as reflecting declines in skill or "quality" across cohorts which are then linked to changes in the source country composition of the inflow.

Duleep and Regets(1992, 2002) question this interpretation. In standard human capital theory, lower entry earnings may reflect greater investment and be rewarded by greater post-arrival earnings growth. Cohorts with the lowest entry earnings may have the highest present value of earnings in the host economy. Duleep and Regets document a strong negative correlation between entry earnings and post-arrival growth for US immigrants. Borjas(1999) demonstrates that this negative correlation depends on conditioning on education and claims that we should focus on unconditional (on education) results where there is a positive correlation between entry earnings and post-arrival growth. Whichever stance one takes on conditioning, Duleep and Regets(1992) are correct that cross-cohort movements in entry earnings form a poor measure of relative cohort performance once we consider the immigrant adjustment problem in the context of a human capital investment model. In this paper, we start from this insight, developing an alternative approach to measuring cohort "quality". We illustrate this approach by examining immigrant earnings performance in Canada, where well-documented, large cross-cohort declines in entry earnings in the 1980s have been followed by even larger declines in the 1990s and early 2000s.

Standard approaches to examining immigrant earnings involve writing single year earnings

regressions in terms of cohort, year and time since arrival effects. The well known identification problem arising from the collinearity of these effects is typically addressed by using a comparison group to identify the macro (year) effects. Estimates of the size and direction of differences across immigrant cohorts are well known to vary, in some cases quite substantially, with different comparison groups (Lalonde and Topel(1992), Borjas(1999)). Once we consider the problem within a framework of potential immigrant investment in human capital after arrival, however, the very notions of cohort and macro effects become murkier. As Duleep and Regets(1992) argue, differences in single year earnings of the type investigated in standard regression estimation may reflect different investment choices as well as (or in response to) underlying differences in skill levels across cohorts or differences in the macro environment. Trying to decompose, say, entry year earnings into cohort and year effects can be misleading. One possible response to this is to simply present the whole earnings-years-since-arrival profile for each cohort, as is done in, for example, Lalonde and Topel(1992) and Baker and Benjamin(1994). While this provides a complete picture, it does not supply the reader with a means of comparing two profiles that cross and have very different intercepts and slopes. We argue that in light of these points, comparisons of the present value of earnings in the host country provides an appropriate and useful framework for understanding true differences in cohorts, and we use a trick from Mincer(1974) to get estimates of the present values that do not require a reliance on wildly out of sample earnings projections.

We still, of course, need a comparison group to establish whether cross-cohort patterns in the present value of immigrant earnings reflect skill differences across cohorts or general macro effects. The life-cycle approach implies that we need to organize the earnings of the comparison group in cohorts, as well, in order to generate present values for earnings that match those for the immigrants. Further, we argue that the best comparison group is other new (native born) labour market entrants since their earnings patterns will reflect macro events in the context of human capital investments that are similar to those undertaken by immigrants.

Using matching native born new entrants as a comparison group also fits with the rather general definition of macro effects we use throughout the paper. We define the macro effects relevant for a particular immigrant cohort as the impact of economy-wide events on the average earnings of any worker entering the Canadian labour market at the same time as the immigrant

cohort. Included in the set of economy-wide events we are contemplating are cyclical and growth movements in the economy, but also events such as the movement of the baby boom through the labour force and changes in educational institutions that affect the relative supply of skills in the economy. Moreover, we argue that in examining earnings, one cannot separate the impact of these events from investment responses to them and so our definition of macro effects is intended to reflect both overall economic events and the investment decisions of a general set of new entrants in reaction to those events. Immigrant cohort effects are then the movements in an immigrant cohort's earnings profile relative to the profile of other new entrants entering the labour market at the same time. These effects capture a combination of implicit skill differences and differences in responses to economy-wide events between immigrants and other new labour market entrants.

We examine immigrant earnings using a unique dataset formed by linking immigrant landing records for all immigrants entering Canada after 1980 to their tax records in all successive years up to and including 2003. Immigrant landing records contain application information, including source country, age at arrival, gender and education level at arrival. We focus only on males and divide our investigation by education levels and by age at arrival, both of which have important impacts on earnings patterns. Our native born data comes from large representative annual surveys (the Survey of Consumer Finance and the Survey of Labour and Income Dynamics). We confirm that the earnings patterns we obtain from combining these datasets match those from Census data. The datasets we use have advantages over the Census because we get earnings data at an annual frequency with, for the immigrants, a very large number of observations.

Using these data, we find that, over the past two decades, successive cohorts of immigrants have experienced larger and larger declines in entry earnings. The declines across the 1980s are large (on the order of .28 log points) and well documented (see, Baker and Benjamin(1994), Bloom, Grenier and Gunderson(1995), Grant(1999)). The declines in the 1990s were larger (.43 log points) and have been documented using Canadian Census data (see, for example, Aydemir and Skuterud, 2005). We show that the declines continued in the early 2000s. Borjas (1995), in an examination of US data, argues that macro events explain little of the observed cross-cohort earnings differences in that country and that, as a result, those differences should be interpreted as reflecting skill differentials. Macro effects defined using standard approaches play a similarly small role when

using Canadian data. However, macro effects defined using native born new entrants arranged in cohorts play a much greater role. Native born new entrants also experience sizeable declines in earnings over this period and these declines account for half the decline in immigrant earnings in the 1980s. Most of the remainder of the decline is accounted for by changes in the source country composition of immigration. Thus, while about half the decline may be interpreted as resulting from falling "skill" levels across cohorts (due to shifts in source country composition), the other half is related to poorer outcomes for new labour market entrants in general. This implies a re-balancing of policy interest with less emphasis on immigrant specific issues and more on issues relating to outcomes for all new labour market entrants. The former set of issues would be addressed mainly through immigration policies while the latter would, for the most part, not be.[1]

Another key feature of earnings patterns for immigrants in this data is the evaporation of earnings differentials by years of foreign experience between the early 1980s and the 1990s. Thus, for the 1980-82 entry cohort, immigrants in all education groups have earnings patterns reflecting substantial "returns" to foreign experience. By the 1990-92 entry cohort, however, there is no evidence of any differential in entry earnings by years of foreign experience. The finding of a flat foreign experience profile fits with Friedberg(2000)'s results for Israel, but in Canada's case this represents a dramatic shift from earlier periods.

The paper proceeds in seven sections. The second section contains a description of the data and of the basic data patterns we are seeking to explain. In the third section, we set out a standard human capital investment model and define macro and cohort effects within the context of that model. In the fourth section, we describe our empirical model, discuss our approach to calculating the present value of earnings and present the main estimation results. In section five, we present robustness exercises and provide a comparison to estimates from more standard methods. In the sixth, we investigate the determinants of the cohort patterns set out in section four, including a decomposition exercise assigning the cross-cohort changes in the present value of earnings to: 1) general new entrant, 2) shifting source country composition, 3) shifting age at arrival composition,

[1] It is, of course, possible that it is the immigrant inflows themselves that are generating the worsening outcomes for all labour market entrants (see Card(2001) and Aydemir and Borjas (2007)). We do not address this issue in this paper.

and 4) shifting education composition effects. The final section concludes.

II Data and Basic Patterns

II.1 Data Description

We examine earnings patterns using three datasets. For immigrants, we use a special dataset based on immigrant administrative data and tax data called the Immigrant Database (IMDB). For the native born, we use both the Survey of Consumer Finances (SCF) and the Survey of Labour and Income Dynamics (SLID). Both are large household surveys which can be used to generate statistics representative of the Canadian-born population. We use all available years for the individual level files from the SCF, 1981, 1982, 1984-1997, and use the SLID for the period 1996 through 2003 (using the overlapping years of 1996 and 1997 to account for possible differences in design across the two Statistics Canada surveys). We also use the IMDB tax year samples for the years 1981, 1982, 1984-2003, dropping the 1983 tax year data to improve comparability with the SCF, for which the 1983 data does not exist.

The IMDB is constructed from a linkage of the landing records for all the immigrants arriving in Canada after 1980 to their tax records in subsequent years. The landing records contain information collected by immigration officials as part of processing the immigrant application, including the immigrant's source country, gender, and their education level and age at time of arrival. Immigrant applicants are placed in one of three broad assessment categories, information on which forms part of our data: independents (applicants who are assessed based only on their skills - education, experience, language ability, etc); family class (applicants who enter based on family relationships to people living in Canada); and refugees. This information from the landing records is linked to the individual tax records for subsequent years. This means, in part, that we do not observe individuals who do not file tax forms, though since we focus on individuals with positive earnings, this is unlikely to cause problems. Given the nature of the tax data, we do not know if immigrants obtain extra education or training after arriving in Canada since education is not reported on the tax form and, as a result, the education classification we use for immigrants is based on their education at time of arrival.

The SCF is a survey conducted annually up to 1997 as an add-on to the Labour Force Survey (LFS), Canada's general survey for determining labour market stocks and flows. From the

SCF, we obtain data on annual earnings, age, education and gender for native born Canadians in order to generate a benchmark for the immigrant data. The SLID is a longitudinal survey, also built on the LFS sampling frame. We use it (with the provided weights) to generate cross-sections of data that are representative of the native-born population for the relevant survey year. We use it in this way so as to match the cross-sectional information available in the SCF data.

The outcome measure we use is real annual earnings, deflated using the CPI. We have no way of pro-rating immigrant earnings according to how long they were in the country in their landing year. In response, we do not use earnings data from the landing year. Thus, our entry earnings measure corresponds to the first full year after landing in Canada. Given that we are using annual earnings, our dependent variable will reflect variation in hours and weeks worked as well as wages, which is worth noting for immigrants, who tend to have high unemployment rates just after arrival (Reitz(2001)). For immigrants, earnings patterns for a given education at arrival group may also reflect educational upgrading, which we view as part of immigrant assimilation.

We divide the immigrant sample into cohorts defined by year of landing in Canada. Even though the IMDB is a true panel, in order to match with the SCF, we carry out our analysis by forming synthetic cohorts.[2] That is, we treat the data as a series of cross-sections. In each year, we identify the individuals who entered Canada in a given period and calculate their average earnings. The set of these averages across years constitutes the annual earnings path for the cohort. As we will see below, an educational break-down is crucial for understanding movements in overall earnings. Thus, we define cohorts by both landing year of entry and education level. This is simple for immigrants since we can group them according to a time invariant education measure (the education listed on their landing record). However, in the native born data we only see the individual's education in the current year and, so, need to restrict our attention to individuals for whom education is unlikely to change if we want to use education as a cohort definition dimension. For this reason, we focus our analysis on individuals (either native born or immigrant) whose age is greater than or equal to 25 (which we will call the age of entering the mature labour market). We also specify a maximum age for our samples of 64. We focus only on men in this analysis,

[2] Data access restrictions also dictated that we treat the IMDB data this way.

addressing the very different patterns for females in another paper.

Immigrants are assigned to a given cohort according to the year of obtaining landed immigrant status in Canada. We define 7 cohorts: 1980-82, 1983-86, 1987-89, 1990-92, 1993-1996, 1997-1999 and 2000-2002. The cohort groupings are chosen to reflect a combination of immigration policy regimes and cyclical conditions. Thus, the 1980-82 period contains the beginning of a recession and a period in which immigration inflows were relatively large. The period 1983-86 contains a period of economic recovery but is also a period in which the immigration door was basically shut to independents: applicants could only enter the country through the family or refugee classes or if they had already arranged employment. In 1986, the arranged employment restriction was removed and the proportion of the inflow accounted for by independents increased again. However, the inflows in the next 5 to 8 years were still dominated by family and refugee class immigrants. Thus, the 1987-89 cohort enters in a period with this type of immigration policy in an economic boom and the 1990-93 cohort enters in a period with similar policy but a recession. The period 1993-96 exhibits no strong trends in the labour market, and in policy is marked by a move toward giving greater priority to independent class immigrants. The period 1997-99 reflects a period of strong labour market conditions while the period 2000-02 represents a period of turbulent macroeconomic conditions. We do not relate our results directly to policy regimes, but we do feel it is useful to organize the cohorts so that they are not a muddle of policies and labour market conditions.[3] We also organize the native born by cohort, in this case defined by their year of labour market entry, with cohorts defined using the same year groups as for immigrants. We define the year of labour market entry as the year in which they turn 25.

II.2 The Dependent Variable

Due to access restrictions to the confidential IMDB data, we carried out our estimation in two steps. First, using the individual data of the IMDB, we estimated log earnings models that contained provincial dummy variables as well as dummy variables for each year-of- arrival/survey

3. Antecol, Kuhn and Trejo(2006) analyse the relationship between differences in immigration policy and differences in immigrant outcomes across countries.

year combination.[4] Three separate models were estimated for the three education groups: 1) high school diploma or less, 2) post secondary education below a university degree and 3) at least one university degree. For immigrants (for each education group), we carried this exercise out separately for four age-at-arrival categories: 25-29, 30-34, 35-39 and 40-44. Next, the synthetic cohort sample was generated by predicting the log earnings for each year-of-arrival/survey year/education/age-at-arrival cell holding the province of residence effect at the default value (Ontario). Therefore, provincial variation in earnings was removed from the synthetic cohort sample. The end result was an immigrant synthetic cohort sample containing predicted log earnings for approximately 950 cells (year of arrival/survey year/education/age-at-arrival combinations). It is this immigrant sample that we use in subsequent estimation. We also make use, later in the paper, of data created in the same way but also broken down by country of origin, resulting in a total of approximately 2800 cells. Sample sizes for each cell in the synthetic cohort samples vary but are typically around 100. Weighted least squares regression is employed throughout the analysis with the weights based upon the estimates of the standard errors of the predicted log earnings from the first stage regression analysis.

The equivalent first stage analysis was carried out for the native born samples generated using the combined SCF and SLID data. Regression models were estimated over the pooled individual data across all years of the SLID and the SCF with the same set of controls as were included in the first stage model estimated over the immigrant IMDB samples. As stated above, the native born cohorts are defined in terms of single years of entry into the mature labour market (assumed to be age 25). Three models were estimated according to the three education categories defined above. Unlike the immigrant case, we did not need to estimate the models separately by either age-at-arrival or country of origin since these dimensions are not relevant for the native born. From these three regression models, we predicted the log earnings for each native born cell based on the labour market cohort/survey year/education permutation holding the province variables at the Ontario default value. This results in a synthetic cohort sample of approximately 300 cells. In the second stage estimation described below, we combine the native born (SCF/SLID) and the

4. These regressions were actually run upon our request by a Statistics Canada employee using the confidential IMDB data.

immigrant (IMDB) synthetic cohort samples so that we can estimate immigrant/native born differences in earnings by cohort and with years-since-entry into the Canadian labour market.

II.3 The Pattern to be Explained

To set out the basic patterns of interest, we begin, in Figure 1, with separate, earnings-Canadian experience profiles for each immigrant cohort with cycle effects removed. The plots correspond to fitted average earnings from a regression of average log earnings on a set of cohort dummy variables, a spline function in the years since entering the Canadian labour market (YSE) variable with a linear segment over the range 1 to 9 years and a second linear segment over the range 10 and more years, interactions of the 1 to 9 YSE spline segment and the cohort dummy variables, education dummy variables, and a de-trended unemployment rate variable.[5] The spline approach to the specification of YSE effects is unconventional in the immigration literature. However, we investigated different parameterizations of the YSE profiles and found that this spline approach best represented the underlying patterns in the data. The de-trended unemployment rate variable is included in an attempt to strip out cyclical variation and focus on long term patterns. We normalize the plots relative to the entry earnings for the 1980-82 cohort.

The most striking pattern in Figure 1, and the point of emphasis in this paper, is the dramatic fall in real earnings at time of arrival across cohorts. Relative to the 1980-82 entry cohort, earnings at arrival are .6 log points lower for the 1993-96 cohort and this trend of deteriorating entry earnings accelerates further for the 1997-99 cohort at .74 log points lower and 1.07 log points lower for the 2000-02 cohort. However, the cohorts with the lowest starting earnings also have the highest earnings growth rates after arrival. The overall pattern can be roughly divided into two periods: 1) the cohorts entering in the mid and late 1980s earn approximately .3 log points lower earnings at arrival than the 1980-82 cohort and, with profiles that are roughly parallel to the first cohort profile, do not catch up to them within the 20 year window; 2) the cohorts entering in the 1990s have much lower entry earnings but the cohorts since 1997 have also seen larger post-arrival earnings growth. The fact that the 1980s cohorts fell behind earlier cohorts (and the native born) and do not catch

[5] We use the acronym YSE rather than the more conventional YSM (for years-since-migration) since we also use an equivalent definition for the native born where YSE represents years since entering the Canadian labour market for the native born.

back up has been the source of considerable investigation (e.g., Baker and Benjamin (1994), Bloom Grenier and Gunderson (1995), McDonald and Worswick(1998), and Grant(1999)). The fact that the 1990s entry cohorts have even lower entry earnings is also known (Li(2003), Frenette and Morissette (2003), and Aydemir and Skuterud (2005)) but we are able to follow those cohorts longer. The results also match those for the US, where declines in entry earnings across cohorts has been extensively debated since first identified by Borjas(1985). While Borjas and Friedberg (2009), employing Census data, find an improvement in the entry earnings of recent immigrants who arrived in the US in the late 1990s (relative to those who had arrived in the early 1990s), they also present evidence from CPS data indicating very low earnings outcomes for the immigrant arrival cohorts entering the US after 2000.[6]

All of the earlier literature on Canadian immigrant earnings uses data either from Censuses or the SCFs. If our estimates were substantially different from earlier studies, it would call into question the comparability, and possibly the validity, of our results. We carried out an extensive comparison of mean log annual earnings of recent cohorts of immigrants to Canada using both the IMDB and the Census. Due to grouping of arrival years in the public use samples of the Census, it was not always possible to match cohorts perfectly between the two data sources. However, in general, the differences in entry earnings across arrival cohorts were very similar. For example, we were able to compare the change in earnings of immigrants who had been in Canada for 1 to 5 years in the 1991 and 1996 Canadian Census files and the IMDB (the data actually correspond to 1990 and 1995). We used sample selection rules that mirrored those used in this paper. Using the IMDB, the change in log annual earnings between 1990 and 1995 was -.32 log points, compared to -.29 in the Census data. Thus, we believe that our results are comparable to those based on Census data, though we have presented them in a somewhat different form from earlier papers.

III Defining Cohort and Macro Effects

The much poorer initial earnings levels in the 1990s, shown in Figure 1, raises concerns that Canada is doing worse either in terms of selecting or integrating immigrants. Of course, the period from 1990 to 1997 was a rough time in the Canadian labour market in general and it is possible that what

[6]See also Smith (2006) for an analysis of immigrant earnings in the US.

appears to be an immigrant problem when viewed in isolation is actually a macro economic problem when viewed in broader perspective. To understand how to properly evaluate the relative outcomes for immigrants and other workers, we require a framework that can capture their potential differences and similarities.

III.1 Standard Approach

Estimation in most papers on immigrant earnings is based on a standard human capital regression. As a purely heuristic device, we begin by re-deriving that regression, mainly using assumptions set out in Mincer(1974). In particular, we will assume that an individual, i, with schooling level, s, starts his working life with an initial stock of human capital, e^{Hsoi} . Each period thereafter, the individual decides on a proportion of time, I_{ix}, to devote to generating more human capital, spending the remaining time, $(1 - I_{ix})$, in generating earnings. Note that x indexes years of experience. Following Mincer, assume that the human capital stock grows at a rate ρI_{ix}, where ρ is a parameter that the individual takes as given. The human capital stock available at x years of experience is then given by,

$$1) \quad H_{ix} = e^{H_{s0i}} e^{\int_0^x \rho I_{i\tau} d\tau}$$

Given period specific rental rates on human capital, R_{st}, and the assuming that $I_{ix} = \gamma_0 - \gamma_1 x$ (where, $\gamma_0 > 0$ and $\gamma_1 > 0$ are parameters chosen by the individual), we can write the log of earnings for an individual with schooling, s, and experience, x, in calendar year, t, as,

$$2) \quad \ln Y_{istx} = H_{s0i} + \ln R_{st} + \rho\gamma_0 x - 0.5\rho\gamma_1 x^2 + \ln(1-I_{ix})$$

Finally, we assume that $H_{s0i} = H_{s0} + \varepsilon_i^*$, where H_{s0} is the human capital stock a randomly chosen individual would accumulate in s years of schooling and ε_i^* is interpreted as ability, written in terms of effective human capital the individual accumulated before entering the labour market. Given non-random selection into years of schooling, ε_i^* will have a non-zero mean, μ_s, and we can write, $H_{s0i} = H_{s0} + \mu_s + \varepsilon_i$, where ε_i is mean zero. Using this and an approximation to the last term in 2), we arrive at a log earnings regression:

$$3) \quad \ln Y_{itx} = \mu_s + H_{s0} - \gamma_0 + \ln R_{st} + (\rho\gamma_0 + \gamma_1)x - 0.5\rho\gamma_1 x^2 + \varepsilon_i$$

This type of specification embodies the main conclusions from more rigorous derivations such as those found in the work following Ben-Porath(1967) while still allowing for a simple closed form representation for the earnings regression.

III.2 Human Capital at Arrival and Investments after Arrival

We are ultimately interested in the amounts of human capital different cohorts of immigrants effectively contribute to the host economy. From a policy perspective, knowing whether and why cohorts differ in this contribution could help in designing better immigrant selection and adaptation policies. If we define an immigrant cohort as a set of individuals who arrive in the same period and have the same level of education at arrival, we would expect differences in source country composition to be a prime source of differences across cohorts in their human capital contribution (Borjas(1987)). Referring to 3), it seems reasonable to assume that immigrants from different source countries differ in their values of H_{s0} (reflecting differences in transferability of schooling human capital to the host economy) and μ_s (reflecting systematic differences in ability).[7] Both of these elements have received considerable attention, with work as early as Chiswick(1978) emphasizing the importance of skill transferability and the line of work following Borjas(1985) emphasizing the importance of ability selection issues. Differences across cohorts might also arise from differences in speed of adaptation to the host economy, including the rate at which immigrants learn the host country language and how to implement their human capital in the host country labour market (Eckstein and Weiss(2004), Chiswick and Miller(2002), and Chiswick and Miller (2003)).[8]

Given potential differences in relative skill prices, average ability, the initial human capital stock and learning ability, different cohorts will choose different human capital investment paths,

[7] Note that parameters are not indexed by s from this point forward since our definition of cohort involves s and, hence, schooling levels will be captured in the cohort index. In the main part of our empirical work, we allow for completely separate earnings-experience profiles by schooling level, implying that all of the parameters in the underlying model vary with s.

[8] It is also possible that immigrants differ in their ability to learn, as captured in the ρ parameter above. However, differences in ρ imply earnings-experience profiles with different slopes but the same present value in these type of models so they cannot be the source of differences in the present value of lifetime earnings, which is what we define as relevant cohort effects below.

reflected in γ_0 and γ_1. As Duleep and Regets (1997, 2002) and Eckstein and Weiss(2004) point out, how these paths differ will depend on assumptions about how human capital stocks and investment time interact in the human capital production function. For example, following Duleep and Regets(2002), consider a version of the model which is simplified by having only two periods but in which we endogenize the choice of proportion of time spent investing in period 1 (I_1). Further, assume an immigrant arrives with human capital stock, H_0, and can generate new human capital according to the production function, $h = \beta_0(I_1^{\beta 1} H_0^{\beta 2})$. The latter production function implies complementarity in production between new investment time and the existing human capital stock. Given this, the present value of earnings for an immigrant equals:

$$4) \quad PV = R_1 H_0(1 - I_1) + R_2(H_2 + \beta_0(I_1^{\beta 1} H_1^{\beta 2})$$

and optimal investment is given by:

$$5) \quad I_1^* = \left(\frac{R_2 \beta_0 \beta_1}{R_1 H_0^{1-\beta 2}}\right)^{\frac{1}{1-\beta 1}}$$

Notice that the larger is β_2, the more relatively useful is human capital imported from the home country in generating host country human capital versus host country earnings. We might reasonably expect that immigrants from different host countries differ in their values for β_2. It is simple to show that I_1^* is increasing in β_2. Thus, immigrants from host countries with human capital that is more easily transferrable to learning than earning in the host country will have lower observed earnings in their first period after arrival ($Y_1 = R_1 H_0(1-I_1^*)$) because they spend more of their time investing. That investment, in turn, will imply higher second period earnings and, therefore, a steeper slope to the earnings profile. In this situation one could observe a given cohort having lower entry earnings (holding aside differences in the values for R_{st}) because of low values for average ability and transferred human capital, μ and H_0, (which would mean this is a poor quality cohort) or high values of initial investment, γ_0 (which might mean this is a good quality cohort once future, higher earnings are taken into account).

Given these issues, it might appear that our goal should be to either parameterize γ_0 and γ_1 in terms of observables or eliminate them altogether so that we can identify the non-choice (after

arrival) elements of cohort earnings profiles: μ and H_0. However, if we return to our definition of a relevant cohort effect as reflecting the amount of human capital an individual from a given cohort ultimately transfers to the host economy then γ_0 and γ_1 are also part of that effect. If two cohorts have the same values for the non-choice parameters but one (perhaps because of differential access to capital markets) invests more and ultimately creates more human capital then we would want to call the higher investing cohort a better cohort. Essentially, we want to identify which cohorts adapt better to the host economy, and that includes their human capital investment decisions.

Based on these arguments, we would like a measure of cohort "quality" that reflects the total amount of human capital implemented by a typical member of a cohort over their working lifetimes in the host economy. Of course, we want to account for the actual value of the human capital to the host economy (i.e., we do not want to count a person who was trained as a surgeon in their source country as contributing more than a person who was a janitor in their source country if both are taxi drivers in the host country). The natural measure for capturing these effects is the present value of earnings in the host country (PVEH), which, in the standard human capital model, reflects human capital actually employed in the economy, priced at the value put on it by the host economy.

III.3 The Native Born Comparison Group and Macro Effects

In a stationary macro environment, we could proceed by comparing PVEH for different cohorts. However, comparisons of PVEH values only provide a clean measure of cohort "quality" if the cohorts face the same macro environment. A common response to this is to use native born workers with the same schooling and experience as a given immigrant to benchmark macro effects. In terms of our framework, the goal would be to identify R_{st} by differencing movements in immigrant earnings relative to earnings for native born workers with the same experience and education. However, this simple approach does not work once we take account of human capital investment decisions made by native born workers. To see this, define native born cohorts as groups of workers with the same schooling level who enter the workforce in the same period. Different native born cohorts will face different R_{st} paths over their lifetime, perhaps because of differences in rates of technological change or cohort sizes. Assuming the workers can anticipate these differences to some extent, this will cause different cohorts to invest differently, i.e., to choose different values for γ_0 and γ_1. Further, native born cohorts may differ in the quality of schooling based human capital

(H_{0c}) and/or in who selects to go to school (μ_c). But if this is true then differences in native born average log earnings across different years, holding experience constant, will not identify general R_{st}'s for the economy. These differences, instead, will include differences in H_0, μ and cohort specific returns to skill, as well as differences in investment choices across cohorts.

These arguments imply that earnings patterns should differ across native born cohorts. Beaudry and Green(2000) organize Canadian data by labour market entry cohorts and find approximately 20% falls in real wages for both the high school and university educated between the 1981 and 1993 entry cohorts. Green and Townsend(2010) examine cohorts defined by when workers enter jobs, finding that successive job entry cohorts have lower wage profiles until the mid-1990s, after which both the profile intercepts and slopes rise. MaCurdy and Mroz(1995), for the US, and Gosling, Machin and Meghir (2000), for the UK, also find strong cohort patterns in earnings. Card and Lemieux(2001) examine educational wage premia in a cohort framework for the US, UK and Canada and find evidence that the premia differ according to the relative supply of university educated workers in a cohort. Thus, there is good reason to believe that we need to take account of native born cohort effects in any attempt to use the native born as a benchmark for immigrants.

Given these arguments, we need to reconsider our measure of macro effects. One way to define macro effects is in terms of what would happen to an immigrant's earnings if he were a typical worker rather than an immigrant. Having a measure of this would allow us to isolate what is special about immigrants from a specific cohort, which is our goal. Based on our discussion, we need to capture both movements in R_{st}, the pure skill prices, and also factors such as cohort size that affect a typical worker entering the labour market, immigrant or not. However, we also want to capture how the human capital investment decisions of a typical worker would respond to movements in these factors since this will allow us to isolate not only how immigrants are special in terms of their initial human capital endowments and the skill prices they face but also in terms of the investment decisions they make. Thus, the best benchmark is other workers who enter the labour market at the same time as a given immigrant cohort since their earnings will reflect both the relevant skill price movements and coincident investment decisions. In our empirical approach, we

implement this approach by matching immigrant cohorts with cohorts of native born workers entering the Canadian labour market at the same time.[9]

III.4 Introducing Age at Migration

We have implicitly conducted the discussion to this point in terms of immigrants who migrate just after leaving school, so that x measures both experience in the host economy and experience more generally. Immigrants migrating at older ages will have initial human capital, H_0, that reflects not only the transferability of schooling acquired human capital but also that of human capital acquired through experience in the source country. They will also likely have different selection terms (μ's) because the decision to migrate at age 40 is different from that at age 25. Further, with less time to reap the rewards of human capital investment in the source country and with different amounts of initial human capital, older age-at-arrival immigrants will make different investment decisions. For all of these reasons, all the parameters in 3) should be indexed by age at migration, and in our empirical analysis we allow earnings profile parameters to differ by age at migration. This fits with other studies that have investigated age-at-arrival effects for immigrants (e.g., Friedberg(2000) and Schaafsma and Sweetman(2001)).

Of course, we also need to decide on a benchmark group for the older migrants. Using older cohorts of the native born seems inappropriate because, in contrast to immigrants, they may have virtually stopped investing and so their earning paths will not present skill price paths through the

[9] Inspection of 3) indicates that differences between immigrants and the native born in the same cohort may move because of differences in ability and initial human capital stocks across native born cohorts. This may not be desirable since these terms reflect features of the native born earnings experience that are not what one would expect immigrants to experience if they were not immigrants. However, the cross-cohort variation in these factors may be small. We investigated this using literacy differentials across native born birth cohorts from the 1995 Canadian version of the International Adult Literacy Survey (IALS). In the IALS, sample respondents were asked both labour force survey questions and given literacy tests designed to capture quantitative, reading, and document interpretation skills. We ran separate regressions of the average of the respondent's scores on the literacy tests on age for high school, post-secondary, and university native born, male graduates. Since the IALS is a cross-section, age corresponds to birth cohort. The estimated coefficient on age is not significant at conventional levels for any of the education groups. If we assume that adult literacy reflects a combination of innate ability and schooling outcomes then this result indicates that there are no significant differences across native born cohorts in ability and initial human capital stock (at least as they relate to cognitive skills). Thus, differences in earnings across native born cohorts will reflect differences in what we are trying to isolate: cohort specific prices and investment behaviour.

lens of investment. We believe that, for this reason, older immigrants should still be matched to the cohort of native born workers entering the host labour market at the same time. To investigate whether using younger workers as a benchmark is likely to create biases, we rearranged our samples of native born workers by job tenure. In particular, we calculated average annual earnings for males with less than 1 year of job tenure in the period 1981-82 and then did the same for males in the 1993-97 period.[10] In each case, we calculated average earnings separately by twelve possible education/age groups defined by our three education categories and the four age ranges, 25-29, 30-34, 35-39, and 40-44. This provides us with a picture of the experiences of new job entrants of different ages in the early 1980s and in the mid 1990s. Using these averages, we calculate that average annual earnings for males aged 25 to 29 with a high school education and one year or less of job tenure fell by 9.6% between the 1981-82 and the 1993-97 periods. The same figure for 35 to 39 year old high school educated males is a fall of 9.2% and for 40 to 44 years olds, a fall of 7.2%. For the university educated, the average annual earnings of 25 to 29 year olds with less than one year of tenure fell by 6.8%, those of 35 to 39 year olds fell by 7.3% and those of 40-44 year olds fell by 14.8% between 1981-82 and 1993-97. Thus, within each education group, annual earnings for new job starters fell by about the same amount for different age groups, with the exception of the oldest university educated workers. Our conclusion is that using the youngest native born job starters as a benchmark will not generate biases for the high school educated. Even for the university educated, the relatively larger decline for new entrant older workers is dwarfed by the size of the cohort effects we report in Section IV.[11]

III.5 Implications of Return Migration

We do not explicitly account for the possibility of return migration or onward migration to a third country in our analysis. Using the IMDB data, Aydemir and Robinson (2008) estimate the five-year emigration rate of immigrants in Canada to be approximately 24 percent. To the extent this

[10] We know weeks worked in the previous year and use this to pro-rate the reported earnings so that they are on an annualized basis.

[11] Potentially, we could use this data to construct "job entry" cohorts, i.e., groups of workers who started their jobs in a given period. Older job starters could then be used as a benchmark for older age-at-arrival immigrants. However, tenure is not reported as a continuous variable in the public use version of the SCF, making such an exercise impossible.

emigration is not random with respect to earnings, this weakens our interpretation of wage profiles as reflecting human capital investment. Picot and Piraino(2011) investigate this issue using a longitudinal Canadian tax dataset and find that while lower earning immigrants are more likely to leave a sample of workers with positive earnings, the same is true for native born workers, and the resulting impact on the earnings gap between immigrants and matched native born workers is minimal. Whether emigration affects our conclusion about cohort patterns depends on whether it has differed over time. Aydemir and Robinson (2008) show that emigration differs systematically by source country, education level, and the unemployment rate at time of arrival. Since we control for all of these dimensions in our estimation, the impact of emigration on our estimated patterns will be lessened. Whether there are further effects through trends in unobservables is unclear.

IV Empirical Specification and Main Results

IV.1 Regression Specification

Based on the discussion in the previous section, we adopt an estimating equation given by:

6) $$y = \beta^N_{0c} + \beta^N_{1c} YSE19_{jt} + \beta^N_{2c} YSEG9_{jt}$$

$$+DIMIG * \{\sum_{k=1}^{K} D_{ck} * \left(\left(\omega^I_{0ck} + \omega^I_{2ck} YSE19_{jt} + \omega^I_{3ck} YSEG9_{jt}\right)\right)\} + u_{tck}$$

where, k indexes age at arrival, j equals year of entry, $YSE19_{jt}$ and $YSEG9_{jt}$ define a spline in years since entry defined so that β^N_{1c} is read as the slope for the first 9 years and β^N_{2c} is read as the slope for years 10 and beyond,[12] DIMIG is a dummy variable equaling one for immigrants and the D_{ck}=s are dummy variables taking values of one for immigrants in age at arrival group. This specification allows for a different profile for each cohort for natives and each cohort x age at entry group for immigrants. Note that the β parameters correspond to a combination of experience, cohort and year effects for natives. As is well known, the identity x = t - c for a given s, implies that these effects cannot be separated without further identifying assumptions. However, we do not need to achieve that identification to meet our goal of identifying the immigrant specific profiles and, so, do not try.

In the actual implementation of 6), we run separate regressions for each of four immigrant age at arrival groupings: 25-29, 30-34, 35-39 and 40-44. In each case, the immigrant data is pooled

[12] In particular YSE19 = YSE if YSE<9 and equals 9 if YSE∃9. YSEG9 = 0 if YSE<9 and equals YSE-9 if YSE∃9, where YSE is years since labour market entry.

with data from native born workers who are in one of the seven cohorts defined earlier (i.e., we do not use native born workers who entered the labour market before 1981). For regressors, we include a full set of cohort dummies, the YSE spline variables defined earlier, interactions of the YSE variables with the cohort dummies, the de-trended unemployment rate, and interactions of all of these variables plus the intercept with an immigrant dummy variable. We estimate two versions of 6). In the first (used in Tables 1, 2 and 3), we pool all education groups and capture their differences with simple intercept shifts. In the second (used in all the remaining analysis in the paper), we run 6) separately for each of the three education groups.

IV.2 Main Results

IV.2.a Native Born Results

We present the results for the native born cohort profiles in the first column of Table 1.[13] The results reported here correspond to a somewhat restricted specification in which education groups are pooled and allowed to differ only in the intercepts of their earnings profiles. We also estimated a more general specification in which equation 6) is implemented separately for each of three education groups: high school graduate or less; post-secondary less than university; and an undergraduate degree or more. This more general specification underlies the decomposition exercise later in the paper but here we discuss the more restricted specification in the interests of brevity.

A comparison of the results in column 1 with Figure 1 indicates that native born and immigrant new entrants experienced broadly similar cross-cohort earnings patterns, but with the magnitudes being larger for the foreign born. In particular, the 1990s native born cohorts have lower labour market entry earnings than their 1980s counter-parts, with the 1997-99 cohort having entry earnings that are over 25% lower than those for the 1980-82 cohort. As with the immigrants, however, these declines are offset by higher earnings growth rates after entry for the cohorts entering the labour market after 1990. There is also some evidence of a turnaround in the downward trend in entry earnings for the very last cohort. As discussed earlier, patterns for the native born are

[13]The SCF and SLID surveys are not perfectly representative and the survey weights were used in all regressions.

very similar to those reported in Beaudry and Green(2000) and Green and Townsend(2010) for Canada and MaCurdy and Mroz(1995) for the US.

IV.2.b Immigrant Results

In the remaining columns of Table 1, we present the estimated (ω) coefficients on the interactions of the immigrant dummy variable with cohort, YSE, and de-trended unemployment rate variables. Each column in the table corresponds to a separate regression run for a different age at arrival group, listed at the top. In each case, the immigrant group is pooled with all native born entry cohorts and the native born coefficients are given in column 1.

The results for all four age at immigration groups indicate larger declines in entry earnings compared to those experienced by native born new labour market entrants. All of the age groups also share a common pattern in which their changes in YSE slopes across cohorts are the same as those for the native born with the sole exception of the very last cohort. For that cohort, there is a much steeper YSE slope for immigrants, though this should be treated with caution since it is based on a small number of data points. The education coefficients indicate that younger immigrants experience a larger university premium (relative to the post-secondary-less-than-BA base group) than the native born but little difference in the penalty to having only a high school education while the opposite is true for the oldest age group. Finally, immigrant earnings are more cyclically sensitive than those of their native born counterparts, fitting with McDonald and Worswick(1998).

Perhaps the most interesting aspect of Table 1 is the patterns across age at entry groups. For ease of examination, we form fitted differences between entry year earnings for immigrants and the native born using the coefficients in Table 1 and plot those differences in Figure 2. In the 1980-82 cohort, the youngest age group faced a 12% short fall in initial earnings compared to native born new entrants from the same cohort. Meanwhile, those aged 40-44 had entry earnings that were 9% higher than the young native born entrants. The extra 15 years of foreign labour market experience was associated with 20% higher earnings. Across cohorts, though, the foreign experience difference evaporates, changing to 14% for the 1987-89 cohort and actually becoming negative for the last two cohorts. The finding that the foreign experience profile had become flat by the 1990s fits with Friedberg(2000)'s results for Israel, but for Canada this represents a shift from earlier periods.

Patterns in the returns to Canadian labour market experience for immigrants are also of interest. For all cohorts except the last, the return to Canadian experience is higher for younger than older entrants. Recall that these estimates represent differences relative to the experience of native born labour market entrants. Thus, these estimates plausibly suggest that younger immigrants make a similar investment in skills in Canada and receive a similar return in consequence when compared to their native born counterparts. In contrast, the oldest age group in the early cohorts was apparently able to transfer the value of their foreign experience to Canada and this, plus the fact they were older and had less time to realize returns on human capital investments, may have induced them to invest less. Indeed, the overall YSE profile for the oldest age at entry group (obtained by adding the YSE($t<9$) coefficient from first column to the same coefficient in the last column of Table 1) is essentially horizontal.

Finally, the youngest entry groups are more sensitive to cyclical variation than comparable native born workers. The cyclical effect diminishes with age to the point where the oldest group experiences cycle effects in a manner nearly identical to native born new labour market entrants. Thus, older immigrants are almost certainly more sensitive to the cycle than older native born workers. This supports claims that a defining feature of immigrants of all ages is their greater flexibility in reaction to labour market conditions (e.g., Green(1999)).

IV.3 Calculating Present Values of Earnings

Given the estimates of the cohort specific earnings profiles from equation 6), we are now in a position to calculate PVEH, the present values of earnings streams. We can calculate PVEH for a cohort by projecting cohort average earnings using the estimated intercept and YSE coefficients for the cohort and then taking the present value. The difficulty with this approach is that it requires us to put faith in profiles that are projected a long way out of sample for recent entry cohorts. This problem is highlighted by our spline specification, where there would be no way to obtain an estimate of the slope of the second branch of the spline for cohorts observed for less than 10 years.

We propose to use a concept from Mincer's 1974 analysis of empirical human capital models: the present value equivalent constant earnings level, which we will call, y_e. The idea is simple but very useful: for any earnings profile $y(x)$ and its associated present value there exists a level of annual earnings, y_e, paid out every year of the working life, which provides the same

present value (where both present values are calculated using the same discount rate). In earnings-experience space, the constant earnings path corresponds to a horizontal line at height, y_e, which crosses the upward-sloping y(x) line at a number of years of experience, x*. Thus, if we know x*, we can obtain $y_e = y(x^*)$. Then, we can calculate the appropriate present value using y_e.

This approach would be no different from simply calculating the present value from projected profiles if we chose a different value of x* for each possible earnings profile (letting it vary with the different estimated slopes). We actually use one common x* value for everyone in the same age group and evaluate the present values using that value. As we will describe, we choose the common x* based on an analysis of the earnings profiles we see in the native born data. An alternative would be to calculate x* for each profile, using a prediction for the slope of the upper part of the spline based on the estimates from earlier cohorts for those cohorts not observed for long enough to permit a direct estimate of that slope. The difficulty with this approach is that x* would move with the estimate of the slopes of the spline segments – estimates which tend to be poorly defined for cohorts observed for short time periods. This would serve to amplify the variability of PVEH estimates across cohorts in a way that does not arise when we use one common x* value. Thus, the advantage of the single value approach is that we get a relatively well defined representation of the present value of lifetime earnings even for the most recent cohorts that permits less noisy comparisons across cohorts. The potential disadvantage is that if the true x* for a cohort is not close to our common value then we will misrepresent the PVEH for that cohort.

The key question in implementing this approach is what value to choose for x*. It is easy to show that if y(x) is linear and increasing in x then $x^* = (1/r)$, where r is the discount rate. However, as Mincer points out, if the second derivative of y(x) is negative then x* will be less than (1/r). In our spline specification, the first step in finding x* is to derive the formula for the present value of our tied-spline earnings profile, taking account of the fact the person has a fixed working life, T. We then set this equal to the formula for the present value of earnings for a flat profile, $y_e(1 - e^{-rT})/r$. Finally, we solve for y_e and set it equal to the formula for the lower branch of the spline profile. Rearranging yields a cross-over value for experience given by,

$$7)\ x^* = \left(\frac{1-e^{-rJ}}{1-e^{-rT}}\right) * \frac{1}{r} - \left(\frac{e^{-rT}}{1-e^{-rT}}\right) * J + \frac{\alpha_2}{\alpha_1}\left[\left(\frac{e^{-rT}}{1-e^{-rT}}\right) * (J-T) + \left(\frac{e^{-rJ}-e^{-rT}}{1-e^{-rT}}\right) * \frac{1}{r}\right]$$

Where J is the knot point of the spline profile, α_1 is the slope of the branch of the spline for x<J, and α_2 is the slope of the branch for x≥J.[14]

To establish a plausible value for x* we use the average estimated values for α_1 and α_2 for the 1980s native born cohorts (the ones we observe the longest) and set J=9 as we do throughout our estimations. Inspection of equation 7) indicates that x* will then vary with T (time until retirement) and r (the discount rate). Given that we observe our cohorts starting at age 25, we assume a value of T=40 and, therefore a retirement age of 65, for all of our native born cohorts. For the immigrant cohorts we use T=40 for those in the 25 – 29 age at arrival group but values of 35, 30 and 25 for the 30-34, 35-39 and 40-44 age at arrival groups, respectively, in order to capture the fact that the latter groups have less time to generate earnings in Canada.

Mincer argues for setting r=0.1 on the basis that this matches typically estimated rates of return on human capital, implying in our case that the present value of earnings can be viewed as the human capital asset an individual brings to the Canadian labour market. One could argue, in this case, that a return of 0.1 reflects what individuals need in response to the riskiness of the schooling investment. However, policy makers in the receiving society should view human capital investments as one of a set of investments with independent risks, implying that they would likely choose a lower discount rate. The Canadian Treasury Board Secretariat requires a discount rate of 0.08 for evaluating federal government projects but Boardman et al(2008) argue that this is too high. An alternative would be to use a standard after-tax return on private investments of 0.02. We focus on a discount rate of 0.06, which lies in the middle of these possibilities, but assess the sensitivity of our result to different discount rates in section V. With T=40 and r=0.06, the implied x* for the native born cohorts is 8.4 years and the values for the immigrant cohorts range from 7.2 for the 40-44 age at arrival group to 8.4 for the age 25-29 group.

14 If the x* value generated in this way is greater than J then we use the formula for the upper section of the spline rather than for the lower section in generating the final value for x*.

One question of interest is the sensitivity of x* to variations in values for T and r. We provide a range of values for x* under different combinations of T and r in the web appendix Table A1. As we just noted for the immigrant arrival groups, x* is relatively robust to variation in T, varying from 7.2 to 8.4 as we vary T from 25 to 40 with an r of 0.06. It shows more variation with r, however, as x* varies from 12 when r = 0.03 and T=40 to 6.8 when r = 0.1 and T=40. We prefer r=0.06 both for the reasons just mentioned and because it implies that more recent cohorts are included in the analysis. We assess the robustness of our results to different values of r in section V. Finally, it is worth noting that when we use the estimated α_1 and α_2 values for immigrants from the 1981-83 cohort who arrived at age 25 to 29, the implied x* is 8.9. Thus, the single value of x* = 8.4 that we use for the native born and the youngest age at arrival cohorts does not imply a large distortion for immigrant cohorts for which we can calculate the x* number directly.

IV.4 Comparing Present Values of Earnings

IV.4.a Native Born

Using the method just outlined, we calculate the differences in PVEH for the different native born cohorts relative to the first (1980-82) cohort and present the resulting values in the first column of Table 2.[15] This set of values is interesting, in part, because it reveals the importance of making the present value calculation. Based on the estimated coefficients on the cohort dummies in the first column of Table 1, entry earnings for the native born cohorts fall nearly continuously across the cohorts and reaches a difference in entry earnings between the 1997-99 cohort and the first cohort of -.33 log points. Because of the offsetting increase in the profile slopes for later cohorts, that translates into virtually no difference in PVEH between those two cohorts. According to our arguments earlier, the U-shaped pattern in PVEH values across native born cohorts seen in Table 2 is the appropriate trend to benchmark general macro conditions for new-entrant immigrant cohorts.

IV.4.b Immigrants

In the remaining columns of Table 2, we present the differences in PVEH values between a given entry cohort and the 1980-82 cohort for each age at entry group. For the 25-29 age-at-arrival

[15] We could also present a PVEH for the 2000-2 cohort but do not do so here or in the rest of the paper because these estimates tend to be erratic as a result of the short time span for estimating profile slopes for that cohort. Part of generating the log PVEH values involves adjusting for the remaining working life. In particular, we add ln((1 - exp(-rT))/r) to the log earnings value at the cross-over point.

group, the pattern reveals a .21 log point decline across the 1980s followed by a further .13 log point decline across the 1990s. As with the native born cohorts, this pattern is a substantial departure from what happens with entry earnings. In particular, adding the coefficients for the relevant cohorts in the first two columns of Table 1, the 1987-89 cohort has entry earnings that are .33 log points lower than the 1980-82 cohort while the 1997-99 cohort has entry earnings that are .63 log points lower. Thus, focusing on PVEH values makes the downward trend in immigrant outcomes less dramatic – though still substantial. Moreover, it draws attention to the importance of the increases in the slope of the earnings profiles that have been offsetting declines in entry earnings across recent cohorts. Based on Table 1, though, these slope increases are almost exactly the same as for recent native born cohorts: there is no added increase for immigrant cohort slopes to match their greater decline in entry earnings.

Examining the remaining columns in Table 2, the various age-at-arrival groups experience quite similar declines in PVEH across the 1980s. Over the 1990s, however, older age-at-arrival immigrants fall farther behind, with their relative decline increasing in age. The PVEH value for the 40-44 year old arrivals in the 1997-99 cohort is .82 log points (or 56%) below that for the same age arrivals in the 1980-82 cohort while the same comparison for the 25-29 year old arrivals reveals a .34 log point (or 29%) decline.

We can also use these numbers to understand the role of macro trends in the general declines in immigrant cohort outcomes. With the present value of native born earnings declining by 6.5% between the 1980-82 and 1987-89 cohorts and PVEH for immigrants in the 25-29 age at arrival group falling by 19% (or .21 log points) across these cohorts, this implies that just over a third of the immigrant decline in the 80s can be accounted for by a fall in earnings for all new entrants. In contrast, while PVEH improved across the 90s native born cohorts, cross cohort movements for immigrants continued to be negative. Thus, while general new entrant patterns provide an important explanation for the immigrant experience in the 80s, they appear less useful for explaining the 90s.

IV.4.c Comparisons Between Immigrants and the Native Born

In Table 3, we present the differences in PVEH values between immigrant entry cohorts and the matching native born cohorts (again, expressed in log points), broken down by immigrant age at arrival. Since they are based on the Table 1 estimates, they again correspond to a specification

where education groups are pooled and education differences are captured as intercept shifts. These figures correspond to the outcome for each immigrant age-at-arrival/cohort group, netting out macro trends as represented by native born new entrants. Thus, from the first column of the table, immigrants from the 1980-82 cohort who are age 25-29 at arrival have a present value of lifetime earnings that is 0.20 log points or about 18% less than (and statistically significantly different from) that for native born workers from the 1980-82 cohort. From the third row in that same column, young immigrants entering in 1987-89 have a PVEH that is 29% (0.34 log points) lower than native born workers from the same cohort. Comparing this to the 1980-82 difference indicates immigrant earnings fell by 11% more across the 1980s cohorts than the fall across the same native born cohorts. This is our measure of the decline in cohort "quality" over the 1980s, netting out general macro movements. For the 1990s, there is a further decline of 0.18 log points, or 16%. In section V.1, we compare these results to estimates from more standard specifications.

Perhaps the most striking feature of the results for the older age at entry groups in the remaining columns of Table 3 is their size, particularly in the later cohorts. For immigrants aged 40-44 at arrival in the 1997-99 cohort, for example, their PVEH value is 67% (1.12 log points) lower than the matching native born new entrants. This partly reflects the fact that the older arrival groups are assumed to have fewer working years in Canada. If the 40-44 year old arrivals in the last cohort had the same number of years left to contribute in the labour market as the native born comparators, the difference in the PVEH values would be 60% below that of the 1980-82 native born cohort. The large negative values for the older age-at-arrival groups have important implications for selection policy. Over and above this, though, we can also ask how the older groups are doing in terms of their patterns over time. Here, the answer is much the same as for the 25-29 age at arrival group: for the 1980s they show declines of about .2 log points after netting out macro trends, with about a third of their total decline being attributable to general declines for new entrants. However, after 1990, when the native born new entrant PVEH values improve, all immigrant age groups show declines and those declines are worse for the oldest age-at-arrival groups. This fits with the evaporation of the returns to foreign experience described earlier. It is worth noting that when we estimate separately by education group, new entrant effects account for a larger portion of the 1980s declines for all age groups. Indeed, they account for at least 2/3 of the declines for all age groups for the high

school educated. We do not report this full set of results here for brevity, but they underlie the decomposition results in section VI where the stronger new entrant effects are evident.

V Comparison to Previous Approaches and Robustness Checks

In this section, we compare the results from our preferred specification with those derived from other specifications commonly used in the literature.

V.1 Specifications

The first, more restrictive specification is:

$$8)\ y_{jtks} = \alpha_0 + \alpha_1 EXP_{jtks} + \alpha_2 EXP_{jtks}^2 + \alpha_3 EDN_s + \alpha_4 DIMIG$$
$$+\alpha_5 YSE19_{jt} + \alpha_6 YSEG9_{jt} + \psi' DCOH_j + \xi' DYR + u_{jtks}$$

where: t , j, k and s are the survey year, the year of entry to the Canadian labour force, the age at time of entry, and the number of years of schooling, respectively; the α=s are individual parameters and ψ and ξ are parameter vectors; experience (EXP) is defined as (t - j + (k – s)), with s being years of schooling and (k-s)=0 for natives; DIMIG is an immigrant dummy variable; YSE is years since entry for immigrants and equals (t-j) for immigrants and 0 for natives; DCOH is a set of dummy variables corresponding to immigrant entry cohort; DYR is a set of dummy variables corresponding to the current calendar year; and u_{jtks} is an error term. Movements in native born earnings over time identify the experience and year effects, while differences between immigrant and native born earnings identify the immigrant cohort effects and years since entry profile.

This specification can be derived from equation 6) by imposing the following restrictions: i) there are no cohort effects for native-born workers; ii) earnings-experience profiles differ across education groups only in their intercepts; iii) macro events affect all workers, regardless of education, experience or immigrant status, in the same way; iv) immigrants earn the same return to experience and education acquired in the source country as that earned by native born workers for Canadian experience and education; v) all immigrants, regardless of education or foreign experience, face the same relative differences in entry earnings across cohorts; and vi) all immigrants, regardless of education, foreign experience or cohort, face the same earnings assimilation path (apart from the intercept). We will test this set of restrictions with our data.

Another common estimation strategy (used by, for example, LaLonde and Topel(1992)) involves estimating separate age-earnings profiles for each Census. Allowing age effects to vary

over time in this way is equivalent (subject to restrictions implied by the form for the age polynomial) to allowing for birth cohort effects, and thus this approach too implies a matching of immigrant and native born workers from the same birth cohort.[16] This approach differs from the specification in 6) only because we match immigrants and native born workers by labour market entry cohort rather than birth cohort. Most noticeably, immigrants who are older at arrival are matched to young native born workers entering the Canadian labour market at the same time. In section III, we argued for this type of matching based on a lifecycle human capital framework. This choice of comparison group is an identifying assumption that cannot be tested.

V.2 Estimation Results

We present the results from the alternative specifications in Table 4. The first two columns of Table 4 contain results from estimating 8) and a variant of 8) in which the slope of the first branch of the immigrant YSE spline is allowed to vary by cohort. As with the earlier estimates, the dependent variable actually consists of year×cohort×education×age-at-arrival cell means obtained from first stage regressions that included provincial dummy variables. These regressions are based on a sample in which we pool all the native born observations for the years 1981-2003 (i.e., all native born workers aged 25 to 65 in each year) and all the immigrants available in the IMDB (i.e., all the immigrants who arrived after 1980. We include education dummy variables, experience (constructed according to the standard Mincer equation) and experience squared for the native born. For immigrants, we include these same variables plus an immigrant dummy variable, a full set of cohort variables, and the spline in YSE, described earlier. We also include a full set of year dummies to capture overall trends in the labour market.

The results in the first column of Table 4 indicate that male real average earnings fell precipitously in this period for all workers: falling by .28 log points from 1981 to 1993 and then improving somewhat thereafter. Nonetheless, immigrant entry earnings dropped even faster: by .65 log points, relative to the overall trend, from the first cohort to the last. However, the results from the second specification, in which the YSE profiles are allowed to differ across cohorts, are much like

[16] Equivalently, Borjas(1995), for example, presents tables matching birth cohorts of immigrant and native born workers across US Censuses

what is observed in Figure 1: the 1990s cohorts have much lower entry earnings and much higher post-arrival growth rates than earlier cohorts. We can capture the net effect of these changes using PVEH calculations for the immigrant cohorts. We do this using r=0.06 and an x* of 7.7.[17] This results in PVEH values (relative to the value for the 1980-82 cohort) of -.25, -.24, -.40, -.36 and -.31 for the 1983-86, 1987-89, 1990-92, 1993-96, and 1997-99 cohorts, respectively. Thus, shifting to present values in this case alters the picture from one of dramatic decline in the 1990s as depicted in the entry earnings (i.e., cohort dummy coefficients) to one where all cohorts are somewhat similar in the extent to which they lag behind the 1980-82 cohort.

Column 3 of Table 4 contains estimates from our specification (equation (6)) with dummy variables included to capture the education level and estimated over the pooled sample for all immigrants (rather than broken down by age at arrival) in order to allow a direct comparison with the more common specifications. Since the immigrant dummy variable is fully interacted with all other covariates in this specification, we need only report the estimates from estimating with immigrants alone. The relevant comparison is again the native born estimation organized by cohort in the first column of Table 1 and, again, we use PVEH values based on r=0.06 and x*=7.7. To take out macro trends as captured in native born earnings, we difference calculated PVEH values relative to those for the matching native born cohorts. If we then difference these trend corrected estimates relative to the 1980-82 cohort, the resulting cohort differences (in log points) are -.21, -.22, -.40, -.51, -.55 for the 1983-86, 1987-89, 1990-92, 1993-96 and 1997-99 cohorts, respectively. These differences are very similar to those calculated from the standard specification in column 2 up to the 1990-92 cohort but show much larger negative differences for the 1993-96 and 1997-99 cohorts. Recall that in the 1980s, the native born and immigrant entry cohorts shared similar patterns but in the late 1990s, the native born entry cohorts experienced improved PVEH values while the new immigrant cohorts continued to decline. The standard specification does not focus on native born new entrants as the comparison group and so misses the turnaround in outcomes for new entrants in general. Thus, this table shows both that using PVEH and using native born new entrant cohorts to capture macro trends matters.

[17] We choose 7.7 because the average age at arrival for immigrants is approximately 35 and our calculated value for x* with 30 years until retirement is 7.7.

V.3 Robustness to Choice of Discount Rate

One key point of interest with the present value approach is the sensitivity of results to our choice of r, the discount rate. In the web appendix, we present alternative versions of Table 3 (Tables A2 and A3) in which we employ a discount rate of 0.1 (Mincer's preferred rate) and 0.02 (a commonly used real interest rate). The choice of discount rate has its largest impact for the older age-at-arrival groups since a lower discount rate puts more emphasis on the fact that these workers have a short horizon until retirement. For example, for the 40-44 age at arrival group in the 1990-92 cohort, the PVEH difference relative to the native born comparison group takes values of -1.0, -0.78 and -0.63 log points for r = 0.02, 0.06, and 0.1, respectively. In contrast, the differences for the 25-29 age at arrival group are small, with the PVEH difference equaling -.52, -.49 and -.48 for the same cohort and the same r values, in order. The general patterns in the tables are also the same, with declines in PVEH values in the 1980s followed by even strong declines in the 1990s and the 1990s being particularly bad for older age-at-arrival immigrants. Thus, our main conclusions stand up to changes in r, though some of the magnitudes change.

V.4 Robustness to Choice of Native Born Comparison Group

As argued above, we believe that the best comparison group for a cohort of new immigrants is the native-born new entrants who entered the labour market at the same time. However, if matched immigrant and native born cohorts are systematically different in characteristics that are related to responses to macroeconomic events then the native born cohorts may be a poor comparison group. One potentially important difference in this regard is in the occupational distributions of the native born and immigrant cohorts, which are particularly likely to differ between older age at arrival immigrant groups and new-entrant native born workers. We attempt to assess the importance of any such differences by effectively constructing a set of alternative native born comparison groups, each with the same occupational distribution as a given age-at-arrival/entry cohort immigrant group. In particular, we do this within the three education groups so that we match the native born occupational distribution for a given cohort/education level combination to the immigrant occupational distribution for the corresponding cohort and education level. To do this, we construct the proportions of native born workers in each of 14 broad occupation groups for each cohort and education level at 3 to 6 years after arrival in Canada. We then obtain the proportions of

immigrants in each of these occupation groups for each cohort/education grouping. For a given cohort/education combination, we take the ratio of the immigrant proportion to the corresponding native born proportion for each occupation.[18] Using these proportions, we rescaled the weight variable in the first stage regression analysis for the native born then re-estimated the second stage regression model which is equivalent to the first column in Table 1. For example, consider the case of men in the 1990-92 cohort with a university degree. The percentage of immigrant men who were in the Professionals occupational category was 35% while the corresponding figure for native born men in this cohort/education group was 50% resulting in a ratio of 0.7 (used in the re-weighting of the native born first stage observations for this cohort/education group). Next, we re-calculate the PVEH values in Tables 2 and 3. Comparing these results to those without the re-weighting, we find small differences between the two. Based on this, we conclude that our results are not sensitive to the comparison group, at least in this dimension.

VI Investigating Determinants of the Cohort Patterns

Our focus now turns to explaining the immigrant earnings patterns described to this point. We are interested in understanding the substantial declines in immigrant PVEH values across the 1980s and the even more substantial declines in the 1990s. It already appears that the pattern of declines in earnings for all new entrants provides part of the answer for the 1980s but we would like to quantify that contribution.[19]

[18] Problems with occupation coding in the IMDB and SCF/SLID meant that we had to carry out the exercise with Census data. We re-estimated our Table 1 specification with and without the occupational re-weighting to see the effect of the latter. Complete details on this exercise and the resulting estimates are available in the Web appendix.

[19] In an earlier version of the paper, we investigated the explanatory power of changes in the entry class composition of immigration. However, the composition shifted toward the skills assessed entrants and the latter had higher earnings than other entrants and a similar cross-cohort time pattern to what we present here for all immigrants. Shifts in composition toward a group who have higher earnings but similar over time patterns cannot explain a general pattern of decline, and we have chosen not to present the entry class results here for brevity.

VI.1 The Role of Shifts in the Country of Origin Composition

Shifts in the source country composition of immigration toward countries where the skills acquired in the labour market may be harder to match to the Canadian labour market provide a potentially credible explanation for the cross-cohort patterns. Table 5 contains the proportion of immigrants in our sample who are from the US, the UK, Australia or New Zealand by cohort and education level. We chose this grouping to highlight a set of source countries from which it would likely be easy for immigrants to transfer human capital.[20] While the proportions vary across education levels, the pattern is much the same in each column: the proportion of immigrants from these English countries falls by about 50% from the first to the last of the 1980s cohorts and falls further, though at a slower rate, over the 1990s. Thus, shifts in country composition may be useful in explaining the 1980s declines in entry earnings and, to some extent, the 1990s shifts as well.

A necessary condition for shifts in source country composition to be important is that the earnings outcomes differ across country. To check this, we re-estimated equation 6) for three source country groups: English (US, UK, Australia and New Zealand); North-Western Europe (France, Germany, Holland, Denmark, Belgium, Switzerland, Sweden, Norway); and Others. We estimated 6) separately for each of our three education groups for each source country grouping. Rather than presenting the extensive set of resulting parameter estimates, we summarize our results by recreating Figure 2 for each source country/education group to show how entry earnings patterns differ and recreating Table 3 for each group to show how PVEH results differ by source region. The results for the North-Western European group are somewhat erratic, perhaps due to a smaller underlying sample size, and we do not report them here in order to save on space.

We begin by considering the English source country group. Figures 3a and 3b show the entry earnings for various cohort × age at arrival groups for the high school and the university educated, separately. The height of the bars in this graph can be used both to see cross-cohort movements in entry earnings and to examine movements in the foreign experience profile. Cross-cohort movements in entry earnings for the youngest age at arrival group can be seen in the left-most bar in each cohort grouping. For the high school educated, these bars indicate that these immigrants had cross-cohort earnings patterns that closely matched those of other workers entering the mature

[20]The proportion of immigrants from these countries in our sample are higher than those seen in tables on the source country composition of the total immigrant inflow because we select for prime-age males who have positive earnings and because immigrants from other source countries tend to have larger accompanying families.

labour market at the same time up to the 1993-96 cohort. However, the last two cohorts of immigrants show substantial relative declines in entry earnings. Comparing the earnings of the youngest and oldest age groups in each cohort suggests that a positive foreign experience profile exists in all cohorts but with a smaller differential in more recent cohorts. Similar general patterns are evident for the university educated in Figure 3b: the youngest cohort maintains a relatively constant advantage over matching native born cohorts for all cohorts except the last; and the slope of the foreign experience profile remains strongly positive until the last two cohorts when it becomes flat or even negative.

The entry earnings for the immigrants from the rest of the world (shown in Figures 4a and b) have lower entry earnings in most age groups and have much flatter foreign experience profiles even in the earlier years. By the last three entry cohorts for both education groups, the immigrants from this region actually face a strongly negatively sloped foreign experience profile. Thus, shifts in composition toward this latter group will generate both lower overall entry earnings and a tendency for the overall foreign experience profile to flatten. But the flattening of the foreign experience profile is not due solely to this: immigrants from all regions face some such flattening, particularly in the last three cohorts. One interpretation of these patterns is that the Canadian labour market has always placed little value on foreign experience from non-English speaking countries outside Europe and that changes in the 1990s reduced the valuation of foreign experience from all countries.

Table 6 contains differences in PVEH values between high school educated immigrants and the native born broken down by region of origin. Comparing the patterns in this table to those in the preceding figures tells us something about how post-arrival earnings growth differs across age and region groups. For the English region immigrants in the first cohort, for example, the PVEH for the oldest group is roughly double the value for the youngest group. In comparison, Figure 3 shows that the entry earnings of the oldest immigrants were over four times those for the youngest group. The difference between entry earnings and PVEH values reflects the fact that the youngest immigrants have much stronger post-arrival growth rates as well as that the oldest group's value is calculated over a much shorter remaining work time. The same pattern is observed for North-West European immigrants in the first cohort (not shown here): a positive age differential in entry earnings converts into a flat age profile in PVEH. For immigrants from the rest of the world, this same effect converts a flat age at arrival profile in entry earnings into a negatively sloped profile in PVEH.

The PVEH values move sporadically across cohorts for the English immigrants, making it

difficult to make generalizations, though the numbers are often positive. For the two older age at arrival groups, though, there is a trend toward lower PVEH values across cohorts. For immigrants from the rest of the world, there is little change in PVEH across the 1980s but sharp drops from the last cohort of the 1980s to the first of the 1990s and continuing drops thereafter. Thus, the PVEH values reflect the same difficulties with recent immigrant cohorts as are evident in the entry earnings. In fact, the present values show even more decline than the entry earnings after 1990, implying that for more recent immigrant cohorts both their entry earnings and their post-entry earnings growth are falling behind in relative terms. This should be a point of some concern. Similar patterns are evident in results for the university educated presented in Table 7. Once again, the post-1990 cohorts are faring much worse.

VI.4 Decomposing the Cross-Cohort Movements in PVEH

The results in the previous sections imply that both general new entrant effects and shifts in the source country composition of immigration provide potential explanations for shifts in immigrant earnings across cohorts. We turn now to a simple Oaxaca type decomposition to get a measure of the relative importance of these forces. Specifically, we ask the question: What percentage of the cross cohort decline in PVEH for immigrants can be explained by the cross cohort changes in: 1) the PVEH for the native born, 2) the immigrant source country composition, 3) the distribution across age at arrival groups, and 4) the educational composition for immigrants?

In this exercise, we first use native-born estimates from our entry cohort specification and versions of Table 1 that are broken down by the three source country groups to form fitted PVEH values for a set of cohort × age at arrival × source country groups and we do this separately by education level. This is the most flexible specification estimated in the paper since it allows for completely separate estimation by each permutation of the three education levels, the four age-at-arrival groupings and the three source country groupings.[21] We combine these estimated PVEH values according to the proportion of a given cohort accounted for by a given age at arrival group from a given source country group then combine the results according to the proportion from each source country group in the cohort. This creates fitted PVEH values for each cohort which we normalize to express the movements relative to the first cohort in our sample. In the first stage of the decomposition, we subtract from these relative immigrant cohort PVEH values the change in the

[21] We recalculate the cross-over YSE value, x*, separately for each group, using their estimated year of arrival effect.

PVEH for the matching native born cohort (again measured relative to the first cohort). The resulting counterfactual series shows the change in immigrant earnings that would have happened if the general changes for all new labour market entrants had not occurred. In the second stage, we recreate the counterfactual but use the source country proportions from the first cohort in creating the fitted earnings for all cohorts. Since we again subtract the native born cohort effects, the resulting counterfactual series shows what would have happened to immigrant PVEH values if neither the changes in general new entrant conditions nor the changes in source country composition had occurred. In the third stage, we repeat this exercise but also hold the distribution across age at arrival groups constant at their initial period value. Comparing the second and third counterfactuals shows the impact of changes in the age at arrival distribution while holding the country composition and new entrant effects constant. Finally, to get overall movements, we combine the previous PVEH values using the proportions of a given immigrant entry cohort with each education level. We then create an extra step in which we hold those proportions constant at their 1980-82 cohort values. The educational composition changes substantially over time, with the proportion who are university educated rising from .30 in the first cohort to .40 in the 1993-96 cohort to .63 in the last cohort.

We present the results from the decomposition exercise in Table 8. In the 1980s, declines in earnings for all new entrants explain approximately 50% of the overall decline in PVEH across immigrant cohorts. This is in strong contrast to the results obtained with the standard specification earlier and to the types of conclusions drawn in earlier papers, i.e., that general macro conditions explain little of observed cross-cohort declines and, thus, that these declines largely represent declines in immigrant "skills". The large shifts in country composition described earlier also played an important role in the 1980s, accounting for 20% of the overall decline. In contrast, shifts in age and education composition across cohorts play relatively small roles. In total, we can explain approximately 75% of the decline in the present value of earnings across the 1980s cohorts. For the 1990s, new entrant effects again imply substantial declines in immigrant earnings. Country composition shifts have similar sized (negative) effects to those in the 1980s and foreign experience effects also imply negative shifts in immigrant earnings. These negative forces are offset by the increased education level of immigrants, which, on its own, would have implied a .21 log point increase in the present value of immigrant earnings. For the entire period (defined by the 1980/82 to 1997/99 cohorts), new entrant effects can explain over 90% of the total decline in immigrant

earnings while education composition effects are in the opposite direction. Together, the four factors account for 91% of the decline across the whole period.

It is interesting to contrast these results from those in Table 2. There, the fact that the PVEH of native born earnings was almost unchanged from the first to last cohorts while the immigrant PVEH declined suggested that general new entrant effects were unlikely to provide a strong explanation for immigrant patterns. The difference between the tables arises from shifting educational composition: for each separate educational group, the native born show substantial declines in PVEH across cohorts but when aggregated together, the shift in composition toward the higher earning university group implies that the overall average PVEH is increasing across native born cohorts. In the decomposition, immigrants are first compared to native born workers in the same education group and then aggregated together. The declines for the native born then turn out to be strongly related to the immigrant declines within each education group.

The decomposition results in Table 8 correspond to PVEH calculations in which we assume a discount rate of .06. However, as we discussed earlier, much of the immigration literature focuses on entry earnings, which corresponds to r = 1.0. In Table 9, we recreate our decomposition using r = 1.0. The results for the 1980s are substantively similar to those in Table 8: new entrant and country composition effects together account for about 75% of the overall decline in the decade. In the 1990s (column 2 in both tables), when large declines in entry earnings were partially offset by increases in time since arrival slope coefficients, using a higher discount rate implies a much larger decline in PVEH. New entrant and country composition effects are still present but explain much less of the 1990s' larger decline. The results in the third column indicate they also explain much less of the decline for the whole period . Thus, shifting to using present values to compare cohorts has the potential to alter conclusions. Working in present value terms, general new entrant effects explain most of the patterns we observe, suggesting that troubles with recent immigrant cohorts reflect something more pervasive in the economy. Focusing on entry earnings alone, implies more emphasis on the immigrant cohorts themselves.

VII Conclusions

Following discussions in Duleep and Regets(1992, 2002) and Borjas(1999), we argue that immigrant earnings profiles in the host country should be viewed in the context of a life-cycle model of human capital acquisition. Within that context, we argue that the best comparison group defining the impact of general macro events on immigrants consists of native born workers who enter the

host labour market at the same time as the immigrants. We present evidence suggesting that native born new entrants provide an appropriate comparison for both older and younger age at arrival immigrants. Further, we argue that a true representation of cross-cohort differences in immigrant contributions of human capital to the host economy must be done in the context of the present value of earnings in the host economy rather than, as is typically done, by comparing earnings at the time of arrival.

We examine the importance of these comparison group and earnings measure decisions using a unique Canadian dataset that matches immigrant arrival records with tax data. Using a standard estimation approach we find, as is well known, that entry earnings for successive immigrant cohorts fell substantially over the 1980s. Further, we find that entry earnings fell even faster in the 1990s. We show that substantial declines in returns to foreign experience play an important role in these declines. Most importantly, when we use the native born cohorts as comparison groups and work with present values of earnings streams, we find that much of the decline earnings across immigrant cohorts entering Canada in the 1980s and 1990s can be accounted for as part of a general decline facing all new entrant workers. This suggests that the answers to how to better integrate immigrant human capital into the Canadian economy may lie more in policies targeting new labour market entrants in general than in policies targeted exclusively at immigrants and that part of our concern over immigrant earnings should be redirected to the broader issue of difficulties facing all new entrants.

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Table 1
Cohort Based Regression Estimates of Average Log Annual Earnings:
Native Born Cohorts and Differences Between Immigrant and Native Born Men

Variables	**Native Born**	**Immigrant/Native Born Differences by Age at Entry**			
		Age 25-29 at Entry	Age 30-34 at Entry	Age 35-39 at Entry	Age 40-44 at Entry
Constant	10.20(.028)**	-.12 (.037)**	.041 (.039)	.14 (.039)**	.090 (.043)**
Cohort Dummies:					
1983-86	-.10(.044)**	-.27 (.055)**	-.29 (.055)**	-.27 (.057)**	-.23 (.059)**
1987-89	-.14 (.040)**	-.19 (.052)**	-.24 (.053)**	-.27 (.055)**	-.23(.058)**
1990-92	-.25 (.039)**	-.29 (.054)**	-.38 (.056)**	-.45 (.058)**	-.38 (.061)**
1993-96	-.25 (.040)**	-.28 (.052)**	-.43 (.056)**	-.55 (.059)**	-.50(.064)**
1997-99	-.33 (.072)**	-.30 (.083)**	-.50 (.091)**	-.68 (.090)*	-.74(.095)**
2000-02	-.24 (.080)**	-.66 (.14)**	-.92 (.16)**	-1.17 (.14)**	-1.23(.15)**
YSE (t<9)	.038 (.004)**	-.0091(.006)	-.016(.006)**	-.025 (.0059)**	-.033 (.007)**
YSE (t ∃9)	.0091(.0023)*	.0022(.0053)	-.0074(.0055)	-.014 (.0055)*	-.019 (.006)**
Cohort - YSE (t<9) Interactions					
1983-86	.0069 (.0064)	.012 (.0086)	.0082(.0085)	.0058 (.0088)	.0059 (.0092)
1987-89	.008 (.006)**	.0056(.0079)	.0025(.0082)	.0040 (.0084)	.0060 (.0089)
1990-92	.019 (.007)**	-00027(.009)	-.0033 (.009)	-.0014 (.010)	-.0073 (.010)
1993-96	.026 (.007)**	-.0087(.009)	-.0049(.009)	-.0045 (.0097)	-.024 (.010)*
1997-99	.039 (.019)*	-.0037 (.021)	-.0053 (.023)	.00093 (.023)	-.0037 (.023)
2000-02	-.012 (.036)	.12 (.063)+	.15 (.071)*	.19 (.064)**	.21 (.064)**
YSE (t∃9) Cohort Interactions					
1983-86	-.0034 (.004)	-.0078 (.008)	.001 (.0085)	.0003 (.01)	-.016 (.096)
1987-89	.011 (.0056)+	-.027 (.009)*	-.02 (.0089)*	-.023 (.0088)**	-.047 (.010)**
1990-92	-.0089 (.013)	-.006 (.017)	.0079 (.018)	-.003 (.019)	-.028 (.021)
Education					

Secondary or Less	-.17(.0082)**	-.013 (.011)	-.062(.011)**	-.086 (.013)**	-.056(.013)**
BA or More	.23 (.011)**	.071(.014)**	.052 (.014)*	.029 (.015)+	-.020 (.016)
De-trend. U.R.	-.018(.0042)**	-.021(.005)**	-.019(.0053)**	-.014 (.0057)*	-.0073(.0058)
R^2		0.93	0.92	0.92	0.92

Notes: + ,*,** significantly different from zero at the 10, 5, 1 % level of significance. The first column reports coefficients for the base group (native born) in a regression of ln earnings on the regressors listed in the "Variables" column. The coefficients in the remaining columns correspond to coefficients on interactions between the relevant variables and an immigrant dummy variable.

Table 2
Differences in Present Value Relative to 1980-82 Cohort
Native Born and Immigrants by Age-at-Arrival Group

Cohort	Native Born	Immigrant			
		Age 25-29	Age 30-34	Age 35-39	Age 40-44
1983-86	-.043 (.017)*	-.21(.021)**	-.28(.020)**	-.28(.021)**	-.24(.020)**
1987-89	-.065 (.018)**	-.21(.018)**	-.30(.018)**	-.32(.016)**	-.27(.018)**
1990-92	-.081 (.024)**	-.39(.020)**	-.51(.021)**	-.56(.023)**	-.54(.023)**
1993-96	-.030 (.028)	-.39(.022)**	-.51(.021)**	-.64(.022)**	-.74(.022)**
1997-99	-.008 (.091)	-.34(.043)**	-.56(.057)**	-.71(.060)**	-.82(.044)**

Notes: + ,*,** significantly different from zero at the 10, 5, 1 % level of significance. The entries are differences in the calculated present values of Canadian lifetime earnings between the cohort listed in the left-most column and the 1980-82 cohort for each group listed at the top of the column based on r = 0.06. See section IV.3 for a description of the derivation of the present values. Standard errors in parentheses.

Table 3
Differences in Present Values of Earnings
Immigrant Cohorts Relative to Matching Native Born Cohorts

Cohort	25-29 at Arrival	30-34 at Arrival	35-39 at Arrival	40-44 at Arrival
1980-82	-0.20 (.020)**	-0.13(.021)**	-0.17 (.019)**	-0.34 (.021)**
1983-86	-0.36 (.020)**	-0.36 (.020)**	-0.40 (.021)**	-0.54 (.022)**
1987-89	-0.34 (.018)**	-0.36 (.018)**	-0.42 (.018)**	-0.54 (.019)**
1990-92	-0.49 (.028)**	-0.55 (.027)**	-0.63 (.028)**	-0.78 (.026)**
1993-96	-0.55 (.032)**	-0.60 (.031)**	-0.77 (.031)**	-1.02 (.029)**
1997-99	-0.52 (.11)**	-0.68 (.11)**	-0.85 (.10)**	-1.12 (.087)**

Notes: + ,*,** significantly different from zero at the 10, 5, 1 % level of significance. The entries are differences in the calculated present values of Canadian lifetime earnings between immigrants in the given age-at-arrival/cohort group and native born new entrants in the matching cohort based on r= .06. Note that the same native born new entrants (aged 25-29) are matched against immigrants in all age-at-arrival groups for a cohort. See section IV.3 for a description of the derivation of the present values. Standard errors in parentheses.

Table 4
Standard Log Wage Regressions

Variables	Standard Regression (Immigrants + Natives)	Regression with YSE Varying by Cohort (Immigrants + Natives)	Regression with YSE Varying by Cohort (Immigrants Only)
Immigrant Variables			
Immigrant Dummy	-.38 (.017)***	-.24 (.025)***	-
YSE (t<9)	.037 (.0016)***	.019 (.0034)***	.020 (.0028)***
YSE (t ∃9)	.013 (.0020)***	.017 (.0036)***	.0023 (.0029)
1983-86 Cohort	-.24 (.0078)***	-.35 (.023)***	-.37 (.023)***
1987-89 Cohort	-.23 (.011)***	-.33 (.029)***	-.37 (.022)***
1990-92 Cohort	-.42 (.015)***	-.60 (.030)***	-.61 (.024)***
1993-96 Cohort	-.44 (.015)***	-.63 (.032)***	-.66 (.024)***
1997-99 Cohort	-.51 (.027)***	-.69 (.045)***	-.82 (.034)***
2000-02 Cohort	-.65 (.041)***	-.94 (.084)***	-1.17 (.075)***
YSE (t<9) - Cohort Interactions			
1983-86 Cohort	-	.013 (.0037)***	.016 (.0037)***
1987-89 Cohort	-	.012 (.0044)**	.012 (.0035)***
1990-92 Cohort	-	.026 (.0046)***	.017 (.0040)***
1993-96 Cohort	-	.035 (.0051)***	.016 (.0040)***
1997-99 Cohort	-	.049 (.011)***	.033 (.0085)***
2000-02 Cohort	-	.15 (.037)***	.15 (.033)***
YSE (t∃9) Cohort Interactions			
1983-86 Cohort	-	.0042 (.0045)	-.0081 (.0045)
1987-89 Cohort	-	.011 (.0052)**	-.017 (.0047)***
1990-92 Cohort	-	.016 (.0072)**	-.015 (.0081)*
Other Controls			
High School Education	-.22 (.0048)***	-.22 (.0048)*	-.22(.0055)***
University Education	.29 (.0057)***	.29 (.0055)*	.28 (.0063)***
Experience	.056 (.0019)***	.054 (.0019)*	-
Experience Squared	-.0013 (.000041)***	-.0013 (.000041)*	-

Year Dummies			
1982	-.14 (.031)***	-.13 (.028)***	-
1984	-.22 (.027)***	-.17 (.025)***	-
1985	-.18 (.026)***	-.11 (.025)***	-
1986	-.19 (.026)***	-.12 (.025)***	-
1987	-.17 (.025)**	-.083 (.026)***	-
1988	-.11 (.026)***	-.020 (.027)	-
1989	-.10 (.026)***	-.0039 (.028)	-
1990	-.15 (.027)***	-.046 (.028)	-
1991	-.32 (.028)***	-.16 (.022)***	-
1992	-.31 (.028)***	-.21 (.029)***	-
1993	-.28 (.028)***	-.19 (.029)***	-
1994	-.24 (.029)***	-.12 (.030)***	-
1995	-.25 (.029)***	-.13 (.029)***	-
1996	-.25 (.030)***	-.14 (.029)***	-
1997	-.23 (.030)***	-.12 (.029)***	-
1998	-.22 (.032)***	-.12 (.030)***	-
1999	-.21 (.033)***	-.12 (.031)***	-
2000	-.22 (.034)***	-.14 (.031)***	-
2001	-.23 (.035)***	-.16 (.032)***	-
2002	-.27 (.036)***	-.22 (.033)***	-
2003	-.27 (.036)***	-.25 (.034)***	-
SLID Data Years	.20 (.015)***	.22 (.016)***	
Detrended Unemp Rate	-	-	-.035 (.0021)***
Constant	10.11 (.032)***	10.02 (.029)***	10.22 (.019)***
# Observations	3762	3762	2844
R^2	.89	.89	.86

*,**,*** significantly different from zero at the 10, 5, 1 % level of significance. Standard errors in parentheses. All regressions are estimated from year×cohort×education×age-at-arrival cell means obtained from first stage regressions that included provincial dummy variable. The first stage regressions were run separately for each natives and immigrants and by education category. Standard errors are White standard errors. Note that the omitted category for the education variables is high school, the omitted cohort group is 1980-82, and the omitted year in estimating the year effects is 1981.

Table 5
Proportion of Immigrants from US, UK, Australia or New Zealand by Cohort for Different Schooling Levels

Cohort	High School	Post-Secondary	University
1980-82	0.1	0.26	0.24
1983-86	0.07	0.12	0.17
1987-89	0.048	0.11	0.098
1990-92	0.033	0.076	0.077
1993-96	0.035	0.076	0.06
1997-99	0.049	0.077	0.047
2000-02	0.061	0.087	0.036

Source: Calculations using IMDB dataset. Sample restrictions are the same as those used in first stage regression analysis and are listed in section II.1.

Table 6
Differences in Present Values of Earnings
Immigrant Cohorts Relative to Matching Native Born Cohorts
By Region of Origin
High School

English				
Cohort	25-29 at Arrival	30-34 at Arrival	35-39 at Arrival	40-44 at Arrival
1980-82	0.10 (.023)**	0.094 (.025)**	0.003 (.025)	0.18 (.025)**
1983-86	-0.067 (.041)	-0.13 (.034)**	-0.14 (.038)**	0.026 (.036)
1987-89	0.062 (.037)	-0.086 (.039)*	-0.14 (.043)**	0.023 (.041)
1990-92	0.13 (.053)*	0.036 (.052)	-0.096 (.056)+	0.059 (.050)
1993-96	0.032 (.065)	-0.28 (.073)**	-0.53 (.11)**	-0.34 (.10)**
1997-99	0.29 (.22)	-.010 (.20)	-0.48 (.37)	-.29 (.33)
Other				
Cohort	25-29 at Arrival	30-34 at Arrival	35-39 at Arrival	40-44 at Arrival
1980-82	-0.30 (.027)**	-0.32 (.028)**	-0.41 (.027)**	-0.56 (.028)**
1983-86	-0.35 (.026)**	-0.42 (.027)**	-0.48 (.031)**	-0.60 (.032)**
1987-89	-0.36 (.024)**	-0.40 (.027)**	-0.46 (.023)**	-0.58 (.028)**
1990-92	-0.46 (.051)**	-0.55 (.052)**	-0.65 (.054)**	-0.71 (.052)**
1993-96	-0.66 (.047)**	-0.74 (.048)**	-0.95 (.12)**	-1.14 (.045)**
1997-99	-.54 (.12)**	-0.76 (.14)**	-0.96 (.12)**	-1.17 (.10)**

+,*,** Significantly different from zero at the 10, 5, 1% level of significance. The entries are differences in the calculated present values of Canadian lifetime earnings between immigrants in the given age-at-arrival/cohort group and native born new entrants in the matching cohort based on r= .06. Note that the same native born new entrants (aged 25-29) are matched against immigrants in all age-at-arrival groups for a cohort. See section IV.3 for a description of the derivation of the present values. Standard errors in parentheses.

Table 7
Differences in Present Values of Earnings
Immigrant Cohorts Relative to Matching Native Born Cohorts
By Region of Origin
University

English				
Cohort	25-29 at Arrival	30-34 at Arrival	35-39 at Arrival	40-44 at Arrival
1980-82	0.086 (.032)**	0.10 (.031)**	0.087 (.031)**	0.051 (.040)
1983-86	0.021 (.036)	-.010 (.037)	0.054 (.041)	-0.072 (.044)
1987-89	0.076 (.043)+	0.057 (.038)	-0.023 (.038)	-0.096 (.053)+
1990-92	0.035 (.044)	0.042 (.041)	0.040 (.039)	-0.29 (.047)**
1993-96	0.11 (.068)	-0.11 (.059)+	-0.20 (.058)**	-0.24 (.068)**
1997-99	-0.26 (.22)	-.40 (.20)+	-0.50 (.19)*	-0.78 (.18)**
Other				
Cohort	25-29 at Arrival	30-34 at Arrival	35-39 at Arrival	40-44 at Arrival
1980-82	-0.19 (.031)**	-0.18 (.031)**	-0.26 (.032)**	-0.52 (.037)**
1983-86	-0.29 (.035)**	-0.33 (.039)**	-0.42 (.039)**	-0.65 (.041)**
1987-89	-0.30 (.035)**	-0.38 (.037)**	-0.48 (.038)**	-0.71 (.038)**
1990-92	-0.49 (.037)**	-0.60 (.036)**	-0.75 (.039)**	-0.99 (.039)**
1993-96	-0.46 (.062)**	-0.51 (.061)**	-0.72 (.058)**	-1.10 (.057)**
1997-99	-0.65 (.21)**	-0.90 (.20)**	-0.99 (.19)**	-1.35 (.17)**

+ ,*,** Significantly different from zero at the 10, 5, 1% level of significance. The entries are differences in the calculated present values of Canadian lifetime earnings between immigrants in the given age-at-arrival/cohort group and native born new entrants in the matching cohort based on r= .06. Note that the same native born new entrants (aged 25-29) are matched against immigrants in all age-at-arrival groups for a cohort. See section IV.3 for a description of the derivation of the present values. Standard errors in parentheses.

Table 8
Counterfactual Results, All Education Groups

Component	1980s	1990s	Whole Period
Total	-.28 (1.0)	-.14 (1.0)	-.41 (1.0)
New Entrant Effect	-.15 (.54)	-.25 (1.76)	-.40 (.95)
Country Composition Effect	-.052 (.19)	-.054 (.39)	-.11 (.26)
Age at Arrival Composition Effect	-.019 (.068)	-.080 (.57)	-.099 (.24)
Education Composition Effect	.014 (-.051)	.21 (-1.51)	.22 (-.54)
Sum of Counterfactual Effects	-.21 (.75)	-.17 (1.21)	-.39 (.91)

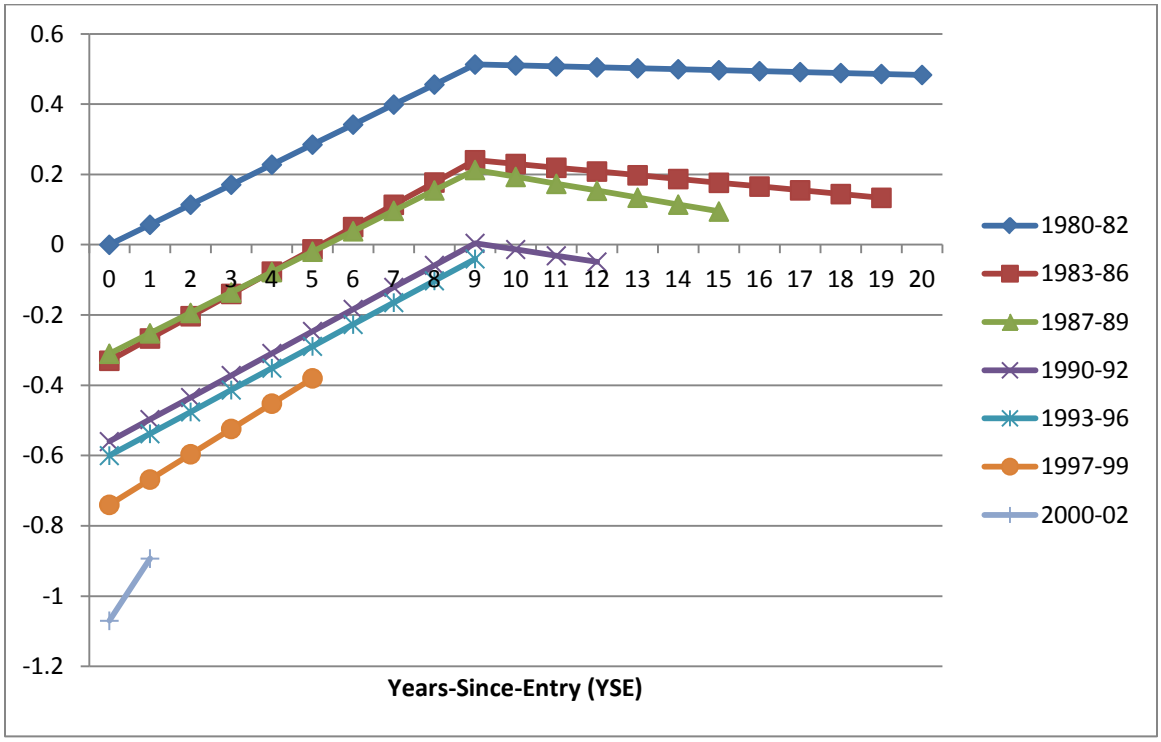
Source: Authors' calculations based on decomposition exercise defined in section VI.4. Number in parenthesis is the proportion of the total decline accounted for by the given component.

Table 9
Counterfactual Results, All Education Groups
Discount Rate = 1.0

Component	1980s	1990s	Whole Period
Total	-.31 (1.0)	-.43 (1.0)	-.74 (1.0)
New Entrant Effect	-.15 (.48)	-.25 (.58)	-.40 (.54)
Country Composition Effect	-.073 (.24)	-.064 (.15)	-.14 (.19)
Age at Arrival Composition Effect	.014 (-.047)	-.049 (.12)	-.035 (.048)
Education Composition Effect	.020 (-.063)	.12 (-.28)	.14 (-.19)
Sum of Counterfactual Effects	-.19 (.61)	-.24 (.56)	-.44 (.59)

Source: Authors' calculations based on decomposition exercise defined in section VI.4. Number in parenthesis is the proportion of the total decline accounted for by the given component.

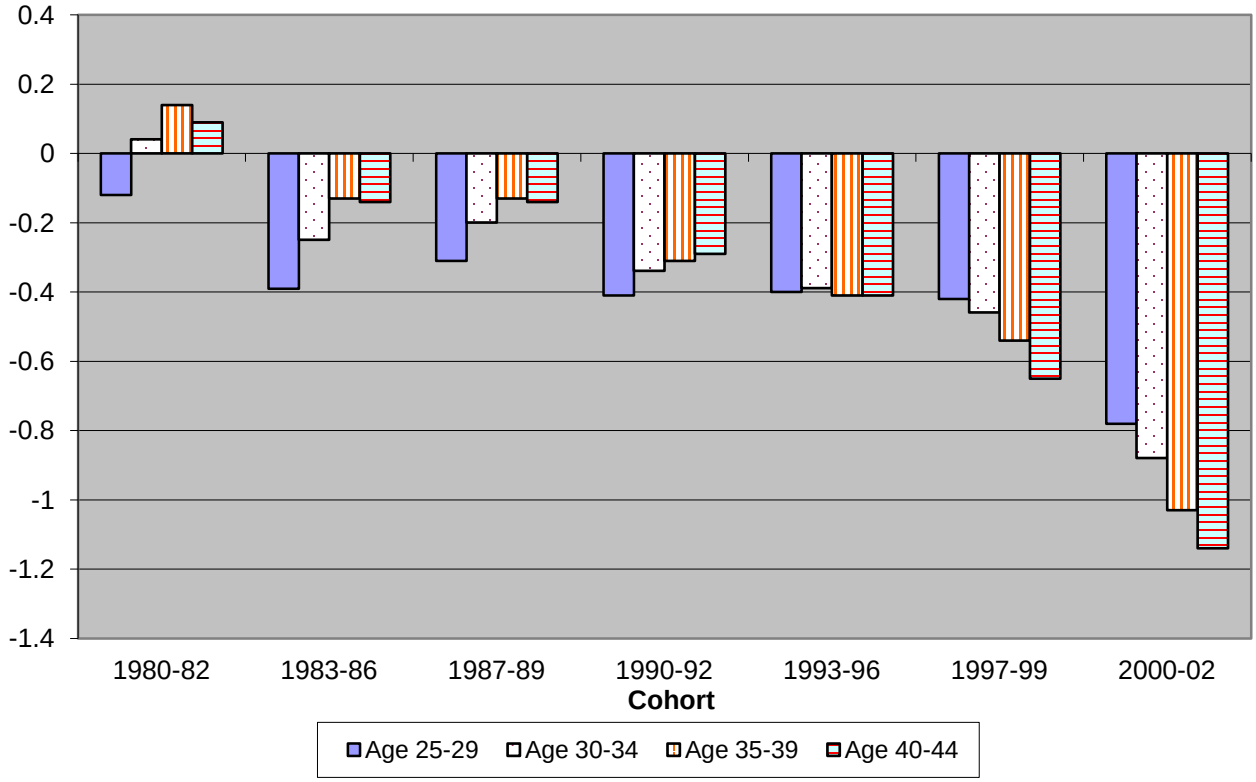
Figure 1
Predicted Differences in log Earnings
Relative to Entry Earnings of
1980-82 Immigrant Arrival Cohort,
Immigrant Men



Notes:

Authors' calculations based on log earnings regression estimates over the second stage sample of synthetic cohort cells for immigrant men. All differences are relative to the entry earnings for the 1980-82 immigrant arrival cohort.

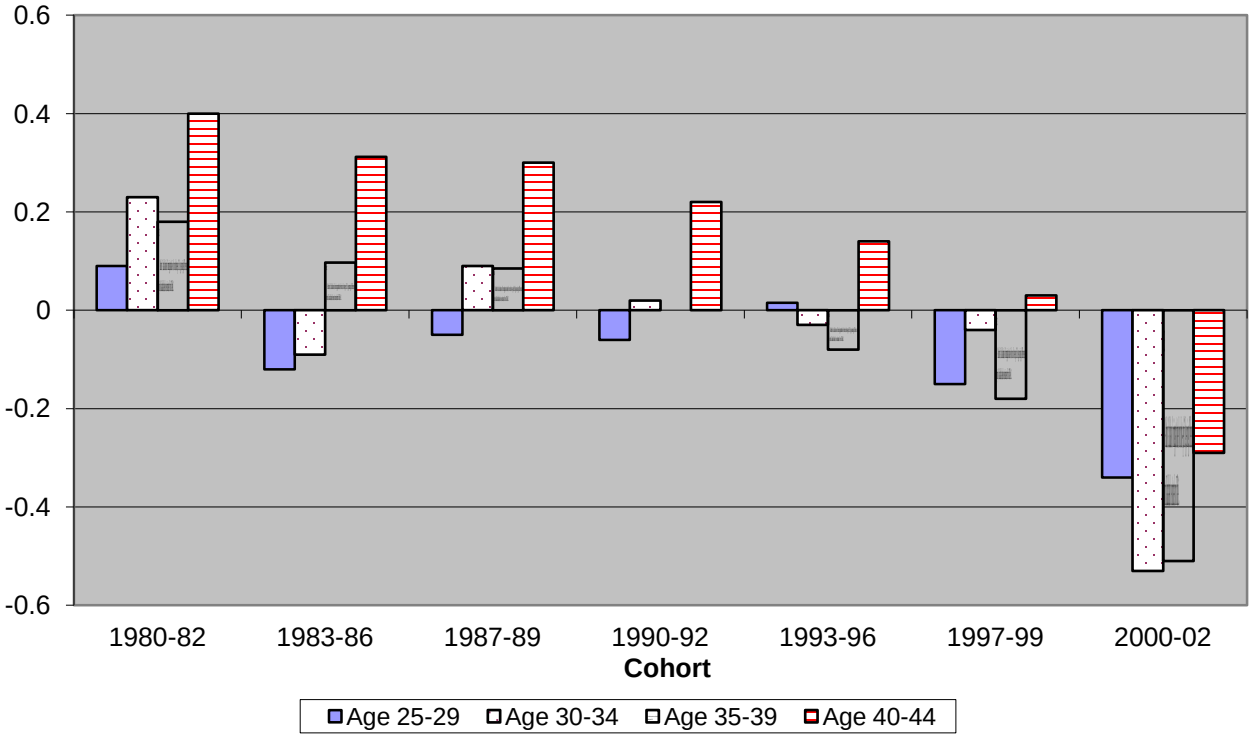
Figure 2: Entry Wages by Age and Cohort Relative to Native Born in the Same Cohort



Notes:

Authors' calculations of immigrant/native born cohort-specific log earnings differences at entry into Canada based on estimates from Table 1.

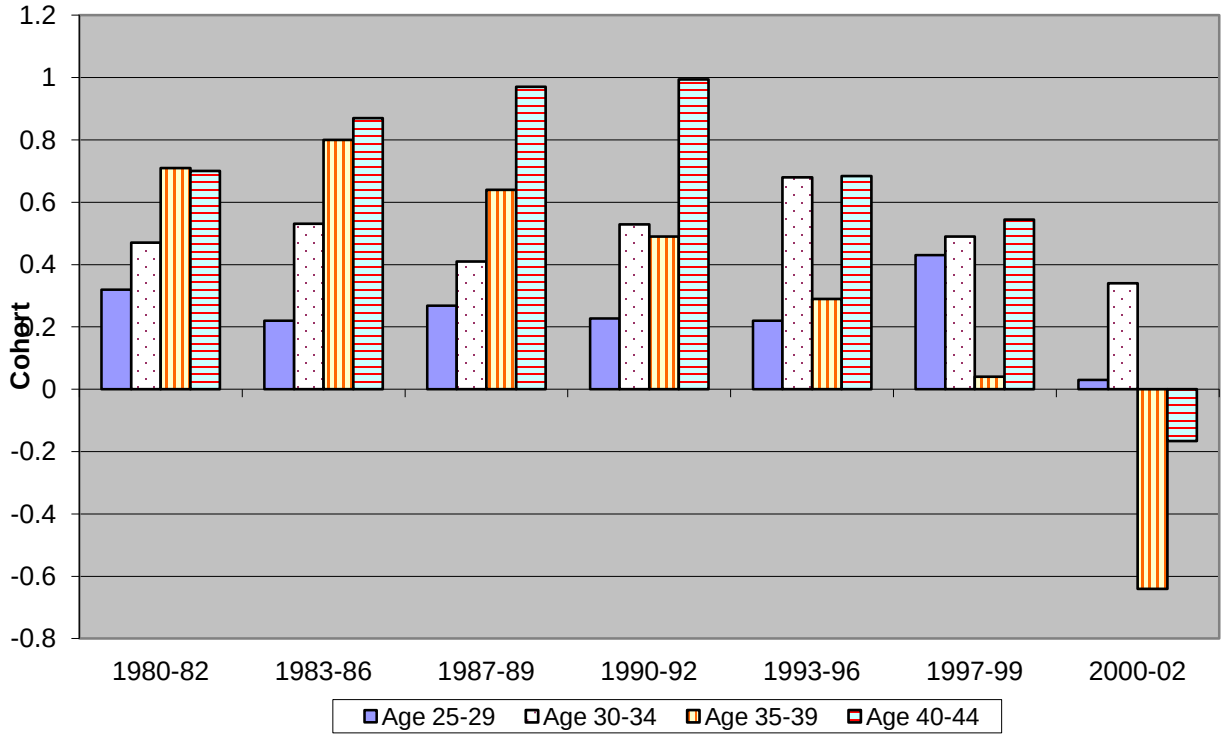
Figure 3a: Fitted Entry Earnings by Age and Cohort: English Source Countries, High School



Notes:

Authors' calculations of immigrant/native born cohort-specific log earnings differences at entry into Canada based on regression estimates carried out separately by source country region and by education group.

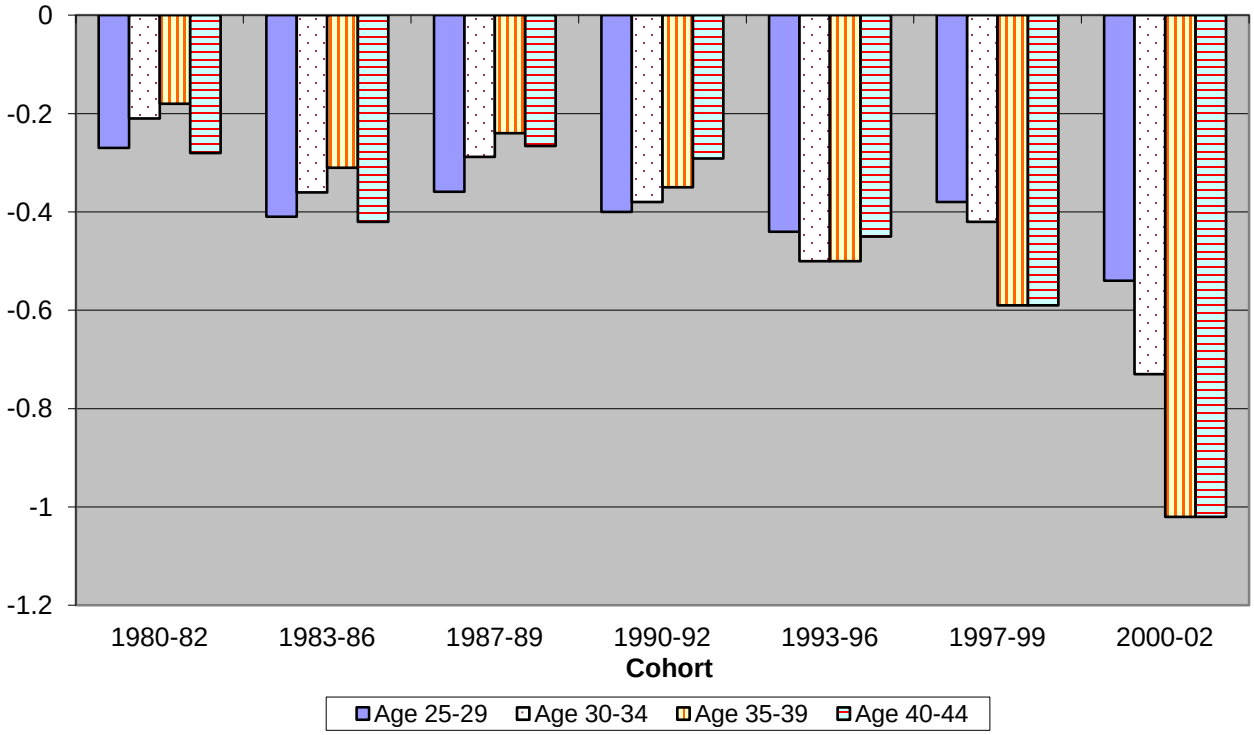
Figure 3b: Fitted Entry Earnings by Age and Cohort: English Source Countries, University



Notes:

Authors' calculations of immigrant/native born cohort-specific log earnings differences at entry into Canada based on regression estimates carried out separately by source country region and by education group.

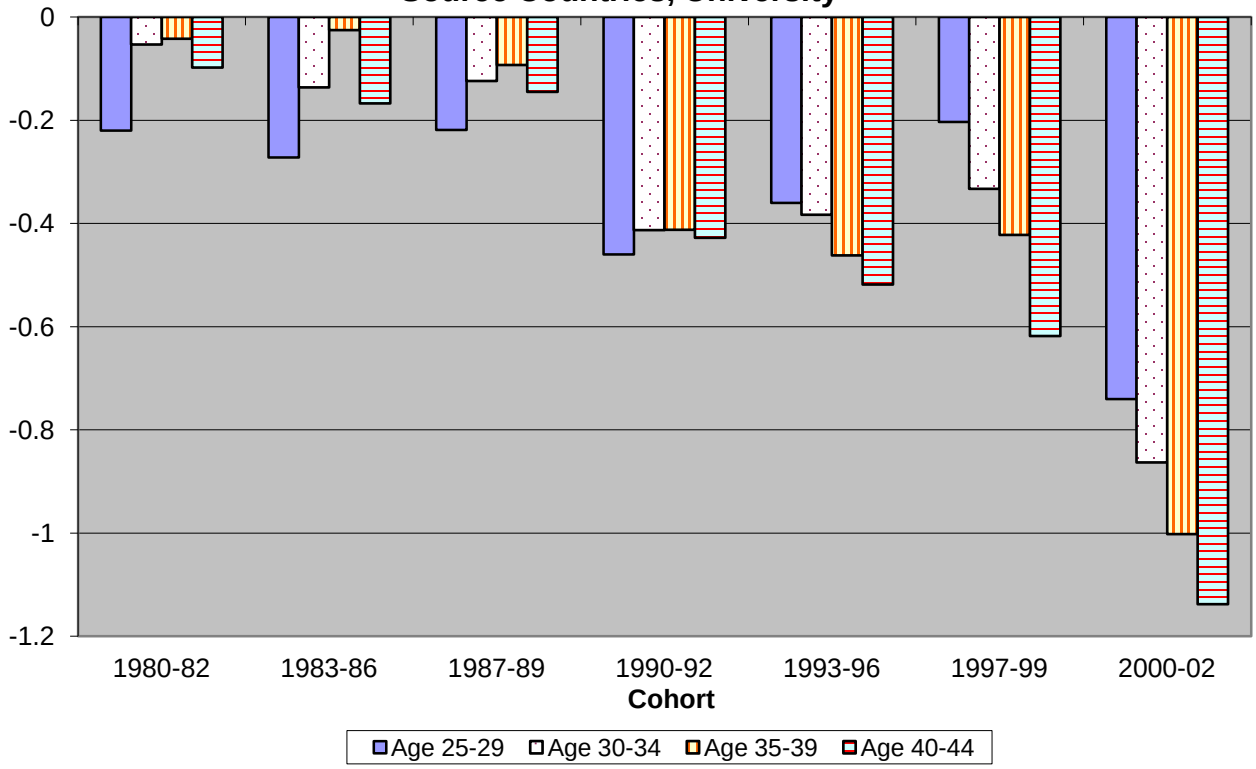
Figure 4a: Fitted Entry Earnings by Age and Cohort: Rest of the World Source Countries, High School



Notes:

Authors' calculations of immigrant/native born cohort-specific log earnings differences at entry into Canada based on regression estimates carried out separately by source country region and by education group.

Figure 4b: Fitted Earnings by Age and Cohort: Rest of World Source Countries, University



Notes:

Authors' calculations of immigrant/native born cohort-specific log earnings differences at entry into Canada based on regression estimates carried out separately by source country region and by education group.