Catalogue no. 11F0019M — No. 309
ISSN 1205-9153
ISBN 978-0-662-48388-5

Research Paper

Analytical Studies Branch Research Paper Series

Earnings Inequality and Earnings Instability of Immigrants in Canada

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April 2008

Acknowledgment: I am grateful to Michael Baker, David Gray and René Morissette for very helpful comments and suggestions.

Published by authority of the Minister responsible for Statistics Canada

La version française de cette publication est disponible (n° 11F0019MIF au catalogue, n° 309).

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Abstract

The deterioration of immigrants' entry earnings in Canada in the past three decades has been well documented. This study provides further insights into the changing fortunes of immigrants by focusing on their earnings inequality and earnings instability. The analysis is based on a flexible econometric model that decomposes earnings inequality into current and long-term components. In addition to constructing earnings inequality and earnings instability profiles for different arrival cohorts, we also examine the underlying causes of earnings inequality, including the impact of foreign education, birthplace and the ability to speak English or French.

Keywords: earnings of immigrants, earnings inequality, earnings instability

Executive summary

Most of the literature on the evolution of immigrant earnings and economic progress of immigrants relies on a convenient benchmark such as, for instance, the earnings—income, wealth, employment rates—of the non-immigrants In many cases, this is an informative comparison, although matching immigrants to non-immigrants in a way that would make such a comparison meaningful is not always straightforward. An altogether different approach to the issue of economic well-being of immigrants, which so far has received little attention in the literature, is to look at the over-time changes in the distribution of immigrants' earnings and, more specifically, at the dynamics of earnings inequality and earnings instability among immigrants. As economic theory suggests, an increase in income inequality is usually associated with a reduction in social welfare, although its impact must be considered in conjunction with earnings trends.

This study relies on the life-cycle/permanent-income theory and the concepts of permanent and transitory income components to distinguish between current and long-term immigrant earnings inequality in a way consistent with the recent studies on earnings inequality and earnings instability in Canada and the United States. Our descriptive analysis shows that earnings inequality accounts for a larger portion of the immigrant earnings dispersion than earnings instability; earnings inequality is higher for more recent cohorts than for those who arrived in the early 1980s; and, earnings instability is highly pro-cyclical—immigrants who arrived just before or during the recession in the early 1990s have experienced higher levels of earnings instability than did earlier cohorts.

Although an analysis of immigrants' earnings inequality and earnings instability dynamics may be informative in itself, ultimately we are interested in their underlying causes. In particular, this study relates earnings inequality and earnings instability to immigrants' education, language ability and cultural background. Such a link is especially interesting, since most immigrants to Canada come through the 'skilled immigration' program that evaluates potential immigrants according to their age, education level, work experience and language proficiency. Hence, another critical aspect of this study is to gauge the effects of these variables on immigrants' earnings inequality and instability.

Generally, the region of birth has the strongest impact on earnings inequality, while the impacts of a foreign education and the ability to speak an official language vary from cohort to cohort and across arrival-age groups. Although controlling for education, language ability and origin reduces earnings inequality, it has very little effect on earnings instability. It is important to note that even after controlling for education, language and birthplace, a large portion of immigrant earnings inequality remains unexplained.

The flexible econometric model used in this study provides further insights into immigrants' earnings inequality and earnings instability dynamics. In particular, there seems to be considerable evidence of cohort effects in earnings inequality, which is consistent with the descriptive results that show the presence of cohort effects and higher levels of earnings inequality for more recent cohorts. Compared with the earnings inequality of the pre-1992 cohorts, the earnings inequality levels of the post-1992 cohorts are substantially higher in the first year after their arrival and remain higher in the next several years during which these cohorts are observed. The inequality levels of all pre-1992 cohorts rose in 1990 and 1991, and then they declined during the 1993-to-1995 period. For all immigrants in the sample—with the exception of the 1980-to-1982- and 1998-to-2000-arrival cohort—the permanent variance was rising during the first four years of the current decade. Unlike the earlier cohorts, the earnings inequality of recent cohorts appears to have been rising slowly but steadily after a decline during the first post-arrival years.

For most immigrant cohorts, earnings instability is particularly high among those immigrants just entering the labour market, but it falls sharply during the subsequent two or three years. The total earnings variance in the first several post-arrival years is mostly driven by the transitory component, while the permanent component becomes predominant once immigrants settle down in their new country. Therefore, it is not surprising that the recession of the early 1990s had a greater impact on the total earnings volatility of the 1989-to-1991 and 1986-to-1988 cohorts than it did on previous cohorts; for these recently arrived cohorts, the transitory component played a more important role in their total earnings volatility.

The impact of immigrants' origins on earnings inequality generally increases in the first several years and it remains strong long after their entrance to the labour market. For the earlier cohorts, which are observed for the longest periods of time, we see that the birthplace effect is actually stronger some 10 to 20 years after their arrival than it was in the first several years. Finally, similar to the birthplace, the effect of education is somewhat weaker for more recent cohorts, although its relative importance is greater. For the most recent cohorts, after several years, a foreign education plays as important a role in reducing earnings inequality as their birthplace does (although this result should be considered with caution, as the effects of education cannot be disentangled from unobserved factors they may be correlated with, such as, for instance, personal motivation, discipline and initiative). All in all, these results seem to indicate that the importance of a foreign schooling—and unobserved individual characteristics it may be correlated with—is increasing as immigrants adjust to the demands of the Canadian labour market.

1 Introduction

Most of the literature on the evolution of immigrant earnings and the economic progress of immigrants relies on a convenient benchmark such as, for instance, the earnings—income, wealth, employment rates—of the non-immigrants. In many cases, this is an informative comparison, although matching immigrants to non-immigrants in a manner that would make such a comparison meaningful is not always straightforward. In addition to the characteristics that immigrants and non-immigrants share, the economic performance of immigrants may depend on the age at immigration (Schaafsma and Sweetman 2001; Ferrer, Green and Riddell 2006), language ability (Dustmann and Van Soest 2002), share of foreign schooling and foreign experience in the total educational attainment and experience (Chiswick 1978, Betts and Lofstrom 2000, Friedberg 2000, Green and Worswick 2004, Smith 2006), and country of birth (Jasso, Rosenzweig and Smith 2000; Aydemir and Skuterud 2005; Smith 2006).

The success of immigrants can be measured not just in relation to the economic progress of non-immigrants, but also in relation to the economic progress of non-immigrants in the country from which the immigrants have come. For many workers with bleak employment or earnings prospects in their countries of origin, any stable employment in their new country is often a step up, even if it does not fully correspond to their skills or it falls short of what would be considered acceptable by non-immigrants. Despite the intuitive appeal of such a comparison, however, an obvious problem is that it requires data from the immigrants' countries of origin. For a country such as Canada, with a highly diverse immigrant population, this approach poses an enormous challenge.

An altogether different approach toward the issue of economic well-being of immigrants, which has so far received little attention in the literature, is to look at the over-time changes in the distribution of immigrants' earnings and, more specifically, at the dynamics of earnings inequality and earnings instability among immigrants. Compared with the standard 'immigrants versus non-immigrants' framework, this approach does not need the non-immigrants as a reference point. Instead, it relies on the familiar life-cycle/permanent income theory and the concepts of permanent- and transitory-income components. An increase in income inequality is usually associated with a reduction in social welfare, although its impact must be considered in conjunction with earnings trends (Deaton 1997: 136). A rise in earnings instability may lead to greater uncertainty and lower consumption, particularly if consumption smoothing is costly or impossible because of liquidity constraints (Browning and Lusardi 1996, Browning and Crossley 2001). Therefore, an analysis of immigrants' earnings inequality and earnings instability is a natural extension of the analysis of immigrant labour-market outcomes. Combined with previous studies that compare labour-market outcomes of immigrants with those of the non-immigrants, an analysis of immigrants' earnings instability and earnings inequality may provide further insights into immigrants' welfare dynamics and help assess the effectiveness of recent immigration policies.

One key feature of this study is that it distinguishes between current and long-term inequalities in a way consistent with the recent studies on earnings inequality and earnings instability in Canada and the United States (Gottschalk and Moffitt 1994; Baker 1997; Haider 2001; Moffitt and Gottschalk 2002; Baker and Solon 2003; Beach, Finnie and Gray 2003; Morissette and Ostrovsky 2005). These studies incorporate several features of life-cycle earnings profiles such as, for instance, the heterogeneity of entry earnings and earnings growth rates. None of these studies, however, focus specifically on immigrants.

Although an analysis of immigrants' earnings inequality and instability dynamics may be informative in itself, ultimately we are interested in their underlying causes. In particular, it would be useful to relate earnings inequality and earnings instability to immigrants' education, linguistic ability and cultural background. Such a link would be particularly interesting, since most of the immigrants to Canada came through the 'skilled immigration' program that evaluates potential immigrants based on their age, education level, work experience and language proficiency. Hence, another critical aspect of this study is to gauge the effects of these variables on immigrants' earnings inequality and instability. The analysis of these issues is made possible, thanks to a truly unique Statistics Canada dataset described below.

Our major findings indicate that recent immigrant cohorts have higher levels of earnings inequality than those who came to Canada in the early 1980s. Although foreign education, the ability to speak one of the official languages, and birthplace explain a large part of immigrants' earnings inequality, much of it remains unexplained by these factors. The transitory component of immigrant earnings volatility (earnings instability) dominates the permanent component (earnings inequality) in the first several years after the arrival; later, however, the roles are reversed.

The paper begins with a brief overview of recent trends in immigrant assimilation in Canada (Section 2). Section 3 discusses recently used models of instability and their relevance to this study. The estimation methods used in this study are presented in Section 4. Section 5 describes the data and sample selection. Descriptive results are presented in Section 6, followed by the estimation results in Section 7. Finally, Section 8 highlights major findings and offers possible conclusions.

2 Recent trends in immigrant worker assimilation in Canada

A basic theory of immigrant assimilation emphasizes the difficulties experienced by new immigrants in finding employment in their host country. Immigrants, who may face linguistic, information and social barriers, initially have fewer employment opportunities and receive lower wages compared with the Canadian-born residents. As they become more knowledgeable about the labour-market conditions in their new country, acquire more country-specific skills and establish an employment record, their earnings begin to rise and the slope of the immigrant earnings profile is often steeper than that of the Canadian born. Eventually many immigrants may actually do better than the Canadian born with similar characteristics.

The economic performance of immigrants to Canada in the past 25 years has been a subject of numerous studies with mixed results. Immigrants to Canada are generally noted to be more educated but have less work experience compared with persons born in Canada (Frenette and Morissette 2003). Increasingly, immigrants to Canada come from 'non-traditional' sources and are members of visible minorities.[1] Baker and Benjamin (1994) find that, similar to the U.S.

1. The *Employment Equity Act* defines visible minorities as "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour."

experience, the immigrants who arrived in Canada during the 1970s were not as successful in integrating into the Canadian labour market as those who had arrived in the previous decade; the entry earnings and assimilation rates of the former were considerably lower. They conclude that their picture of immigrant experience in the Canadian labour market is "fairly pessimistic" (p. 400). Grant (1999), on the other hand, shows that immigrants who came to Canada during the 1980s had better fortune than previous cohorts; the entry level earnings were about the same at the beginning and end of the decade, and the assimilations rates of immigrants in the 1980s were higher than the assimilation rates experienced by their predecessors.

Frenette and Morissette (2003), who use census data covering the years from 1980 to 2000 to analyse the convergence rates of immigrant and non-immigrant earnings, argue that the relative entry earnings of immigrants declined drastically during this period, and this trend was only partially offset by the greater relative earnings growth of recent immigrants. Despite an increasing number of university graduates among immigrants, the relative earnings of immigrants did not improve from 1990 to 2000, and the low-income rates among immigrants rose substantially by the end of the decade.

The deterioration of immigrant entry earnings in Canada is further documented by Aydemir and Skuterud (2005), who explore its causes using the same census data as the previous study. They find that about one third of the deterioration in immigrants' entry earnings can be explained by the shifting ethnic composition of immigrant cohorts. Although they find little evidence of the decline in the returns to foreign education, they find a strong evidence of the decline to the foreign labour-market experience, which may account for somewhere between one quarter and one half of the overall deterioration in the entry earnings of immigrants.

In sum, the picture emerging from these and other studies seems to show the immigrants' integration into the Canadian labour market is becoming increasingly difficult. These results raise further questions, which so far have not been answered. In particular, have these difficulties translated into growing inequality among immigrants? Have falling entry earnings been accompanied by increases in earnings instability among immigrants? What was the impact of changes in immigrant cohort composition on the changes in earnings inequality and earnings instability since the early 1980s? Although the immigrant wage dynamics are a very important indicator of immigrant economic progress, the picture is not complete without looking into other aspects of immigrant earnings dynamics, such as earnings inequality and earnings instability.

The distinction between current (cross-sectional) inequality and long-term inequality, however, is crucial in the analysis of earnings inequality and earnings instability. Changes in earnings inequality are usually related to fundamental skill-based technological changes, which make certain skills obsolete while creating a demand for new skills (worker attributes). Changes in earnings instability, on the other hand, are mostly related to increased competition, institutional changes or changes in trade regulations.

Clearly, a snapshot of earnings inequality obtained from cross-sectional data does not distinguish between permanent and transitory components of earnings, so the source of current earnings inequality cannot be identified. Such separation can only be possible with panel data models; some of such models relevant to this study are discussed in the next section.

3 Models of earnings inequality

A general mechanism of examining earnings inequality and earnings instability was introduced by Gottschalk and Moffitt (1994) in a study of the growth of earnings instability in the United States. It was further developed in Baker (1997), Haider (2001), Moffitt and Gottschalk (2002), and Baker and Solon (2003), who added considerably more flexibility into the earlier models.

The basic idea of the approach is that individual earnings (or rather, log-earnings) in period t can be thought of as a sum of two orthogonal components, permanent and transitory, that evolve independently over time. A simple life-cycle model that incorporates dynamic changes in both components can be written as

$$y_{it} = p_t \alpha_i + \lambda_t v_{it}\,, \qquad (1)$$

where y_{it} represents the (log) earnings of an individual i in period t, α_i and v_{it} are permanent and transitory components, and p_t and λ_t are period-specific factor loading on each of these components.

Note that $cov(v_{it}, v_{is}) = 0$ in (1) implies that, unlike $var(y_{it})$, $cov(y_{it}, y_{is})$ does not depend on λ_t, so the source of cross-sectional inequality can be identified in a dynamic context from changes in autocovariances (Baker and Solon 2003). Put otherwise, an increase in p_t leads to an increase in earnings inequality, both current and long term; an increase in λ_t, on the other hand, does not imply a long-term effect. Such an increase can be thought of as an increase in a person's earnings instability. Assuming that the permanent component measures the life-time earnings potential or skill, p_t can be interpreted as the price of skill, which changes with changes in demand and supply for skill, due to technological transformation or other types of economic restructuring (Moffitt and Gottschalk 2002). In the context of immigrants' earnings, changes in p_t may reflect the general 'quality' of immigrants' human capital, affecting their ability to adjust to technological changes in the host country, as well as the diversity of immigrants' skills determined by immigration policies.

The model above can incorporate several additional features of earnings growth. For instance, the first term in (1) can incorporate heterogeneity in individual growth rates (Haider 2001), or a random walk component that would allow for permanent changes (Moffitt and Gottschalk 2002), or both (Baker and Solon 2003), so (1) may take the following form

$$y_{it} = p_t(\alpha_i + \beta_i x_{it} + u_{it}) + \varepsilon_{it}\,, \qquad (2)$$

where x_{it} is a set of variables determining growth rates, $u_{it} = u_{i,t-1} + r_{it}$ and ε_{it} represents the transitory component.

The last term in (2) can also take a more flexible specification. Baker and Solon (2003) allow for serial correlation in the transitory component

$$\varepsilon_{it} = \rho \varepsilon_{i,t-1} + \lambda_t v_{it}\,, \qquad (3)$$

and model the variance of v_{it} as a quartic function of age. Haider (2001) and Moffitt and Gottschalk (2002), on the other hand, assume an ARMA[2] (1,1) specification.

By specifying the functional form of y_{it}, we also specify the functional form of the variance–covariance matrix of individual earnings, Ω, so that each element in Ω is expressed as $\omega_i = f(x_i;\theta)$, where θ is a set of parameters that includes p_t and λ_t. Crucially, unlike the model in (2), θ does not include individual specific parameters α_i and β_i; instead, it includes $\sigma_\alpha^2, \sigma_\beta^2$ as well as $\sigma_{\alpha\beta}$.

The parameters of the resulting model are usually estimated using the generalized method of moments (GMM) based on minimizing the distance between the observed sample moments (elements of $\hat{\Omega}$) and $f(x_i;\hat{\theta})$. The parameter estimates $\hat{\theta}$ are used to construct the profiles of earnings inequality and earnings instability.

4 Estimation method

Consider now an immigrant *i* who arrived in year *c* (a member of arrival cohort *c*) at the age of *j*. The earnings of this person in year *t* can be described with a fair degree of flexibility by

$$\log Y_{cjit} = \mu_{cjt} + y_{cjit}, \tag{4}$$

where μ_{cjt} is the mean log earnings in each *cjt* cell. Equation (4) is the first-stage estimation equation that extracts the individual earnings component from the earnings dynamics of the arrival cohort. A two-stage approach is standard in the literature on earnings inequality and earnings instability; however, in some studies $\hat{y}_{cjit}$ are obtained by regressing log-earnings on an age polynomial (Haider 2001; Beach, Finnie and Gray 2003; Morissette and Ostrovsky 2005). The approach above appears more flexible in the context of this study.

After obtaining $\hat{y}_{cjit}$ from the first-stage regression, the variance of $\hat{y}_{cjit}$ can be decomposed into 'between' and 'within' components. In the descriptive part of this study, it is simply assumed (as in Beach, Finnie and Gray 2003; Morissette and Ostrovsky 2005) that $y_{cjit} = \bar{y}_{cji} + v_{cjit}$, and both variance components are computed following the formulas in Johnston (1984).[3]

2. The acronym ARMA stands for autoregressive moving average. ARMA models describe changes in a variable in terms only of its past value.

3. The within variance component is computed according to

$$\sigma_w^2 = \left(\frac{1}{N}\right)\sum_{i=1}^{N}\left[\left(\frac{1}{T-1}\right)\sum_{t=1}^{T}\left(y_{it} - \bar{y}_i\right)^2\right],$$

and the between variance component can be computed according to

$$\sigma_b^2 = \frac{1}{N}\sum_{i=1}^{N}\bar{y}_i^2 - \frac{\sigma_w^2}{\bar{T}}.$$

As different arrival cohorts are observed for a different number of years (for instance, the 1980-to-1982 cohort is observed for 22 years, while the 1998-to-2000 cohort is observed for only 4 years) it would be difficult to make a cross-cohort comparison of inequality and instability if calculations were made for all t's in which a cohort is observed. To make results comparable across cohorts, the decomposition is computed for a fixed number of post-arrival periods: t=4 (all cohorts), t=7 (all cohorts except that of 1998 to 2000) and t=10 (all cohorts except those of 1995 to 1997 and 1998 to 2000). For instance, if t=4 then the variance for the 1980-to-1982 arrival cohort is computed based on 1983, 1984, 1985 and 1986; the variance for the 1983-to-1985 arrival cohort is computed based on 1986, 1987, 1988 and 1989; and so on. The resulting panels are unbalanced because, for instance, in four-year panels, those who were present for only two or three periods are also included; similarly, seven-year panels include those who were observed for five or six periods and 10-year panels include those who were observed for eight or nine periods.

As mentioned in the introduction, the goal of this study is not only to document immigrant earnings inequality and earnings instability but also to analyse their potential causes, in particular, the role of pre-arrival education, language ability and country of birth. The effects of these variables can be estimated by adding control variables into the first-stage equation, re-estimating y_{cjit} and using the new estimates of y_{cjit} on the second stage. More specifically, Equation (4) takes the following form

$$\log Y_{cjit} = \mu_{cjt} + \phi_{cjt}\Theta(X_{cji}, L_{cji}, B_{cji}) + y_{cjit}, \tag{5}$$

where X_{cji} is foreign education measured by the years of schooling, L_{cji} is a set of dummy variables reflecting the ability to speak either official language or both, and B_{cji} is the set of dummies related to the place of birth. A model that includes either X_{cji}, L_{cji}, B_{cji}, or the full set can be estimated. Hence, we can not only compare measures of earnings inequality and earnings instability across different arrival cohorts and arrival ages but also see the degree to which the earnings inequality and instability of each cohort are influenced by these variables. In the context of the Canadian immigrant selection process based on a point system[4] that rewards foreign education and the ability to speak one of the official Canadian languages, such analysis may be particularly useful.

Although this is a very simple and intuitive method of analysing inequality and instability, it has obvious drawbacks. First, and most importantly, it does not allow for over-time changes in either permanent or transitory components. Second, it does not allow for the heterogeneity in earnings growth, as opposed to the heterogeneity in the levels of earnings. Finally, it ignores serial correlation in the transitory component. Hence, we will consider a more flexible model, similar to the models in Haider (2001) and Baker and Solon (2003).

We proceed as follows. Similar to (2), individual earnings of the members of c^{th} arrival cohort who were j-years old at arrival are assumed to follow

$$y_{cjit} = p_t(\alpha_{cji} + \beta_{cji}t_c + \gamma_{cji}Z_{cji} + u_{cjit}) + \varepsilon_{cjit}, \tag{6}$$

4. The 'point system' introduced in Canada in 1967 rewards applicants with extra points for a higher education level, knowledge of official languages (English or French) and younger age.

where $u_{cjit} = u_{cji,t-1} + r_{cjit}$ and $\varepsilon_{cjit} = \rho\varepsilon_{cji,t-1} + \lambda_t v_{cjit}$. Hence, total experience is broken down into two components: (1) 'Canadian experience,' t_c, which is the same for all members of the c^{th} arrival cohort, and (2) potential foreign experience Z_{cji}, simply defined as the age at arrival minus 25.

From the residuals in (4), a sample auto-covariance matrix is constructed for each cohort and arrival age. For instance, for those who arrived during the 1980-to-1982 period at the age of 30, this will be a 22×22 matrix (t=1983, 1984,…, 2004); for those who arrived during the 1995-to-1997 period at the age of 30 this will be a 7×7 matrix (t=1998, 1999,…, 2004). The size of the matrix will depend on both c and j; as the total number of arrival cohorts is seven, then for $j \in [25,49]$ there will be 7×25=175 auto-covariance matrices Ω_{cj} in total, which will produce 13,615 sample moments.

Let ω_{cj} be a vector of unique elements of Ω_{cj},

$$\omega_{cj} = \left(\omega_{cj11}, \omega_{cj12}, ..., \omega_{cj1M}, \omega_{cj22}, \omega_{cj23}, ..., \omega_{cj2M}, ..., \omega_{cjMM}\right)',$$

where M×M is the size of each Ω_{cj} matrix depending on c and j. All ω_{cj} can be stacked into a single vector Ω so that each diagonal element ω_{cjt} in Ω_{cj} can be written as

$$\omega_{cjt} = p_t^2(\sigma_{\alpha_c}^2 + \sigma_{\beta_c}^2 \cdot t_c^2 + 2\sigma_{\alpha\beta} \cdot t_c + \sigma_\gamma^2 Z_{cj}^2 + 2\sigma_{\beta\gamma_c} Z_{cj} t_c + 2\sigma_{\alpha\gamma_c} Z_{cj} + t_c \sigma_r^2) + \sigma_{\varepsilon_t}^2 \tag{7}$$

and each off-diagonal element ω_{cjts} as

$$\begin{aligned}\omega_{cjts} = p_t p_s(\sigma_{\alpha_c}^2 + \sigma_{\beta_c}^2 \cdot t_c s_c + \sigma_{\alpha\beta} \cdot (t_c + s_c) + \sigma_\gamma^2 Z_{cj}^2 + \sigma_{\beta\gamma_c} Z_{cj}(t_c + s_c) + \\ + 2\sigma_{\alpha\gamma_c} Z_{cj} + t_c \sigma_r^2) + \sigma_{\varepsilon_t\varepsilon_s}, \quad for \quad s \geq t.\end{aligned} \tag{8}$$

The transitory variance component $\varepsilon_{cjit} = \rho\varepsilon_{cji,t-1} + \lambda_t v_{cjit}$ takes the form of

$$\sigma_{\varepsilon_t}^2 = \rho^{2t}\sigma_{\varepsilon_0}^2 + \rho^{2(t-1)}\lambda_1^2\sigma_{v_1}^2 + \rho^{2(t-2)}\lambda_2^2\sigma_{v_2}^2 + \rho^{2(t-3)}\lambda_3^2\sigma_{v_3}^2 + ... + \rho^2\lambda_{t-1}^2\sigma_{v_{t-1}}^2 + \lambda_t^2\sigma_{v_t}^2 \tag{9}$$

and the covariance takes the form of

$$\sigma_{\varepsilon_t\varepsilon_s} = \sigma_{\varepsilon_t}^2 \cdot \rho^{(s-t)}, s \geq t\,. \tag{10}$$

As in Baker and Solon (2003), σ_v^2 can be modelled as a quadratic or quartic function of t and Z_{cj}. In particular, it may be written as

$$var(v_{cjt}) = g_0 + g_1 t_c + g_2 t_c^2 + g_3 t_c^3 + g_4 t_c^4 + m Z_{cj}\,. \tag{11}$$

Assuming that $\Omega^* = f(t, s, Z; \theta)$ is the population analog of Ω, we can now estimate the set of model parameters

$$\theta = (p_t, \sigma_\alpha^2, \sigma_\beta^2, \sigma_{\alpha\beta}, \sigma_\gamma^2, \sigma_{\alpha\gamma}, \sigma_{\beta\gamma}, \sigma_r^2, \lambda_t^2, \sigma_v^2, \sigma_{\varepsilon_c}^2, \rho, g_0, g_1, g_2, g_3, g_4, m)$$

by the generalized method of moments (GMM) using 13,615 sample moment corresponding to 13,615 elements in Ω

$$E\left[\Omega - f(t,s,Z;\hat{\theta})\right] = 0. \qquad (12)$$

The parameters in (12) can be estimated using a GMM minimum distance estimator that chooses an optimal set of parameter estimates $\hat{\theta}$ by minimizing

$$\Delta = \left[\Omega - f(t,s,Z;\hat{\theta})\right]' W \left[\Omega - f(t,s,Z;\hat{\theta})\right]. \qquad (13)$$

Haider (2001) and Baker and Solon (2003) point out the advantages of using an identity matrix as a weighting matrix in place of *W* (see also Altonji and Segal 1996, Clark 1996). One particular source of efficiency loss in an equal-weighted minimum distance estimator is that it ignores the fact that ω_{cj} elements of Ω are based on a different number of observations. A more efficient estimator may be obtained if sample moments are weighted in proportion to the size of each *cj* cell. The estimation results in this study are based on a minimum-distance estimator that uses both an identity matrix as a weighting matrix and a weighting matrix that weights the sample moments according to their sample sizes.

It can be seen from (7) that setting p_{1983}=1 (t=0) identifies σ_α^2 in a model with a single σ_α^2 parameter in the growth term. In a full model with cohort-specific parameters $\sigma_{\alpha_c}^2$ in the growth term, it is assumed that $\alpha_i = \frac{\alpha_i^*}{p_{t^*}}$, where t^* is the first loading factor for the cohort to which *i* belongs. For instance, for the 1980-to-1982 cohort t^*=1983; for the 1983-to-1985 cohort t^*=1986; and so on. A diagonal element in Ω_{cjt} can now be expressed as

$$\omega_{cjt} = p_t^2 \left[\frac{\sigma_{\alpha_c^*}^2}{p_{t^*}^2} + \sigma_{\beta_c}^2 \cdot t_c^2 + 2\sigma_{\alpha\beta_c} \cdot t_c + \sigma_\gamma^2 Z_{cj}^2 + 2\sigma_{\beta\gamma_c} Z_{cj} t_c + 2\sigma_{\alpha\gamma_c} Z_{cj} + t_c \sigma_r^2 \right] + \sigma_{\varepsilon_t}^2 .$$

Hence, assuming Z_{cj}=0, the permanent variance component for the 1980-to-1982 cohort in year 1983 (t=0) is $p_{1983}^2 \sigma_{\alpha_{1980-1982}}^2 = p_{1983}^2 \left[\frac{1}{p_{1983}^2} \sigma_{\alpha_{1980-1982}^*}^2 \right] = \sigma_{\alpha_{1980-1982}^*}^2$; for the 1983-to-1985 cohort it is $p_{1986}^2 \sigma_{\alpha_{1983-1985}}^2 = \sigma_{\alpha_{1983-1985}^*}^2$, and so on. Put otherwise, all $\sigma_{\alpha_c^*}^2$ 'absorb' the first loading factor for the cohorts they represent. The estimates of $\sigma_{\alpha_c^*}^2$ can be used instead of $\hat{\sigma}_{\alpha_c}^2$ to construct cohort-specific profiles of immigrant earning inequality.

5 Data and sample

The Longitudinal Administrative Databank (LAD) is the 20% random sample based on annual information provided on personal tax returns. Once selected, individuals are in the sample whenever they file a tax return. To keep the sample current, a part of each year's sample consists of individuals who file their returns for the first time. For instance, the first year of LAD is 1982, so the 1982 LAD is simply a 20% sample of all files in 1982. The 1983 sample consists of those selected in 1982 who also filed in 1983 plus a sample of those who filed for the first time in 1983. The total of these two groups is a 20% sample of all filers in 1983. This scheme allows annual increases in the LAD sample to parallel the annual increases in the Canadian population.

The Longitudinal Immigration Database (IMDB) is a database that, when merged with LAD, provides a direct link between immigration records and the economic performance of immigrants. A person is included in the database only if he or she obtained landed-immigrant status since 1980 and filed at least one tax return after becoming a landed immigrant. Each year the IMDB is updated with a new cohort of landings. Moreover, in each new tax year there are new entrants from previous landing cohorts, not just the newly added cohort, who have filed (or are matched) for the first time. There are also those immigrants who have filed previously, but have not filed in that year. These immigrants remain in the IMDB as they could file in future years.

By linking the IMDB (1980 to 2000) with LAD (1982 to 2004) we can observe the earnings of those who became landed immigrants during the 1980-to-2000 period from 1982 to 2004. Seven immigrant cohorts are considered: 1980 to 1982, 1983 to 1985, 1986 to 1988, 1989 to 1991, 1992 to 1994, 1995 to 1997 and 1998 to 2000. The three-year band is chosen, based on a trade-off between the size of each cohort and the total number of cohorts.

The earnings variable used in the study is as a sum of two LAD variables. The first variable is the employment income from T4 slips issued to the individual—that is, all paid-employment income (except self-employment income) including wages, salaries and commissions before deductions. The second variable is the so-called 'other employment income,' which captures taxable employment income other than wages, salaries and commissions (tips, gratuities or director's fee that are not reported on a T4 slip).

The immigrant's years of schooling at landing are the number of years of formal schooling—top coded at 25 years—successfully completed by the time of arrival in Canada. The official languages ability indicator is the self-reported ability to communicate in either French or English, or both. Finally, the immigrant's country of birth is identified, based on a list of countries including countries that no longer exist or are not recognized as a nation state.[5] All countries are divided into nine regions of birth, based on religious, ethnic and historical considerations (Appendix A).

The sample includes all male immigrants in the IMDB, who were at least 24 years old in the year they became landed immigrants and had positive earnings in the year following the last year in

5. The list, for instance, includes the Czech Republic, the Slovak Republic and Czechoslovakia.

the cohort band.[6] This restriction ensures that the persons in the sample had completed all or most of their schooling outside Canada and entered the Canadian labour market soon after arrival. Persons were kept in the sample for as long as they had positive earnings and were under 55 years, for a minimum of two periods. The structure of the resulting panel is similar to the one adopted by Haider (2001). Although it has its drawbacks, the alternatives—a fully balanced or a fully unbalanced panel—appear to be worse. A fully balanced panel, for instance, would require immigrants from the 1980-to-1982 cohort to have 22 years of positive earnings to be in the sample, leaving us with a very narrow sample of immigrants from this cohort: those who entered the Canadian labour market at a young age and had a strong attachment to the labour market. At the other extreme, immigrants from the 1998-to-2000 cohort would only need four years of positive earnings to be in the sample and would have been in their late forties when entering Canada. These differences in the 'age-at-arrival' distributions would make cross-cohort comparisons very difficult. A fully unbalanced panel, on the other hand, which would allow for a later entry and/or re-entry into the sample of those who had zero earnings in some years, would also allow for a possibility of school attendance during these years. At a minimum, a 'delayed entry' of those who attended school in Canada prior to entering the labour market would create differences in the timing of the earnings profiles within each arrival cohort, making cohorts' inequality and instability profiles difficult to interpret. There is also evidence that the earnings profiles of immigrants who attended school in Canada may be quite different from the earnings profiles of those with only a foreign education (see Schaafsma and Sweetman 2001, for a discussion).

As we focus on immigrants whose main income source is employment income (wages and salaries), we exclude immigrants with self-employment income greater than $100 (in 2004 dollars) in absolute terms. Some immigrants report very small annual earnings. Retaining these observations in the sample would allow some zero earners to escape deletion 'on technicality.' To avoid this, annual earnings of less than $50 were reset to zero.

The summary of sample averages and percentages of immigrants in different categories is given in Appendix B, Table B.1.

6 Descriptive analysis

We begin by estimating the individual component of immigrant earnings in (4). To obtain y_{cjit} we simply demean $\log Y_{cjit}$ within each cjt (cohort×arrival age×year) cell by regressing $\log Y_{cjit}$ on a constant. Later, additional explanatory variables will be added to this regression to determine their effect on earnings inequality and earnings instability. In what follows, computations are performed for each c and j separately so subscripts c and j are dropped to simplify the notation.

Table 1 shows the results of variance decomposition for all immigrants in each cohort and for different arrival age groups within each cohort. The between and within variances do not sum up to the total variance because the panels are unbalanced. For all cohorts, the between component is larger than the within component, although the between-within difference differs from cohort to cohort.

6. For instance, if the person arrived between 1983 and 1985, he would be included in the sample if he filed for tax return and had positive earnings in 1986.

The first notable result sheds some light on the issue of whether earnings inequality among recent immigrants is higher than among those who arrived in Canada in the past. The between variance component computed for the first four periods after arrival (t=4) is 46% higher for the 1998-to-2000 cohort and 28% higher for the 1995-to-1997 cohort than for the 1980-to-1982 cohort. For t=7 the comparison between 1998 to 2000 and 1980 to 1982 is not available; however, the between variance computed for the 1995-to-1997 period is 27% higher than for the 1980-to-1982 period. Finally, for t=10 the between variance is about 9% higher for the 1992-to-1994 cohort than for the 1980-to-1982 cohort. This is considerably lower than the 16% difference between these cohorts computed for t=7 and 23% difference computed for t=4. Judging by these results, more recent immigrant cohorts experienced much higher earnings inequality in the first several years after arrival than did previous cohorts; however, in the longer run the cross-cohort differences may not be as pronounced, and all immigrant cohorts eventually reach comparable levels of earnings inequality.

The within variance component appears to follow more pro-cyclical paths. For instance, those who arrived during the 1989-to-1991 period and entered the labour market in the midst of the 1990-to-1993 recession, have the highest four-year within variance. Not surprisingly, however, computed for seven- and 10-year periods, the within variances for this cohort are almost the same as the within variances of the two previous cohorts. Generally, those who entered the labour market in the mid-1980s have substantially smaller $\sigma^2_{within,t=4}$ than those who entered the labour market later. As may be expected, the cross-cohort differences are smaller for t=7 and t=10, although even in these cases the within variance computed for the 1980-to-1982 cohort is considerably lower than for any other cohort.

Breaking these trends down by arrival age groups, we find that, while for the earlier cohorts the between variance is considerably higher for older immigrants than for younger ones, there is little cross-age difference for the recent cohorts. The cross-age equalization appears to be mostly due to the rising between variance among younger immigrants. The $\sigma^2_{between,t=4}$ is 47% higher for the 1980-to-1982 cohort than for the 1998-to-2000 cohort (0.627 compared with 0.427) in the 25-to-29 category, 68% higher in the 30-to-34 category (0.692 compared with 0.413) and only 16% higher in the 45-to-49 age category (0.635 compared with 0.549). Therefore, it appears that cross-cohort differences in between variance are mostly driven by the rising inequality among immigrants who arrived at younger ages. The between variances computed for t=7 and t=10 seem to follow similar patters.

Table 2 shows the effect of education, language ability and origin on earnings inequality and earnings instability. As mentioned above, this is achieved by adding each of these explanatory variables into the first-stage regression and then re-computing variance decomposition. Although controlling for education, language and origin has a clear impact on inequality, it has very little effect on instability. This is not surprising, considering the differences in the sources for inequality and instability. Education, language and cultural background are skill-related characteristics that are absorbed into the persistent component of earnings variability and have a long-term effect.

Controlling for the birthplace brings about the largest reduction in $\sigma^2_{between,t=4}$ for all arrival cohorts. The relative effect of education and language ability, on the other hand, is different for different cohorts. For most cohorts, the effects of foreign education and language ability are similar for t=4; the impact of foreign education is somewhat weaker for the 1980-to-1982 and 1986-to-1988 cohorts but stronger for the 1995-to-1997 cohort. On the other hand, the effect of a foreign education seems to grow when we consider $\sigma^2_{between,t=10}$. For instance, for the 1989-to-1991 and 1992-to-1994 cohorts, $\sigma^2_{between,t=4}$ is about the same for both categories, while $\sigma^2_{between,t=10}$ is smaller for foreign education.

These results provide an interesting insight into the role of foreign education in the economic progress of immigrants. Although, shortly after arrival, a foreign education may have less impact on labour market prospects of immigrants than more easily recognizable skills, such as the ability to speak English or French, in the longer run, immigrants to Canada with higher educational attainment have a greater ability to adjust to the demands of the Canadian labour market.

It is also worth pointing out that even after controlling for all three factors, a large part of immigrant earnings inequality remains unexplained. For t=4, controlling for all three variables reduces the between variance by 14% to 26 %, depending on a cohort; for t=10, the reduction is from 20% to 35%. Furthermore, the combined effects of language, education and birthplace appear to be stronger for earlier cohorts. For the 1980-to-1982 cohort, for instance, controlling for all three variables reduces $\sigma^2_{between,t=4}$ by 26% (35% for t=10) compared with 17% for the 1992-to-1994 cohort (24% for t=10) and 15 % for the 1998-to-2000 cohort.

Differences in education, the ability to speak one of the official languages or ethnic background can be broadly viewed as differences in cohorts' human capital, so the impact of these variables should be absorbed in the between variance component. The within variance component, on the other hand, measures the 'unexplained' earnings variation, which is not skill related. It may be related, among other things, to local labour market fluctuations or seasonal oscillations in the demand for goods and services. Although the within variance may be affected indirectly by the changes in the cohort skill composition, controlling for education, language and ethnic background should not have any direct effect on the within variance. Indeed, Table 2 shows that the between variance component absorbs virtually all the effect of controlling for extra variables in the first-stage regressions. This result holds both for t=4 and t=10.

In Table 3 the results are broken down by arrival-age groups. The birthplace has the strongest impact on $\sigma^2_{between,t=4}$ for all cohorts and arrival-age groups. The relative effects of education and language, however, vary considerably with cohorts, age groups and the number of years for which variance is computed. For t=10, the impact of foreign education is stronger than the impact of language for immigrants in all age categories for the 1989-to-1991 and 1992-to-1994 cohorts. It is also stronger for immigrants in the 30-to-34 arrival-age groups for all cohorts. Generally, it seems that compared with language ability, the longer-term effect of foreign education is somewhat stronger for more recent cohorts in all age groups.

In sum, the descriptive results seem to indicate the following: earnings inequality accounts for a larger portion of the immigrant earnings dispersion than earnings instability; earnings inequality is higher for more recent cohorts than for those who arrived in the early 1980s; earnings instability is pro-cyclical—immigrants who arrived just before or during the recession in the early 1990s have experienced higher levels of earnings instability than earlier cohorts; the region of birth has the strongest impact on earnings inequality, while the impacts of foreign education and the ability to speak an official language vary from cohort to cohort and across arrival age groups; although controlling for education, language ability and origin reduces earnings inequality, it has very little effect on earnings instability; and, even after controlling for education, language and birthplace, a large portion of immigrant earnings inequality remains unexplained.

In the next section, we will examine cohorts' earnings inequality and earnings instability dynamics using a more flexible econometrics model.

7 Estimation results

The $\hat{y}_{it}$'s obtained from the first stage estimation regression described in the previous section can be used to estimate parameters of a more flexible model discussed in Section 4, using a generalized method of moments (GMM) minimum distance estimator in (13).

We first consider three models with common $\sigma_\alpha^2, \sigma_\beta^2, \sigma_{\alpha\beta}, \sigma_{\alpha\gamma}$ and $\sigma_{\beta\gamma}$ for all cohorts. This specification is almost identical to the specification in Baker and Solon (2003) but with a different set of explanatory variables. Instead of 'potential experience' used in most earnings inequality and earnings instability studies, the set of explanatory variables is chosen to be more consistent with the context of immigrant studies. The total potential experience is divided into 'Canadian experience' (also the age of the cohort) and 'potential foreign experience,' simply defined as the age at arrival minus 25.

Table 4 shows the estimation results for two models using equal-weighted and sample-weighted GMM estimators. In the first model, $var(v_{it})$ is a quartic function of t; in the second model, $var(v_{it})$ is also allowed to depend on potential foreign experience. For identification, the first-year factor loadings are normalized to 1 (that is, p_{1983}=1 and λ_{1984}=1).

Consider first the coefficients related to the permanent variance component, which include $\sigma_\alpha^2, \sigma_\beta^2, \sigma_\gamma^2, \sigma_{\alpha\beta}, \sigma_{\beta\gamma}, \sigma_{\alpha\gamma}, \sigma_r^2$ and p_t. The first parameter, σ_α^2, reflects the intercept heterogeneity in (10) and is assumed to be common for all cohorts. Given the p_{1983}=1 normalization, it also represents the 1983 permanent variance component for immigrants from the 1980-to-1982 arrival cohort who had no potential foreign experience (t and Z equal zero and p_t=1 in [11]). The estimates of $\sigma_\alpha^2, \sigma_\beta^2, \sigma_{\alpha\beta}$ and σ_r^2 are significant at the 95% level in all three models. Consistent with previous studies on earnings inequality, the estimates of $\sigma_{\alpha\beta}$ are significantly negative. In the immigrant context this trade-off between entry earnings and subsequent earnings growth is quite intuitive: those whose entry wages are higher may expect lower earnings growth rates. The estimate of the variance of the random walk component is 0.010 to 0.011 in all models.

Arriving in a new country at an older age may affect the economic progress of immigrants in more ways than one. The estimates of $\sigma_{\alpha\gamma}$ are positive and significant in all models, meaning that arrival age is positively correlated with entry earnings. However, the estimates of $\sigma_{\beta\gamma}$ are negative and significant: the earnings of those who arrive at an older age are likely to grow at a slower pace than the earnings of those who arrive at a younger age. The direct effect of the arrival age heterogeneity on earnings variance appears to be weak. In both models, the estimates of σ_{γ}^{2} are very small and not significant at the 95% level.

The profile of yearly factor loadings p_t gives us some idea about the changes in the persistent variance component of immigrants' earnings during the 1983-to-2004 period. All models show declining yearly effects during the 1980s, rising sharply during the recession of the early 1990s. The results, based on equally-weighted minimum distance estimators, suggest a substantial decline in inequality in the late 1990s; the results based on sample-weighted estimators show a much smaller decline in the late 1990s and subsequent rise in earning inequality at the beginning of the 2000s.

Figures 1-1 and 1-2 underscore the main problem with the previous analysis: the three starting points of the profile, for instance, are estimated only for those immigrants who arrived in Canada from 1980 to 1982, and had just entered the labour market. The last three points, on the other hand, are estimated on the mix of all arrival cohorts in the sample: those who arrived recently as well as those who had lived in Canada for a considerable period of time. Hence, although it appears that the early 1980s were years with high levels of earnings inequality, compared with the mid- and late 1990s, this result is clearly related to the fact that this portion of the profile is estimated on cohorts that had arrived just prior to this period. Therefore, given the nature of the sample, Figures 1-1 and 1-2 provide a somewhat misleading picture of immigrant earnings inequality dynamics. An alternative is to focus on cohort-specific profiles by considering a more flexible model with cohort-specific $\sigma_{\alpha}^{2}, \sigma_{\beta}^{2}, \sigma_{\alpha\beta}, \sigma_{\alpha\gamma}$ and $\sigma_{\beta\gamma}$.

Before we consider a more flexible specification that allows for cohort-specific parameters in the permanent variance component, let us examine the parameters related to the transitory variance component. This variance component is determined by the 'initial variances' $\sigma_{\varepsilon_0}^{2}$, factor loadings λ_2, parameters g_0, g_1, g_2, g_3 and g_4, and parameter m in the second model. By allowing cohort-specific initial variances, we are effectively separating cohort effects captured by $\sigma_{\varepsilon_0}^{2}$ from yearly effects captured by λ_t.

The initial variances capture the earnings instability of immigrants in each arrival cohort in the first post-arrival year, that is, 1983 for the 1980-to-1982 cohort, 1986 for the 1983-to-1985 cohort, and so on. More recent cohorts appear to have much larger initial variances than earlier cohorts; in fact, the estimates of the $\sigma_{\varepsilon_{2001}}^{2}$ are about twice as large as the estimates of $\sigma_{\varepsilon_{1983}}^{2}$.

The estimate of the autoregressive parameter is around 0.46 to 0.47 in all models, which is slightly lower than the parameter estimate reported by Baker and Solon (2003) and Haider (2001) for all workers. The estimates of g_0 and g_2 are positive and significant in all models; the estimates of g_1 and g_3 are negative and significant. The estimates of g_4 are positive and not significant. In the second model, the estimates of m are negative for both equally weighted (EW) and sample weighted (SW) estimators.

The shape of the λ_t profile appears highly pro-cyclical (λ_{1984} is 1 for identification), much more so than the factor loading profile of the persistent variance component. The profile peaks in 1992

(λ_{1992} is about 1.53 for EW models and 1.51 and 1.52 for SW models); λ_t declines from 1992 to 1998 and rises in from 1999 to 2004. The λ_t profile, however, does not tell the whole story of immigrant earnings instability. As initial variances that determine the starting point of each cohort's profile vary considerably, it is clear that cohort-specific profiles will be different.

We now turn to the models with a more flexible specification for the permanent variance component. Just as in the models above, where we assumed cohort-specific initial variances, we can also consider a model with cohort-specific variances and covariances in the permanent variance component, as discussed in Section 4. The estimation results based on the full model using EW and SW estimators are presented in Appendix B, Table B.2.

Table 5 shows the permanent and transitory variance component profiles computed for a hypothetical immigrant from each arrival cohort with five years of potential foreign experience (Z_{cji}=5) using the SW parameter estimates in Appendix B, Table B.2. There seems to be considerable evidence of cohort effects in earnings inequality, which is consistent with the descriptive results that show the presence of cohort effects and higher levels of earnings inequality for more recent cohorts. Compared with the earnings inequality (permanent component) profiles of the pre-1992 cohorts, the earnings inequality levels of the post-1992 cohorts are substantially higher in the first year after arrival and they remain higher in the next several years during which these cohorts are observed. The inequality levels of all pre-1992 cohorts rose in 1991 and 1992 and then declined during the 1993-to-1995 period. For all immigrants in the sample, with the exception of the 1980-to-1982 and 1998-to-2000 arrival cohorts, the permanent variance was rising during the first four years of the current decade. Unlike the earlier cohorts, the earnings inequality of recent cohorts appears to be rising slowly but steadily after declining during the first post-arrival years.

The earnings instability profiles can also be computed for each cohort (second column). Most profiles show that earnings instability is particularly high among immigrants just entering the labour market but it falls sharply during the subsequent two or three years. As in previous models, the instability profiles are highly pro-cyclical. The 1989-to-1991 cohort, which consists of immigrants who arrived right before or during the recession of the early 1990s, has the highest initial transitory variance (0.63); the 1986-to-1988 cohort has the lowest (0.33). For all cohorts, transitory variance declines sharply in the first two to three years after entering the labour market (a notable exception is the 1986-to-1988 cohort, which entered the labour market right before the recession). The 1980-to-1982 and 1983-to-1985 cohorts, observed for the longest period of time, show rising instability at the end, which is likely to be related to the aging of these cohorts.[7]

Table 6 shows the predicted total variance—the sum of permanent and transitory components—and the unconditional variance of $\hat{y}_{cjit}$. Overall, the cohort profiles of the predicted total variance are fairly close to the profiles of $var(\hat{y}_{cjit})$ (see Figure 2). Clearly, the total earnings variance in the first several post-arrival years is mostly driven by the transitory component, while the permanent component becomes predominant as immigrants settle down in their new country.

7. Higher earnings instability of older immigrants is consistent with generally higher earnings instability of older male workers (see Beach, Finnie and Gray 2003). Older workers may experience higher earnings instability due to, for instance, greater earnings losses and/or lower probability of finding new employment after a layoff; it may also reflect gradual retirement of some workers.

Hence, it is not surprising that the recession of the early 1990s had a greater impact on the total earnings volatility of the 1989-to-1991 and 1986-to-1988 cohorts than on previous cohorts; for these recently arrived cohorts, the transitory component played a more important role in their total earnings volatility.

An interesting question is to what degree immigrants share larger trends in earnings inequality and earnings instability in Canada, and whether immigrant profiles are similar to the profiles of the Canadian-born workers who entered the labour market at around the same time. Morissette, Myles and Picot (1994), Beach, Finnie and Gray (2003) and Baker and Solon (2003) show that, generally, earnings inequality in Canada fell gradually in the mid-1980s, and increased rapidly in the late 1980s and early 1990s, which is consistent with the trends in earnings inequality of immigrants found in this study. The comparison for the 1992-to-2004 period is more difficult. Beach, Finnie and Gray find only a slight increase in earnings inequality from 1990 to 1997 compared with from 1982 to 1989 for young men entering the labour market, while Morissette and Ostrovsky (2005) show that the family earnings inequality and earnings instability was generally higher from 1996 to 2001 than it was from 1986 to 1991, although the increase was not universal across different age and income groups. In sum, the information about general trends in earnings inequality and earnings instability in Canada in the 1990s and 2000s appears to be insufficient to make a more thorough comparison with the immigrant trends. Such a comparison may be a subject of future research.

7.1 The effects of foreign education, language ability and the place of birth

Although the profiles of immigrant earnings inequality and earnings instability are interesting in themselves, the linkage between the Longitudinal Administrative Databank and the Longitudinal Immigration Database allows us to take the analysis a step further and consider the effects of foreign education, the ability to speak an official language and the place of birth on immigrant earnings inequality and earnings instability.

Given that these variables are available for immigrants, we can estimate the full model with cohort-specific variances and covariances in the permanent growth component using the four samples described in Section 6: the first sample is based on the residuals from the first-stage regression, with foreign education as a control variable; the second sample is based on the first-stage regression, with the ability to speak one of the official languages as a control variable; the third sample is based on the first-stage regression, with the place of birth as a control variable; and, finally, the fourth sample is based on the first-stage regression, in which all the above mentioned variables are controlled for. The estimation results are shown in Appendix B, Table B.3.

Using the coefficient estimates in Table B.3 we can now construct five earnings inequality profiles for each arrival cohort (Table 7). Figure 3 helps visualize the effect of foreign education, ability to speak an official language and birthplace on earnings inequality. Each of these variables has an impact on immigrant earnings inequality and the effect of the birthplace is generally the largest. However, Figure 3 also illustrates the importance of a dynamic analysis. In contrast to the descriptive analysis, the dynamic models allow us to observe how the effects of different variables on earnings inequality change with time.

Table 7 also shows the percentage decline in the permanent variance component after controlling for education, language and birthplace. Consistent with the descriptive results, the place of birth has the strongest overall impact on inequality. Controlling for immigrants' origins reduces the permanent variance component of the 1980-to-1982 cohort by from 22% to 31%, depending on the period. However, the effect of birthplace is clearly less strong for more recent cohorts; for all post-1992 cohorts the effect of birthplace is less than or equal to 18% in any given period, and for the 1995-to-1997 cohort the effect is less than 16%.

The place of birth is, of course, not just a geographic location; it is a proxy for ethnic, religious and cultural attributes of immigrants. It may also signal the quality of immigrants' education and the relevance of their foreign work experience to potential employers, and may influence their hiring decisions. Interestingly, the effect of the immigrant origins generally increases in the first several years and remains strong long after entrance to the labour market. For the earlier cohorts, which are observed for the longest periods of time, we see that the birthplace effect is actually stronger 10 to 20 years after their arrival than in the first several years.

Table 7 also shows that although foreign education has a relatively small impact on inequality in the early years after arrival, its importance increases as the cohort ages. For the 1980-to-1982 cohort, for instance, controlling for language ability reduces the permanent variance component by 16.7% to 19.4% in the first three years after arrival, while controlling for foreign education leads only to a 10.9% to 13.7% reduction. In all years after 1992, however, the effects of education are greater than the effects of language competence. Similar to the birthplace, the effect of education is somewhat weaker for more recent cohorts, although its relative importance is greater. For the most recent cohorts, after several years, education plays as important a role in reducing earnings inequality as the birthplace. All in all, these results seem to indicate that foreign schooling has a positive long-term effect and that it plays an increasing role in reducing earnings inequality.[8]

In contrast to education, the effect of the language competence does not change much as immigrants settle in their new country; it appears to be at its strongest in the recession years. It also seems weaker for immigrants who arrived in the late 1980s and 1990s compared with the earlier cohorts.

The last two columns in Table 7 show the combined effect of including all three explanatory variables in the first-stage regression. The cohort effects noted earlier remain strong: even after controlling for foreign education, the ability to speak an official language and birthplace. The most recent cohorts have generally higher levels of earnings inequality than those who arrived in the 1980s. Not surprisingly, the total effect is smaller that the sum of individual effects because of collinearity. Although controlling for all three variables leads to a substantial reduction in the permanent variance component, most of the immigrant earnings inequality remains unexplained. It is interesting to note that for the pre-1992-arrival cohorts, the combined effect of the three variables on the permanent variance component increased during the recession years and remained high during the post-recession period.

Finally, the cohort profiles of the transitory variance components based on all five samples are presented in Table 8. The inclusion of extra explanatory variables into the first-stage regression

8. The effects of foreign schooling may also reflect the effects of unobserved individual characteristics that are usually correlated with higher education, such as, for instance, strong motivation.

generally has little effect on the dynamics of the transitory variance component, although we notice the divergence between the first (no controls) and the third (language) column for the 1980-to-1982 and 1983-to-1985 cohorts. However, as with the descriptive analysis, there is a noticeable drop in instability when all additional variables are controlled for.

The similarity of the earnings instability profiles in Table 8 is consistent with our understanding of the nature of earnings instability: the transitory component of the variance of immigrants' earnings is a residual variance component; changes in the skill composition of immigrant cohorts—broadly defined to include education, official language ability, as well as religious and cultural attributes—will affect immigrant earnings inequality but will have little direct effect on earnings instability.

8 Conclusion

This study examines the dynamics of immigrant earnings inequality and earnings instability, using a unique dataset based on Canadian administrative and immigrant data. Our goal is to complement the existing immigrant literature, which mostly focuses on immigrant wage dynamics, by examining the second moments of the wage distribution. The key feature of the approach used in this study is that it allows for distinguishing between current and long-term inequality in a way consistent with the recent literature on general earnings inequality in Canada and the United States. The parameter estimates of a flexible econometric model obtained using a generalized method of moments method are used to construct the earnings inequality and earnings instability profiles for immigrant cohorts that arrived in Canada in the period from 1980 to 2000.

An important part of this study examines the role of foreign education, the ability to speak one of the official languages and immigrants' origins on immigrant earnings inequality. Our analysis sheds light not only on the overall impact of these variables but also on the changes in their relative importance as immigrants adjust to the labour-market demands in their new country.

The results of the study indicate the presence of cohort effects in earnings inequality: more recent immigrant cohorts generally experienced higher levels of earnings inequality than did older ones, particularly the cohort that arrived in Canada in the early 1980s.

The place of birth, which may be thought of as a proxy for cultural, religious and ethnic characteristics of immigrants, has the strongest impact on immigrants' earnings inequality; however, fluency in English or French, as well as a foreign education, also play important roles. There is also some evidence that the effect of a foreign education on earnings inequality is gradually increasing as immigrants adjust to the labour market in their new country. Yet, although language, foreign education and birthplace explain a large part of immigrant earnings inequality, most of it is not explained by these factors.

When immigrants enter the labour market, the total volatility of immigrants' earnings is largely determined by the short-term earnings volatility (earnings instability). After several years, however, inequality becomes a dominant factor. It should also be noted that, while immigrants' earnings instability generally decreases during the first several years of their careers, it also appears to be highly pro-cyclical—rising rapidly during the recession years in the early 1990s and falling in subsequent years. Although almost all cohorts in the sample were affected by the early-1990's recession, the timing of its impact relative to the entry was different for all cohorts, making the cross-cohort comparison of instability more difficult. It appears, however, that those who entered the labour market in the mid-1980s generally experienced lower levels of earnings instability in the first several years of their working careers in Canada than those who entered the labour market in the mid-1990s.

Overall, taken together with previous studies of immigrants' labour market outcomes, the results seem to support the prevailing view in the immigrant literature that the economic fortunes of immigrants in Canada in the recent years have declined.

Table 1
The 'between' and 'within' variance decomposition of immigrant earnings, by arrival cohort and age at arrival

	Arrival cohort																	
	1980 to 1982			1983 to 1985			1986 to 1988			1989 to 1991			1992 to 1994			1995 to 1997		1998 to 2000
Age at arrival	t=4	t=7	t=10	t=4	t=7	t=10	t=4	t=7	t=10	t=4	t=7	t=10	t=4	t=7	t=10	t=4	t=7	t=4
All																		
Standard deviation y_{cjit}	0.670	0.546	0.517	0.718	0.653	0.558	0.758	0.621	0.517	0.881	0.647	0.543	0.847	0.662	0.568	0.872	0.710	0.971
Between	0.456	0.335	0.301	0.472	0.374	0.313	0.442	0.341	0.280	0.541	0.361	0.292	0.560	0.389	0.327	0.582	0.424	0.666
Within	0.261	0.221	0.219	0.295	0.298	0.251	0.370	0.299	0.243	0.423	0.304	0.256	0.372	0.290	0.248	0.364	0.304	0.387
Number of observations	6,400	4,400	3,200	4,500	2,700	1,900	8,500	5,400	4,000	13,000	8,700	6,600	13,000	8,900	6,700	12,000	8,200	13,000
25 to 29 years																		
Standard deviation y_{cjit}	0.650	0.544	0.512	0.693	0.647	0.578	0.746	0.598	0.514	0.851	0.635	0.516	0.801	0.621	0.542	0.876	0.705	0.920
Between	0.427	0.317	0.275	0.413	0.336	0.291	0.423	0.313	0.264	0.491	0.346	0.266	0.493	0.346	0.293	0.565	0.404	0.627
Within	0.270	0.238	0.241	0.328	0.334	0.294	0.378	0.301	0.252	0.441	0.309	0.258	0.380	0.287	0.254	0.381	0.317	0.352
Number of observations	2,600	1,800	1,300	1,800	1,100	800	2,900	1,900	1,400	4,600	3,000	2,300	4,100	2,800	2,100	3,100	2,100	3,400
30 to 34 years																		
Standard deviation y_{cjit}	0.629	0.509	0.493	0.659	0.563	0.458	0.710	0.584	0.496	0.878	0.633	0.543	0.803	0.640	0.547	0.821	0.676	1.027
Between	0.413	0.307	0.280	0.452	0.328	0.267	0.418	0.316	0.266	0.551	0.338	0.290	0.557	0.373	0.320	0.545	0.405	0.692
Within	0.259	0.210	0.217	0.251	0.254	0.198	0.340	0.287	0.237	0.419	0.311	0.257	0.338	0.283	0.234	0.355	0.288	0.434
Number of observations	1,800	1,300	1,000	1,200	700	500	2,500	1,600	1,200	3,900	2,600	2,100	3,700	2,600	2,000	3,300	2,400	3,900
35 to 39 years																		
Standard deviation y_{cjit}	0.656	0.526	0.523	0.738	0.705	0.604	0.743	0.633	0.535	0.881	0.654	0.540	0.876	0.686	0.600	0.911	0.775	0.974
Between	0.483	0.344	0.343	0.496	0.421	0.362	0.415	0.344	0.296	0.564	0.380	0.295	0.563	0.402	0.349	0.627	0.470	0.682
Within	0.230	0.185	0.183	0.289	0.287	0.248	0.386	0.305	0.249	0.394	0.292	0.248	0.391	0.302	0.261	0.342	0.327	0.378
Number of observations	1,100	800	600	800	500	400	1,700	1,100	900	2,600	1,700	1,400	2,600	1,900	1,600	2,600	1,900	2,900
40 to 44 years																		
Standard deviation y_{cjit}	0.746	0.630	0.558	0.836	0.747	0.605	0.817	0.675	0.535	0.929	0.675	0.615	0.920	0.706	0.589	0.853	0.673	0.961
Between	0.539	0.409	0.350	0.623	0.459	0.389	0.482	0.400	0.329	0.582	0.408	0.356	0.647	0.444	0.359	0.583	0.398	0.666
Within	0.246	0.238	0.212	0.259	0.310	0.221	0.377	0.300	0.210	0.412	0.287	0.262	0.379	0.285	0.237	0.371	0.285	0.385
Number of observations	600	400	300	400	200	200	900	600	500	1,400	1,000	800	1,500	1,100	900	1,700	1,300	1,800
45 to 49 years																		
Standard deviation y_{cjit}	0.808	…	…	0.794	…	…	0.928	…	…	0.963	…	…	1.014	…	…	0.936	…	0.908
Between	0.549	…	…	0.517	…	…	0.608	…	…	0.618	…	…	0.708	…	…	0.614	…	0.635
Within	0.316	…	…	0.335	…	…	0.407	…	…	0.451	…	…	0.405	…	…	0.388	…	0.346
Number of observations	400	…	…	300	…	…	500	…	…	700	…	…	800	…	…	900	…	1,000

… not applicable
Note: t stands for time period.
Sources: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004, and Longitudinal Immigration Database, 1980 to 2000.

Table 2
The 'between' and 'within' variance decomposition of immigrant earnings based on Equations (4) and (5), by arrival cohort

	Arrival cohort											
	1982		1985		1988		1991		1994		1997	2000
	t=4	t=10	t=4	t=10	t=4	t=10	t=4	t=10	t=4	t=10	t=4	t=4
No controls												
Standard deviation y_{cjit}	0.670	0.517	0.718	0.558	0.758	0.517	0.881	0.543	0.847	0.568	0.872	0.971
Between	0.456	0.301	0.472	0.313	0.442	0.280	0.541	0.292	0.560	0.327	0.582	0.666
Within	0.261	0.219	0.295	0.251	0.370	0.243	0.423	0.256	0.372	0.248	0.364	0.387
Control for foreign education												
Standard deviation y_{cjit}	0.631	0.471	0.688	0.515	0.734	0.493	0.867	0.518	0.819	0.526	0.833	0.941
Between	0.415	0.256	0.442	0.271	0.420	0.256	0.527	0.267	0.533	0.286	0.545	0.638
Within	0.261	0.218	0.295	0.251	0.368	0.243	0.423	0.257	0.372	0.247	0.363	0.387
Control for language ability												
Standard deviation y_{cjit}	0.613	0.463	0.692	0.527	0.723	0.494	0.864	0.531	0.825	0.550	0.850	0.939
Between	0.397	0.248	0.446	0.283	0.407	0.257	0.522	0.280	0.536	0.309	0.561	0.633
Within	0.261	0.219	0.294	0.251	0.369	0.243	0.423	0.256	0.372	0.248	0.364	0.387
Control for origin												
Standard deviation y_{cjit}	0.580	0.440	0.640	0.505	0.702	0.483	0.833	0.515	0.786	0.525	0.823	0.922
Between	0.367	0.226	0.391	0.261	0.385	0.247	0.490	0.265	0.497	0.286	0.533	0.615
Within	0.257	0.217	0.295	0.251	0.368	0.242	0.422	0.255	0.371	0.247	0.362	0.386
Control for all												
Standard deviation y_{cjit}	0.553	0.410	0.618	0.474	0.663	0.451	0.807	0.484	0.754	0.488	0.773	0.873
Between	0.339	0.197	0.369	0.231	0.347	0.215	0.464	0.234	0.464	0.249	0.485	0.567
Within	0.257	0.216	0.294	0.249	0.366	0.241	0.422	0.255	0.370	0.246	0.361	0.386

Note: t stands for time period.
Sources: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004, and Longitudinal Immigration Database, 1980 to 2000.

Table 3
The effect of foreign education, language ability and birthplace on the between variance component of immigrants' earnings, by arrival cohort and age at arrival

	Arrival cohort											
	1982		1985		1988		1991		1994		1997	2000
Age at arrival	t=4	t=10	t=4	t=10	t=4	t=10	t=4	t=10	t=4	t=10	t=4	t=4
25 to 29 years												
No controls	0.427	0.275	0.413	0.291	0.423	0.264	0.491	0.266	0.493	0.293	0.565	0.627
Control for education	0.398	0.245	0.402	0.263	0.411	0.244	0.484	0.242	0.480	0.265	0.533	0.593
Control for language	0.384	0.237	0.399	0.270	0.399	0.240	0.473	0.254	0.479	0.277	0.543	0.598
Control for origin	0.351	0.219	0.357	0.257	0.368	0.230	0.444	0.242	0.449	0.264	0.514	0.591
All three controls	0.336	0.201	0.347	0.234	0.345	0.205	0.426	0.215	0.428	0.232	0.472	0.541
30 to 34 years												
No controls	0.413	0.280	0.452	0.267	0.418	0.266	0.551	0.290	0.557	0.320	0.545	0.692
Control for education	0.376	0.226	0.416	0.218	0.400	0.247	0.532	0.262	0.527	0.275	0.504	0.665
Control for language	0.359	0.227	0.423	0.231	0.376	0.249	0.526	0.276	0.532	0.302	0.522	0.658
Control for origin	0.339	0.206	0.370	0.199	0.372	0.238	0.493	0.262	0.501	0.278	0.504	0.635
All three controls	0.306	0.172	0.345	0.171	0.333	0.212	0.458	0.229	0.463	0.240	0.448	0.586
35 to 39 years												
No controls	0.483	0.343	0.496	0.362	0.415	0.296	0.564	0.295	0.563	0.349	0.627	0.682
Control for education	0.433	0.285	0.450	0.304	0.391	0.269	0.550	0.269	0.532	0.303	0.592	0.649
Control for language	0.396	0.269	0.461	0.324	0.375	0.269	0.549	0.284	0.536	0.326	0.606	0.636
Control for origin	0.365	0.241	0.405	0.317	0.359	0.261	0.509	0.259	0.487	0.292	0.564	0.621
All three controls	0.330	0.203	0.376	0.276	0.312	0.219	0.485	0.229	0.452	0.254	0.516	0.557
40 to 44 years												
No controls	0.539	0.350	0.623	0.389	0.482	0.329	0.582	0.356	0.647	0.359	0.583	0.666
Control for education	0.481	0.297	0.569	0.339	0.451	0.288	0.566	0.333	0.605	0.306	0.551	0.643
Control for language	0.459	0.263	0.556	0.337	0.447	0.299	0.569	0.335	0.601	0.340	0.569	0.634
Control for origin	0.372	0.224	0.477	0.282	0.382	0.262	0.539	0.329	0.548	0.308	0.523	0.600
All three controls	0.332	0.191	0.441	0.250	0.343	0.221	0.510	0.290	0.500	0.269	0.487	0.557

Note: t stands for time period.
Sources: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004, and Longitudinal Immigration Database, 1980 to 2000.

Table 4
Parameter estimates related to the permanent component for models with common variances in the growth term

	First model, no foreign experience in var(v[it])				Second model, including foreign experience in var(v[it])			
	Equal weighted		Sample weighted		Equal weighted		Sample weighted	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
p1984	0.938	0.031	0.949	0.024	0.939	0.031	0.950	0.024
p1985	0.907	0.031	0.927	0.025	0.909	0.031	0.923	0.025
p1986	0.888	0.027	0.907	0.022	0.888	0.027	0.896	0.022
p1987	0.891	0.027	0.914	0.023	0.892	0.027	0.903	0.022
p1988	0.883	0.027	0.913	0.023	0.884	0.027	0.904	0.023
p1989	0.864	0.025	0.883	0.020	0.865	0.025	0.867	0.019
p1990	0.878	0.025	0.875	0.020	0.881	0.025	0.862	0.019
p1991	0.935	0.026	0.922	0.021	0.938	0.026	0.916	0.021
p1992	0.919	0.025	0.913	0.019	0.921	0.025	0.903	0.019
p1993	0.905	0.025	0.889	0.019	0.907	0.025	0.882	0.019
p1994	0.909	0.025	0.871	0.019	0.911	0.025	0.864	0.019
p1995	0.896	0.025	0.897	0.019	0.898	0.025	0.886	0.018
p1996	0.901	0.025	0.911	0.019	0.904	0.025	0.903	0.019
p1997	0.924	0.025	0.913	0.019	0.927	0.025	0.905	0.019
p1998	0.915	0.025	0.927	0.019	0.917	0.025	0.917	0.019
p1999	0.881	0.024	0.904	0.019	0.883	0.024	0.895	0.019
p2000	0.860	0.024	0.896	0.019	0.861	0.024	0.886	0.018
p2001	0.869	0.024	0.918	0.019	0.870	0.024	0.909	0.019
p2002	0.861	0.024	0.907	0.019	0.861	0.024	0.900	0.019
p2003	0.864	0.024	0.917	0.019	0.864	0.024	0.909	0.019
p2004	0.873	0.024	0.942	0.019	0.874	0.024	0.934	0.019
sig2_r	0.011	0.002	0.011	0.001	0.010	0.002	0.011	0.001
sig2_α	0.305	0.017	0.292	0.012	0.299	0.017	0.293	0.012
sig2_β	5.3E-04	9.4E-05	5.4E-04	7.1E-05	5.4E-04	9.4E-05	5.4E-04	7.2E-05
sig2_γ	4.3E-06	3.5E-05	9.2E-10	2.6E-05	2.7E-05	3.6E-05	6.7E-10	2.7E-05
sig_αβ	-7.3E-03	7.5E-04	-7.7E-03	5.1E-04	-7.0E-03	7.5E-04	-7.6E-03	5.2E-04
sig_αγ	3.6E-03	5.2E-04	4.0E-03	3.5E-04	3.5E-03	5.1E-04	4.2E-03	3.6E-04
sig_βγ	-3.8E-05	3.4E-05	-1.6E-04	2.7E-05	-2.1E-05	3.4E-05	-1.4E-04	2.8E-05

Table 4
Parameter estimates related to the permanent component for models with common variances in the growth term (concluded)

	First model, no foreign experience in var(v[it])				Second model, including foreign experience in var(v[it])			
	Equal weighted		Sample weighted		Equal weighted		Sample weighted	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
λ1986	0.877	0.078	0.921	0.058	0.883	0.077	0.941	0.058
λ1987	1.060	0.063	1.007	0.046	1.059	0.063	1.020	0.047
λ1988	1.099	0.068	1.046	0.052	1.098	0.067	1.059	0.053
λ1989	1.178	0.072	1.170	0.055	1.176	0.071	1.194	0.056
λ1990	1.197	0.066	1.135	0.044	1.192	0.065	1.149	0.045
λ1991	1.435	0.077	1.376	0.052	1.429	0.075	1.386	0.053
λ1992	1.531	0.082	1.505	0.057	1.526	0.081	1.520	0.058
λ1993	1.360	0.071	1.337	0.047	1.354	0.070	1.347	0.048
λ1994	1.284	0.070	1.289	0.048	1.279	0.069	1.301	0.049
λ1995	1.272	0.072	1.252	0.049	1.267	0.071	1.270	0.050
λ1996	1.277	0.068	1.219	0.044	1.270	0.067	1.230	0.045
λ1997	1.157	0.066	1.176	0.045	1.152	0.065	1.189	0.046
λ1998	1.150	0.068	1.101	0.046	1.147	0.068	1.116	0.046
λ1999	1.275	0.068	1.238	0.045	1.272	0.067	1.254	0.046
λ2000	1.263	0.069	1.207	0.045	1.262	0.068	1.225	0.046
λ2001	1.360	0.075	1.280	0.049	1.356	0.073	1.297	0.050
λ2002	1.423	0.073	1.389	0.049	1.422	0.072	1.406	0.050
λ2003	1.404	0.074	1.353	0.049	1.404	0.073	1.374	0.050
λ2004	1.412	0.077	1.315	0.050	1.408	0.076	1.332	0.051
ρ	0.455	0.008	0.466	0.005	0.456	0.008	0.468	0.005
s0_1983	0.424	0.029	0.405	0.021	0.427	0.029	0.399	0.021
s0_1986	0.493	0.023	0.480	0.020	0.496	0.023	0.484	0.020
s0_1989	0.351	0.022	0.313	0.015	0.353	0.022	0.320	0.015
s0_1992	0.648	0.022	0.631	0.012	0.649	0.022	0.634	0.012
s0_1995	0.705	0.022	0.675	0.012	0.707	0.022	0.678	0.012
s0_1998	0.725	0.022	0.713	0.013	0.726	0.022	0.715	0.012
s0_2001	0.806	0.021	0.808	0.012	0.808	0.021	0.808	0.012
g0	0.327	0.032	0.344	0.023	0.338	0.033	0.347	0.024
g1	-0.056	0.007	-0.061	0.006	-0.056	0.007	-0.059	0.006
g2	5.6E-03	1.1E-03	6.4E-03	9.9E-04	5.5E-03	1.1E-03	6.1E-03	9.6E-04
g3	-2.7E-04	7.8E-05	-3.4E-04	7.4E-05	-2.7E-04	7.8E-05	-3.2E-04	7.2E-05
g4	5.0E-06	1.9E-06	6.6E-06	1.9E-06	4.9E-06	1.9E-06	6.3E-06	1.8E-06
m	…	…	…	…	-8.4E-04	2.4E-04	-1.4E-03	2.1E-04

… not applicable
Sources: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004, and Longitudinal Immigration Database, 1980 to 2000.

Table 5
The variance components of individual earnings, by year and cohort, sample weighted

Year	1980 to 1982		1983 to 1985		1986 to 1988		1989 to 1991		1992 to 1994		1995 to 1997		1998 to 2000	
	Permanent	Transitory	Permanent	Transitory	Permanent	Transitory	Permanent	Transitory	Permanent	Transitory	Permanent	Transitory	Permanent	Transitory
1983	0.269	0.503	…	…	…	…	…	…	…	…	…	…	…	…
1984	0.279	0.420	…	…	…	…	…	…	…	…	…	…	…	…
1985	0.264	0.304	…	…	…	…	…	…	…	…	…	…	…	…
1986	0.253	0.276	0.307	0.410	…	…	…	…	…	…	…	…	…	…
1987	0.250	0.267	0.289	0.399	…	…	…	…	…	…	…	…	…	…
1988	0.261	0.235	0.289	0.344	…	…	…	…	…	…	…	…	…	…
1989	0.261	0.229	0.278	0.326	0.232	0.333	…	…	…	…	…	…	…	…
1990	0.268	0.239	0.275	0.329	0.233	0.470	…	…	…	…	…	…	…	…
1991	0.316	0.297	0.315	0.396	0.269	0.576	…	…	…	…	…	…	…	…
1992	0.331	0.322	0.321	0.415	0.278	0.590	0.326	0.630	…	…	…	…	…	…
1993	0.325	0.259	0.310	0.324	0.270	0.448	0.305	0.634	…	…	…	…	…	…
1994	0.316	0.228	0.297	0.276	0.260	0.369	0.284	0.536	…	…	…	…	…	…
1995	0.318	0.215	0.296	0.252	0.261	0.325	0.277	0.463	0.332	0.595	…	…	…	…
1996	0.328	0.187	0.305	0.213	0.271	0.267	0.280	0.368	0.326	0.537	…	…	…	…
1997	0.334	0.165	0.311	0.183	0.277	0.221	0.282	0.296	0.319	0.432	…	…	…	…
1998	0.328	0.149	0.308	0.160	0.275	0.188	0.278	0.243	0.307	0.346	0.386	0.603	…	…
1999	0.320	0.165	0.304	0.172	0.271	0.196	0.274	0.245	0.298	0.338	0.362	0.517	…	…
2000	0.314	0.158	0.303	0.159	0.270	0.176	0.274	0.213	0.295	0.284	0.348	0.418	…	…
2001	0.329	0.172	0.323	0.166	0.288	0.178	0.295	0.209	0.315	0.270	0.363	0.385	0.612	0.410
2002	0.322	0.199	0.324	0.183	0.288	0.191	0.300	0.217	0.320	0.272	0.362	0.375	0.496	0.537
2003	0.317	0.216	0.327	0.189	0.289	0.190	0.307	0.210	0.329	0.254	0.368	0.340	0.416	0.494
2004	0.320	0.224	0.340	0.185	0.299	0.179	0.325	0.192	0.351	0.225	0.389	0.291	0.378	0.415

… not applicable
Sources: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004, and Longitudinal Immigration Database, 1980 to 2000.

Table 6
The variance components of individual earnings, by year and cohort, sample weighted

Year	Permanent and transitory		Permanent and transitory		Permanent and transitory		Permanent and transitory		Permanent and transitory		Permanent and transitory		Permanent and transitory	
	Total	Actual	Total	Actual	Total	Actual	Total	Actual	Total	Actual	Total	Actual	Total	Actual
1983	0.772	0.767	…	…	…	…	…	…	…	…	…	…	…	…
1984	0.698	0.712	…	…	…	…	…	…	…	…	…	…	…	…
1985	0.568	0.582	…	…	…	…	…	…	…	…	…	…	…	…
1986	0.528	0.540	0.717	0.769	…	…	…	…	…	…	…	…	…	…
1987	0.517	0.510	0.688	0.728	…	…	…	…	…	…	…	…	…	…
1988	0.496	0.480	0.633	0.664	…	…	…	…	…	…	…	…	…	…
1989	0.490	0.486	0.604	0.632	0.565	0.612	…	…	…	…	…	…	…	…
1990	0.507	0.470	0.605	0.697	0.704	0.706	…	…	…	…	…	…	…	…
1991	0.613	0.578	0.710	0.802	0.845	0.858	…	…	…	…	…	…	…	…
1992	0.653	0.713	0.737	0.748	0.868	0.873	0.957	0.934	…	…	…	…	…	…
1993	0.585	0.607	0.634	0.647	0.718	0.776	0.939	0.947	…	…	…	…	…	…
1994	0.544	0.622	0.573	0.635	0.630	0.615	0.820	0.837	…	…	…	…	…	…
1995	0.532	0.507	0.548	0.598	0.587	0.596	0.740	0.750	0.927	0.961	…	…	…	…
1996	0.515	0.511	0.518	0.511	0.537	0.548	0.649	0.687	0.862	0.895	…	…	…	…
1997	0.499	0.505	0.494	0.504	0.498	0.503	0.579	0.554	0.751	0.806	…	…	…	…
1998	0.477	0.451	0.468	0.532	0.463	0.502	0.521	0.525	0.654	0.670	0.989	1.015	…	…
1999	0.485	0.460	0.476	0.504	0.467	0.485	0.519	0.487	0.635	0.645	0.879	0.912	…	…
2000	0.472	0.462	0.461	0.467	0.446	0.424	0.487	0.492	0.579	0.640	0.766	0.750	…	…
2001	0.501	0.455	0.489	0.444	0.466	0.433	0.505	0.550	0.586	0.598	0.749	0.756	1.021	1.065
2002	0.521	0.529	0.508	0.567	0.479	0.457	0.517	0.543	0.592	0.568	0.737	0.741	1.032	1.036
2003	0.533	0.491	0.516	0.531	0.479	0.490	0.518	0.509	0.584	0.585	0.708	0.714	0.911	0.918
2004	0.544	0.558	0.525	0.488	0.478	0.493	0.517	0.524	0.576	0.566	0.681	0.666	0.793	0.807

… not applicable
Sources: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004, and Longitudinal Immigration Database, 1980 to 2000.

Table 7
The cohort-specific permanent variance components for the sample-weighted model with no controls, and with controls for foreign education, language ability and birthplace

		Foreign education		Language ability		Place of birth		All controls	
	No controls	Education	Decline	Language	Decline	Birthplace	Decline	All	Decline
			percent		percent		percent		percent
1980 to 1982									
1983	0.269	0.240	-10.9	0.217	-19.4	0.209	-22.2	0.183	-32.1
1984	0.279	0.247	-11.3	0.229	-17.7	0.203	-27.0	0.183	-34.4
1985	0.264	0.228	-13.7	0.220	-16.7	0.203	-23.2	0.178	-32.5
1986	0.253	0.217	-14.2	0.215	-15.1	0.189	-25.4	0.167	-33.9
1987	0.250	0.220	-12.0	0.209	-16.2	0.184	-26.4	0.163	-34.8
1988	0.261	0.221	-15.2	0.217	-16.6	0.199	-23.6	0.174	-33.2
1989	0.261	0.220	-15.7	0.217	-16.7	0.202	-22.6	0.172	-34.0
1990	0.268	0.217	-19.2	0.215	-19.8	0.202	-24.8	0.160	-40.2
1991	0.316	0.247	-21.7	0.243	-23.2	0.230	-27.1	0.184	-41.9
1992	0.331	0.261	-21.2	0.250	-24.6	0.232	-30.0	0.185	-44.2
1993	0.325	0.256	-21.2	0.250	-23.0	0.233	-28.3	0.188	-42.3
1994	0.316	0.249	-21.3	0.250	-21.0	0.221	-30.2	0.179	-43.3
1995	0.318	0.248	-22.1	0.254	-20.1	0.227	-28.6	0.182	-42.6
1996	0.328	0.258	-21.5	0.264	-19.5	0.234	-28.6	0.191	-41.8
1997	0.334	0.261	-21.8	0.268	-19.7	0.233	-30.3	0.190	-43.2
1998	0.328	0.255	-22.4	0.266	-19.0	0.229	-30.4	0.186	-43.2
1999	0.320	0.246	-23.2	0.262	-18.1	0.224	-30.1	0.182	-43.2
2000	0.314	0.239	-24.0	0.261	-16.9	0.222	-29.3	0.179	-42.8
2001	0.329	0.250	-23.9	0.271	-17.4	0.230	-30.0	0.184	-43.9
2002	0.322	0.246	-23.6	0.271	-15.9	0.224	-30.4	0.184	-42.9
2003	0.317	0.243	-23.4	0.268	-15.6	0.215	-32.2	0.177	-44.3
2004	0.320	0.247	-23.0	0.272	-15.2	0.222	-30.7	0.183	-42.8
1983 to 1985									
1986	0.307	0.279	-9.1	0.300	-2.2	0.248	-19.1	0.230	-25.1
1987	0.289	0.270	-6.7	0.277	-4.0	0.230	-20.4	0.213	-26.4
1988	0.289	0.259	-10.1	0.274	-5.0	0.237	-17.8	0.216	-25.1
1989	0.278	0.248	-10.7	0.261	-5.8	0.230	-17.2	0.204	-26.5
1990	0.275	0.235	-14.5	0.248	-10.0	0.220	-20.1	0.182	-34.1
1991	0.315	0.260	-17.2	0.269	-14.5	0.242	-23.0	0.199	-36.6
1992	0.321	0.268	-16.8	0.268	-16.7	0.236	-26.6	0.193	-39.9
1993	0.310	0.257	-17.0	0.262	-15.5	0.232	-25.3	0.191	-38.5
1994	0.297	0.246	-17.2	0.255	-13.9	0.215	-27.7	0.177	-40.2
1995	0.296	0.243	-18.0	0.256	-13.4	0.218	-26.4	0.177	-40.1
1996	0.305	0.252	-17.4	0.265	-13.3	0.223	-26.8	0.183	-39.9
1997	0.311	0.256	-17.8	0.268	-13.8	0.221	-28.8	0.181	-41.8
1998	0.308	0.251	-18.4	0.267	-13.4	0.218	-29.1	0.178	-42.2
1999	0.304	0.246	-19.1	0.265	-12.8	0.216	-29.0	0.175	-42.5
2000	0.303	0.243	-19.9	0.267	-11.8	0.217	-28.3	0.174	-42.4
2001	0.323	0.259	-19.7	0.282	-12.7	0.229	-29.1	0.182	-43.7
2002	0.324	0.262	-19.3	0.287	-11.4	0.229	-29.5	0.185	-42.8
2003	0.327	0.265	-18.9	0.290	-11.3	0.225	-31.4	0.182	-44.3
2004	0.340	0.277	-18.4	0.302	-11.3	0.238	-29.9	0.194	-43.0
1986 to 1988									
1989	0.232	0.227	-2.3	0.225	-3.1	0.213	-8.3	0.197	-15.2
1990	0.233	0.218	-6.4	0.216	-7.4	0.208	-10.8	0.178	-23.5
1991	0.269	0.244	-9.4	0.237	-12.0	0.233	-13.3	0.199	-26.1
1992	0.278	0.253	-9.0	0.238	-14.2	0.232	-16.7	0.196	-29.6
1993	0.270	0.245	-9.3	0.235	-13.1	0.231	-14.5	0.196	-27.5
1994	0.260	0.235	-9.6	0.231	-11.4	0.217	-16.8	0.184	-29.2
1995	0.261	0.233	-10.7	0.233	-11.0	0.223	-14.8	0.186	-28.7
1996	0.271	0.243	-10.3	0.241	-10.9	0.230	-14.8	0.195	-28.1
1997	0.277	0.246	-10.9	0.245	-11.6	0.230	-16.8	0.193	-30.1
1998	0.275	0.242	-11.9	0.243	-11.3	0.228	-16.9	0.191	-30.4
1999	0.271	0.236	-12.9	0.242	-10.9	0.226	-16.6	0.188	-30.6
2000	0.270	0.232	-14.0	0.243	-10.0	0.228	-15.6	0.188	-30.4
2001	0.288	0.247	-14.2	0.256	-11.1	0.240	-16.6	0.196	-31.9
2002	0.288	0.248	-14.0	0.259	-9.9	0.238	-17.2	0.199	-30.9
2003	0.289	0.249	-13.9	0.260	-10.0	0.233	-19.4	0.195	-32.7
2004	0.299	0.259	-13.6	0.269	-10.1	0.246	-17.8	0.206	-31.2

Table 7
The cohort-specific permanent variance components for the sample-weighted model with no controls and controls for foreign education, language ability and birthplace (concluded)

		Foreign education		Language ability		Place of birth		All controls	
	No controls	Education	Decline	Language	Decline	Birthplace	Decline	All	Decline
			percent		percent		percent		percent
1989 to 1991									
1992	0.326	0.311	-4.7	0.297	-9.1	0.289	-11.4	0.261	-20.0
1993	0.305	0.287	-5.7	0.280	-8.1	0.276	-9.5	0.248	-18.5
1994	0.284	0.265	-6.8	0.265	-6.6	0.249	-12.1	0.223	-21.3
1995	0.277	0.253	-8.6	0.259	-6.4	0.248	-10.4	0.217	-21.7
1996	0.280	0.256	-8.8	0.261	-6.8	0.251	-10.6	0.219	-21.9
1997	0.282	0.254	-10.0	0.260	-7.8	0.246	-12.9	0.212	-24.8
1998	0.278	0.247	-11.3	0.256	-7.9	0.242	-13.1	0.206	-25.7
1999	0.274	0.240	-12.6	0.253	-7.8	0.239	-12.8	0.202	-26.3
2000	0.274	0.236	-13.8	0.254	-7.2	0.242	-11.9	0.202	-26.4
2001	0.295	0.254	-13.9	0.270	-8.6	0.257	-12.8	0.212	-28.0
2002	0.300	0.259	-13.6	0.277	-7.7	0.260	-13.4	0.219	-27.0
2003	0.307	0.267	-13.3	0.282	-8.1	0.259	-15.8	0.219	-28.8
2004	0.325	0.284	-12.7	0.297	-8.5	0.279	-14.0	0.237	-27.0
1992 to 1994									
1995	0.332	0.306	-7.8	0.310	-6.5	0.296	-10.7	0.266	-19.9
1996	0.326	0.299	-8.2	0.303	-6.9	0.289	-11.3	0.259	-20.5
1997	0.319	0.288	-9.7	0.293	-8.1	0.275	-13.9	0.243	-24.0
1998	0.307	0.272	-11.6	0.282	-8.4	0.263	-14.4	0.228	-25.6
1999	0.298	0.258	-13.5	0.273	-8.4	0.255	-14.5	0.217	-27.0
2000	0.295	0.249	-15.4	0.271	-8.0	0.254	-13.7	0.212	-27.9
2001	0.315	0.264	-16.2	0.285	-9.6	0.269	-14.9	0.220	-30.3
2002	0.320	0.267	-16.6	0.292	-8.9	0.270	-15.6	0.224	-30.0
2003	0.329	0.274	-16.9	0.298	-9.5	0.270	-18.0	0.223	-32.3
2004	0.351	0.291	-16.9	0.315	-10.0	0.293	-16.4	0.241	-31.2
1995 to 1997									
1998	0.386	0.361	-6.5	0.347	-10.1	0.345	-10.8	0.307	-20.6
1999	0.362	0.326	-9.9	0.328	-9.4	0.321	-11.3	0.277	-23.5
2000	0.348	0.302	-13.2	0.318	-8.6	0.310	-10.9	0.258	-25.7
2001	0.363	0.307	-15.4	0.327	-9.9	0.319	-12.1	0.256	-29.4
2002	0.362	0.301	-16.9	0.329	-9.2	0.316	-12.7	0.253	-30.1
2003	0.368	0.301	-18.1	0.331	-10.0	0.313	-14.9	0.246	-33.1
2004	0.389	0.316	-18.7	0.347	-11.0	0.339	-12.8	0.263	-32.4
1998 to 2000									
2001	0.612	0.587	-4.0	0.580	-5.1	0.573	-6.2	0.505	-17.5
2002	0.496	0.461	-7.0	0.466	-6.0	0.455	-8.3	0.401	-19.1
2003	0.416	0.378	-9.3	0.383	-8.0	0.369	-11.3	0.318	-23.6
2004	0.378	0.342	-9.6	0.342	-9.5	0.345	-8.8	0.290	-23.4

Source: Statistics Canada, Longitudinal Administrative Databank.

Table 8
The cohort-specific transitory variance components for the sample-weighted model, with no controls, with controls for foreign education, language ability and birthplace

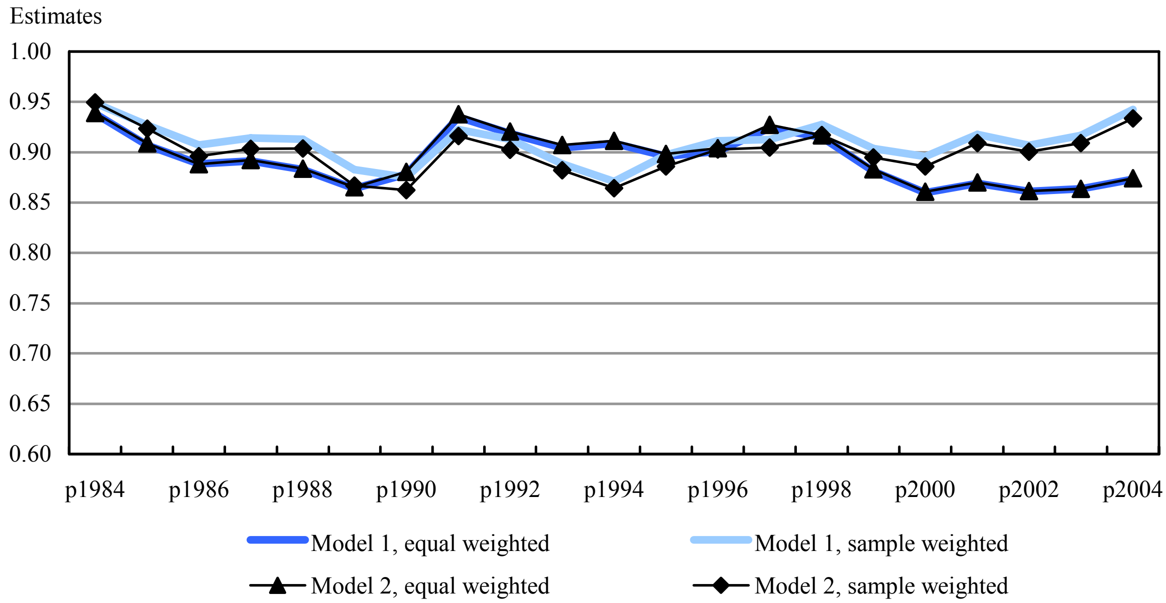
	No controls	Foreign education	Language ability	Birthplace	All
1980 to 1982					
1983	0.503	0.491	0.483	0.435	0.424
1984	0.420	0.417	0.413	0.400	0.392
1985	0.304	0.302	0.296	0.290	0.285
1986	0.276	0.275	0.268	0.266	0.261
1987	0.267	0.260	0.251	0.249	0.244
1988	0.235	0.229	0.220	0.217	0.210
1989	0.229	0.222	0.210	0.207	0.199
1990	0.239	0.233	0.218	0.220	0.213
1991	0.297	0.296	0.278	0.276	0.268
1992	0.322	0.321	0.298	0.308	0.299
1993	0.259	0.264	0.240	0.243	0.241
1994	0.228	0.234	0.205	0.215	0.213
1995	0.215	0.220	0.189	0.200	0.198
1996	0.187	0.189	0.162	0.172	0.169
1997	0.165	0.167	0.142	0.155	0.151
1998	0.149	0.149	0.124	0.139	0.133
1999	0.165	0.163	0.135	0.154	0.146
2000	0.158	0.152	0.124	0.145	0.135
2001	0.172	0.166	0.134	0.160	0.149
2002	0.199	0.196	0.153	0.189	0.174
2003	0.216	0.215	0.165	0.211	0.193
2004	0.224	0.227	0.173	0.218	0.202
1983 to 1985					
1986	0.410	0.411	0.410	0.377	0.382
1987	0.399	0.397	0.390	0.373	0.369
1988	0.344	0.340	0.335	0.320	0.311
1989	0.326	0.316	0.312	0.297	0.286
1990	0.329	0.319	0.313	0.304	0.296
1991	0.396	0.388	0.385	0.370	0.359
1992	0.415	0.406	0.399	0.400	0.388
1993	0.324	0.323	0.312	0.307	0.304
1994	0.276	0.279	0.259	0.264	0.261
1995	0.252	0.256	0.233	0.238	0.237
1996	0.213	0.216	0.195	0.200	0.198
1997	0.183	0.188	0.167	0.175	0.174
1998	0.160	0.165	0.143	0.152	0.150
1999	0.172	0.175	0.151	0.163	0.159
2000	0.159	0.159	0.135	0.147	0.142
2001	0.166	0.165	0.138	0.155	0.148
2002	0.183	0.181	0.148	0.171	0.163
2003	0.189	0.183	0.149	0.178	0.167
2004	0.185	0.177	0.144	0.171	0.160
1986 to 1988					
1989	0.333	0.335	0.331	0.305	0.299
1990	0.470	0.468	0.465	0.439	0.431
1991	0.576	0.572	0.584	0.543	0.530
1992	0.590	0.579	0.592	0.571	0.556
1993	0.448	0.443	0.449	0.426	0.423
1994	0.369	0.367	0.360	0.354	0.351
1995	0.325	0.324	0.313	0.309	0.309
1996	0.267	0.265	0.254	0.253	0.250
1997	0.221	0.224	0.211	0.215	0.214
1998	0.188	0.192	0.176	0.182	0.179
1999	0.196	0.201	0.182	0.189	0.187
2000	0.176	0.179	0.159	0.167	0.163
2001	0.178	0.182	0.159	0.170	0.167
2002	0.191	0.195	0.166	0.181	0.178
2003	0.190	0.191	0.161	0.181	0.176
2004	0.179	0.175	0.149	0.165	0.160

Table 8
The cohort-specific transitory variance components for the sample-weighted model, with no controls, with controls for foreign education, language ability and birthplace (concluded)

	No controls	Education	Language	Birthplace	All
1989 to 1991					
1992	0.630	0.617	0.620	0.591	0.580
1993	0.634	0.641	0.656	0.605	0.606
1994	0.536	0.541	0.544	0.517	0.515
1995	0.463	0.463	0.464	0.442	0.443
1996	0.368	0.363	0.365	0.351	0.347
1997	0.296	0.294	0.293	0.289	0.287
1998	0.243	0.243	0.237	0.236	0.233
1999	0.245	0.245	0.236	0.238	0.235
2000	0.213	0.213	0.200	0.204	0.200
2001	0.209	0.212	0.196	0.202	0.200
2002	0.217	0.224	0.200	0.211	0.209
2003	0.210	0.215	0.190	0.205	0.202
2004	0.192	0.194	0.171	0.181	0.180
1992 to 1994					
1995	0.595	0.588	0.588	0.561	0.557
1996	0.537	0.540	0.549	0.514	0.512
1997	0.432	0.435	0.445	0.424	0.423
1998	0.346	0.347	0.352	0.338	0.335
1999	0.338	0.336	0.339	0.330	0.327
2000	0.284	0.280	0.279	0.274	0.269
2001	0.270	0.268	0.264	0.263	0.260
2002	0.272	0.274	0.260	0.265	0.263
2003	0.254	0.256	0.240	0.251	0.248
2004	0.225	0.226	0.211	0.216	0.216
1995 to 1997					
1998	0.603	0.588	0.615	0.553	0.557
1999	0.517	0.523	0.539	0.504	0.503
2000	0.418	0.417	0.427	0.405	0.399
2001	0.385	0.383	0.391	0.376	0.373
2002	0.375	0.374	0.374	0.368	0.365
2003	0.340	0.336	0.334	0.336	0.333
2004	0.291	0.286	0.284	0.281	0.280
1998 to 2000					
2001	0.410	0.358	0.373	0.349	0.354
2002	0.537	0.542	0.548	0.524	0.526
2003	0.494	0.495	0.504	0.492	0.489
2004	0.415	0.408	0.420	0.402	0.402

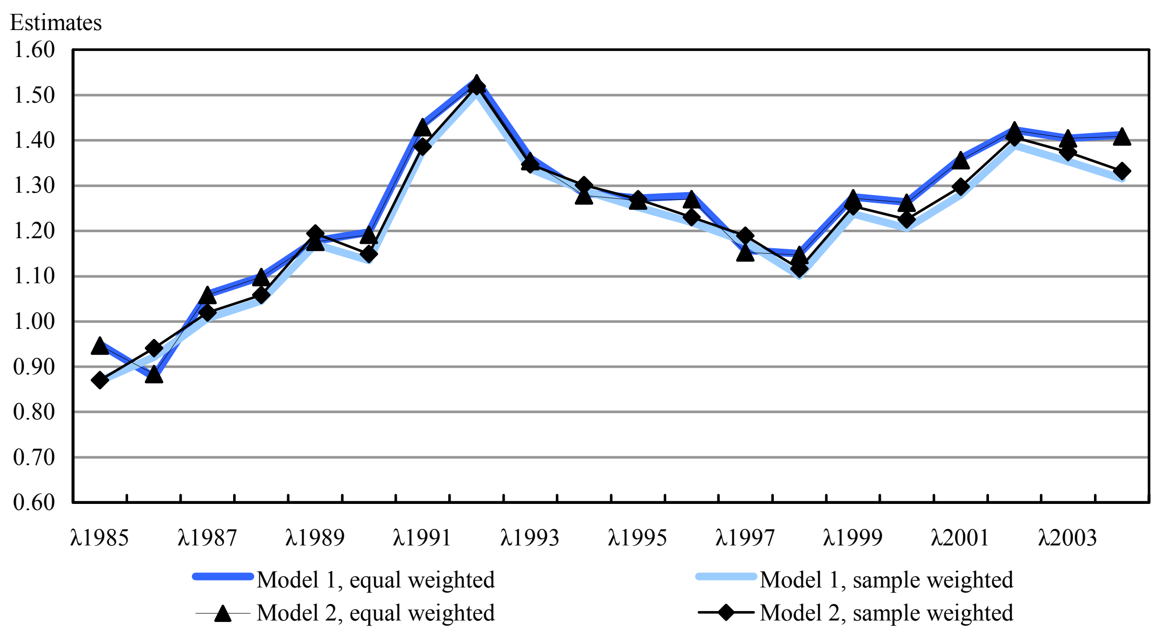
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 1-1
Estimates of p_t from Models 1 and 2 (equal weighted and sample weighted)



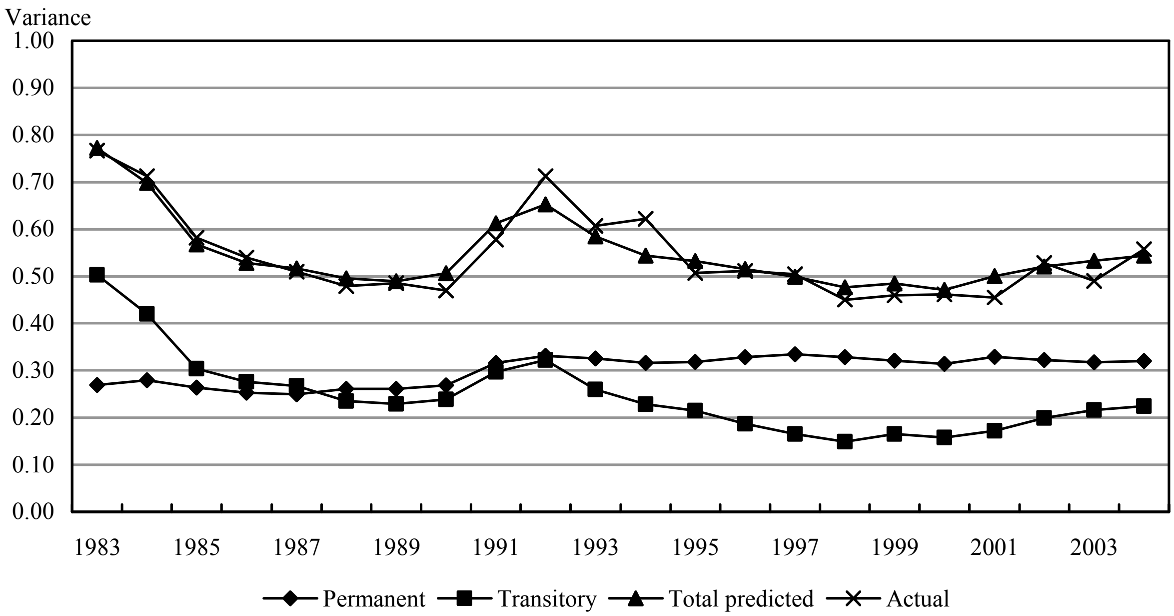
Sources: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004, and Longitudinal Immigration Database, 1980 to 2000.

Figure 1-2
Estimates of λ_t from Models 1 and 2 (equal weighted and sample weighted)



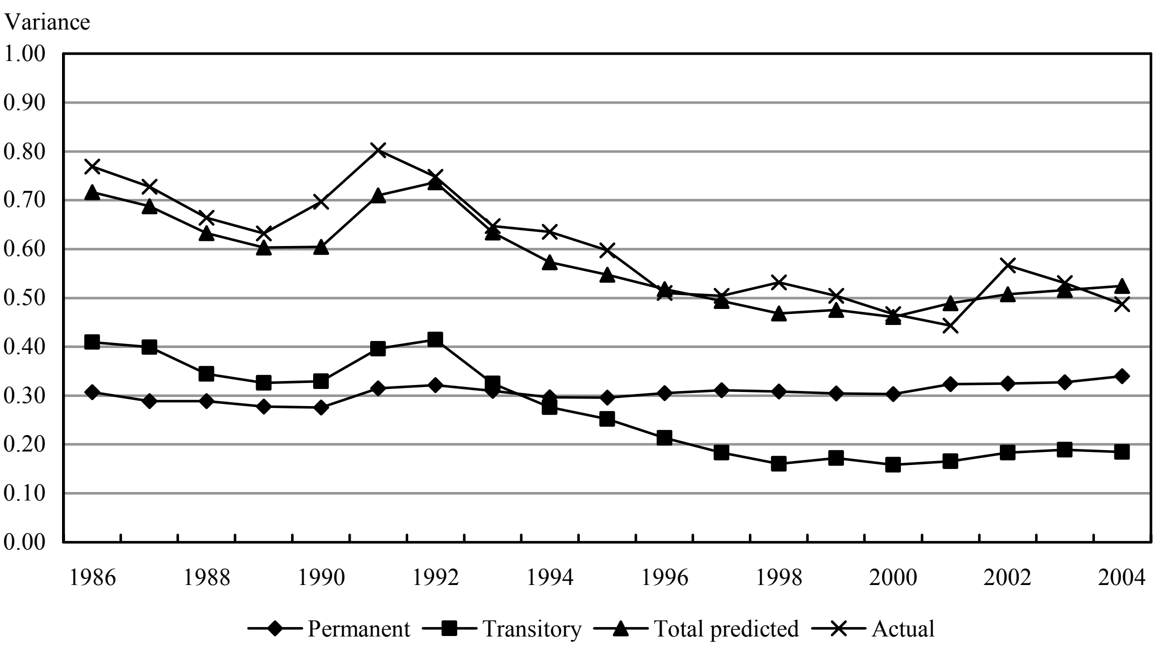
Sources: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004, and Longitudinal Immigration Database, 1980 to 2000.

Figure 2-1
Variance (actual and predicted) and variance components (permanent and transitory) for different cohorts, based on estimates in Table 5 — 1980-to-1982 cohort



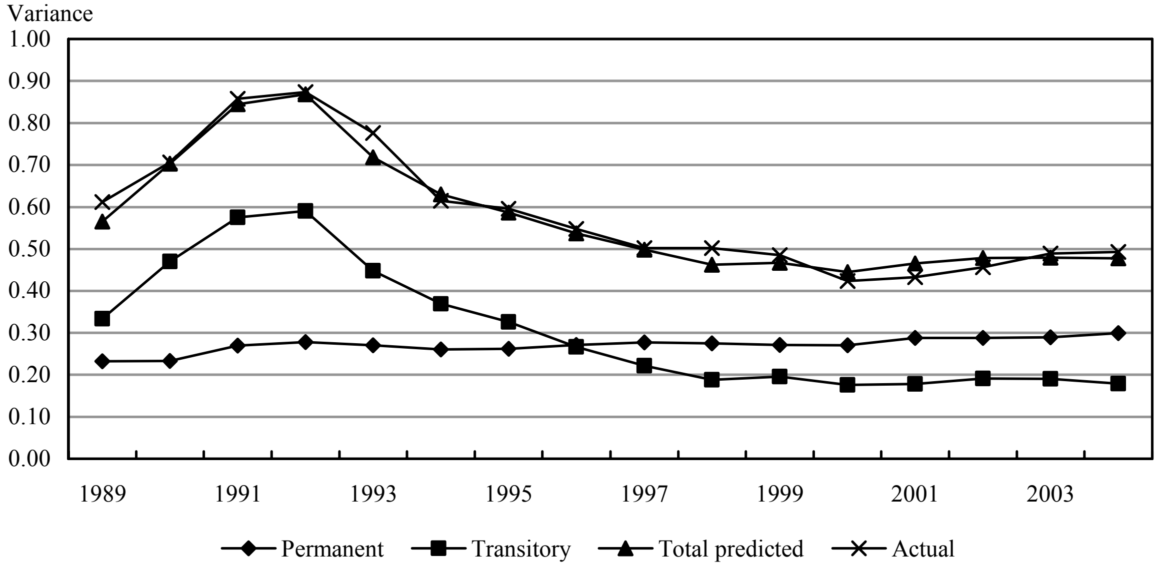
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 2-2
Variance (actual and predicted) and variance components (permanent and transitory) for different cohorts, based on estimates in Table 5 — 1983-to-1985 cohort



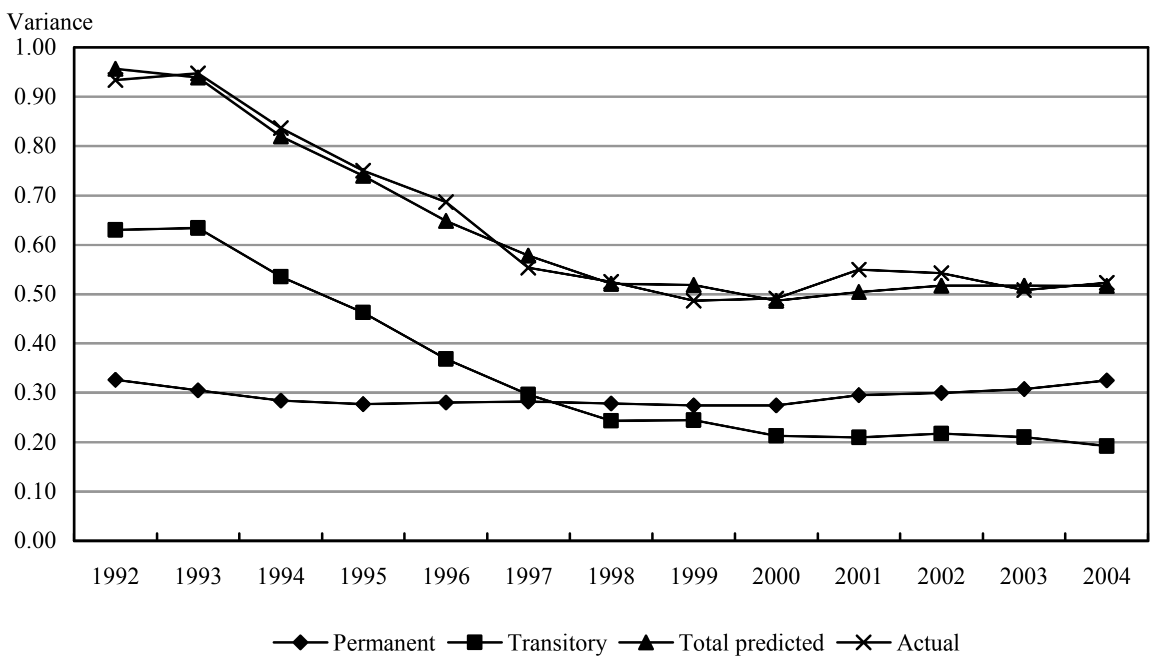
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 2-3
Variance (actual and predicted) and variance components (permanent and transitory) for different cohorts, based on estimates in Table 5 — 1986-to-1988 cohort



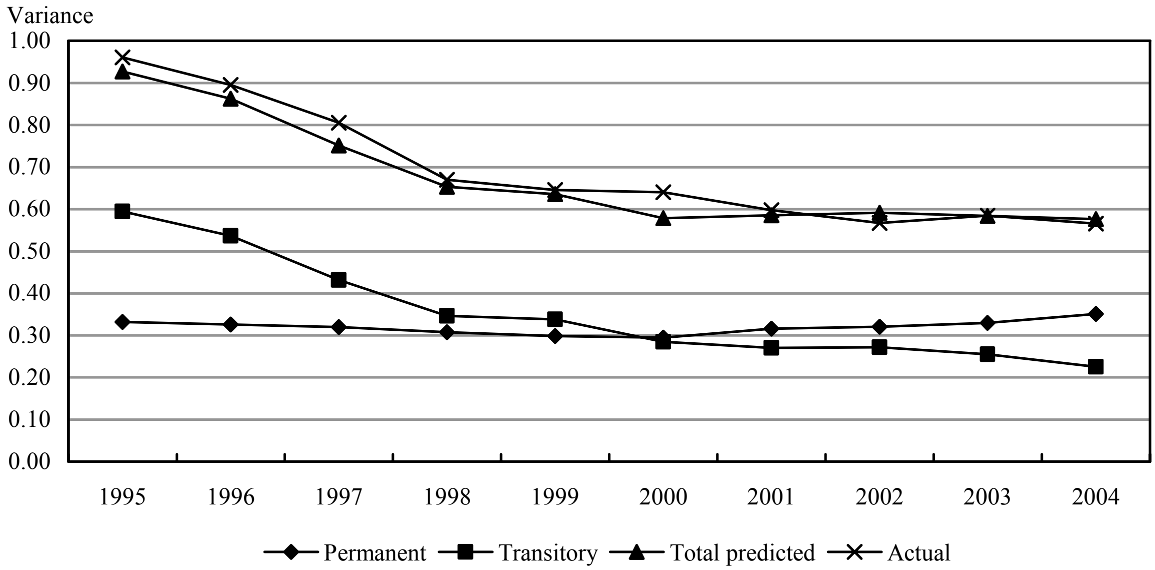
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 2-4
Variance (actual and predicted) and variance components (permanent and transitory) for different cohorts, based on estimates in Table 5 — 1989-to-1991 cohort



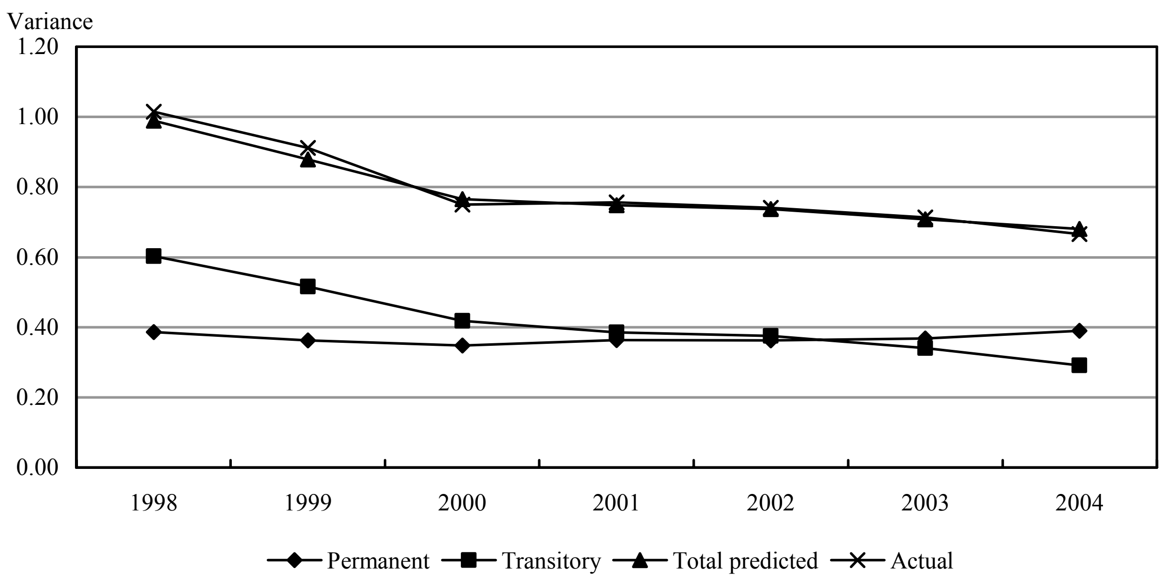
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 2-5
Variance (actual and predicted) and variance components (permanent and transitory) for different cohorts, based on estimates in Table 5 — 1992-to-1994 cohort



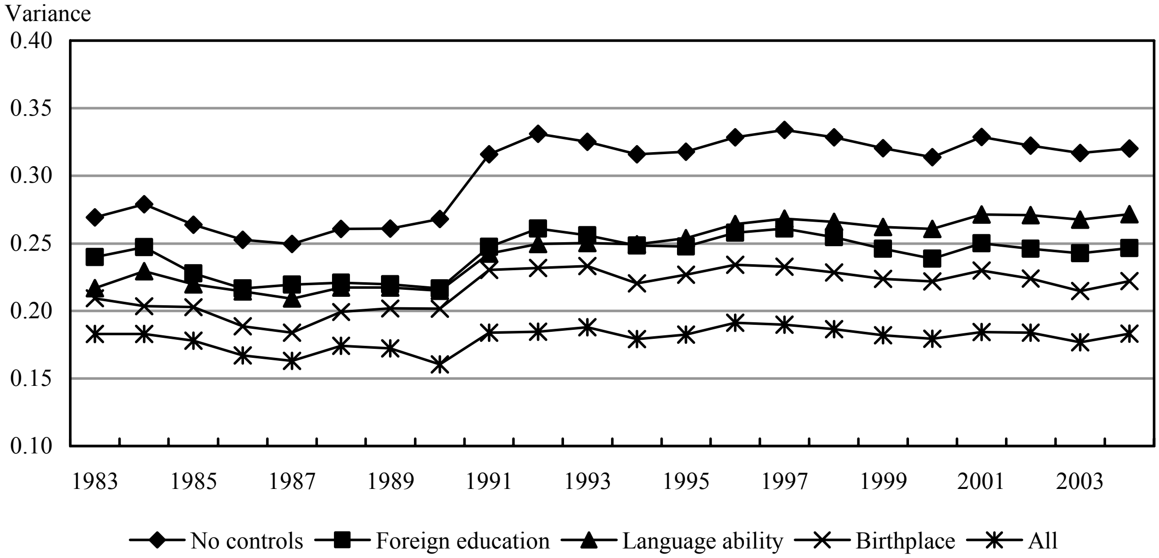
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 2-6
Variance (actual and predicted) and variance components (permanent and transitory) for different cohorts, based on estimates in Table 5 — 1995-to-1997 cohort



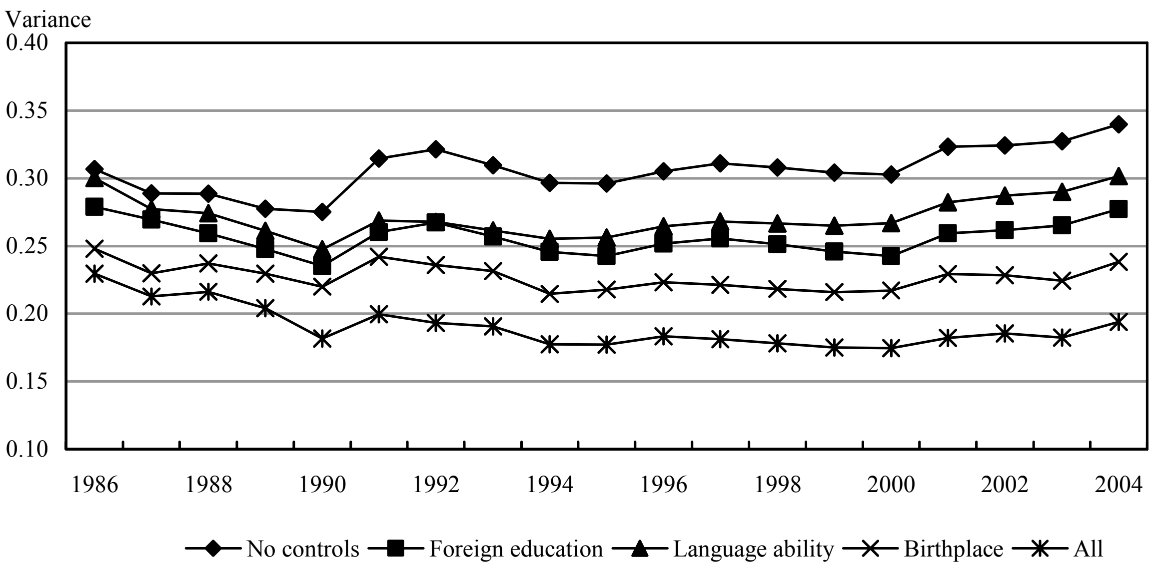
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 3-1
The permanent variance component, based on estimates in Table 7 — 1980-to-1982 arrival cohort



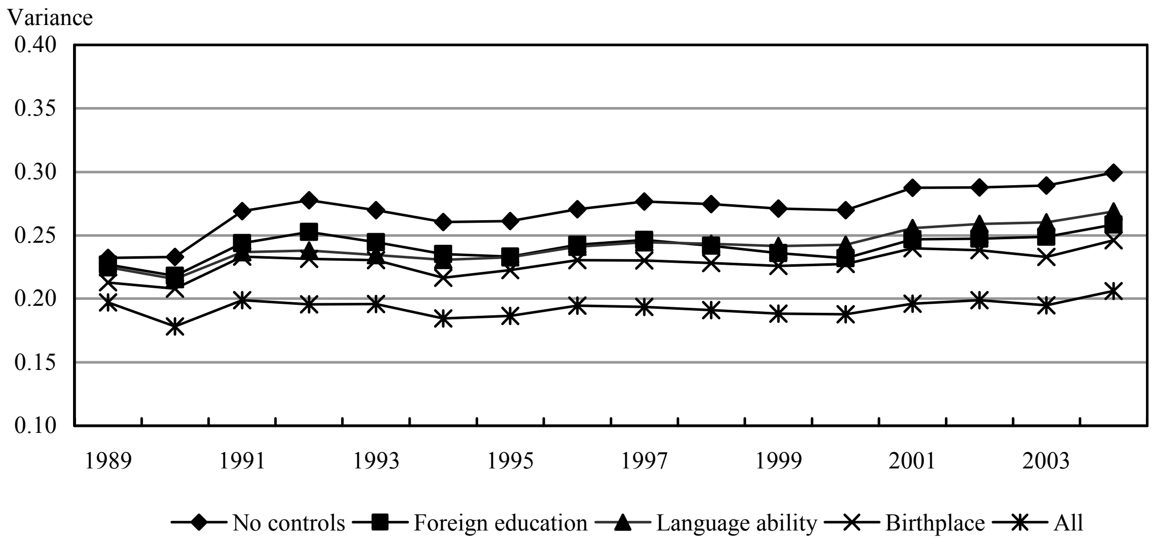
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 3-2
The permanent variance component, based on estimates in Table 7 — 1983-to-1985 arrival cohort



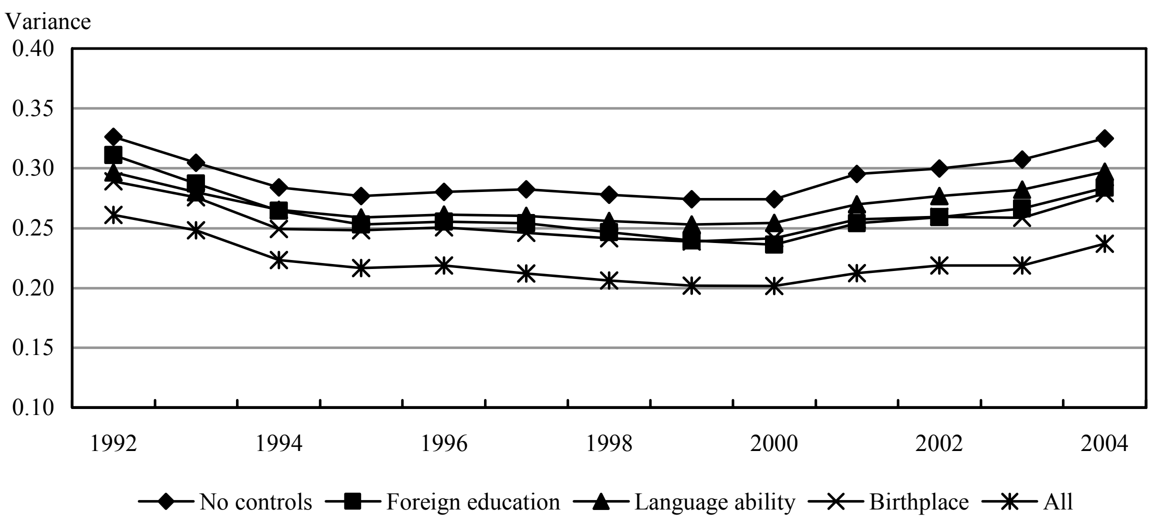
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 3-3
The permanent variance component, based on estimates in Table 7 — 1986-to-1988 arrival cohort



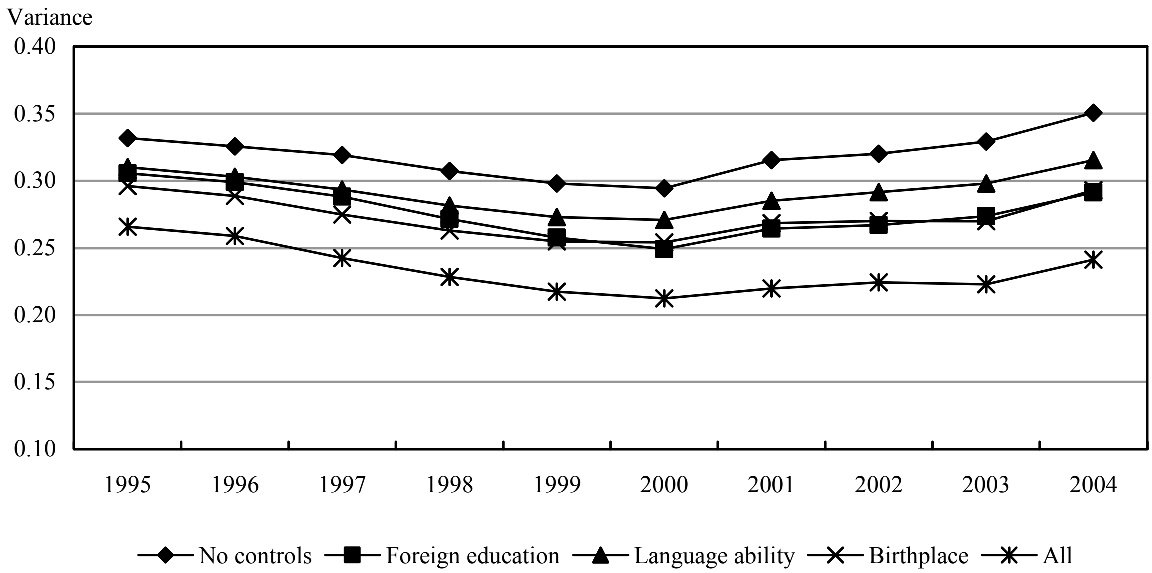
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 3-4
The permanent variance component, based on estimates in Table 7 — 1989-to-1991 arrival cohort



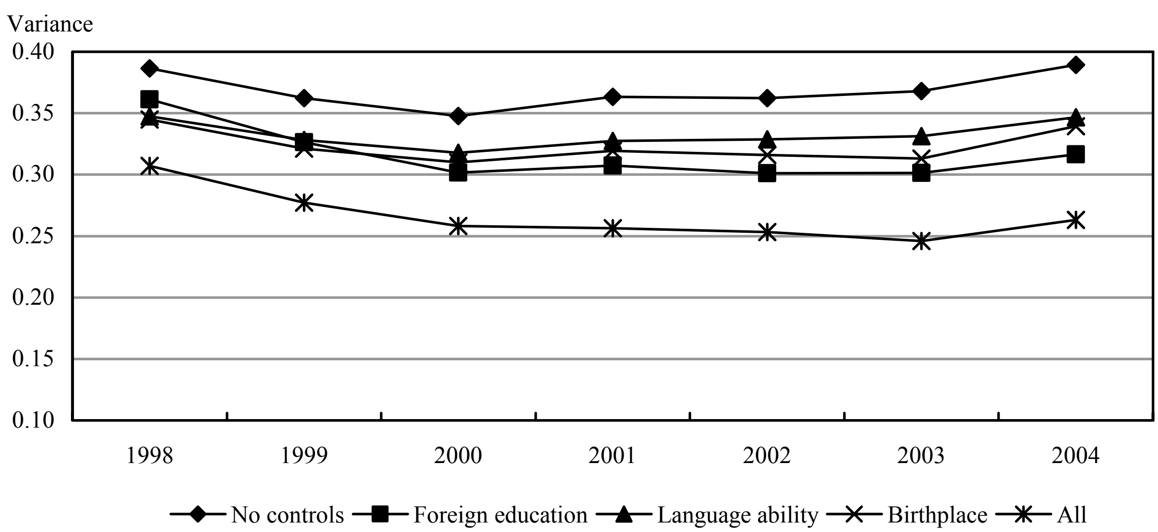
Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 3-5
The permanent variance component, based on estimates in Table 7 — 1992-to-1994 arrival cohort



Source: Statistics Canada, Longitudinal Administrative Databank.

Figure 3-6
The permanent variance component, based on estimates in Table 7 — 1995-to-1997 arrival cohort



Source: Statistics Canada, Longitudinal Administrative Databank.

Appendix A

The regions are defined as following:

1. United States, United Kingdom, Ireland, Australia, New Zealand and South African Republic.
2. Western Europe.
3. Eastern, Southern and Central Europe; Russia.
4. Latin America and the Caribbean.
5. North Africa and the Middle East.
6. India, Sri Lanka, Bhutan, Nepal and Bangladesh.
7. China (mainland), Hong Kong, Taiwan and Macao.
8. South East Asia and Oceania.
9. Africa (except North Africa and South African Republic).

A detailed list of countries included in each region is available from the author.

Appendix B

Table B.1
Sample averages

	1980 to 1982	1983 to 1985	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000
Age at immigration	32.4	32.5	33.2	33.0	33.5	34.4	34.2
Years of foreign schooling	12.7	12.7	12.6	12.8	13.1	14.3	15.1
Percentage of immigrants who							
speak English	52.4	48.9	59.9	54.4	64.8	70.0	65.5
speak French	4.1	5.9	2.9	5.4	5.3	6.5	6.7
speak English and French	5.4	6.8	4.8	6.7	6.7	5.6	7.7
Percentage by region of origin[1]							
Region 1	22.5	11.6	10.6	6.5	5.9	4.7	5.1
Region 2	10.3	8.0	9.5	7.4	4.9	4.1	4.7
Region 3	16.8	20.0	15.0	17.1	13.8	14.7	14.9
Region 4	5.4	8.8	8.8	12.1	9.6	16.5	17.5
Region 5	2.2	4.3	5.5	5.2	6.9	5.2	5.0
Region 6	5.3	7.0	9.9	9.0	15.3	17.8	16.7
Region 7	6.7	6.5	10.1	12.8	12.3	15.4	19.7
Region 8	9.7	17.1	15.8	15.5	17.0	9.9	7.6
Region 9	21.2	16.8	14.9	14.4	14.3	11.8	8.9

1. See definitions in Appendix A.
Sources: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004, and Longitudinal Immigration Database, 1980 to 2000.

Table B.2
Parameter estimates for the full model

	Equal weighted		Sample weighted	
	Coefficient	Standard error	Coefficient	Standard error
p1984	1.022	0.029	1.013	0.020
p1985	0.992	0.028	0.980	0.020
p1986	0.950	0.026	0.953	0.019
p1987	0.945	0.020	0.942	0.016
p1988	0.943	0.020	0.956	0.016
p1989	0.949	0.021	0.950	0.017
p1990	0.967	0.019	0.956	0.014
p1991	1.028	0.021	1.030	0.015
p1992	1.029	0.022	1.046	0.016
p1993	1.019	0.021	1.028	0.014
p1994	1.028	0.022	1.005	0.014
p1995	0.998	0.023	0.999	0.015
p1996	1.006	0.023	1.007	0.014
p1997	1.029	0.025	1.006	0.015
p1998	0.989	0.026	0.988	0.017
p1999	0.951	0.027	0.967	0.017
p2000	0.921	0.030	0.947	0.019
p2001	0.915	0.033	0.960	0.023
p2002	0.892	0.037	0.941	0.026
p2003	0.865	0.041	0.924	0.030
p2004	0.847	0.044	0.919	0.033
sig2_r	0.005	0.003	0.010	0.002
sig2*_α1982	0.248	0.013	0.242	0.008
sig2_β1982	4.2E-04	1.8E-04	1.3E-04	1.2E-04
sig2_γ	3.2E-05	2.9E-05	2.1E-06	2.2E-05
sig_βγ1982	1.4E-04	4.8E-05	1.4E-04	4.2E-05
sig_αβ1982	-4.2E-03	8.6E-04	-4.4E-03	5.7E-04
sig_αγ1982	2.0E-03	5.1E-04	2.7E-03	3.9E-04
sig2*_α1985	0.277	0.018	0.262	0.013
sig_αβ1985	-1.1E-02	1.1E-03	-1.1E-02	8.1E-04
sig_αγ1985	3.6E-03	5.3E-04	4.9E-03	4.7E-04
sig2_β1985	1.1E-03	2.2E-04	9.1E-04	1.5E-04
sig_βγ1985	1.1E-05	5.6E-05	-1.4E-04	5.9E-05
sig2*_α1988	0.169	0.014	0.196	0.009
sig_αβ1988	-2.8E-03	1.4E-03	-4.7E-03	8.7E-04
sig_αγ1988	5.1E-03	5.4E-04	4.1E-03	3.8E-04
sig2_β1988	1.0E-03	2.6E-04	6.4E-04	1.7E-04
sig_βγ1988	-4.7E-04	6.2E-05	-3.8E-04	4.9E-05
sig2*_α1991	0.266	0.019	0.295	0.011
sig_αβ1991	-7.0E-03	2.1E-03	-1.0E-02	1.1E-03
sig_αγ1991	2.3E-03	5.7E-04	2.8E-03	3.5E-04
sig2_β1991	1.9E-03	3.8E-04	1.6E-03	2.3E-04
sig_βγ1991	-1.0E-04	8.2E-05	-1.3E-04	5.2E-05

Table B.2
Parameter estimates for the full model (concluded)

	Equal weighted		Sample weighted	
	Coefficient	Standard error	Coefficient	Standard error
sig2*_α1994	0.256	0.023	0.278	0.013
sig_αβ1994	-5.1E-03	3.6E-03	-9.2E-03	1.9E-03
sig_αγ1994	5.5E-03	6.5E-04	5.3E-03	4.0E-04
sig2_β1994	3.0E-03	6.6E-04	2.5E-03	3.7E-04
sig_βγ1994	-5.5E-04	1.2E-04	-5.1E-04	7.7E-05
sig2*_α1997	0.338	0.035	0.360	0.019
sig_αβ1997	1.2E-03	7.8E-03	-9.0E-03	4.2E-03
sig_αγ1997	2.7E-03	7.9E-04	2.7E-03	4.9E-04
sig2_β1997	3.3E-03	1.9E-03	3.8E-03	1.0E-03
sig_βγ1997	-4.6E-04	2.3E-04	-3.8E-04	1.4E-04
sig*2_α2000	0.637	0.073	0.622	0.037
sig_αβ2000	-8.3E-02	3.3E-02	-7.0E-02	1.5E-02
sig_αγ2000	-2.5E-03	1.1E-03	-1.1E-03	6.4E-04
sig2_β2000	2.2E-02	1.4E-02	1.6E-02	7.0E-03
sig_βγ2000	1.6E-03	6.5E-04	1.1E-03	3.8E-04
λ1985	0.955	0.060	0.899	0.042
λ1986	0.927	0.063	0.938	0.046
λ1987	1.001	0.050	0.990	0.036
λ1988	1.008	0.053	0.975	0.041
λ1989	1.026	0.057	1.025	0.046
λ1990	1.130	0.051	1.103	0.034
λ1991	1.347	0.059	1.298	0.040
λ1992	1.416	0.064	1.388	0.044
λ1993	1.300	0.056	1.251	0.036
λ1994	1.227	0.056	1.215	0.036
λ1995	1.230	0.058	1.210	0.038
λ1996	1.172	0.053	1.140	0.034
λ1997	1.050	0.052	1.085	0.034
λ1998	1.064	0.054	1.039	0.036
λ1999	1.132	0.052	1.113	0.034
λ2000	1.096	0.053	1.068	0.034
λ2001	1.165	0.057	1.111	0.037
λ2002	1.197	0.055	1.172	0.036
λ2003	1.196	0.058	1.176	0.037
λ2004	1.197	0.063	1.142	0.042
ρ	0.385	0.011	0.377	0.007
s0_1983	0.545	0.024	0.503	0.017
s0_1986	0.390	0.024	0.410	0.020
s0_1989	0.350	0.025	0.333	0.015
s0_1992	0.698	0.027	0.630	0.014
s0_1995	0.612	0.031	0.595	0.016
s0_1998	0.622	0.043	0.603	0.023
s0_2001	0.339	0.109	0.410	0.052
g0	0.391	0.031	0.409	0.022
g1	-0.055	0.008	-0.060	0.006
g2	0.004	0.001	0.005	0.001
g3	-1.6E-04	1.0E-04	-2.3E-04	9.7E-05
g4	2.2E-06	2.5E-06	4.3E-06	2.5E-06
m	-7.0E-04	3.0E-04	-1.2E-03	2.6E-04

Source: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004.

Table B.3
Parameter estimates for sample-weighted models controlling for foreign education, language ability and birthplace

	Foreign education		Language ability		Birthplace		All	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
p1984	1.015	0.024	1.028	0.026	0.988	0.027	1.006	0.032
p1985	0.973	0.023	1.005	0.025	0.987	0.027	0.997	0.031
p1986	0.948	0.023	0.991	0.024	0.951	0.026	0.969	0.030
p1987	0.952	0.018	0.974	0.019	0.938	0.020	0.959	0.023
p1988	0.952	0.019	0.989	0.019	0.974	0.021	0.992	0.024
p1989	0.946	0.019	0.982	0.020	0.977	0.021	0.986	0.025
p1990	0.935	0.015	0.969	0.016	0.972	0.017	0.950	0.019
p1991	0.994	0.017	1.021	0.017	1.033	0.018	1.013	0.020
p1992	1.015	0.017	1.025	0.017	1.030	0.018	1.010	0.021
p1993	1.000	0.015	1.016	0.014	1.025	0.015	1.012	0.016
p1994	0.978	0.015	1.002	0.015	0.988	0.015	0.982	0.017
p1995	0.969	0.016	0.998	0.016	0.993	0.016	0.982	0.018
p1996	0.981	0.015	1.005	0.014	0.999	0.014	0.995	0.016
p1997	0.979	0.016	0.998	0.016	0.985	0.015	0.981	0.017
p1998	0.958	0.018	0.979	0.017	0.965	0.016	0.960	0.018
p1999	0.933	0.018	0.957	0.017	0.943	0.016	0.937	0.018
p2000	0.910	0.021	0.940	0.020	0.927	0.019	0.918	0.021
p2001	0.922	0.024	0.943	0.023	0.932	0.022	0.917	0.024
p2002	0.905	0.027	0.926	0.026	0.907	0.025	0.902	0.027
p2003	0.889	0.032	0.905	0.030	0.876	0.029	0.870	0.031
p2004	0.886	0.036	0.896	0.034	0.877	0.033	0.872	0.035
sig2_r	0.009	0.002	0.009	0.002	0.012	0.002	0.010	0.002
sig2_α1982	0.227	0.008	0.204	0.008	0.184	0.008	0.173	0.007
sig2_β1982	1.7E-04	1.2E-04	2.9E-04	1.1E-04	2.3E-04	1.0E-04	2.5E-04	9.7E-05
sig2_γ	1.0E-04	2.2E-05	4.0E-10	2.0E-05	2.2E-09	1.9E-05	1.1E-09	1.8E-05
sig_βγ1982	7.8E-05	4.1E-05	2.4E-05	3.8E-05	-2.3E-04	3.7E-05	-2.2E-04	3.5E-05
sig_αβ1982	-5.1E-03	5.5E-04	-4.6E-03	5.1E-04	-5.3E-03	4.8E-04	-5.0E-03	4.6E-04
sig_αγ1982	1.0E-03	3.8E-04	1.3E-03	3.5E-04	2.6E-03	3.4E-04	1.0E-03	3.2E-04
sig2_α1985	0.256	0.014	0.269	0.015	0.221	0.013	0.217	0.014
sig2_β1985	-1.1E-02	8.1E-04	-1.1E-02	7.5E-04	-1.1E-02	7.0E-04	-1.1E-02	6.7E-04
sig_βγ1985	2.3E-03	4.6E-04	3.2E-03	4.3E-04	3.0E-03	4.0E-04	1.3E-03	3.8E-04
sig_αβ1985	9.1E-04	1.5E-04	1.0E-03	1.4E-04	8.8E-04	1.3E-04	8.1E-04	1.2E-04
sig_αγ1985	-1.0E-04	5.8E-05	-1.1E-04	5.4E-05	-3.6E-04	5.2E-05	-2.7E-04	4.9E-05
sig2_α1988	0.207	0.010	0.193	0.010	0.179	0.010	0.178	0.010
sig2_β1988	-5.8E-03	8.9E-04	-5.0E-03	8.1E-04	-5.8E-03	7.4E-04	-6.2E-03	7.1E-04
sig_βγ1988	1.9E-03	3.8E-04	3.3E-03	3.6E-04	3.6E-03	3.4E-04	2.0E-03	3.2E-04
sig_αβ1988	6.6E-04	1.7E-04	7.5E-04	1.6E-04	6.7E-04	1.5E-04	6.8E-04	1.4E-04
sig_αγ1988	-2.5E-04	5.0E-05	-3.1E-04	4.6E-05	-4.0E-04	4.4E-05	-2.9E-04	4.2E-05
sig2_α1991	0.295	0.012	0.266	0.011	0.250	0.011	0.234	0.011
sig2_β1991	-1.3E-02	1.1E-03	-9.5E-03	1.1E-03	-1.0E-02	9.7E-04	-1.2E-02	9.2E-04
sig_βγ1991	1.3E-03	3.6E-04	2.9E-03	3.3E-04	3.7E-03	3.2E-04	2.7E-03	3.0E-04
sig_αβ1991	1.8E-03	2.3E-04	1.6E-03	2.2E-04	1.6E-03	2.0E-04	1.7E-03	1.9E-04
sig_αγ1991	-9.9E-06	5.4E-05	-1.9E-04	4.9E-05	-2.9E-04	4.7E-05	-2.2E-04	4.5E-05

Table B.3
Parameter estimates for sample-weighted models controlling for foreign education, language ability and birthplace (concluded)

	Foreign education		Language ability		Birthplace		All	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
sig2_α1994	0.269	0.012	0.260	0.012	0.247	0.011	0.229	0.011
sig2_β1994	-1.1E-02	2.0E-03	-8.5E-03	1.8E-03	-9.8E-03	1.7E-03	-1.1E-02	1.6E-03
sig_βγ1994	3.7E-03	4.0E-04	5.0E-03	3.8E-04	5.0E-03	3.6E-04	3.8E-03	3.4E-04
sig_αβ1994	2.5E-03	3.7E-04	2.5E-03	3.6E-04	2.5E-03	3.4E-04	2.3E-03	3.2E-04
sig_αγ1994	-5.5E-04	7.7E-05	-4.9E-04	7.3E-05	-5.7E-04	7.0E-05	-4.8E-04	6.6E-05
sig2_α1997	0.349	0.018	0.324	0.018	0.312	0.016	0.288	0.016
sig2_β1997	-1.5E-02	4.2E-03	-7.1E-03	4.0E-03	-1.1E-02	3.7E-03	-1.5E-02	3.5E-03
sig_βγ1997	1.1E-03	4.9E-04	2.4E-03	4.6E-04	3.6E-03	4.4E-04	2.0E-03	4.2E-04
sig_αβ1997	4.0E-03	1.0E-03	3.2E-03	1.0E-03	4.2E-03	9.7E-04	3.8E-03	9.1E-04
sig_αγ1997	-1.8E-04	1.5E-04	-1.8E-04	1.4E-04	-4.1E-04	1.3E-04	-1.0E-04	1.3E-04
sig2_α2000	0.603	0.036	0.589	0.036	0.581	0.033	0.518	0.031
sig2_β2000	-8.6E-02	1.6E-02	-7.4E-02	1.5E-02	-7.6E-02	1.5E-02	-7.5E-02	1.4E-02
sig_βγ2000	-2.2E-03	6.3E-04	-9.3E-04	6.0E-04	-9.0E-04	5.7E-04	-1.6E-03	5.4E-04
sig_αβ2000	2.1E-02	7.6E-03	1.7E-02	7.1E-03	1.9E-02	6.8E-03	1.7E-02	6.6E-03
sig_αγ2000	1.4E-03	3.8E-04	1.3E-03	3.7E-04	1.4E-03	3.5E-04	1.5E-03	3.4E-04
λ1985	0.903	0.042	0.897	0.041	0.893	0.040	0.898	0.039
λ1986	0.949	0.045	0.943	0.045	0.940	0.043	0.942	0.042
λ1987	0.988	0.036	0.983	0.036	0.971	0.034	0.974	0.034
λ1988	0.976	0.041	0.974	0.041	0.956	0.039	0.952	0.039
λ1989	1.019	0.046	1.020	0.046	0.993	0.044	0.987	0.043
λ1990	1.100	0.034	1.103	0.033	1.081	0.032	1.081	0.031
λ1991	1.303	0.039	1.327	0.039	1.281	0.037	1.279	0.036
λ1992	1.388	0.043	1.416	0.043	1.392	0.041	1.391	0.040
λ1993	1.262	0.035	1.285	0.035	1.242	0.033	1.256	0.033
λ1994	1.229	0.036	1.236	0.036	1.215	0.034	1.226	0.034
λ1995	1.223	0.038	1.233	0.038	1.204	0.036	1.220	0.036
λ1996	1.146	0.033	1.163	0.033	1.134	0.032	1.143	0.031
λ1997	1.098	0.034	1.116	0.034	1.096	0.032	1.108	0.032
λ1998	1.052	0.035	1.065	0.035	1.045	0.034	1.053	0.033
λ1999	1.125	0.033	1.145	0.033	1.122	0.032	1.131	0.031
λ2000	1.073	0.034	1.090	0.034	1.069	0.032	1.072	0.031
λ2001	1.120	0.037	1.141	0.037	1.119	0.035	1.129	0.034
λ2002	1.189	0.035	1.201	0.035	1.184	0.034	1.196	0.033
λ2003	1.184	0.037	1.203	0.037	1.195	0.035	1.205	0.035
λ2004	1.144	0.041	1.171	0.042	1.142	0.039	1.158	0.038
ρ	0.375	0.007	0.384	0.007	0.371	0.007	0.370	0.006
s0_1983	0.491	0.016	0.483	0.015	0.435	0.015	0.424	0.014
s0_1986	0.411	0.019	0.410	0.019	0.377	0.017	0.382	0.016
s0_1989	0.335	0.015	0.331	0.014	0.305	0.013	0.299	0.013
s0_1992	0.617	0.014	0.620	0.013	0.591	0.012	0.580	0.012
s0_1995	0.588	0.016	0.588	0.015	0.561	0.014	0.557	0.014
s0_1998	0.588	0.023	0.615	0.022	0.553	0.020	0.557	0.020
s0_2001	0.358	0.058	0.373	0.054	0.349	0.051	0.354	0.050
g0	0.415	0.022	0.404	0.021	0.404	0.020	0.399	0.020
g1	-0.068	0.006	-0.065	0.006	-0.060	0.006	-0.061	0.005
g2	0.007	0.001	0.006	0.001	0.005	0.001	0.006	0.001
g3	-3.4E-04	9.3E-05	-2.7E-04	8.7E-05	-2.6E-04	8.5E-05	-2.8E-04	7.9E-05
g4	6.9E-06	2.4E-06	5.2E-06	2.2E-06	5.1E-06	2.2E-06	5.5E-06	2.0E-06
m	-1.2E-03	2.5E-04	-5.3E-04	2.3E-04	-1.8E-03	2.4E-04	-1.9E-03	2.2E-04

Sources: Statistics Canada, Longitudinal Administrative Databank, 1983 to 2004, and Longitudinal Immigration Database, 1980 to 2000.

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