Internal Migration, Asymmetric Shocks,
and Interprovincial Economic Adjustments in Canada

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Abstract

This paper provides an empirical analysis of the role of labour mobility in the intranational (interprovincial) macroeconomic adjustment process in Canada. This analysis is based on a pooled time-series cross-section econometric set-up of net migration flows across age groups between the ten Canadian provinces since 1977. The results indicate that interprovincial migration is driven by structural factors such as the long-run regional differential in unemployment rates, labour productivity, and the rural/urban differential structure of the provinces. Furthermore, it appears that interprovincial migration is not that sensitive to regional asymmetric shocks at the business cycle horizon. Finally, using a conditional convergence model of human capital in the spirit of Coulombe (2003), we estimate that migration has a powerful effect on the redistribution of human capital across Canadian provinces. With the interprovincial migration process, human capital is redistributed from the more rural to the predominantly urban provinces, and from the poor to the rich provinces.

JEL classification: E32, J61, R11, R15
Keywords: Internal migration, convergence, regional growth, business cycles, human capital, urbanization

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1. Introduction

Geographically, Canada is one of the largest countries in the world and is characterized by a wide diversity of land settlement patterns. Manufacturing industries and many tradable services such as financial services, transportation, and wholesale trade are concentrated in the Quebec-Windsor corridor. In the periphery, land settlement and economic activity are often highly dependent on the exploitation of natural resources. Not surprisingly, in the course of history, Canadian regions have followed different growth paths and the effects of economic development, human and physical capital accumulation, and technological progress have not spread homogeneously throughout the territory.¹ In such a framework, interprovincial migration has always been a powerful mechanism of population redistribution in the Canadian federation.

The study of interprovincial migration has always attracted a lot of attention from Canadian economists. Since Courchene (1970), part of the literature has focused on the possible perverse role of transfer payments on factor mobility and regional disparities.² Another part of the literature has studied the effect of interprovincial migration on individual earnings and provincial wage structures.³ As pointed out by Day and Winer (1994, 39), many Canadian migration studies have been motivated by the potential role of labour mobility in the interprovincial macroeconomic adjustment process but few have tackled the issue directly. Some

¹ The core/periphery nature of the Canadian economy is given as a typical example in Krugman (1991). Coulombe (1999) uses this stylized framework to survey Canadian economic studies on provincial growth and convergence.
³ On this topic, see Courchene (1974), and Osberg, Gordon, and Lin (1994). The study by Finnie (2001) provides new results using a longitudinal microeconomic database and surveys the relevant literature.
studies, such as Boadway and Green (1981), Rosenbluth (1987), and Vanderkamp (1988), focused on the effect of migration on provincial wages and employments.

In this paper, we follow a different approach. We analyze empirically the role of migration in a Canadian regional macroeconomic adjustment process that is characterized by asymmetric shocks and structural patterns at the business cycle horizon and in the convergence-growth (long-run) process. First, we try to estimate if interprovincial migration is reacting to asymmetric shocks at the business cycle horizon and/or to medium and long-run structural asymmetries. To our knowledge, our empirical methodology to examine the dynamics of migration is novel in the empirical literature. Our findings indicate that the reaction of interprovincial migration to short-run regional shocks, although statistically significant, is not quantitatively important. The real driving factors of interprovincial migration are related to phenomena that go beyond the business cycle horizon, factors such as the rural/urban structure of provinces, long-run differentials in relative unemployment rates and labour productivity.

Second, we examine closely the potentially important role played by interprovincial net migration flows in the reallocation of human capital in a conditional convergence-growth empirical framework.

Thinking broadly about the migration decision-process level is a useful way of stretching the methodology proposed in this paper and of underlining the importance of the related issues. The decision to migrate follows a cost-benefit analysis at the individual and the family level. The costs of migration might be higher for some subgroups of the population (for example, married couples with children at school). These costs might also differ across different regions with the existence of various migration barriers such as borders, migration laws, language and cultural
differences, distance, and other institutional factors. The benefits to the individual from
migration are mainly in the areas of labour market considerations and the consumption of public
services. One should therefore expect intranational migration flows to be more sensitive to
productivity and unemployment rate differentials than international migration flows.
Intranational flows are not hampered by immigration laws, and the homogeneity of the cultural,
institutional, and political context found in many countries is a cost-reduction factor. Thus the
empirical study of Barro and Sala-i-Martin (1995, 294) not surprisingly finds that the elasticity
of income differentials for intranational migration is about 50 per cent higher than that observed
for international migration.

In this framework, the potential for interprovincial migration is very high in Canada for
three reasons related to the cost-benefit framework. First, despite the long migration distances
inherent in a country the size of Canada, the relative homogeneity of the institutional, political,
and cultural context (with the exception of Quebec with the language barrier) is an important
cost-reduction factor in the migration decision process. Second, as was pointed out in a recent
study (Beine and Coulombe 2003), the degree of asymmetry across Canadian provincial business
cycles is very high, higher even than the asymmetry between Canada as a whole and the United
States. Third, the degree of regional disparities in per capita income and unemployment rates
across Canadian provinces was high to start with in the 1950s and the 1960s. According to
Williamson’s (1965) study, the degree of regional disparities was higher in Canada than in the
other industrialized nations analyzed at the time. But, as has been well documented in recent
studies on Canadian regional growth, the 1950–1980 period was characterized by a substantial
and steady convergence process in various indicators of per capita income and labour
productivity. However, Coulombe (2000; 2003) shows that what remains in per capita income differences across Canadian provinces is structural and real, not just nominal. Consequently, it is unlikely that regional disparities will be eliminated in the future by the convergence-growth process.

What emerges from the previous discussion is that interprovincial migration flows in Canada are likely related to the degree of short-run asymmetries at the business cycle horizon as well as to the degree of structural asymmetries in productivity or income and unemployment rates across the provinces. This research directly addresses the role of labour mobility in the macroeconomic adjustment process to asymmetric shocks. The goal of this paper is to improve our understanding of the determinants and consequences of interprovincial migration flows in Canada by analysing both the structural and cyclical aspects of interprovincial migration.

In Section 2, we present a simple model of migration between two regions. This model is the basis for the empirical analysis in Section 3. The results of the empirical analysis suggest that differences in employment opportunities, labour productivity, and the provinces’ specific factors explain a substantial portion of net interprovincial migration flows. The response of interprovincial migration to economic and structural differences varies considerably across age groups. Furthermore, the empirical results suggest that interprovincial migration is not that sensitive to regional asymmetric shocks at the business cycle horizon. Section 4 contains a brief descriptive analysis, province by province, of the evolution of the structural component of migration per age groups. Finally, in Section 5, we estimate the long-run effect of interprovincial migration on the distribution of human capital across Canadian provinces in a modified version

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4 Following Coulombe and Lee (1995), a number of studies had focused on Canadian regional convergence. For a synthesis of studies dealing with this issue, refer to Coulombe (1999).
of the conditional convergence framework used in Coulombe (2003). We are able to estimate the long-run effect of migration on the distribution of human capital at the provincial level. The quantitative effect is substantial and very significant.

2. A stylized theoretical framework

The common starting point in the economic literature on migration is to assume that people migrate from one region of a country to another to improve their welfare, or more simply, to achieve a higher real income. The standard approach to the problem is microeconomics. It abstracts from growth consideration and assumes there is full employment in all regions. In this framework, migration occurs when factor prices (per unit of human capital or for a given quality of labour) are not equal across regions. Migration is driven by the desire for a higher wage rate and, in a general equilibrium analysis, it translates into factor price equalization on equilibrium. It is important to note that in a set of regional economies as integrated as the Canadian provinces, factor-price equalization might be the result of interprovincial (as well as international) migration and/or interprovincial trade.

In this paper, in order to focus on the role of migration in the macroeconomic adjustment process, we abstract from standard microeconomic considerations and assume that deviation from factor-price equalization at the regional level is white noise. In the empirical set-up, the full-employment, long-run growth, equilibrium migration cannot be captured by macroeconomic variables that are observable; it is captured by the error term.

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5 As in Topel (1986) for example.
6 For a recent discussion of the relationship between trade, migration, and the factor-price equalization theorem, see Wildasin (2002). This paper also provides some Canadian evidence on internal migration gross flows.
In our framework, net migration flows between two provinces of a country are determined by observable structural and cyclical differences in the two provinces. Let $MAB(t)$ be the rate of net migration (migration flow divided by the population) from province $A$ to province $B$ during year $t$ (and $MBA(t) = -cMAB(t)$ where $c$ is the population ratio between the two provinces at time $t$). Let us suppose that the $MAB(t)$ variable is driven by the differential in the probability of achieving a higher income across the two provinces and that three sets of factors might affect this differential. First, in a world characterized by unemployment, the probability of achieving a higher income is intrinsically related to the probability of finding a job. This factor can be associated with the difference in the unemployment rate across provinces $A$ and $B$. Second, the probability of achieving a higher income is also related to the possibility of acquiring a higher wage rate (per unit of human capital). This probability might vary across provinces due to the agglomeration effect, among other things, of human capital such as in Lucas’ (1988) endogenous growth model. The productivity of labour might be positively related to the aggregate level of human capital and wealth at the regional level. Consequently, we use the difference in labour productivity across provinces as the single macroeconomic variable to capture this agglomeration effect. Third, net migration flows might be partly explained by provinces’ specific fixed effects that capture differences in other geographic, institutional, cultural, and policy variables across the provinces that are time invariant. These factors are captured in the following net migration function:

$$MAB(t) = F(u_A(t) - u_B(t), Y_A(t) - Y_B(t), X_{A,B}).$$  \hfill (1) \hfill

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7 It is interesting to note that net migration flows are the net of offsetting gross flows. For Canadian provinces, the latter are considerably larger than net flows. Refer to Wildasin (2002, Section 3.2) for an analysis of gross migration flows in the Canadian context.
In this equation, \( u_A(t) \) and \( u_B(t) \) are the unemployment rates at time \( t \) in province \( A \) and \( B \) respectively; \( Y_A \) and \( Y_B \) are the aggregate level of the logarithm of labour productivity in the two provinces; and \( X_{A,B} \) are the provinces’ fixed effects. In this set-up, the unemployment rate and labour productivity differentials capture all economic (cyclical and structural) variables that affect migration flows.

Suppose first that both regions have the same natural (long-run) economic variables \( u^* \) and \( Y^* \) and that they are on a steady-state growth path. Suppose the two regions share homogeneous geographic, institutional, and cultural characteristics such that the \( X_{A,B} \) are null. In this stylized framework, migration flows between the two regions are driven only by the differential in economic variables \( u(t) \) and \( Y(t) \). In both regions, the unemployment rate and labour productivity fluctuate around their structural values. Let us suppose that the two cyclical components of the unemployment rate are not perfectly correlated as both regions are facing asymmetric business cycle shocks.

On average, over a period that goes beyond the business cycle horizon, unemployment rates and labour productivity in the two regions are equal to the common long-run level, and net migration flows over this period of time tend to sum up to zero. From year to year, however, net migration flows might not be null. When the cyclical unemployment rate is higher in \( A \), or labour productivity temporarily lower, the flow of net migrants is negative in this region. In such a case, the flow of structural migration between \( A \) and \( B \) is zero. All the observed migration identified in this example is cyclical since, in this simple case, migration flows are driven only by the asymmetric business cycles. In this stylized set-up, structural migration comes from differences
in the $X_{A,B}$, and/or differences in natural unemployment rates or labour productivity that last beyond the business cycle horizon.

Two cases of structural migration have to be distinguished: absolute convergence and conditional convergence. First, in the absolute convergence case, the $X(t)$ vector of institutional, policy, and cultural differences is null and the only differences deal with initial conditions: different initial natural unemployment rates (higher in $A$ than in $B$) and/or different initial labour productivity (lower in $A$ than in $B$). In such a case, structural migration from region $A$ to region $B$ will be observed. If the initial difference comes from unemployment rates, however, the long-run differences in unemployment rates will tend to decrease over time since employment is shifting from region $A$ to region $B$. But the decrease in the unemployment differential will not be instantaneous as migration flows are small compared with the labour force. Given the intrinsic cost of migrating, only a subset of the population in this framework (the young) might have a clear incentive to move. If the initial difference comes from labour productivity, the gap between the two provinces will gradually be eliminated in the convergence-growth process. In the absolute convergence case, the structural migration between regions $A$ and $B$ will decrease smoothly in a time horizon that goes beyond the business cycle horizon.

Conditional convergence is necessarily associated with structural differences in the $X(t)$ determinant of migration. For example, if region $A$ is a predominantly rural area like Saskatchewan and Manitoba with a higher natural birth rate than region $B$ (predominantly urban), we could observe a permanent structural flow of migrants from $A$ to $B$. The decreasing

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8 In the analysis, we follow the growth terminology of Barro and Sala-i-Martin (1995).

9 This is what emerges from empirical studies on the characteristics of migrants between Canadian provinces (Boadway and Green 1981; Vachon and Vaillancourt 1998) and U.S. states (Borjas, Bronars, and Trejo 1992), which show that intranational migrants are young and better endowed in human capital than the immobile populations.
proportion of the population remaining in the rural regions in Canada is a phenomenon that has been observed since at least the 1930s. For example, the proportion of the Canadian population living in Manitoba and Saskatchewan reached its peak (15.7 per cent) in the 1931 census.

It is important to point out that the term “cyclical migration” refers to the deviation in the migration-flow time series from its structural component. It does not refer to the time period migrants spend out of their region. The cost of migrating is so high for married couples and families that they could not afford to go back and forth from \( A \) to \( B \) within the business cycle horizon.

3. The determinants of net interprovincial migration rates

In this section, we estimate the determinants of net interprovincial migration rates in a pooled time-series cross-sectional (TSCS) econometric set-up. The empirical analysis, based on the stylized migration model outlined in the previous section, will be carried out in two steps. First we will focus on the structural determinants of net migration rates per age groups. In this analysis, the differences in the unemployment rates and labour productivity across Canadian provinces and provincial fixed effects will play a key role. Second, in Section 3.2, we will estimate the reaction—in the form of temporary movements in migration rates—to short-run deviations in provincial unemployment rates at the business cycle horizon.

The empirical methodology used in this section combines TSCS information across the 10 Canadian provinces with annual data in the 1981–2000 sample for the structural determinant and in the 1977–2000 sample for the cyclical response. The difference in sample size between the two exercises reflects the availability of labour productivity data that are used in the first
experiment only. All data have been extracted from the CANSIM and CANSIM2 databases. Data on net migration per age group (1–17, 18–24, 25–44, 45–64, 65 and over) come from CANSIM matrices 6304 to 6313.\textsuperscript{10} The data capture movements from all other provinces into one given province minus the out-migration from this province to all other provinces. Data on unemployment rates and employment (used to compute labour productivity) were extracted from CANSIM matrices 3453, 2455, 3457, ..., 3471. Data on population per age group (used to compute migration rate per age group) come from CANSIM matrix 6368 to 6377. Finally, data on real GDP were extracted from the CANSIM2 table 3840002.

Appropriate econometric techniques have been used to tackle various heteroscedasticity problems (at the cross-sectional and time-series levels) and serial correlation problems underlying this type of analysis.\textsuperscript{11}

### 3.1 Structural determinants of net migration rates per age group

The econometric approach used in this section bears some similarity to the one used in Blanchard and Katz (1992) and Decressin and Fatas (1995). These studies use pooled regional macro data of the labour market (employment, participation, and wages) for the United States (Blanchard and Katz) and the European Economic Community (Decressin and Fatas) to analyze the adjustment to regional labour demand shocks. In their set-up, regional labour demand shocks

\begin{footnotesize}
\textsuperscript{10} This division of the whole age structure into five age groups is one of the aggregations suggested by Statistics Canada in CANSIM matrices 6304 to 6313. We believe that this specific division is well suited for the purpose of studying migration since ages are aggregated according to specific characteristics of the economic life cycle: dependant children, young workers/university students, workers with dependant children, mature workers, and retirees.

\textsuperscript{11} For more details on the econometric techniques, see the notes to Tables 1 to 3.
\end{footnotesize}
are associated with current variations in relative unemployment rates at the regional level and they analyze the dynamic response of employment and participation. The response of net migration to regional shocks is estimated residually. In the present study, however, we focus directly on the analysis of detailed Canadian data on interprovincial net migration per age group, data that have been available on a yearly basis since 1972.

The econometric specification for the migration regression is the following:

\[ TMIG_{A,i,t} = \beta_1 du_{i,t} + \beta_2 du_{i,t-1} + \beta_3 dY_{i,t-1} + \beta_4 FE_i + \epsilon_{i,t} \]  

(2)

where \( TMIG_{A,i,t} \) are the log of the rates of net migration in cohort \( A \) (for \( A = 1, ..., 5 \), total population) in province \( i \) at time \( t \); \( du_{i,t} \) (and \( du_{i,t-1} \)) are the unemployment rates in province \( i \) at time \( t \) (t-1); \( dY_{i,t-1} \) are the log of labour productivity in province \( i \) at time \( t-1 \); \( FE_i \) are provincial fixed effects; and \( \epsilon_{i,t} \) is an additive error term. Migration data for year \( t \) in the CANSIM database refer to the year ending June 30. It was then natural to include the lagged differential unemployment rates in the regression. Furthermore, migration decisions at time \( t \) might be based partly on the economic situation at time \( t-1 \). The lagged unemployment rate and labour productivity respond very well in various econometric specifications of the migration equation. All variables are measured as deviations from the cross-section mean.

The \( du_{i,t} \) (and \( du_{i,t-1} \)), and \( dY_{i,t-1} \) variables, being deviations from the provinces’ mean, exclude common changes in the evolution of provincial unemployment rates and labour productivity such as the effect of the deep economic slowdowns in 1981–1983 and 1991–1993. This is the correct way to proceed in a TSCS econometric set-up such as the one used in this paper. The dispersions of the differential unemployment rates and labour productivity do not
show any tendency to decrease over time. Consequently, the $du_{i,t}$ and $dY_{i,t-1}$ variables might be considered as measures of structural differences across the provinces.

Estimation results are presented in Table 1 for the five different age groups and for the total population.

**Insert Table 1 around here**

Many interesting findings emerge from the analysis of Table 1. First, the point estimates for the economic variables are usually significant with the expected sign. As anticipated, migration is usually much larger as a response to the lagged unemployment rate than to the current unemployment rate. This is due to the way migration data are constructed by Statistics Canada and to a possible lag in the migration decision process regarding the evolution of regional economic activity. Interestingly, the lagged productivity variable is significant for most regressions. This indicates that, even after having taken differences in unemployment rates and provinces’ fixed effect into account, differences in labour productivity matter at the macroeconomic level as a determinant of net migration flows. Consequently, from the economic point of view, both the probability of finding a job and the opportunity of working in a more productive environment appear to drive migration flows.

Second, and more important, the decision to migrate in response to differentials in unemployment rates, to differentials in labour productivity, and to provinces’ specific factors is much more sensitive for the population aged 44 and younger than for the older population. In absolute value, the point estimates for the unemployment variables and for the fixed effects are the highest for the 18–24 age group. This result indicates that the young between 18 and 24 years of age are more mobile since they are more responsive to economic and provinces’ specific
differences. But the point estimates for the 1–17 and the 25–44 age groups are relatively large. This indicates a strong response to economic and structural differences from young families with children. The results for the 1–17 age group are very comparable overall to the results for the 25–44 age group, suggesting that a comparable number of parents and children are migrating together. The response of the 65-and-over age group to the unemployment rate is not even significant at the 5 per cent level; and interestingly, the point estimate of the productivity variable has the wrong sign and is significant at the 1 per cent level for this population. Interprovincial migration of seniors does not follow the same economic patterns of people in the working age groups. Furthermore, the point estimates for the economic variables of the 45–64 age group are significant but small compared with the numbers estimated for the younger population. These results lead us to interpret the differential productivity variable as a measure of the agglomeration effect rather than a measure of fiscally induced migration. Canadians below the age of 44 moving to find better job opportunities respond more to the productivity variable than do older Canadians. One would have expected a positive and significant point estimate (the reverse of our finding) for the productivity variable in the 65-and-over age group if migration is mainly driven by public rent-seeking rather than job opportunities. This analysis concurs with the main conclusions of Coulombe and Day (1999).

Overall, the results across age groups for the migration response to differentials in economic variables are not surprising. Interestingly, they provide a quantitative estimate of how the response varies across age groups. The net migration rates are measures of the number of migrants (positive when they arrive in a province and negative when they leave) per thousand people in the age group. An unemployment rate that is 50 per cent lower than the provincial
average at time $t$ and $t-1$ in a province (such as Alberta) will generate a net positive interprovincial migration around 7.5 people per thousand in the 18–24 age group. This is a substantial number given the usual rates observed for net interprovincial migration in Canada, documented in Section 4 below.

Third, the analysis of the point estimates for the fixed effects is very revealing. The fixed effects vary substantially across age groups and across provinces. The most substantial and significant negative fixed effects are found for the rural provinces of Manitoba and Saskatchewan: the negative fixed effects are all significantly different from zero at the 1 per cent critical level. For the overall population, the results indicate that for unemployment rates and labour productivity equal to the Canadian mean, the net migration rate will be -7.7 and -11.1 per thousand people in Manitoba and Saskatchewan respectively. In absolute value, the numbers are much higher in the 18–24 age group with an estimated fixed effect of -14.1 and -26.2 for the two provinces respectively. The sign and the size of the estimated fixed effects for these two provinces are an indication of the structural out-migration typical of predominantly rural areas.

Quebec is the only other province for which the fixed effects are all negative and significant. The effects, however, are much smaller in magnitude than for the Prairies and vary between 1 and 3 people per thousand population across age groups. This result might be explained by the comparably larger size of the province and the language barrier. Furthermore, the comparable size of Quebec’s fixed effects indicates that the anglophone exodus is, from a purely quantitative point of view, a relatively minor phenomenon compared with the structural out-migration estimated in rural provinces such as Manitoba and Saskatchewan.

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12 Refer to Plane and Heins (2003) for an analysis of the relationship between destination choices and age cohorts in U.S. inter-metropolitan flows.
The fixed effects in the Maritimes (Nova Scotia, Prince Edward Island, and New Brunswick) display a different pattern from that of Quebec, Manitoba, and Saskatchewan. The results indicate that in the Maritimes, even with unemployment rates and labour productivity comparable with the Canadian mean, the young in the 18–24 age group would be leaving. The effect, however, is usually reversed in the 1–17, 25–44, and 45–64 age groups. The positive effects for these age groups are small for New Brunswick and Nova Scotia (and not significant for this province in the 25–44 age group) but are substantial for Prince Edward Island. For the total population, contrary to the Prairies, the results indicate that most interprovincial migration flows in New Brunswick and Nova Scotia are driven by their differential unemployment rates compared with the Canadian average. The effect, however, is not spread evenly across age groups: the 18–24 age group overreacts and the rest of the population underreacts to differential unemployment rates compared with the Canadian trends.

The fixed effect estimates for Ontario are relatively small in magnitude but are all significant and negative for the population below 65 years of age. Again, this could be explained by the size of the province, which would imply that more opportunities exist for internal migration. For British Columbia, the only significant fixed effect is for the population 65 years and over, after having controlled for differential rates of unemployment and labour productivity. This indicates that people tend to migrate to this province when they approach retirement.

For Newfoundland, the huge point estimate of -31.6 for the 18–24 age group is not even significant from a statistical point of view. As will be illustrated in Section 4, this is due to the fact that the structural component of the net migration in this age group in Newfoundland is not constant but accelerating. The same could be said regarding the sizable but not significant fixed
effect estimated for Alberta. The structural migration in Alberta is not well modelled by a fixed effect since it is strongly related to oil shocks.

Finally, the $R^2_0$ reported in Table 1 refer to the r-square estimated without the autoregressive coefficients used in the various specifications to correct for serial correlations. The $R^2_0$ are very high and vary between 0.67 and 0.87 across the age groups. This indicates that the simple migration model explains a substantial fraction of the observed interprovincial migration flows across Canadian provinces.

3.2 The cyclical response of net migration rates

The purpose here is to verify if interprovincial migration flows react to variations in provincial economic variables at the business cycle horizon. We therefore separate the time series of net migration flows and provincial unemployment rates and labour productivity into structural and cyclical components that could be related to asymmetric regional business cycle shocks. We use the Hodrick and Prescott filter (HP filter hereafter) to perform this task with a smoothing parameter of 100 as the appropriate value for yearly data. The HP filter was designed to identify cyclical variations in time series at the business cycle horizon. We tried many different pooled econometric set-ups and the cyclical productivity variables were never significant. Following the structure of the migration regression equation (2), we used the following regression to estimate the business cycle response of net migration rates:

$$CTMIG_{A,i,t} = \beta_1 cu_{i,t} + \beta_2 cu_{t-1} + \beta_3 FE_{t} + e_{i,t}$$

where $cu_{i,t}$ (and $cu_{t-1}$) is the logarithmic deviation of the unemployment rate in province $i$ from its HP trend; $CTMIG_{A,i,t}$ is the logarithmic deviation of the migration rate in province $i$ from its
HP trend in cohort $A$; and the $FE$ are provincial fixed effects. The $e_{it}$ is an additive error term and the same pooled econometric techniques were used as in the previous analysis. Results are reported in Table 2 for total migration and for migration rates of the 18–24 and 25–44 age groups.

**Insert Table 2 around here**

Generally, as indicated by the magnitude of the $R^2_0$, it appears that short-run movements in net migration rates are not very sensitive to regional business cycles. For the total population, the business cycle explains less than 2 per cent of cyclical migration and the $r$-square is only 6.7 per cent for the very mobile 18–24 age group. This negative result is the main outcome of this subsection: in Canada, interprovincial migration is not very sensitive to regional asymmetric shocks at the business cycle horizon. As shown in Section 3.1, and as will be documented in Section 4, interprovincial migration is a phenomenon that is driven mainly by asymmetric shocks that last longer than a typical business cycle. Examples of such shocks are differentials in natural unemployment rates and labour productivity, provinces’ specific structural factors, and oil shocks.

The point estimates for the contemporary cyclical unemployment rate have the anticipated sign (negative) and are all significant at the 1 per cent level for the three specifications. However, the sign for the lagged cyclical unemployment rate is reversed and significant for the 18–24 and 25–44 age groups. In absolute value, however, the effect of the contemporary cyclical unemployment rate is larger than for the lagged rate and the net effect is negative. A temporary (over the business cycle horizon) negative shock on the regional
employment generates out-migration but the effect is weak. Only Quebec’s fixed effects are significant and are reported in the table.

4. **Evolution of the structural component of migration**

We briefly focus in this section on the smoothed series that provide an estimation of medium- and long-run trends in interprovincial net migration for different age groups. The raw series of net migration rates show great variability and the graphical analysis of the smoothed series reveals numerous interesting points. The structural net migration series per age group are displayed in Figures 1 to 5.

**Insert Figures 1 to 5 around here**

The HP filter is known for being non-reliable at the beginning and end of the sample since it is then very sensitive to the first and the last few observations. The grey zones in the figures indicate the period for which the structural migrations might be identified with great uncertainty. We used an automatic selection for optimizing the time-series display for each province. It is important to look at the number of the net migration rates on the left axis to evaluate relative trends across provinces.

The most striking fact that emerges from the analysis is the evolution of the structural net migration rate for the 18–24 age group in Newfoundland, starting around 1991. Of course this structural break has to be related to the dramatic structural decline of many groundfish species observed in the 1990–1992 period. In the 1980s, the rate of net migration in the 18–24 age group was already trending down and was substantial (around -20 per thousand people). The structural rate is increasing in absolute terms at an accelerating pace and approached -50 per thousand in
1998. As in many other provinces, the structural rate in Newfoundland for the 1–17 age group is very closely associated with the rate for the 25–44 age group since children tend to migrate with their parents. Compared with the absolute values of net migration rates for the young, the out-migration rates for the 45–64 and 65-and-over age groups are very small. Older Newfoundlanders tend to remain in their province.

The net migration rate structures per age group for Nova Scotia, New Brunswick, and Prince Edward Island share many common characteristics. The only sizable out-migration comes from the 18–24 age group. The net migration rates for the population aged 45 years and older are comparatively small and positive. Older Canadians tend to migrate (or return) to the Maritime provinces when they approach retirement.

Net interprovincial migration rates are much smaller in absolute value in Central Canada than in Atlantic Canada. As shown in Wildasin (2002), this could largely be explained by the fact that larger provinces, such as Quebec and Ontario, are expected to exhibit higher levels of intra-provincial migration, and therefore a lower level of interprovincial migration, simply because of their size. People living in rural Quebec and Ontario have many more opportunities to migrate within their own province than do people living in smaller provinces. The general profile of Quebec net migration rates differs considerably from that of Ontario. Quebec net migration rates are all negative but are tending to decrease in absolute value. The beginning of the time period coincides with the start of the exodus of anglophones in 1970. All age groups were affected by this phenomenon but the effect appears to be gradually slowing down. Ontario numbers are strikingly small in magnitude and are strongly negatively correlated with Alberta’s
counterpart numbers. For example, the correlation coefficient between Ontario’s and Alberta’s structural migration is -0.57 for the 18–24 age group and -0.72 for the 25–44 age group.

Structural migration rates for Manitoba and Saskatchewan are typical of what one would expect in a predominantly rural area—significant and negative for all age groups.

5. Migration, urbanization, and human capital geographical redistribution

In this section, we use the growth empirical framework for human capital (developed in our recent work) to estimate the long-run effect of migration on the distribution of a human capital indicator across the Canadian provinces. The idea is based on an empirical application of the theoretical framework of Barro, Mankiw, and Sala-i-Martin (1995) to the analysis of the evolution of a variety of human capital indicators of the Canadian provinces in the 1951–1996 sample. In Coulombe (2003), we extended the analysis to the conditional convergence framework using relative urbanization rates and dummy variables for Alberta (the oil shock), Quebec (the anglophone exodus in the 1970s), and a Nova Scotia fixed effect as instrumental variables for long-run differences in the steady-state distribution of human capital.

The human capital convergence equation used in Coulombe (2003) is the following:

\[
GH_{i,t} = \gamma_1 H_{i,t} - P + \gamma_2 UR_{i,t} + \gamma_3 DA_{i,t} + \gamma_4 DO_{i,t} + \gamma_5 DNS_{i,t} + \epsilon_{i,t},
\]

Here, \(GH_{i,t}\) is the mean annual growth rate of the human capital indicator \(H_{i,t}\) for province \(i\) in period \(t\). As a proxy for human capital, Coulombe (2003) uses census data on the percentage of the population 15 years and over, and 25 years and over with at least a university

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degree. The $H$ variable is measured as the logarithmic deviation from the cross-sectional sample mean in each period. This indicator was identified in Coulombe and Tremblay (2001) as a good proxy of the overall human capital stock.\footnote{This evaluation is based on the fact that our estimate of the human capital share in national income with this indicator in our paper with Tremblay is around 0.5, a number consistent with findings in other growth studies such as Mankiw (1995).}

The $UR_i$ variable is the urbanization variable developed in our conditional convergence of per capita income of the Canadian provinces.\footnote{See Coulombe (2000).} The $UR_i$ variable contains only one observation per province based on the logarithmic deviation from the provincial mean urbanization rate. During the period under study, the distribution of relative urbanization across the provinces appears to be around its steady state and this variable works efficiently as a proxy for long-run differences in per capita income and human capital.

The $DA$, $DQ$, and $DNS$ variables capture shocks to the long-run relative position of a province with $DA$ and $DQ$ (the oil shock and the anglophone exodus respectively) for Alberta and Quebec and a fixed effect for Nova Scotia. In Coulombe (2003), we show, using a comparative convergence analysis of per capita income and human capital, that a substantial proportion of educated Nova Scotians still remain in this relatively poor province without generating the same per capita income that educated people generate in the other nine provinces.

Both the oil shock and the anglophone exodus occurred after 1970 and are related to the interprovincial migration process. The idea here is to see if a migration variable could account for those two shocks as well as shocks to other provinces undetected in the analysis of Coulombe (2003) for the human capital indicator of the population 25 years and over. We computed a migration variable $MIG_i$ based on the mean value of net interprovincial migration.
rates for the total population and the population in the 18–24 age group in the 1972–1996 sample according to the census data sample used in Coulombe (2003). As for the \( UR_i \) variable, the \( MIG_i \) variable is cross-sectional with just one observation per province. The following human capital conditional convergence-growth regression was estimated using the same econometric methodology employed in Coulombe 2003:\(^\text{16}\)

\[
GH_{i,t} = \gamma_1 H_{i,t} - P + \gamma_2 UR_i + \gamma_3 MIG_i + \gamma_4 DNS + \epsilon_{i,t}.
\]  

(4)

Results for the panel estimation of regression equation (4) are presented in Table 3 for the two migration variables (total population and population in the 18–24 age group).

**Insert Table 3 around here**

It is important to note at the beginning that (non-reported) results of convergence regression (4) with \( DA \) and \( DQ \) fixed effects indicate clearly that the Alberta and Quebec dummies are not significant—unlike the Nova Scotia dummy—when the \( MIG \) variable is introduced into the regression. Thus the effects of Alberta and Quebec dummies on the redistribution of human capital estimated in Coulombe (2003) could be explained effectively and fully by a migration phenomenon.

The convergence speeds (point estimates of the parameter for the initial level of human capital) are somehow a little smaller than the one estimated in Coulombe (2003) for this indicator of human capital (-0.0633). The urbanization and the Nova Scotia dummy variables are still significant with the expected sign and the point estimates are very close to those in our 2003 study.

\(^\text{16}\) For details on the econometric methodology, refer to the note to Table 3. For data sources for the human capital and urbanization variables, refer to Coulombe (2003).
More importantly for this paper, the point estimates of the parameters for the net migration variable are significant at the 1 per cent level with the anticipated sign. The positive relationship between net migration and the long-run steady-state level of relative human capital indicates that migration is a significant redistribution mechanism of human capital across the Canadian provinces. After having taken into account the different urban/rural structure of the provinces and the specific nature of Nova Scotia, the migration variable helps explain the dynamic adjustments of the relative human capital stock for the population 25 years and older across the Canadian provinces.

The point estimates of the migration variable are much smaller than that for the urbanization variable but the two numbers could not be compared in a straightforward manner. The urbanization variable is a logarithmic deviation from the cross-sectional mean and the migration variable is a net migration rate per thousand people. Logarithms could not be taken from net migration numbers since some of them are negative. However, we could compute a normalized long-run effect of the migration and urbanization variables on the human capital stock per standard deviation units of the migration and the urbanization variables

\[
\frac{\partial H(\text{long-run})}{\partial X} = -\frac{SD(X) \cdot \gamma_X}{\gamma_1},
\]

where \(X\) stands for either the migration or the urbanization variable; \(SD(X)\) is one standard cross-sectional variation in \(X\); and \(\gamma_X\) is \(\gamma_2\) for \(UR\) and \(\gamma_3\) for the \(MIG\) variables. The results are reported at the bottom of Table 3. The partial long-run effect of the urbanization variable is much more important than the partial effects of migration. One standard deviation of the
urbanization variable translates into a massive redistribution of human capital for the population 25 years and over—between 12.5 and 14 per cent. The effect is more modest for the migration variables since one standard cross-sectional deviation of net migration rates produces a 2 per cent and a 3.2 per cent change in the long-run in the distribution of human capital for the population 25 years and over. Overall, the migration variable based on the population between 18 and 24 years of age captures the effect on human capital better than does the variable based on total population. The long-run effect is higher and the effect of the urbanization variable is smaller with the 18 to 24 years of age.

6. Conclusion

The results of our empirical analysis regarding the response of interprovincial migration to asymmetric regional shocks at the business cycle horizon are somewhat negative. We tried many econometric specifications other than the one presented in Section 3.2 but were unable to isolate a strong and significant effect. Overall, the results of our empirical analysis suggest that interprovincial migration across Canadian regions does not react much to asymmetric shocks at the business cycle horizon. A Canadian is not likely to react to a temporary slowdown in New Brunswick or to a temporary boom in Ontario by migrating from New Brunswick to Ontario. One way to interpret this result is to argue that Canadians are not shortsighted and therefore do not propose structural responses (migration) to solve short-run problems (at the business cycle horizon). Perhaps with the exception of the 18–24 age group, migration at the individual level is a structural adjustment since it carries with it very high costs: selling residential assets, relocating the children’s education, and coordinating jobs for a married couple. But even the
migration response of the 18–24 age group to business cycle shocks is very weak since less than 7 per cent of the cyclical migration is explained by the business cycle. It is interesting to relate this negative finding to the literature on optimal currency areas (OCAs). Following Mundell’s (1961) seminal contribution, especially in the studies related to European monetary integration, internal migration as a response to asymmetric business cycle shocks among regions of a monetary union has been emphasized as a potentially important OCA criterion. Our analysis suggests that despite the high level of asymmetry in Canadian regional business cycles (Beine and Coulombe 2003), internal migration plays a very limited role in smoothing regional business cycles. It thus could not be counted as a critical element in the sustainability of the Canadian currency area.

The empirical analysis shows that the decision to migrate from one province to another is driven mainly by structural differences across Canadian provinces. There are three main dynamic channels. The search for better job opportunities appears to be the first key channel of interprovincial migration. The unemployment rate differential would seem to be an important observable economic variable that drives interprovincial migration for people under 65 years of age. The tendency of those under 65 years of age to migrate from low productivity to high productivity provinces is the second channel. Given the differences in the migration response across age groups, the results suggest that migration is driven by agglomeration effects rather than by public rent-seeking. The migration from rural to urban areas is the third channel. Some provinces such as Manitoba and Saskatchewan show a substantial outflow of net migration despite their relatively low unemployment rates. But more importantly, as shown in the human capital growth regression, interprovincial migration is a powerful mechanism of human capital
redistribution across the Canadian provinces. Typically, a rich province with a positive net migration rate one standard deviation above the provincial average will end up in the long run with 10 per cent more human capital than the average Canadian province. A substantial proportion of this effect is again associated with the rural/urban asymmetric structure of the Canadian provinces.

From the viewpoint of the overall Canadian economy, the effect of interprovincial migration on the geographic distribution of production factors is substantial and clearly beneficial given its driving channels. Interprovincial migration clearly improves welfare for the migrants because young Canadians move from low productivity and high unemployment regions to provinces where they can be productively employed. Furthermore, the potential of interprovincial migration increases the expected return of investment in human capital in lower productivity provinces and therefore should induce private investment in education. But from the regional point of view, interprovincial migration increases provincial differences in the standard of living, redistributing human capital from the relatively poor and rural provinces to the relatively rich and urban provinces. This is because the most mobile component of the population is the educated young.

Of course the same redistributive effect would be observed within the rural and urban areas of big provinces like Quebec, Ontario, and Alberta: interregional migration accentuates the human capital gap between rural and urban areas, between the relatively poor regions and the rich. But from a public policy perspective, the redistributive effect of interregional migration (within a province) differs substantially from the effect on a province of interprovincial

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17 For a discussion of the relationship between investment in human capital and labour market integration, see Wildasin (2000).
migration. Public services such as health, education, and social assistance are provided mainly by provincial governments. A provincial government automatically redistributes resources for the financing of health, education, and welfare across intraprovincial regions as dictated by the expenditure needs. As shown and discussed in Coulombe and Mérette (2000), this is not the case with federal transfers to provinces. Given the demographic structure of interprovincial migration, one should expect increased disparities in the future in the per capita expenditure needs for the financing of health services across Canadian provinces. This factor will increase the political pressures for adjusting equalization and provincial transfer programs in the Canadian federation. We think that the federal government should respond adequately to this demand since part of the efficiency gains generated by the inter-provincial migration channel are captured by the federal government through the tax system. The federal government is taxing the national GDP which is increased by the migration process. This generates the logics for compensating declining regions in a federal state.

Finally, from an economic policy point of view, the preceding discussion suggests that the choice of the provinces as the geographical unit of observation appears appropriate if the primary purpose of the analysis is to focus on the incidence of migration on the inter-provincial redistribution scheme. However, from a methodological point of view, and this could be an interesting area for further researches since sub-provincial data are becoming more available, the use of data at the census division or urban agglomeration level might provide further insights into migrants’ response to economic imbalances. The multiplication of geographical units with the use of census divisions also opens the analysis of migration to the modelling of spatial
dependancy as in the analysis of Rey and Montouri (1999), something that could hardly be done efficiently with just 10 units of observation when using provincial data.

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31


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<tr>
<th></th>
<th>1–17</th>
<th>18–24</th>
<th>25–44</th>
<th>45–64</th>
<th>65 and over</th>
<th>Total population</th>
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<td>(d_{i,t})</td>
<td>-2.66** (1.15)</td>
<td>-6.89*** (2.23)</td>
<td>-3.46*** (1.45)</td>
<td>-1.57** (0.78)</td>
<td>0.67 (0.45)</td>
<td>-1.54* (0.88)</td>
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<td>(d_{i,t-1})</td>
<td>-9.13*** (1.19)</td>
<td>-7.76*** (2.08)</td>
<td>-8.53*** (1.79)</td>
<td>-2.84*** (0.89)</td>
<td>-0.81* (0.4)</td>
<td>-6.98*** (1.03)</td>
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<td>(dY_{i,t-1})</td>
<td>11.30*** (3.61)</td>
<td>20.55** (9.30)</td>
<td>8.24* (4.47)</td>
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<td>3.90**</td>
<td>-2.05</td>
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<td>(FE_{BC})</td>
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<td>2.55</td>
<td>2.12**</td>
<td>3.11</td>
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<td>-14.06***</td>
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<td>-2.06***</td>
<td>-7.69***</td>
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<td>(FE_{NB})</td>
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<td>-8.20***</td>
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<td>1.94***</td>
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<td>-0.99</td>
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<td>-0.89</td>
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<td>2.51***</td>
<td>0.22*</td>
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<td>0.56*</td>
<td>-2.96***</td>
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<td>7.50***</td>
<td>7.41***</td>
<td>0.08</td>
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<td>(FE_{QU})</td>
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<td>-2.90***</td>
<td>-1.52***</td>
<td>-1.06***</td>
<td>-1.26***</td>
<td>-1.47***</td>
</tr>
<tr>
<td>(FE_{SA})</td>
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<td>-26.21***</td>
<td>-13.70***</td>
<td>-5.13***</td>
<td>-3.25***</td>
<td>-11.08***</td>
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<td>S.E. of r.</td>
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<td>3.07</td>
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<td>0.71</td>
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<td>(R^2_{(ar)})</td>
<td>0.85</td>
<td>0.88</td>
<td>0.86</td>
<td>0.93</td>
<td>0.93</td>
<td>0.89</td>
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<tr>
<td>(R^2_0)</td>
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<td>0.71</td>
<td>0.67</td>
<td>0.87</td>
<td>0.70</td>
<td>0.77</td>
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<tr>
<td>Durbin-Watson</td>
<td>2.01</td>
<td>2.14</td>
<td>2.06</td>
<td>2.12</td>
<td>1.98</td>
<td>2.05</td>
</tr>
</tbody>
</table>

**Notes:** TSCS estimations of equations (2) using annual data. Iterated feasible generalized least-squares (IFGLS) estimations using cross-sectional weighted regressions to account for cross-sectional heteroscedasticity. The ***,**, and * indicate that the null hypothesis could be rejected at 1 per cent, 5 per cent, and 10 per cent critical levels, respectively. White heteroscedasticity-consistent standard errors (HCCME) between brackets. Sample 1981–2000; 170 panel observations. Correction (AR(1) and AR(2)) for autocorrelation.
Table 2. Business cycle response of cyclical migration

<table>
<thead>
<tr>
<th></th>
<th>Total migration</th>
<th>Migration. 18–24</th>
<th>Migration. 25–44</th>
</tr>
</thead>
<tbody>
<tr>
<td>$c u_i$</td>
<td>-0.20***</td>
<td>-0.42***</td>
<td>-0.28***</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>$c u_{i(-1)}$</td>
<td>0.06</td>
<td>0.29***</td>
<td>0.11**</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Quebec fixed effect</td>
<td>0.123***</td>
<td>-0.035*</td>
<td>0.111***</td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>2.71</td>
<td>6.75</td>
<td>3.27</td>
</tr>
<tr>
<td>$R^2_{(ar)}$</td>
<td>0.51</td>
<td>0.44</td>
<td>0.52</td>
</tr>
<tr>
<td>$R^2_0$</td>
<td>0.017</td>
<td>0.067</td>
<td>0.02</td>
</tr>
<tr>
<td>Durbin-Watson</td>
<td>1.96</td>
<td>2.01</td>
<td>1.96</td>
</tr>
</tbody>
</table>

Notes: TSCS estimations of equation (3) using annual data. Only the Quebec fixed effect was significant. IFGLS estimations and HCCME standard errors (between brackets). The ***, **, and * indicate that the null hypothesis could be rejected at 1 per cent, 5 per cent, and 10 per cent critical levels, respectively. Sample 1977–2000; 220 panel observations. Correction (AR(1) and AR(2)) for autocorrelation.
Table 3. Human capital growth regression with migration  
(dependent variable: deviation from the cross-sectional mean of the growth rate of human capital indicator)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>Initial human capital</td>
<td>-0.058</td>
<td>-0.056</td>
</tr>
<tr>
<td></td>
<td>(0.0056)</td>
<td>(0.0063)</td>
</tr>
<tr>
<td>Relative urbanization</td>
<td>0.0373</td>
<td>0.0319</td>
</tr>
<tr>
<td></td>
<td>(0.0055)</td>
<td>(0.0070)</td>
</tr>
<tr>
<td>Net migration rate (total)</td>
<td>0.00029</td>
<td>0.00021</td>
</tr>
<tr>
<td></td>
<td>(.00008)</td>
<td>(.00006)</td>
</tr>
<tr>
<td>Net migration rate (18–24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nova Scotia dummy</td>
<td>0.00394</td>
<td>0.0042</td>
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<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0005)</td>
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<tr>
<td>R-squared</td>
<td>0.78</td>
<td>0.75</td>
</tr>
<tr>
<td>S. E. of regression</td>
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<td>0.0089</td>
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<tr>
<td>Long-run effect of UR</td>
<td>14 per cent</td>
<td>12.5 per cent</td>
</tr>
<tr>
<td>Long-run effect of migration</td>
<td>2.0 per cent</td>
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<tr>
<td>Long-run effect of migration, 18–24</td>
<td></td>
<td>3.2 per cent</td>
</tr>
</tbody>
</table>

Notes: TSCS estimations of equation (4) using 10-year periods (census data) from 1951 to 1991, and the observation for the year 1996 for the 10 Canadian provinces (50 panel observations). All point estimates significant at the 1 per cent critical level. Human capital indicator based on the percentage of population 25 years and over with at least a university degree. Long-run effect captures the effect of one standard deviation (across Canadian provinces) in the urbanization and the migration variables on the steady-state distribution of human capital indicator.
Figure 1. Rate of net structural migration per thousand people per age group

Newfoundland

P.E.I.

- 1-17
- 45-64
- 18-24
- 65 and over
- 25-44
Figure 2. Rate of net structural migration per thousand people per age group

Nova Scotia

New Brunswick
Figure 3. Rate of net structural migration per thousand people per age groups

Ontario

Quebec
Figure 4. Rate of net structural migration per thousand people per age group

Manitoba

Saskatchewan

1-17  45-64
18-24  65 and over
25-44
Figure 5. Rate of net structural migration per thousand people per age group

- Alberta
- British Columbia

Legend:
- 1-17
- 45-64
- 18-24
- 65 and over
- 25-44