Inter-provincial Migration and Regional Labour Market Conditions in Canada

Xuyang Chen and Maxime Fougère *
Human Resources and Skills Development Canada
Policy Research Directorate
140 Promenade du Portage, Phase 4, 3rd floor
Gatineau, Quebec K1A 0J9

Introduction

In 2005, approximately 289,000 Canadians migrated to a different province or territory, accounting for 0.9 % of the total population. Our regional economies are affected by domestic and external shocks, and asymmetric demographic changes will have a significant influence on regional income disparity over the next several decades (Fougère et al 2005). Faced with uneven regional economic and demographic developments, individuals may be enticed to migrate in order to maximize their labour market income.

There is a consensus in the literature that regional labour market disparities are among the key factors in people's decision regarding where to move, live and work. Based on neoclassical macroeconomics migration theory (Lewis 1954), relative demand for labour increases in regions where the unemployment rate falls below the national average, leading to a migration inflow from other regions experiencing relative surpluses of labour (higher unemployment) until the system achieves equilibrium. As an extension to the standard neoclassical approach, Harris and Todaro (1970) formulated a macro model using the concept of expected income. In their study, they model rural-urban migration by taking account of the minimum wage and the probability of been employed and they integrate these in

* Corresponding author. The views expressed in this paper are solely those of the authors and do not necessarily reflect the views of HRSDC. The authors also wish to thank Gilles Bérubé, Mohsen Bouaissa, Jeff Carr, Zhengxi Lin, Christiana Pescarus and Bruno Rainville for valuable comments. All remaining errors are ours.

 XXXII: 2 (Summer/Été 2009), 167-186.
ISSN: 0705-4580 Printed in Canada/Imprimé au Canada

the equilibrium condition to which the system converges. Finally, more recent international research has linked the cause of internal migration to variations in the cost of living (Fry et al 1999) and external migration[1] (Kazakevitch 1996).

Wrage (1981) failed to explain the causal relationship between migration and labour market disparities and argued that internal migration is the cause, not the result of disparities in employment and earnings. In Canada, Osberg et al (1994) examined the simultaneous determinants of migration at the individual level and concluded that wage differentials are only a small determinant of interregional migration. More recently, Audas (2003) and Day and Winer (2001) studied the influence of regional differences in EI policies and found that differences in the EI program do not have significant effects on the decision to migrate. Finnie (2004) examined individual migration behaviour using the Longitudinal Administrative database (LAD) and argued that migration behaviour has been affected by demographic and cultural factors as well as labour market conditions. In summary, most studies in Canada focus on the individual level and little has been done to investigate the extent to which inter-provincial migration acts as labour market adjustment mechanism on an annual basis.

Human Resources and Social Development Canada (HRSDC) uses forecasting and computable general equilibrium (CGE) models to evaluate future trends in the labour market and pressures coming from both labour demand and supply.[2] In this paper, we build and estimate a macro-econometric model to evaluate the effects of regional economic and labour market conditions on net inter-provincial migration. The model can be used to help forecast future trends in inter-provincial migration and recalibrate HRSDC's regional CGE models to capture the effects of relative labour market conditions on the decision to migrate. The model estimates the effect of regional differences in wages, housing prices, unemployment rates, Employment Insurance (EI) disincentives and inflows of external migration on net inter-provincial migration. Dummy variables have been added to measure the effect of extraordinary events, such as political uncertainty that may create migration incentives in some specific provinces.

A reduced-form quarterly macro-econometric model is estimated for each province. Quarterly data of in-migrants/out-migrants, relative unemployment rates, wage rates, housing prices and external migration from 1991 to 2006[3] have been collected from a variety of sources: the LFS, SEPH, CMHC and CANSIM.

The results show that relative regional wage conditions have a significant impact on the decision to move in Nova Scotia, Newfoundland, Alberta, Ontario and Québec, but only a negligible impact in other provinces. Relative regional unemployment rates are another important determining factor, followed by provincial differences in housing prices. Regional differences in EI disincentives have no significant effect on regional migration according to the macro model. Finally, by introducing external migration as an additional explanatory variable,

---

1. We use the term external migration to refer to migration between the rest of the world and Canada.
2. See, for example, the Canadian Occupation Projection System (COPS).
3. Housing price data of P.E.I is only available from 1995 to 2006.

we find that the large inflow of unevenly distributed immigrants across Canada has a significant impact on inter-provincial migration.

The paper is organized as follows. In the following section, we outline our econometric model of net inter-provincial migration flow. Then, we discuss the data used for the analysis. The estimation and interpretation of results are presented in section four. Finally, some conclusions are presented.

An Econometric Model of Inter-provincial Migration

To specify and construct a macro econometric model that accounts for the effect of economic and labour market conditions on inter-provincial migration, we adopt the hypothesis that migration happens when the difference of expected income between destination and origin less the moving cost is higher than a certain level. Following a similar approach to Harris and Todaro (1970), the basic equilibrium condition to which the system converges can be extended as:

$$\frac{dN_i}{dt} = \psi\left(\frac{W_i * N_{iE}}{N_i} - \frac{W_{ROC} * N_{EROC}}{N_{ROC}} - COM\right) \tag{1}$$

where N_i is the total labour supply, N_{iE} the number of employed individuals and W_i the average income in province i. COM denotes the cost of moving and ROC the rest of Canada.[4]. The function ψ is monotone increasing and $\psi(\alpha)=0$ for some real α, which under equation (1) implies that migration will stop when the expected earning differential equals α.

Further, dN_i/dt can be proxied by net in-migration M_u (inflow less outflow) at a unit of time period such as a quarter and expected income can be expressed in terms of unemployment rate U_i and average income W_i:

$$\frac{W_i * N_{iE}}{N_i} = W_i * (1 - U_i)$$

$$\frac{W_{ROC} * N_{ROCE}}{N_{ROC}} = W_{ROC} * (1 - U_{ROC})$$

In order to calculate the cost of moving, we use the regional difference in the cost of living, more specifically, average housing costs as the proxy:

---

4. Equation (1) can also be used for bilateral migration analysis between province i and province j. In this paper we focus on the overall net inflow to each province from rest of Canada.

$$COM \approx H_i - H_{ROC}$$

Although studies using gravity models argue that the contribution from distance and climate may be important contributions to the cost of moving, their effect on overall migration behaviour can hardly be analyzed on a year over year basis[5]. Hence, a more explicitly specified general model of inter-provincial migration follows:

$$M_u = f((W_{i,j} - W_{ROC,t}), (U_{i,t} - U_{ROC,t}), (H_{i,t} - H_{ROC,t}), X_{i,t}) \quad (2)$$

where $X_{i,t}$ represents a set of other explanatory variables.

The basic model defined by equation (2) can be extended to a functional form in several ways. First, we add the inflow of external migration as an additional explanatory variable. Kazakevitch (1996) provides evidence for Australia that a certain proportion of outward interstate migration is caused by external migration. According to Kazakevitch (1996), this is likely to have both direct and indirect effects on inter-provincial migration. However, the net impact on inter-provincial migration is unclear.

As a major destination country, Canada accepts a large number of international immigrants every year (about 262,000 permanent residents were admitted to Canada in 2005). The inflow of immigrants is not proportionally distributed across provinces, as Ontario and British Columbia receive the largest share of immigrants. Provincial differences in international migration are determined by certain social and demographic factors rather than by regional disparity issues. Immigrants may choose the landing destination for family reunion or to live close to their ethnic community. They may also decide to change regional location shortly after moving to Canada to take advantage of better labour market conditions elsewhere. In addition, intensive immigration inflow may pose extra difficulties to local labour markets and change local living conditions, thus creating incentives for locals to leave the province if labour market conditions deteriorate as a consequence of excess labour supply. Under these two channels, international migration could lead to provincial out-migration.

On the other hand, positive feed back from labour market and living conditions for new immigrants may also create incentives for their friends in other provinces to move in. Under this channel, the effect of international migration could have a positive impact on net inter-provincial migration in provinces with excess labour demand conditions, which can better absorb immigrant workers.

A second key factor that may contribute to inter-provincial migration is the relative generosity of the Employment Insurance (EI) system in each province. It is well documented that Employment Insurance is an important source of income for a large proportion of unemployed workers. However, there is no consensus in the literature about the empirical significance of the relationship between EI

5. Distance and climate between destination and origin are considered to be fixed through time hence they are mostly used in studies using cross-section or panel data.

generosity and inter-provincial migration. Using the LAD, Finnie (2005) finds that unemployed individuals are more likely to move, but that the probability decreases with the level of generosity of the EI system. On the other hand, using the Labour Market Activity Survey, Lin (1995) rejects the hypothesis that EI generosity has a significant impact on inter-provincial migration.

A third potentially important group of determinants are extraordinary events, such as political uncertainty in Quebec due to the risk of separation (e.g. the failure of the Charlottetown accord in 1992, the 1995 Quebec referendum and provincial election results) that may create migration incentives that are substantial enough to change the equilibrium condition stated in equation (1). Therefore, it is necessary to add dummy variables to capture the possible effect of specific political events that may influence the decision to move.

The final element under consideration is the lagged effect of inter-provincial migration. Migration is usually found to be auto-correlated with itself since feedback effects from previous migrants may have a significant effect on the decision to move (Kazakevitch 1996; Groenewold 1993).

We also acknowledge that there are other possible factors not being considered, such as provincial taxes and the difference in certain transfer programs aimed at individuals and families, such as child care programs, that may have impact on the decision to move. However, due to the difficulty of obtaining data, we do not include these variables.

Therefore, the reduced-form model that we estimate becomes:

$$M_{it} = \partial_i + \sum_j \rho_{ij} M_{i,t-j} + \beta_i \log\left(\frac{W_{i,t}}{W_{ROC,t}}\right) + \gamma_i (U_{i,t} - U_{ROC,t}) \\ \eta_i \left(\frac{H_{i,t} - H_{ROC,t}}{H_{i,t}}\right) + \tau_i IM_{i,t} + \theta_i (EI_{i,t} - EI_{ROC,t}) + \nu_i Dummy + \varepsilon_i \tag{3}$$

where ε denotes the disturbance term, *IM* external migration and *EI* Employment Insurance disincentives. The *Dummy* variable in equation (3) is used only for the province of Québec. Moreover, due to economic and cultural diversity, the dynamic structure may somewhat differ among the provinces. Therefore, we allow time lags for explanatory variables to differ across the provinces for better model fit.

Finally, to estimate this system of equations, many studies either impose parameter restrictions for those using ratios of $M_{i,t}/POP_{i,t}$ as dependent variables or drop one equation if using levels as dependent variables since the sum of the net inter-provincial flow (in absolute numbers) must be zero. Fry et al (1999) argue that imposing sophisticated parameter restrictions is impractical when the ratio of net migration to population is used as the dependant variable.[6] Moreover,

6. Parameter restrictions will be time dependent since provincial population changes at each point in time. Hence, one needs to apply a separate restriction for each parameter at each point in time but obviously this will result in insufficient degrees of freedom for estimating.

Groenewold (1997) points out that imposing a restriction may be a source of auto correlated error. For this study, we chose not to impose restrictions for two reasons. First, we use a ratio as the dependent variable. Second, we already exclude the three territories, whose combined total net inflow is approximately equal to that of PEI. This is equivalent to dropping a province from the system.

Data

The quarterly data used in this study are extracted from several sources: Monthly Housing Statistics and Market Absorption Survey from Canadian Mortgage and Housing Corporation (CMHC), the Labour Force Survey (LFS), the Survey of Employment, Payrolls and Hours (SEPH) and CANSIM from Statistics Canada. The measure of EI disincentives is taken from Finance Canada.[7] Since the data for weekly earnings of employed workers aged 15 years and over, housing prices and EI disincentives are available monthly, we interpolate them to quarterly data by taking the average in each quarter.

It is possible that the increase in net inter-provincial migration may just reflect a general increase in the population. Although including population size as an explanatory variable is another option, we use the ratio of net-inflow (in-flow less out-flow) migration to total population $M_{i,t}/POP_{i,t}$ [8] as the dependent variable to take account of the size effect.[9]

To calculate the income variable, we use average weekly earnings rather than hourly wage to take account of working hours, since expected income difference for mobility can be gained either by increased wage or longer working hours. We opt to use nominal instead of real wages because the model already accounts for relative housing cost, which likely captures the main factors responsible for provincial differences in cost of living[10]. To calculate housing prices in a specific province, we calculate average unit selling price of all newly completed and unabsorbed single-detached and semi-detached dwellings in metropolitan areas, large urban centers and census agglomerations and use the New Housing Price Index (NPHI) drawn from CANSIM to convert them into a series of quarterly prices[11]. The Employment Insurance disincentive index is from the Department of Finance and based on Sargent (1995). Finally, the external migration variable is presented as the ratio of international immigrant inflow to the population $IM_{i,t}/POP_{i,t}$.

---

7. The method used to construct the EI disincentive index is taken from Sargent (1995).
8. Some literature uses logarithms of net migration; however, this can not be applied here because net migration is negative over the sample period for some provinces.
9. Groenewold (1993) justifies the use of a ratio of migration to population as the dependant variable as it can also reduce the risk of heteroskedasticity and the problem of non-stationarity.
10. Some authors (e.g. Fry et al 1999) in recent literature combined real dollars and housing cost together in their models and failed to conclude the effect of wage on the migration.
11. Apartment rental price is another important component of housing cost; however, we do not include it due to the difficulty in obtaining data series at macro level.

For province *i*, we construct "rest of Canada" variables by calculating the weighted average of all of the other provinces' corresponding variables. The income variable of the "rest of Canada" $W_{ROC,t}$ is the average income weighted by the proportion of regional employment over total employment excluding province *i*. Similarly, the housing price is weighted by the proportion of total absorption units in each province and unemployment rate measures are weighted by the proportion of the regional labour force.

During our modeling process, we did not find consistent significant seasonal effects for most data series. We also tested for nonstationarity of the data series by performing Augmented Dickey-Fuller (ADF) tests to check for the presence of a unit root. According to the results (available upon request), we cannot reject in most cases the hypothesis that the data series are stationary.

According to migration theory, we expect the sign of the relative unemployment rate on the likelihood of migrating to a province to be negative. A higher unemployment rate implies a lower probability of being employed or lower labour demand. This in turn lowers expected income and reduces the net inflow of migration. The sign of relative wages is expected to be positive, while the sign of relative housing prices should be negative. Higher relative wages is a signal of increased employment opportunity. On the other hand, an increase in housing prices raises the cost of moving. The sign of the effect of external migration is uncertain, since it may contribute to both inflow and outflow of inter-provincial migration. Intuitively, we expect positive causality for the provinces that can better absorb immigrants in their local labour market and negative causality if the local labour market is less capable of absorbing additional workers. Finally, lagged migration is expected to have a positive effect because of "copycat behaviour" (see Fry et al 1999). These are discussed further in the next section.

Figure 1 shows the trend of net inflow of inter-provincial migration over the past 15 years. According to the data, Alberta has the highest level of net inflow of migration from other parts of Canada since 1996. Due to the recent oil boom, net quarterly inflow of migration has grown sharply from 0.05 % of total provincial population in the third quarter of 2003 to 0.7 % in the third quarter of 2006. British Columbia has benefited from net in-migration during the 1990s. However, between 1997 and 2003, net inter-provincial migration for BC turned into an outflow. Ontario's net inter-provincial migration has fluctuated around zero over the past 15 years.

In comparison, Quebec, Manitoba, Saskatchewan and most of the Atlantic Provinces have experienced net inter-provincial migration outflows during the past 15 years. Among these, Newfoundland suffered from the largest net out-migration, reaching a high of 1.6 % of its total population in 1997. Recent employment growth and an inflow of workers from the rest of Canada to work on the Hibernia project have contributed to significantly reduce net outflows to 0.2 % in 2003. Trends of other explanatory variables are presented in appendices at the end of the paper.

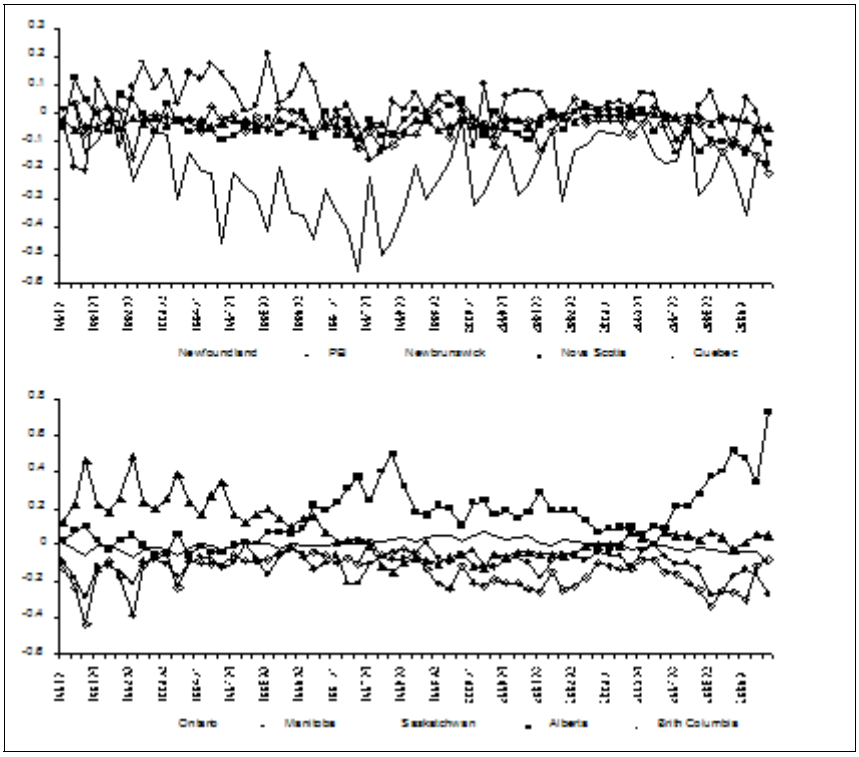


FIGURE 1 Inter-provincial Net In–Migration (Ratio of Net In–Migration to Provincial Population)

Estimation results

The regression results using the OLS method are summarized in Table 1. Also, to examine whether error terms are correlated across equations, we have applied the Seemingly Unrelated Regression (SUR) method to compare with the coefficients estimated by OLS. Overall, the results do not present a significant difference to justify changing our statistical inference (see appendix A for SUR results). Hence, we opt to present OLS results along with corresponding residual tests statistics.

Overall, the effect of relative EI disincentives is not statistically significant. This result supports the findings from Audas and McDonald (2003) and Lin (1995). However, this finding must be taken with some care since the possible effect of EI is likely more difficult to capture in a macro-econometric model, which combines both employed and unemployed individuals as one representative agent. The variable is thus excluded from the model (the results are available upon request).

As shown in Table 1, for most provinces, the sign of the estimated coefficients matches our expectations. We acknowledge, however, that there are three unexpected signs in housing prices (two of them are statistically insignificant),

TABLE 1 Estimated Equations for the Inter-Provincial Migration Model 1991Q1 to 2006Q3, Dependant Variable: $M_{i,t}$ / $POP_{i,t}$

	Newfoundland	PEI	Nova Scotia	New Brunswick	Quebec
Constant	0.454035**	0.170459	0.102414**	0.094870	0.089322**
	(2.06358)	(0.752329)	(2.344699)	(1.557527)	(2.110162)
M(t-1)/POP(t-1)	0.330048	0.172627	0.228077**	0.090087	0.120803
	(2.453894)**	(1.089625)	(1.947420)	(0.686655)	(0.762564)
Ui-UROC	-0.027037	-0.008920	-0.001610***	-0.013608**	-0.015814**
	(-1.304703)	(-0.732818)	(-3.254489)	(-1.927322)	(-2.601339)
log(Wi/WROC)	1.929994**	0.539818	0.635251**	0.435020(t-1)	0.289664
	(2.085325)	(0.839625)	(2.411747)	(0.939132)	(1.555473)
Hi-HROC	0.000550(t-1)	-0.000168	-0.001610***	-0.000380(t-2)	0.00036**
	(0.604724)	(-0.284608)	(-3.254489)	(-1.055842)	(2.107)
IMi/POPi	-5.973454**	-0.875283*	-0.835934***	-3.106635***	-0.264398*
	(-2.086218)	(-1.718062)	(-2.833082)	(-4.009748)	(-1.855327)
R-squared	0.325283	0.166254	0.358951	0.396844	0.405
LM(prob.)	0.121865	0.887574	0.655663	0.06881*	0.309315
ARCH(prob.)	0.652877	0.430632	0.217345	0.263837	0.182800
Durbin-Watson	2.166370	1.956915	1.947451	2.225777	1.782

	Ontario	Manitoba	Saskatchwan	Alberta	British Columbia
Constant	-0.168110***	-0.086065	-0.136202	-0.132376	0.029440
	(-4.103212)	(-0.782006)	(-1.386862)	(-1.019312)	(0.166757)
M(t-1)/POP(t-1)	0.03416	0.442737***	0.298158**	0.63727***	0.663182***
	(0.236677)	(3.499748)	(2.345121)	(5.400982)	(5.165876)
Ui-UROC	-0.024938***	-0.029811*	-0.020467(t-2)	-0.044838**	-0.039134***
	(-3.325674)	(-1.785167)	-1.292276	(-2.13946)	(-2.875440)
log(Wi-WROC)	1.319778***	0.192107(t-1)	0.144077	1.53765*	0.034089
	(4.203545)	(0.218898)	(0.178079)	(1.737009)	(0.051864)
Hi-HROC	-0.03416(t-2)*	-0.000473(t-1)	-0.001263(t-2)*	-0.000535	0.002816
	(-1.888699)	(-0.885061)	(-1.816694)	(-0.888137)	(0.854900)
IMi/POPi	0.090895*	-0.432379	-1.869595(t-2)*	0.04383	-0.709067(t-2)***
	(1.749521)	(-1.653415)	(-1.707735)	(0.09367)	(-2.905460)
R-squared	0.7485	0.450006	0.403721	0.755672	0.769540
LM(prob.)	0.838503	0.016070	0.812650	0.34162	0.224490
ARCH(prob.)	0.186748	0.640487	0.317253	0.05593*	0.000288***
Durbin-Watson	1.825244	1.677512	1.761928	1.809	2.036529

Notes: 1. LM indicates results for first order residual test.
2. t statistics in parentheses.
3. * significant at 10 %, ** significant at 5 % and *** significant at 1 % levels.

which may relate to insufficient accuracy of the housing data. Generally, the model performs well for larger provinces such as Ontario, Alberta and British Columbia (the results for Quebec will be discussed later in the text). The model fits less well for other small provinces, possibly because of poorer data quality due to smaller sample size in the aggregate data construction. The decision to move in these smaller provinces may also depend more on other factors than the variables captured in the macro model.

The effect of relative regional unemployment rates has the expected sign in all the provinces and is found to be a statistically significant determining factor in most provinces. In addition, compared to other labour market and economic indicators, it explains the largest proportion of the variance in net in-migration for most provinces. This is not surprising since the unemployment rate is a well known and easily accessible indicator of labour market tightness. This result also suggests that for unemployed individuals, the probability of finding a job can be a strong incentive to migrate.

The results also show that relative regional wage conditions have a significant positive impact on decisions to move for Ontario, Nova Scotia, Newfoundland, and Alberta, but a negligible impact in the rest of Canada. However, this variable does not generally explain much of the variance in the equations.

We also find strong evidence that external migration is an important factor that influences inter-provincial migration. This variable has a positive impact on inter-provincial migration for Alberta and Ontario and a negative impact in the other provinces. One possible explanation for the positive effect of international migration on net inter-provincial migration for Alberta and Ontario is that labour market conditions have generally been better there than in the rest of Canada. Therefore, international migration may create an incentive for immigrants living elsewhere in Canada to move to Alberta and Ontario. For the remaining provinces, international migration may be reducing job openings and create incentives for out-migration.

Most of the estimated coefficients of relative housing price are negative except for Quebec, British Columbia and Newfoundland. The unexpected positive sign of the relative housing price for Quebec may rise from inconsistent housing data problem in Montreal[12] and the heavy weight assigned to Vancouver, where housing prices are quite high, may yield biased estimates for British Columbia. Overall, this variable explains little variation in inter-provincial migration. Higher relative housing price may increase the disincentive to move but the evidence seems to be weak.

Net in-migration is found to have a strong positive relationship with its lagged effect, which is consistent with many other studies (e.g. Groenewold 1993). Although a lagged dependent variable is usually interpreted as partial adjustment, a significant positive coefficient can also imply that decisions to move to other provinces have a positive feedback effect from previous migration experience[13]. However, the lagged dependant variable is not statistically significant for PEI, New Brunswick, Ontario and Quebec.

The Durbin-Watson statistic is not appropriate as a test for serial correlation at a degree higher than one of residuals if a lagged dependent variable is included in the regressors. Therefore, we perform additional residual Q-test and LM tests. Graphs of residual correlogram and LM tests suggest that there exist serial

12. Housing data for Montreal were terminated and reconstructed for the period of 1998 to 2006. See Absorptions Survey from Canada Mortgage and Housing Corporation (CMHC) more details.
13. For example, see Fry et al (1999) and Kazakevitch (1996).

TABLE 2 Estimated Coefficients of the Adjusted Model for Québec and Ontario

	Quebec	Ontario
Constant	0.04732 *	-1.740507
	(1.848541)	(-1.343351)
M(t-4)/POP(t-4)	0.611808 ***	0.57059 ***
	(6.78063)	(5.850364)
Ui-UROC	-0.011906 ***	-0.01771 ***
	(-3.020423)	(-2.979833)
log(Wi/WROC)	0.195168 *	0.368140
	(1.606028)	(1.337257)
Hi-HROC	0.000108	-0.00057 ***
	(0.3692)	(-2.865006)
IMi/POPi	-0.131822	0.029917
	(-1.437722)	(0.733556)
Dummyref	-0.009877 **	----
	(-1.883522)	----
Dummyelec	0.02350***	----
	(3.218071)	----
R-squared	0.739469	0.843991
LM(prob.)	0.827589	0.845235
ARCH(prob.)	0.416169	0.271840
Durbin-Watson	1.559397	1.688445

Notes: 1. LM indicates results for up to fourth order residual test.
2. t statistics in parentheses.
3. * significant at 10 percent, ** significant at 5 percent and *** significant at 1 percent.

correlation errors at the 4th level in Ontario and Quebec. The results of further specification search[14] show that for Ontario and Quebec, the fourth lagged migration effect is statistically significant. It also eliminates serial correlation at the fourth level and improves the model fit. Ontario and Quebec are major migration partners and it is possible that a large part of mutual migration in these two provinces is related to seasonal employment and education. Hence, migration patterns in these two provinces are correlated more with the corresponding previous season, while other provincial migrations are correlated with the immediately preceding season. Table 2 presents the estimated results of the adjusted model for Ontario and Quebec.

For Quebec, we also add dummy variables to test the effect of special political events on net inter-provincial migration. It is well known that the risk of Quebec

14. To avoid impenetrable complexity, we keep only the first order lagged dependent variable in each province for partial adjustment unless including more lags can significantly improve model fit or reduce serial correlation error.

separation has attracted attention from the rest of Canada and may have discouraged Canadians to move to Quebec. It may also have created incentives for out-migration from people living in Quebec, especially from the English minority and other ethnic groups. To perform the proper test, it is necessary to understand the evolution of the independence movement in Quebec.[15] In the sample period, we consider three such shocks. The first two are the failure of the Charlottetown accord in 1992 and the 1995 Quebec referendum on sovereignty. These first two shocks are expected to have generated a negative impact on net migration. The third effect is the election of the Liberal Party of Quebec in 2003, a federalist political party. This is expected to have generated a positive impact on net migration.

Table 2 shows that in the short run, the two referendums had a significant negative impact on net migration and the election of the Liberal Party of Quebec in 2003 had a significant positive impact on in-migration to Quebec. Compared to the original model, the long-run marginal effects of relative unemployment rate and wage on net migration increase statistical significance in the adjusted model for Quebec. However, this contrasts with Ontario where the effects of relative unemployment rate and wages decrease in both values and significance level.

In addition to serial correlation tests, we also apply the ARCH test to investigate the possibility of autoregressive conditional heteroskedasticity in the residuals. The results do not detect the presence of heteroskedasticity for most provinces, with the exception of Alberta and British Columbia. However, it is well documented that the ARCH test is sensitive to outliers. Even only two outliers in a short sequence can substantially overestimate the variance and result in highly significant ARCH test statistics. Our further investigation in data distribution suggests that the signal of time-varying volatility in Alberta and British Columbia may be caused by only a few isolated outliers as well. To verify this assumption, we have excluded the outliers from our sample for these two provinces and re-estimated the regressions. ARCH test results confirm our assumption and time-varying volatility for these two provinces are corrected successfully (the results are available upon request).

Figure 2 illustrates the predicted values for the larger provinces (accounting for more than two thirds of the Canadian population). Overall, the fitted values of the regressions are quite acceptable for the larger provinces. Graphs for the other six provinces with less fit can be found in Appendix B.

Table 3 summarizes the estimated long run marginal effect of a 10 % increase in relative wage and a 1 percentage point increase in the provincial unemployment rate on net inter-provincial migration $M_{i,t}/POP_{i,t}$. For the relative wage, Alberta has the largest reaction in net inflow migration $M_{i,t}/POP_{i,t}$, followed by Newfoundland. According to the model, a 10% increase in the relative wage raises net inter-provincial migration by 0.4% and 0.3% of the population for Alberta and Newfoundland, respectively. By contrast, for British Columbia, a 10% increase in relative wage has a negligible impact on net migration. For the remaining

15. Vachon and Vaillancourt (1999) provide more details on the evolution in their study.

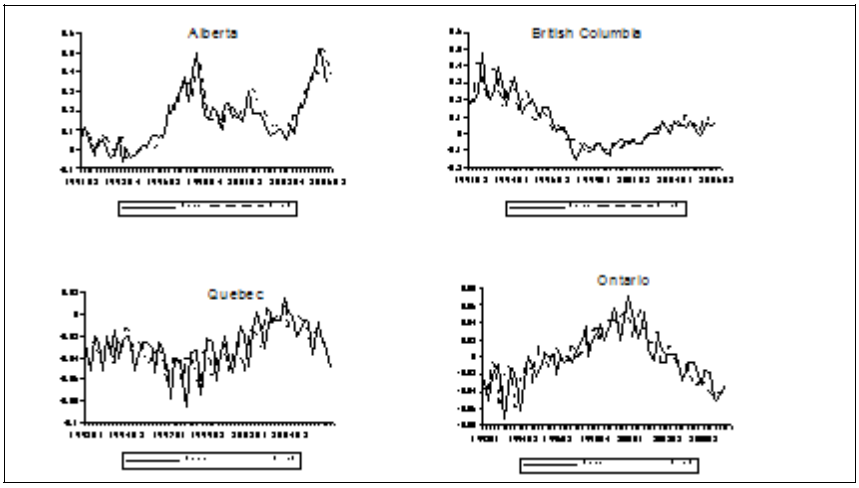


FIGURE 2 Observed and Predicted Net In-Migration for Selected Provinces

TABLE 3 Estimated Change of Net Inflow of Migration $M_{i,t}$ / $POP_{i,t}$, Approximate Change in Quarterly Net Inter-provincial Migration Flow

Province	∆(Wi/WROC)=10%	∆(Ui-UROC)=1 p.p.
Newfoundland	0.27457	-0.04036
PEI	0.06218	-0.01078
Nova Scotia	0.07844	-0.00209
New Brunswick	0.04557	-0.01496
Quebec	0.04792	-0.03067
Ontario	0.0816	-0.04119
Manitoba	0.03286	-0.0535
Saskatchewan	0.01957	-0.02916
Alberta	0.40403	-0.12361
British Columbia	0.00965	-0.11619

provinces, overall, the anticipated gain in net inflow of inter-provincial migration is rather small, ranging from 0.02 % for Saskatchewan to 0.08 % for Ontario.

Approximate Change in quarterly net inter-provincial migration flow

Overall, a 1 percentage point increase in relative unemployment has a larger impact on inter-provincial migration in Western Canada than in Eastern Canada. Among the provinces, Alberta has the largest response (-0.123 %), followed by British Columbia (-0.12 %). For the remaining provinces, the impact ranges from

-0.01 % for PEI to -0.05 % for Manitoba.

According to the results, in most provinces, changes in regional labour market conditions reflected by changes in relative wages and unemployment do not have a large impact on the decision to migrate. This suggests that the adjustment mechanism from inter-provincial migration may not be sufficient to significantly reduce regional disparity. Another interesting finding is that among the provinces, net inter-provincial migration flows to Alberta are the most sensitive to changes in regional labour market conditions. This is welcoming news since Alberta has recently faced large excess demand pressures with rising oil prices in the recent past (before the economic downturn starting in 2008).

Conclusion

Predicting future inter-provincial migration remains a complex task. In this paper, we have developed a macro-econometric model of inter-provincial mobility in Canada over the period of 1991-2006. Overall, the estimated model provides support to migration theory. The model can also be used to help forecast future inter-provincial migration flows and to recalibrate HRSDC's regional computable general equilibrium models.

According to the results, among the key macroeconomic indicators of regional labour market conditions, relative provincial unemployment rates are a key determining factor and a good predictor of inter-provincial migration. Relative provincial wages also have the expected sign, but do not explain a large proportion of the variance.

Other than labour market conditions, higher relative housing prices may increase people's disincentive to move; however, the evidence remains mixed. We also find that a large inflow of unevenly distributed immigrants across Canada may affect the decision to migrate.

Finally, when we look at relative wage and unemployment rate elasticities, the model indicates that inter-provincial migration flows are not very sensitive to changes in regional labour market conditions, although Alberta is one notable exception. This suggests that adjustment mechanism from inter-provincial migration may not be a sufficient driving force to significantly reduce regional disparity. It also suggests that the effects of natural (e.g. age, distance, geography) and institutional barriers (see Gomez and Gunderson (2007)) to labour mobility probably play a significant role in maintaining regional disparity in Canada.

In future work, we plan to examine whether inter-regional migration serves to equilibrate regional economic performance in Canada. This will be accomplished in two ways. First, we plan to estimate a system of equations with inter-provincial migration, provincial wages and unemployment rates determined endogenously to check the dynamic interrelationship in a partial equilibrium framework. Second, we will explore the issue in a general equilibrium framework by recalibrating HRSDC's Canadian multi-regional CGE model and introduce endogenous inter-regional labour mobility.

References

Audas, R. and J. McDonald. 2003. *Employment Insurance and Geographic Mobility: Evidence from the SLID*. SRDC Working Paper Series 03-03. Ottawa: Statistics Canada.

Day, K. and S. Winer. 2001. *Interregional Migration and Public Policy in Canada: An Empirical Study*. Prepared for Human Resources Development Canada and Statistics Canada.

Finnie, R. 2004. "Who moves? A Panel Logit Model Analysis of Inter-Provincial Migration in Canada". *Applied Economics*, 36: 1759-1799.

Fougère, M., S. Harvey, J. Mercenier and M. Mérette. 2005. *Population Ageing and the Effective Age of Retirement in Canada*. Working paper no. 2005 A-03. Ottawa: Skills Research Initiative.

Fry, J., T. Fry and M. Peter. 1999. "Inter-Regional Migration in Australia: An Applied Economic Analysis". *Australasian Journal of Regional Studies*, 5: 111-130.

Gomez, R. and M. Gunderson. 2007. *Barriers to the Inter-Provincial Mobility of Labour*. Ottawa: Prepared for Human Resources and Social Development Canada.

Groenewold, N. 1993. *The Interaction of Regional Unemployment Rates, Regional Wages and Inter-regional Migration in Australia*. Paper No. TS-04. Hobart: Centre for Regional Economic Analysis, University of Tasmania, Hobart.

_____. 1997. "Does Migration Equalise Regional Unemployment Rates? Evidence from Australia". *Papers in Regional Science*, 76: 1-20.

Harris, J. and M. Todaro. 1970. "Migration, Unemployment and Development: A Two- Sector Analysis". *The American Economic Review*, 60: 126-142.

Lewis, A.W. 1954. *Economic Development with Unlimited Supplies of Labour*. Manchester: School of Economic and Social Studies.

Lin, Z. 1995. *Inter-provincial Labour Mobility in Canada: The Role of Unemployment Insurance and Social Assistance*. Ottawa: Human Resources Development Canada.

Kazakevitch, G. 1996. *Regional Labour Market Disparities and International Migration in Austria*. Zurich: European *Regional Science Association 36th European Congress*.

Osberg, L., D. Gordon and Z. Lin. 1994. "Inter-Regional Migration and Inter-Industry Labour Mobility in Canada: A Simultaneous Approach". *Canadian Journal of Economics*, 27: 58-80.

Sargent, T. 1995. *An Index of Unemployment Insurance Disincentives*. Working paper No. 95-10. Ottawa: Department of Finance.

Vachon, M. and F. Vaillancourt. 1999. *Interprovincial Mobility in Canada, 1961-1996: Importance and Destination*. Montreal and Kingston: McGill-Queens University Press.

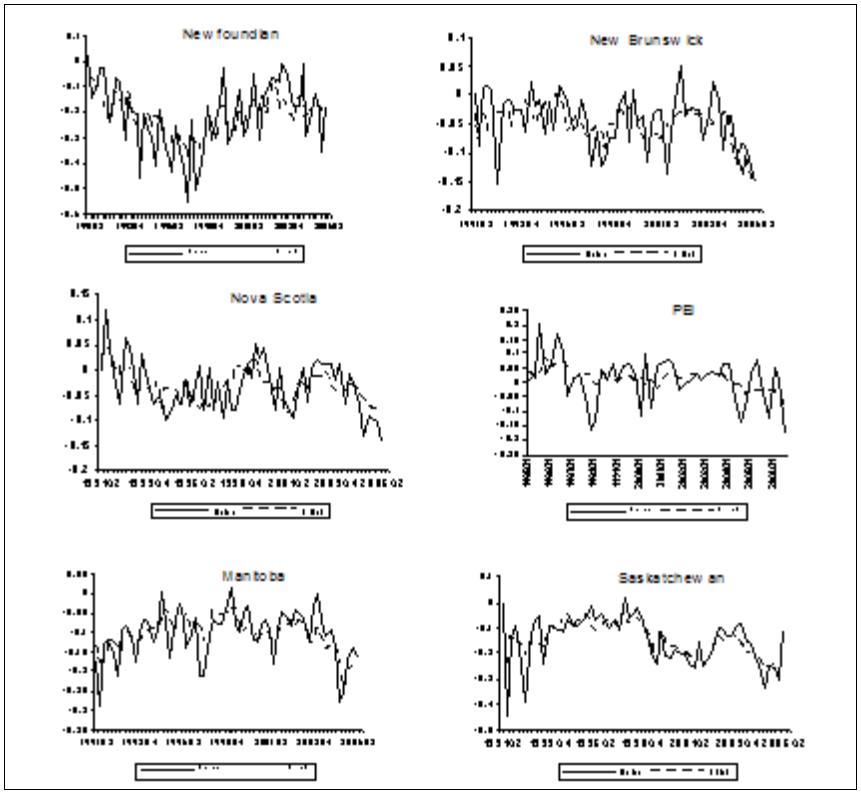
Wrage, P. 1981. "The Effect of Internal Migration on Regional Wage and Unemployment Disparities in Canada". *Journal of Regional Science*, 21: 51-63.

Appendix A:
Estimated Results Using Seemingly Unrelated Regression

	New Foundland	PEI	Nova Scotia	Newbrunswick	Quebec
Constant	0.3323**	0.1216	0.0682*	0.0645	0.0442**
	(2.063)	(0.6004)	(1.7717)	(1.2495)	(2.1319)
$M_{(t-1)}/POP_{(t-1)}$	0.1878	0.1620	0.2110**	0.2100*	0.4917(t-4)***
	(1.8443)*	(1.1509)	(2.1568)	(1.9151)	(6.9092)
U_i-U_{ROC}	-0.0222	-0.0131	-0.0169*	-0.0064	-0.0104**
	(-1.5199)	(-1.1029)	(-1.8651)	(-1.0926)	(-3.3689)
W_i-W_{ROC}	1.1790*	0.4622	0.4378*	0.0882(t-1)	0.1836*
	(1.6719)	(0.8023)	(1.8681)	(0.2229)	(1.7898)
H_i-H_{ROC}	0.0015	-0.0004	-0.0012***	-0.0001(t-2)	0.0001
	(0.6047)	(-0.7589)	(-2.8973)	(-0.1056)	(1.3632)
IM/POP	-3.5526*	-0.6203	-0.7279***	-3.0013***	-0.1206*
	(-1.6951)	(-1.3495)	(-2.9645)	(-4.5942)	(-1.6387)
R-squared	0.2964	0.1552	0.3432	0.3059	0.6464
Durbin-Watson	1.9099	1.9122	1.8575	2.35810	1.3099
	Ontario	Manitoba	Saskatchwan	Alberta	Brith Columbia
Constant	-0.0579**	-0.0715	-0.1361*	0.0065	0.0375
	(-2.3449)	(-0.8407)	(-1.8323)	(0.0941)	(0.2973)
$M_{(t-1)}/POP_{(t-1)}$	0.4971(t-4)***	0.5034***	0.4996***	0.5359***	0.6802***
	(6.5427)	(5.0988)	(5.4058)	(6.9226)	(7.7499)
U_i-U_{ROC}	-0.0238***	-0.0007	-0.0314(t-2)***	-0.0218*	-0.0385***
	(-5.1721)	(-0.5435)	(-2.7102)	(-1.6568)	(-3.8949)
W_i-W_{ROC}	0.4003**	-0.3244(t-1)	-0.2998	1.5151***	-0.3026
	(1.8559)	(-0.4849)	(-0.5183)	(2.9081)	(-0.5989)
H_i-H_{ROC}	-0.0004(t-2)**	-0.0003(t-1)	-0.0004(t-2)	-0.0002	0.0014
	(-2.4142)	(-0.7491)	(-0.7270)	(-0.5423)	(0.6105)
IM/POP	0.0169	-0.5043**	-1.5485(t-2)*	-0.1026	-0.4321(t-2)***
	(0.5133)	(-2.4606)	(-1.8635)	(-0.3482)	(-2.6196)
R-squared	0.8243	0.4281	0.3027	0.7334	0.7419
Durbin-Watson	1.7351	1.8669	2.0861	1.5052	2.0461

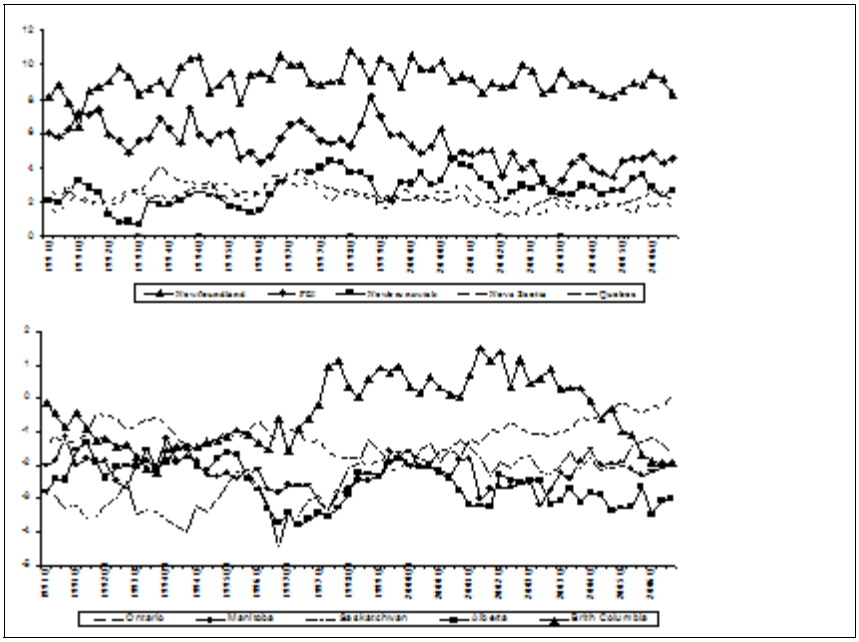
Notes: 1. t statistics in parentheses.
2. * significant at 10 percent, ** significant at 5 percent and *** significant at 1 percent.

Appendix B: Observed and Predicted Net In–Migration for Other Provinces



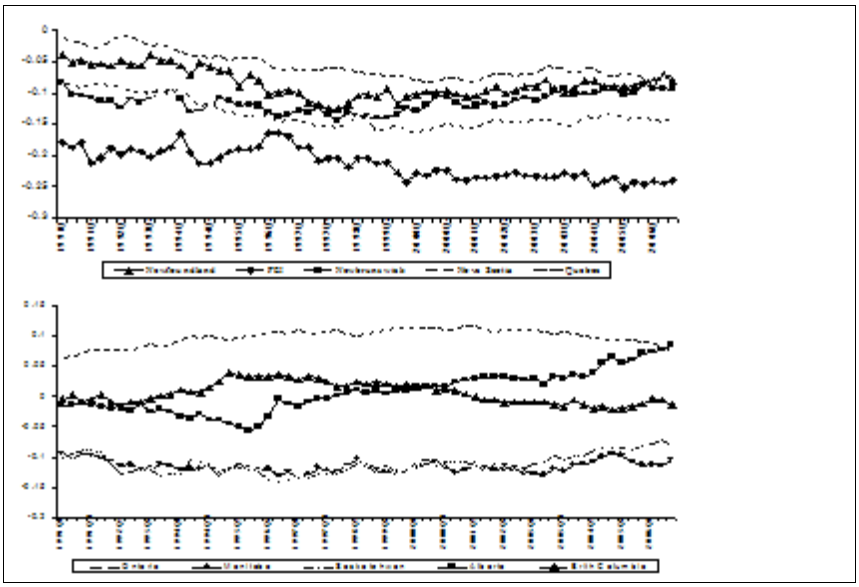
Appendix C: Regional Difference in Unemployment Rates

(Difference Between Province i and Rest of Canada)



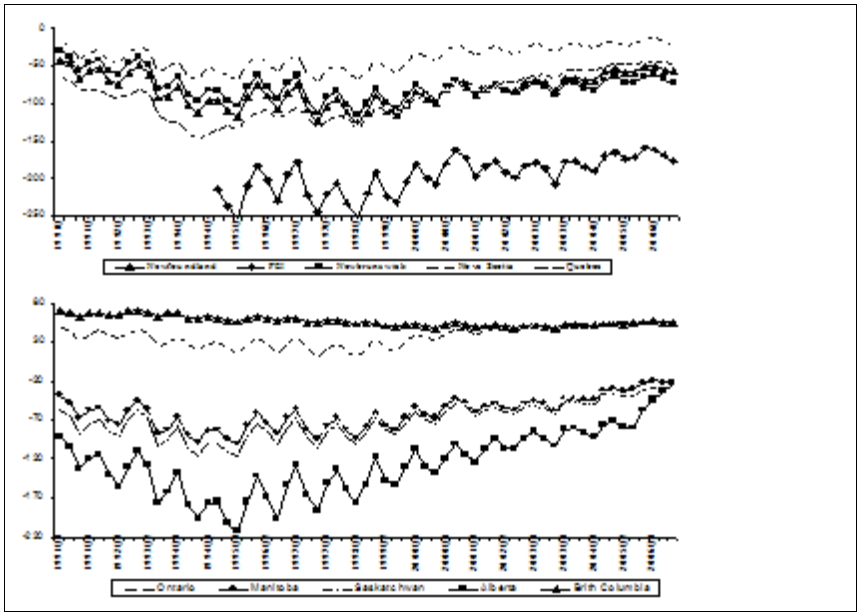
Appendix D: Regional Difference in Weekly Income

(Log Ratio of weekly Income in Province i to Rest of Canada)



Appendix E: Regional Difference in Housing Price

(Ratio of the Difference in Housing Prices between Province *i* and Rest of Canada to the Housing Price in Province *I*)



Appendix F:
Ratio of External Migration to Provincial Population