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**An Econometric Model Describing the
Movement of the Population Between
British Columbia and the Rest of Canada**

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I. INTRODUCTION

The developed model adopts the Push-Pull hypothesis for describing migration flows. This approach views migration as a combination of "push" factors that pressure a migrant to seek better opportunities, and "pull" factors that attract a migrant to a particular location. Consequently, movement between regions is viewed to result from differences in economic and non-economic conditions in the respective regions.

Under the above hypothesis, a model describing the migration movements between British Columbia and the rest of Canada was developed and tested through the use of multiple linear regression.

Migration is governed by a wide variety of economic, demographic, social and political factors. In many instances empirical data on these factors are not available for a sufficient historical period to conduct regression analysis. In addition, in order to forecast migration, consideration must be given to the practicality of forecasting the theorized determinants of migration. Both these constraints put limits on the number and type of variables considered exogenous to the model. Consequently, the independent variables incorporated into this model of migration do not uniquely describe interprovincial migration flows, but rather are ones that fit the criterion of statistically significant correlation with past migration flows, and have the potential to be forecast themselves.

II. THE MODEL

Dependent Variables

The variable considered as dependent in this model is the estimated annual British Columbia net interprovincial migration from 1985 to 1998. In addition, when forecasting population via a Component/Cohort-Survival Model, it is desirable to have information on the direction of the migration flow since the age/sex structure of in and out-migration tends to differ. In order to forecast British Columbia in and out interprovincial migration, an equation was derived for in-migration only. Out-migration from British Columbia was obtained by subtracting the net migration from the in-migration results.

It should be noted that the interprovincial migration data used are estimates produced by Statistics Canada, and are based on the interprovincial movement of

those filing income tax returns.¹ Consequently, although these estimates are generally considered the best available, they are not free from error.

Net Migration Equation

Differences in the relative unemployment rates between British Columbia and the other provinces are assumed to influence migration. The unemployment rate is seen as an indicator of regional economic opportunities. Increases in the relative unemployment rates between British Columbia and the other provinces are assumed to have a negative effect on net migration.

Table 1
Distribution of British Columbia Net Migration by Province
1961-1996 (%)

Atlantic	Que.	Ont.	Man.	Sask.	Alta.	Yuk./N.W.T.
6.3	9.8	27.9	14.3	13.2	26.8	1.6

Source: Statistics Canada, *Interprovincial and International Migration in Canada (91-208)*; *Mobility Status and Interprovincial Migration, Census 1986 (93-108)*; *Mobility and Migration, Census 1991 (93-322)*; *1996 Census*.

As seen in Table 1, the distribution of British Columbia net interprovincial migration varies significantly from region to region. This variation is likely due to variations in such non-economic factors as population size, distance, and language, as well as economic conditions.

Ideally, an economic model of migration should relate British Columbia migration to/from each region to the relative economic conditions in each region. However, this level of disaggregation increases the complexity of the data required when compared to simpler versions such as modeling net migration from all sources as a function of aggregate economic conditions.

In the case of unemployment rate differentials, a middle ground was adopted. As seen in Table 1, Alberta and Ontario are British Columbia's major trading partners vis-a-vis migration. It is likely that an econometric model of migration is more sensitive to changes in the relative economic conditions (such as unemployment) in Ontario and Alberta than, for example, Quebec or the Atlantic region since non-economic factors also heavily dominate British Columbia migration to and from these regions. However, there is a problem of multi-collinearity between the Ontario and Alberta variables, therefore only the unemployment rate differential between British Columbia and Alberta is included in the model.

¹ Note that availability of the income tax data is generally delayed for two years. During the interim, the interprovincial movement of those receiving the Child Tax Benefit is the basis of the estimates.

Another factor that may influence migrants is the relative economic prosperity of the area to which they are moving. This can also be described as the area's standard of living. One readily accessible measure of the economic well-being of a province is the provincial gross domestic product (GDP). In order to normalize for both population difference and inflation, the measure used is the per cent growth in GDP in constant 1992 dollars. The model uses the differential between the British Columbia and the rest of Canada (aggregated) per cent growth in real GDP.

The modeling time period has been reduced from earlier versions of this model in recognition of structural changes that have occurred over the last 30 years.

The equation used to forecast net interprovincial migration for British Columbia is given in Table 2.

Table 2

British Columbia Net Interprovincial Migration Equation

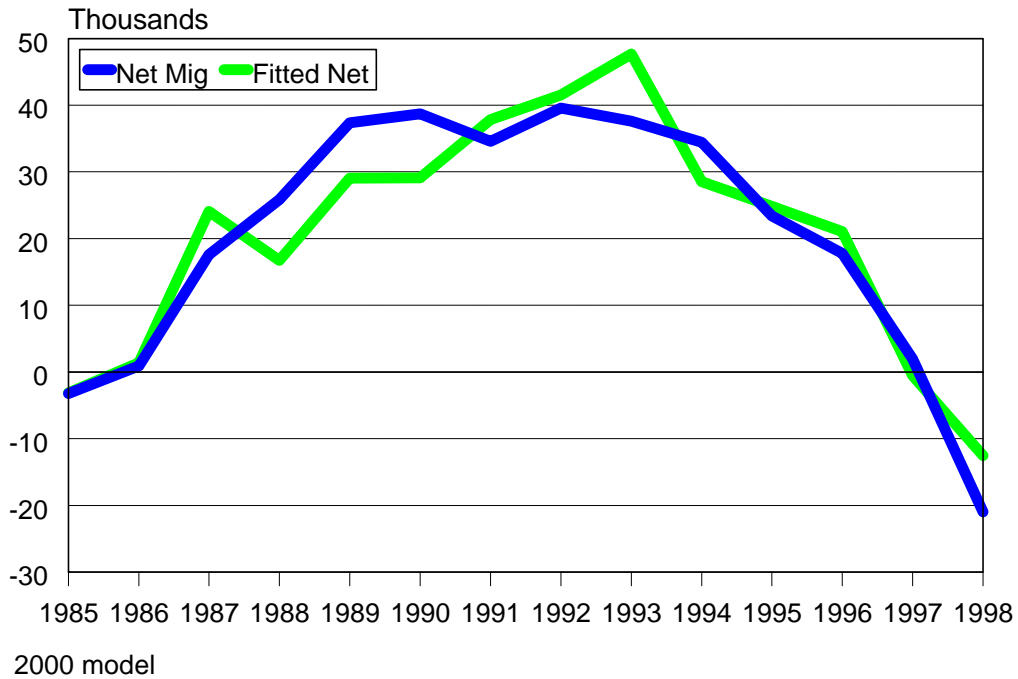
Net = 28869 - 6432 UnA + 6909 GDP

Standard Error: (4420) (1834) (1227)
 T-Value: (6.5) (-3.5) (5.6)

F-Value: 43.7
 R Squared: 88.8%
 R-Bar Squared: 87.9%
 Durbin-Watson: 1.9

Net: British Columbia annual net migration from 1985 to 1998.
 UnA: British Columbia minus Alberta unemployment rates from 1985 to 1998.
 GDP: British Columbia minus rest of Canada per cent growth in GDP in 1992 constant dollars for 1985 to 1998.

Net Migration Model
 Actual vs. Fitted



In-Migration Equation

As noted earlier, the projection model used to forecast provincial population requires directional forecasts of migration. As a result, a British Columbia interprovincial in-migration equation was developed. To minimize the forecasting data requirements, the same independent variables as contained in the net migration equation were used.

Since 1976 the interprovincial migration estimates prepared by Statistics Canada are compiled from two sources, income tax records and Family Allowance accounts (which have recently been replaced by Child Tax Benefits [CTB]). In general, the net interprovincial migration estimates from both sources are comparable; however, in some years the flows (i.e. in and out-migration) are not. The tax based estimates are compiled from annual data while the Family Allowance/CTB based estimates are developed from monthly moves. Hence, the gross flows as reported by Family Allowance/CTB statistics tend to be higher. In order to compensate for this disruption in the data series a time dummy was introduced for the years 1985 and 1986.²

The in-migration equation and summary statistics are given in Table 3.

² Data prior to 1982 and after 1986 indicated that the two sets of migration estimates were roughly comparable. As a result, the time dummy was not extended past 1986. For a more detailed analysis see: "Evaluation of 1989-90 Total Interprovincial Migration Estimates Based on Revenue Canada Income Tax Files", R. Bender and G. Lagrange, Statistics Canada, February 27, 1992, unpublished paper.

Table 3

British Columbia Interprovincial In-Migration Equation

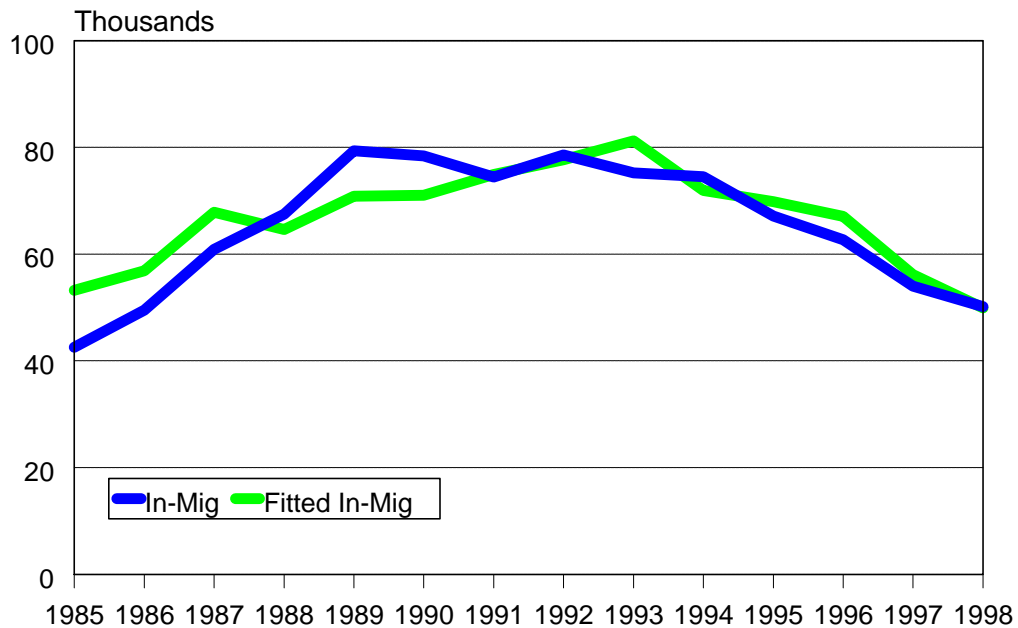
InM= 72324 - 3903 UnA + 3290 GDP - 9013 Dum
 Standard Error: (3411) (1607) (910) (4930)
 T-Value: (21.2) (-2.4) (3.6) (-1.8)

F-Value: 21.5
 R Squared: 86.6%
 R-Bar Squared: 84.2%
 Durbin-Watson: 1.7

InM: British Columbia annual in-migration from 1985 to 1998.
 UnA: British Columbia minus Alberta unemployment rates from 1985 to 1998.
 GDP: British Columbia minus rest of Canada per cent growth in GDP in 1992 constant dollars for 1985 to 1998.
 Dum: In-Migration dummy equal to 1 in 1985 and 1986, 0 otherwise.

The simulated results of the net and in-migration equations are given in Appendix A.

In-Migration Model
 Actual vs. Fitted



2000 model

Appendix A: B.C. Interprovincial Migration Model

Net Migration equation coefficients:			In-Migration equation coefficients:			
28869	-6432	6909	72324	-3903	3290	-9013
β_0	UnA	GDP	β_0	UnA	GDP	Dum

Year	B.C. - Alta. Un. Rates (%)	B.C. - Rest Canada Growth in GDP	Simulated			Actual			Residual Error	
			In-Mig	Out-Mig	Net Mig	In-Mig	Out-Mig	Net Mig	In-Mig	Net Mig
1985	4.6	-0.35	53217	56355	-3137	42568	45767	-3199	-10649	-62
1986	2.8	-1.37	56878	55505	1373	49502	48592	910	-7376	-463
1987	2.6	1.73	67857	43781	24076	60913	43295	17618	-6944	-6458
1988	2.3	0.38	64606	47886	16720	67500	41635	25865	2894	9145
1989	1.9	1.80	70819	41758	29061	79371	42004	37367	8552	8306
1990	1.7	1.62	71007	41904	29102	78389	39685	38704	7382	9602
1991	2.0	3.16	74916	37075	37841	74459	39887	34572	-457	-3269
1992	0.8	2.58	77693	36138	41555	78596	39018	39578	903	-1977
1993	0.1	2.82	81201	33515	47686	75227	37632	37595	-5974	-10091
1994	0.3	0.23	71916	43375	28541	74511	40062	34449	2595	5908
1995	0.7	0.06	69828	44981	24847	67105	43691	23414	-2723	-1433
1996	1.8	0.54	67088	46039	21049	62728	44930	17798	-4360	-3251
1997	2.6	-1.83	56143	56666	-523	54029	52049	1980	-2114	2503
1998	3.2	-3.01	49925	62448	-12523	50170	71154	-20984	245	-8461

Average Absolute Difference 1985-1998
 4512 5066
 Median Absolute Difference 1985-1998
 3627 4589