Canadian Interprovincial Migration Decision

by Bo Yu
(4800674)

Major Paper presented to the
Department of Economics of the University of Ottawa
in partial fulfillment of the requirements of the MA Degree

Supervised by David Gray

ECO 7997

May 14, 2010

Abstract: While there are many factors that influence an individual's migration decision, the primary reason is generally to gain a better life. This paper reviews the methodology and results of five previous studies that examined the migration behaviour of individuals. An assessment of the common procedures and their limitations in analyzing dichotomous decisions follows the review. Using data from the 2001 Canadian Census, an update to Robinson and Tomes (1982) study on Canadian interprovincial migration is conducted and its implications are reviewed.

Introduction

Starting with humans migrating from one region to another following the movement of big game, people have always moved from one region to another in hopes of attaining a better life. Although the methods and specific motivations for relocation have evolved over time, the primary incentive has remained unchanged, which is to improve one's living standards. Today, policy makers are interested in the results of statistical estimation and economic inferences regarding peoples' migration decisions to form efficient policies and guidelines that will improve the overall well-being of its society. Day (1992) suggests that if one provincial government has greater revenue sources over another province, the province with more resources will experience a greater inbound migration because of the more attractive tax and expenditure packages that it is able to offer to its residents. Consequently, without equalization policies that will balance the net benefits across all provinces, migration flows induced by provincial government social welfare programs will cause an inefficient allocation of human resource on a national level (Day p. 124). In addition, there have been many modifications to policies and social-welfare programs over the past three decades that have affected the lifestyles of many Canadians. These changes in relative industry composition and labour market conditions create a need to examine the possible evolution of interprovincial migration decisions.

This study examines the factors that influence an individual's decision to move across provinces in Canada, using cross-sectional micro data from the 2001 Canadian Census of the Population. The methodology of this analysis follows the earlier work on

Canadian interprovincial migration by Robinson and Tomes (1982). The paper will begin by reviewing previous empirical studies that examine the dichotomous decision of migration, four of which using Canadian data, and the other one using American data. Following the survey of those five studies, the common methods of modelling the decision to migrate will be discussed, including some of the complications and shortcomings of the data sets that are employed. The rest of this paper will consist of a partial update to Robinson and Tome's 1982 study on Canadian's decision to migrate interprovincially, which uses data from the 1971 Canadian Census. For this study, the update will be performed only on the first of the three-step analysis conducted by Robinson and Tomes using the more recent data from the 2001 Canadian Census. I expect little change in the estimates of the fundamental factors affecting the migration decision, such as age, education level, and marital status. The potential wage differential between the mover and stayer is not examined directly within the scope of this paper. Following the update is a discussion of the results and some of its implications.

Review of previous studies

Studies on the migration decision are generally based on some form of human capital earnings model. Most studies of the decision to migrate focus on the potential difference in an individual's earnings between the states of migrating and staying. Thus, I will briefly outline the conceptual framework and economic behaviour of workers who are potential migrants. Workers earning a lower wage have incentives to move towards a region that offers a higher wage. Fundamentally, the "migration on the labour market is usually an elementary model of labour demand (Cahuc and Zylberberg p. 607)."

For any market, production is a function of available fixed capital (K), such as land and infrastructures, and human capital (L), which is assumed to be restricted by the labour force size, N. The wage rate is an equilibrium condition and is determined by the marginal productivity of labour at full employment relative to the price (P) of the produced good. In other words, the equilibrium wage may be specified as,

$$w = P\,[\partial f(K, L) / \partial L]$$

In the short-run, the demand for labour is relatively constant because the availability of capital remains fixed, while the labour supply has the ability to fluctuate with migration flows. The market equilibrium wage rate is determined by the supply and demand of labour. At the macro level, as workers migrate from a low-wage region to a high-wage region, there will be an increase in the labour supply of the high-wage region and a corresponding decrease in the low-wage region. Eventually, we can expect the wage rates tend to equalize between the two labour markets due to migration.

The migration of less skilled workers based on higher potential wages available elsewhere can create an increase in inequality and possibly reduce the well-being of native residents. The equilibrium wage is negatively correlated with an increase in migration of labour as a result from the reduction in marginal productivity of labour, which is particularly true for low-skilled workers (Cahuc and Zylberberg p. 605-608). Fundamental supply and demand principles suggest that an increase in supply of labour will depress the wage rate.

From a theoretical perspective, labour demand theories indicate that both short and long-run scenarios yield similar results. An increase in migration of low-skilled workers to a region will generally lead to an increase in inequality between the skilled and unskilled workers of the destination region. However, empirical studies by Borjas (1999) and Card (1990) show the contrary and indicate that the migration of "low-skilled workers has little effect on wages among works with the fewest skills (Cahuc and Zylberberg p. 625)." Nonetheless, the potential increase in one's earnings is still the primary motive for migration, as the following review on four Canadian and one American empirical study demonstrates.

Using cross-sectional micro data set from the 1971 Canadian Census, Robinson and Tomes (1982) were among the pioneers in analyzing the interprovincial migration decisions of Canadians. They looked at the expected earning difference between two regions and used a probit model to estimate the probability of moving based on a set of defined variables that can potentially influence a migration decision. Their underlying theory is that individuals will move from a given province if potential earnings in other provinces, net of moving costs, exceed the earnings in the origin province.

The econometric framework of Robinson and Tomes consists of three estimating procedures, and follows a basic probit model that takes self-selection bias into account. Their analysis begins with an estimation of a reduced-form probit equation, which generates the probability that an individual will move to another province. A separate estimation of the reduced-form equation is conducted for each of the nine provinces. The reduced-form equation expresses the endogenous move variable solely in terms of the specified exogenous variables and its random error terms. The criterion for migrating has the following form:

$$I_i = X_i(\beta_a - \beta_b) - Z_i d + (u_{ai} - u_{bi} - u_{ci})$$

I_i is the criterion for migration and is considered a latent variable. When the value of I_i is greater than 0, then the individual is considered an interprovincial migrant. The latent variable is an unobservable utility index that is conditional to certain explanatory variables that can be observed and measured directly. The X_i denotes the individual's observable characteristics that may influence the migration decision, and consists of years of schooling, experience, university degree, training, ability, language, urban/rural/farm location. The β_a and β_b are vectors of estimated coefficients that correspond to the individual's new and original region of residency, respectively. Robinson and Tomes do not observe the monetary cost for moving and therefore do not include a cost variable in their analysis. Instead, cost is associated with the household structure of the individual and it is assumed to be proportional to permanent income in the origin region. Z_i represents the potential barriers that an individual faces when deciding to migrate, such as family size, marital status, schooling, and language at spoken at home. Estimators for the barrier variables are captured by d. The u_{ai}, u_{bi}, and u_{ci} are the individual's unobserved characteristics, such as work ethics, the unique attributes of the specific region, such as natural environment, and costs or barrier components.

The second part of the Robinson and Tome's study incorporates the estimated values from the reduced-form probit equation to generate a potential log wage function for an individual who moves and for an individual who stays. A fitted wage is estimated for each of the individuals as if they had either moved ($\ln y_{bi}$) or stayed ($\ln y_{ai}$). The specification of the estimated wage equations for movers and stayers are as follow:

$$E(\ln y_{ai} \mid X_i, I_i > 0) = X_i\beta_a + (s_{ae}/ s_e)\lambda_{ai}$$

$$E(\ln y_{bi} \mid X_i, I_i > 0) = X_i\beta_b + (s_{be}/ s_e)\lambda_{bi}$$

The two separate estimated potential earnings both include an additional inverse-Mills ratio variable (λ), which corrects for the issue of self-selection. The additional inverse-Mills ratios allow for the inclusion of a wage-differential variable to be estimated consistently and efficiently. The importance of accounting for selectivity is demonstrated with a comparison of the coefficients before and after the inclusion of the inverse-mills ratio. For the wage gain coefficient, "the failure to account for self-selection changes a significant positive coefficient into a significant negative coefficient (p. 497)." This phenomenon suggests an underestimation when selectivity is ignored. "When the estimated wage gains to migration were introduced into a structural probit equation along with factors influencing the cost of moving, self-selection was found to have a strong effect on the estimated response of migrants to potential wage gains (p. 500)." The effects were not as profound for the other variables, such as family size and marital status.

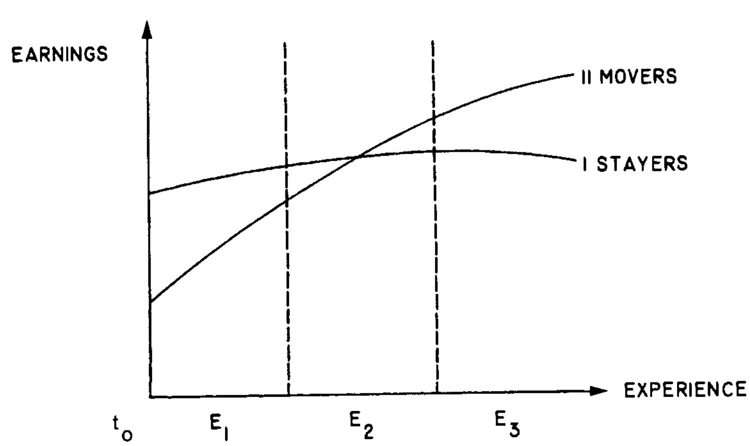
In the third and final step of Robinson and Tomes' study, the estimated potential wages are used to generate a wage-differential variable that is then used in conjunction with previous variables from the reduced-form equation to estimate a structural probit equation for each of the nine provinces again. The structural equations describe the behaviour of the individual accounting for the selection bias issue in the estimated earnings function. Once the problem of selectivity bias is accounted for, which will be discussed in detail later on, the probability that an individual chooses to move is then given by:

$$Pr \{[(X_i \beta_a - X_i \beta_b) - Z_i d] / s_e > (e_i / s_e)\}$$

where s_e is the variance of e, which is a summation of u_{ai}, u_{bi}, and u_{ci}.

At first glance, the aggregate results have mixed significance and implication across the provinces. However, the estimates of the coefficients give the total effect of the exogenous variable on the probability of moving.

The estimations are separated into two groups according to the individual's years of labour market experience. Robinson and Tomes reason that a single observation made for all individuals with different years of experience would result in an underestimation of the stayer's earnings and an overestimation of the mover's earnings during the prime experience years (range E1 on graph). On the other hand, an overestimation on earnings is likely for the stayers and the opposite for the movers during the more experience years (range E3 on graph). The following diagram graphically demonstrates the importance of separating the sample set into different levels of experience as a result of the different earning levels that a mover and stayer can potentially have.



Source: Robinson and Tomes "Self-Selection and Interprovincial Migration in Canada" (1971).

This phenomenon is the result of the movers realizing their gains in earnings after receiving more experience in the latter years. Interestingly, as Robinson and Tomes note, if the order of profiles were reversed, the opposite effects would be experienced by the movers and stayers. Thus, the definite effect of experience on earnings is ambiguous, and the final results are dependent on context. "If there were no cohort effects, this problem could be overcome by computing a permanent wage from the lifetime-wage profile implied by the cross-section estimates (Robinson and Tomes p. 482)." Separating the sample according to experience level allows for the variation in earnings to be captured for at least one experience group. Nonetheless, the ambiguity in earning potentials by the movers and stayers also lead to the issue of selectivity.

Results show that mobility positively increases with greater years of schooling for a majority of the nine provinces examined, except for Quebec, which showed the opposite behaviour. The years of schooling coefficient value for the other four provinces has low statistical significance, and thus their inferences are negligible. Both Age and Age^2 have significant statistical results. Consistent with general human capital model, the positive value for Age and negative value for Age^2 indicate a concave relationship between the two variables. In other words, individuals have a higher propensity to migrate at a younger age that diminishes with age. The negative coefficient for an individual's family size suggests that a larger family hinders mobility. Being married as opposed to being single increase the chances to move, as indicated by a positive and significant estimator value. Robinson and Tomes indicate that interpretation of family size and marital status results may not be consistent because their characteristics are not permanent as an individual may potentially change either of the two qualities. The coefficient value for wage differentials is positive and significant for the majority of the provinces, but especially for the less-experienced group, which is consistent with the traditional human capital model. Education levels have a mixed effect on interprovincial migration, with only New Brunswick, Ontario, Manitoba, Saskatchewan, and British Columbia showing a mobility increase with education. In Quebec, higher education increases mobility among anglophones, while the opposite is true for francophones. Robinson and Tomes suggest that this phenomenon might be due to the fact that greater education on the part of francophones increases the demand for cultural activities conducted in French.

While potential direct wage gain is the basis of migration according to Robinson and Tomes' study, another reason people migrate is based on indirect wage gains, such as government transfer payments. Day (1992) examines the effects of Canadian government transfer payments on the decision to move interprovincially. A multinomial logit model is used to examine the migration decisions of Canadians. Aggregated cross-sectional data are obtained from numerous catalogues published by Statistics Canada between the years of 1962-1981 from fields like National Income and Expenditure Accounts, Consumer Prices and Price Indexes, and the Labour Force Survey. Day's estimations were based on the generalized least square technique as proposed by Parks (1980), and the results suggest that the level of provincial government expenditure and transfer payments have significant impacts on the migration decisions of Canadians, who move based on utility maximization assumptions.

The fundamental framework to Day's analysis is different from that of Robinson and Tomes. She uses aggregated instead of micro data and argues that people's migration decision across provinces takes into consideration not only potential wage increases but also the level of government expenditures on social programs, such as health, welfare, and education. Day composes an indirect utility maximization of the form:

$$v(q_j, w_j, I_{ij}; G_j, A_{ij})$$
$$= \max \{u(X_j, T - L_j; G_j, A_{ij}) : q_j X_j + w_j(T - L_j) = w_j T + I_{ij}\}$$

U($\cdot$) denotes a continuous, increasing, and strictly quasi-concave utility function, and X_j is consumption of goods in province j. ($T - L_j$) represents leisure time, and T represents the total available time (52 weeks) and L_j is the labour supply (numbers of work hours available). G_j is a vector of provincial government spending on public goods, and A_{ij} is a vector of other variables that represents characteristic of province j that individual i perceives as beneficial. q_j is the price of goods, and w_j is the after-tax wage and non-wage income of I_{ij}. Day also includes the probability of being unemployed (p) and the probability of being covered by Unemployment Insurance (d) in province j.

After considerable mathematical manipulations following previous works by Parks (1980), details of which will not be examined within this study, Day uses a multinomial logit model to examine the individual's decision on interprovincial migration. A log-linear Cobb-Douglas model is used to estimate the expected utility of an individual, which is a function of several exogenous variables such as price of goods consumed, wages, government expenditures on health, social services, education, local temperature, distance moved, a binary move variable, and the unemployment rate. Individuals are assumed to choose to live in the province that maximizes their expected level of utility.

The positive value and statistical significance of the price coefficient in all of the models coincides with the theory that an increase in consumer price levels in one province will lead to a decrease in the migration rate for that province. The positive wage coefficient has complicated implications on the effects of a wage increase. As Day states, "first, an increase in wage constitutes an increase in the price of leisure, which will cause people to substitute goods for leisure, thus tending to reduce indirect utility levels; and second, the increase in wage will increase full income, which will encourage people to increase their utility by consuming more. The net effect will depend on which of these two effects is strongest (p. 135)."

Day includes level of government expenditure on public services rather than natural resource revenue and inter-government transfer payments because the latter variables require the implicit assumption that individuals are aware of either the provincial governments' budget constraints or the provincial governments' decision-making process. Similar to the results of other studies, the distance variable in Day's study all have negative coefficient values, which indicates that individuals have a decreased tendency to move as the distance increases, or they prefer short distance move over long distance move. Consistent with popular belief, all other conditions considered, people prefer warm weather over cold weather, which is supported by the positive values of days above 0 degrees Celsius. More interestingly, the government spending variable has a positive composite value along with high statistical significance, which implies that an individual's migration decision is affected by the level of social welfare programs. The health and education positive coefficients further support the fact that individuals are attracted to provinces that offer better health care and education services (p. 136).

Surprisingly, the coefficient for social service spending is negative, which would means that Canadians have distaste for receiving social benefits. Day cites a study conducted by Cebula (1979), using data from the United States that shows a higher in-migration rate of black movers to locations that offer a greater amount of social welfare services. In contrast, regions of lower social services attracted the white movers. Cebula theorized that white migrants viewed areas of greater social services as having potentially higher income-tax rates and thus moved to areas with lower social welfare spending. Although there is no definitive link with Canadians having the same behaviour because of the provincial tax rates were already considered in Day's study, the notion that people with higher income level have a negative connotation associated with social welfare raises the need to examine the migration decision of individuals with different levels of income. The final variable that Day examines is the effects of unemployment rates on individual migration decision. With a negative and significant coefficient value, Canadians are found to be risk averse and less prone to move to regions with a higher unemployment rate because of the fact that it be harder to find a job. All the results give strong support for Day's notion that Canadians do indeed migrate based on provincial fiscal policies and practices.

Another Canadian study by Osberg, Gordon, and Lin (1994) examines the migration decision of Canadians by estimating a bivariate probit model of simultaneous choice among three mobility states. Individuals are assumed to have three options: stay in the same industry and same region, change industry but stay in the same region, or move to a different region. Panel data were obtained through the 1986 and 1987 period of the Labour Market Activity Survey (LMAS), compiled by Statistics Canada. The LMAS follows the same individual over multiple periods of observations.

The model consists of a neo-classical utility-maximizing approach stressing the fact that an individual's mobility, both between industries and regions, is linked to the theory of labour supply. Individuals may face a constraint on their working hours based on the amount that is available, which will affect their income levels. The potential wage is a function of several exogenous variables such as an individual's age, job tenure, education levels, minority status, and job industry type. In other words, interindustry mobility is determined by the availability of work hours, and interregional mobility is determined mostly in by potential wage difference between regions.

The empirical framework of their study consists of four estimating procedures. In the first step, an estimation of the individual's indirect utility level for each of the three states of mobility is conducted. Individuals maximize their utility, which is a function of consumption in goods and hours of leisure, which has two constraints. Individual's total expenditure on consumption cannot exceed earnings plus other non-wage incomes, and hours worked and leisure time must not exceed the total amount of time available. Like other studies, Osberg, Gordon, and Lin recognize that the actual supply of work hours may be constrained by job availability and that actual hours worked may fall short of desired hours. The indirect utility then becomes a function of wages, non-wage income, and the probability of encountering a demand-side constraint, denoted by (P_c), which are all conditional on the individual's exogenous variables (X). Osberg, Gordon, and Lin stress that individuals' migration across industries and regions will affect the variables of the indirect utility functions. The following three indirect utility functions represent the individuals' options:

$U_1 = v(w_1, Y_1, P_{c1} \mid X)$	same industry, same region
$U_2 = v(w_2, Y_2, P_{c2} \mid X)$	different industry, same region
$U_3 = v(w_3, Y_3, P_{c3} \mid X)$	different region

In the second part of the study, the estimated indirect utility levels are then used to determine the individual's probability of choosing one of the three options of mobility. The stochastic uncertainty in estimated wages implies that the mobility process is stochastic. The probability of the individual's three choices of either staying in the same industry and same region, changing industry but staying in the same region, or moving to a different region is denoted by P_1, P_2, and P_3, respectively.

If $U_1 > U_2$ and $U_1 > U_3$	$P_1 = 1$	estimate W_1
If $U_2 > U_1$ and $U_2 > U_3$	$P_2 = 1$	estimate W_2
If $U_3 > U_1$ and $U_3 > U_2$	$P_3 = 1$	estimate W_3

In the third step, the probability for the individual's choice of three mobility status is then used to generate inverse-Mills ratio variables to correct for selection bias. The additional variables are included in the estimation of potential wages. If selectivity was ignored, there will be possible downward bias in the estimated wages. In other words, the wages of the movers might be underestimated while the wages of the stayers might be overestimated. While the details of their mathematical set up and modification will not be examined, the specifications of the three wage estimator are as follows:

$$W_{j1} = \beta_{1w}X_{1wj} + \gamma_1\lambda_{1j} + \gamma_2\lambda_{2j} + u_{wj}$$

$$W_{j2} = \beta_{2w}X_{2wj} + \gamma_3\lambda_{3j} + \gamma_4\lambda_{4j} + u_{wj}$$

$W_{j3} = \beta_{3w}X_{3wj} + \gamma_5\lambda_{5j} + u_{wj}$

The Xs denote the variables for individual's observed characteristics. The ßs represents the vector of estimated coefficients, and the λs are the generated variables of Heckman's selection-bias correctors. For W_1 and W_2, which represent those who stay in the same industry and same region and those who change industry but stay in the same region, respectively, there are two selectivity correctors because of the two possible choices of mobility that an individual faces. As Osberg, Gordon, and Lin note, because actual wages contain both a systematic predictable component and a stochastic element, the estimation of a model with discrete choices using the actual wages will be subject to selectivity bias if the error term both influences the dependent variable and is also simultaneously present in one of the independent variables. Thus two selectivity correctors are added for W_1 and W_2.

In the fourth and final step, the estimated wages from the previous step are used to produce the estimated wage differentials $(W_2 - W_1)$ and $(W_3 - W_1)$ for interindustry and interregional mobility, respectively. The wage differentials are then used in conjunction with other exogenous characteristic variables to estimate a bivariate probit model for which the two mobility choices are modelled jointly. The results give the probability of interindustry and interregional mobility in the year 1987.

Results show that wage differentials have a significant impact on the interregional migration decision, but it has little impact on the decision to move across job industries. On the other hand, job availability promotes migration across industries and has a reduced impact on interregional mobility. Those with a higher level of education are more likely to migrate interregionally rather than to migrate across industry.

Corresponding to other studies and the commonly held belief, mobility across both regions and industries decreases with age and is also relatively lower for the teenager group. Higher-educated individuals are more likely to move, as supported by the increasing estimated coefficients values for the post-secondary, diploma, and university degrees variables. However it is interesting to note that the effects of education are more prominent and significant for the interregional movers than for the interindustry movers, suggesting that perhaps experience has an important role in the choice of changing job industries (p. 73).

Osberg, Gordon, and Lin's study suggests that individuals decide whether to stay where they are, to move to a different industry but remain in the same region, or to migrate to a new region of residence, all based their foreseen benefits. "In evaluating alternatives elsewhere, estimated wage differentials are a statistically significant, but empirically small, determinant of the probability of interregional migration and the interindustry mobility of labour is dominated by the availability of employment hours. Additionally, there is no evidence that the receipt of transfer payments by individuals diminishes their probability of interregional or interindustry mobility (p. 77)."

In the United States, a study by Mills and Hazarika (2001) examine the variables that influence the migration decision of young Americans between rural and urban areas. Panel data were obtained through the National Longitudinal Survey of Youth (NLSY), which is administered by the United States Department of Labor. The NLSY is a nationally representative sample of young men and women who were 14-22 years old when they were first surveyed in 1979. It is similar to the Canadian LAD in that the NLSY follows individuals through time and contains various information, such as household earnings, occupations, educations, and welfare receipts. Other supplemental data for variables such as unemployment rates were gathered from sources such as the Bureau of Labor Statistics.

Mills and Hazarika argue that young Americans evaluate their earnings potentials between non-metropolitan and metropolitan regions and will move to the region that offers a higher wage. The empirical framework is composed of a three-part estimation, which follows a similar approach with the earlier work of Robinson and Tomes. In the first part of their analysis, Mills and Hazarika estimate the individual's discounted present value indirect-utility function for the metropolitan and non-metropolitan regions. The specifications are as follow:

$$V_{i,M} = [(\lambda_{i,M} \cdot W_{i,M}) / (r_i - g_M)] \cdot [1 - e^{-(r_i - g_M)T}]$$

$$V_{i,N} = [(\lambda_{i,N} \cdot W_{i,N}) / (r_i - g_N)] \cdot [1 - e^{-(r_i - g_N)T}]$$

Mills and Hazarika argue that if the ratio of $V_{i,M} / V_{i,N} > C_i$, then the individual will likely move from the rural to the urban region. Taking the log-ratio difference of the two equations above yields an estimate for latent variable that represents the individual's propensity to migrate. The unobserved latent variable has the following specification:

$$I_i = \ln(\lambda_{i,M}) - \ln(\lambda_{i,N}) - \ln(W_{i,M}) - \ln(W_{i,N}) - \ln(r_i - g_M)$$
$$+ \ln(r_i - g_N) + \ln[1 - e^{-(r_i - g_M)T}] - \ln[1 - e^{-(r_i - g_N)T}] - \ln C_i$$

Individual *i* migrates if $I_i > 0$. W_M and W_N represent the individual's current metropolitan and non-metropolitan wage, λ is the probability of being offered a job, r is the individual's discount rate, g represents the growth rate of earnings for that region, and C_i denotes the individual's cost of migration.

In the second step, Taylor series approximations of the estimates from the mobility index are used to generate a separate potential earnings equation for movers and stayers within the urban and rural regions. Because the wages of migrants are only observed for movers and the wages of non-migrants are only observed for stayers, a maximum likelihood method of a modified tobit model (type 2) is then used to account for the selectivity bias. Mills and Hazarika also add an additional inverse-Mills ratio variable to correct for selectivity bias in the estimated potential log wages of the mover and non-mover. In their study, the individual's potential earning is a function of several exogenous variables, including human capital attributes such as grades, experience level, gender, ethnicity, parent's education level, local unemployment rates, and three dummy variables indicating general regions.

Lastly, the estimated wages from the previous step are used to generate a predicted wage differential for stayers and movers of the metropolitan and non-metropolitan regions. The estimated wage differential variable is then used in a structural probit estimation to analyze the individual's mobility decision. The following is the specification of the structural equation used in the estimation.

$$I_i = a + (\ln W_{i,M} - \ln W_{i,N}) + X_{i3}\beta_3 + e_i$$

I_i represents the individual's propensity to migrate, which is contingent on perceived earnings differences in log wages between the two regions and the cost component of moving, $X_{i3}\beta_3$.

Interestingly, the common belief that individuals from non-metropolitan areas would prefer to move to larger urban areas is challenged by Mills and Hazarika's study. Results show (with significance) a higher rate of return to schooling and experience for those who migrated from a rural to another non-metropolitan county as opposed to those who migrated to metropolitan areas. Those who migrated within rural regions experienced a greater rate of return to moving in the log hourly earnings of 9.3% and 8.3% for education and experience levels, compared to a rate of return to mobility of only 4.8% and 5.9% for those individuals who migrated to urban areas. Mills and Hazarika interpret this outcome as a result of a skill-specific labour demand for the higher educated younger Americans in non-metropolitan areas. Because the jobs for highly educated individuals are relatively skill-specific and their availability is low within non-metropolitan areas, those with a higher education who prefer to stay in their rural region of origin are more likely to obtain jobs that do not match their skill sets and thus receive a lower wage than they would receive if they moved to a region where their skills would be a better match with the employer's needs. Individuals with low levels of education are less affected by skill mismatches "because low-skilled positions are relatively abundant in non-metropolitan areas (p.338)." At the same time, the rate of return to schooling in the form of higher earnings may be greater when moving to other non-metropolitan areas because individuals need to be compensated for their migration across the greater distance and also to offset the risk of moving to labour markets with fewer available job alternatives.

Other implications from the results suggest that non-metropolitan areas face competition on their human resources from more than just large urban regions but also other non-metropolitan areas. As Mills and Hazarika note, "low local returns to schooling create a disincentive to invest in education and contribute to persistently lower levels of educational attainment in non-metropolitan areas (p. 338)." Nonetheless, a larger earnings difference between rural and urban regions does promote the probability of moving from a rural to urban region, as indicated by the DIFFEARN coefficient, which is the log of the ratio of estimated earnings. However, these results only show the ex post of the migration behaviour of young Americans and do not give an explanation to the cause.

In a more recent study, Finnie (2004) performs an intricate analysis on Canadian interprovincial migration decision using panel data from the Longitudinal Administrative Database (LAD), administered by Revenue Canada. The study covered the years from 1983 to 1995. The LAD is a collection of data gathered from Revenue Canada tax files and "covers a broad spectrum of economic and demographic dynamic behaviour within the household context. Households are randomly selected and followed over time and surveyed annually, which provides individual and family-level information on income, taxes, and basic demographic characteristics in a dynamic framework (Finnie p. 1761). Unlike other data sources, such as the Canadian Census, which takes a snapshot of individual's characteristics at one time, the LAD follows individuals throughout periods of time.

Finnie uses a logit model to estimate a reduced-form equation where the coefficient estimates reflect the total/net effects (both cost and benefits) of the exogenous variables that affect the individual's propensity to migrate. The individual's exogenous variables include province of residence prior to move, language, population size of region, age and family status, provincial unemployment rates, social welfare assistance, earnings, and series of year-indicators on the probability an individual will move. "The relationships between the explanatory variables and the probability of moving are then estimated using maximum likelihood techniques with the underlying stochastic process assumed to follow an extreme value distribution (p. 1762)." Because Finnie's study focuses on the question of "who moves" rather motives of moving, it is primarily a descriptive study rather than a behaviour study. The estimated equations are all reduced form, and therefore the issue of selection bias on wages is not addressed in this particular study because estimated wage differentials of the movers and stayers are not utilized in the analysis. Instead, the earnings variable in Finnie's model captures, in reduced form, the degree to which employment opportunities in the current province versus other provinces vary by earning levels, as well as individual characteristics not captured by other variables.

Similar to Robinson and Tomes' separation of the sample by experience levels, Finnie separates his analysis on migration propensity into four "major phases of the life cycle (1763):" Entry (20-24 years-old), Younger (25-34 years-old), Prime-Younger (35-44 years-old), and Prime-Older (45-54 years-old). The age of a migrant has great bearing on the decision to move. Like other empirical studies, Finnie's results show that age has a significant role in one's mobility status and is negatively correlated to one's migration decision, which is supported by the increasing magnitude of negative coefficients in the four age groups. Consistent with conventional life-cycle models, the estimates indicate that younger individuals have greater mobility than older ones. The order of magnitude of the age variable in Finnie's (2004) study has similar results with the study by Robinson and Tomes (1982). All these results are consistent with standard economic life-cycle models, in which younger individuals have a longer time period to reap the benefits of a move.

Marital status and family size are other important factors in one's decision to move. With the base category being single individuals, the increasing negative coefficient values for Married w/o children, Married w/ children, and Lone Parent suggest that a larger household size have a negative propensity to migrate and that being married and having children increases the costs of interprovincial mobility . Finnie's study indicates that the population density of a region impacts the individuals' decision to move. "The clearest and most in interesting result is that living in a rural area has been associated with lower rates of inter-provincial mobility than all other area types- for all age-sex groups, and significantly so in every case except Entry Men (p. 1773)." This is evident from the positive and statistically significant values for all of the coefficients representing the second-tier cities variable (population size of 100,000 to 500,000). As the population size decreases, so does the value of the coefficients, which means a decrease in the propensity to migrate.

To summarize, in the three studies that incorporate an estimated wage or earnings differential function in the analysis of migration decision, the inverse-Mills ratio is added into the model's specification to correct the issue of self-selection. The studies by Day (1992) and Finnie (2004) do not account for wage selectivity as their studies do not estimate a separate earnings equations for movers and stayers. Although the previous works all examine the potential factors that may influence an individual's decision to migrate, the types of data used varied across the five studies. Cross-sectional micro data was used by Robinson and Tomes (1982), while Day (1992) used aggregated cross-sectional data in her study. Osberg, Gordon, and Lin (1994), Mills and Hazarika (2001), and Finnie (2004) all used micro panel data in their analysis.

In estimating the coefficient values for the factors that influences an individual's decision to migrate, there is a problem of identification process because "different sets of structural coefficients may be compatible with the same data sets. A given reduced-form equation may be compatible with different structural equation or models, and it may be difficult to tell which particular model we are investigating (Gujarati p. 739)." In this case, it is difficult to identify if the estimated values of the reduced form coefficients will generate unique values for the structural equations. The source of variation in the individual's characteristics that influences the migration decision is difficult to determine. For example, the estimated value of a coefficient describes the relationship between changes in the dependent variable proportional to the exogenous variable, and can be written as:

$$\beta = \partial Y_i / \partial X_i$$

As Gujarati notes, too many restrictions and too much information will lead to an issue of overidentification, in which there are multiple estimate values of the same coefficient. The opposite is true with not enough information (p. 747). Furthermore, as Robinson and Tomes note, the final values that are obtained in the analysis are only estimates on variables that are often estimates themselves of other data. Thus, the estimated coefficients values are only as good as the data from which they are derived.

With the review of previous studies on the migration decision in mind, the remainder of this study will describe the methods in modelling the decision to migrate, followed by the update to the first-half of Robinson and Tome's (1982) study on the Canadian interprovincial migration decision.

Methods of Migration Modelling

Following previous empirical studies, the decision to migrate is usually represented by an unobservable variable taking on a binary value. The event-based model can be specified as follows:

$$M_i = \beta_1 + \beta_2 X_i + U_i \qquad (1)$$

In the case of migration decision, a regressand value of 0 traditionally indicates a non-migrant, and a value of 1 a migrant. Because of the binary outcome and linear form, equation (1) is referred to as a Linear Probability Model (LPM) and can be interpreted as the conditional expectation of migrating (M) given by the individual's characteristics (X). Assuming that the disturbance term has zero mean ($E(U_i) = 0$), equation (1) can be re-written as:

$$E(M_i \mid X_i) = \beta_1 + \beta_2 X_i \qquad (2)$$

Let P_i equal the probability that M_i takes a value of 1, and $(1 - P_i)$ equal the probability that M_i takes a value 0. Equation (2) is the mathematical expectation of equation (1). The binary variable M_i follows the Bernoulli probability distribution and by definition of expectation, the following are true:

$$E(M_i) = 0(1 - P_i) + 1(P_i) = P_i \qquad (3)$$

and

$$E(M_i \mid X_i) = \beta_1 + \beta_2 X_i = P_i \qquad (4)$$

The expectation of a random variable is the probability that the random variable equals 1.

Although the results of the LPM are simple to interpret and are useful in discrete binary model analysis, the model does have some shortcomings including an error-term that may not be normally distributed, and it also exhibits heteroscedasticity. The model also "assumes that $P_i = E(M_i = 1 | X)$ increases linearly with X, that is, the marginal or incremental effect of X remains constant throughout [the sample set] (Gujarati p. 593)." Furthermore, the estimated probabilities are not bounded between 0 and 1. Individuals with the same characteristics such as levels of education, language proficiency, marital status, and even income levels are assumed to all have the same constant probability of migrating. Alternatively, in the real world, each person has a different propensity to migrate conditional on a numerous factors. There is also the restriction that the change in the probability of moving (∂P_i) relative to the change in the individual's characteristic traits (∂X_i) is always the same regardless of X_i's values. Thus, a model that accounts for a non-linear relationship is required.

The two most commonly used probability models for estimating the outcome for a latent variable that takes on a discrete binary value are the Logit and Probit models. Like all probability distributions, both the Logit and Probit models have their corresponding Cumulative Distribution Functions (CDF). Both models produce estimated probabilities that are bounded between 0 and 1 and generate more efficient estimators than the LPM. The Logit model follows a logistic distribution function and has the following form:

Let P_i = the probability of moving and (1 – Pi) = the probability of not moving,

$$P_i = E(M_i | X_i) = 1 / [1 + e^{-(\beta_1 + \beta_2 Xi)}]$$

$$= 1 / [1 + e^{-Zi}]$$

$$= e^Z / [1 + e^Z] \qquad (5)$$

where $Z_i = (ß_1 + ß_2X_i)$

Let $P_i / (1 - P_i)$ be the odds ratio of the event of moving, or the ratio of probability that an individual will move, divided by the probability that the individual will not move.

$$P_i / (1 - P_i) = [1 + e^{Zi}] / [1 + e^{-Zi}] = e^{Zi} \qquad (6)$$

Finally, the logit model is formed by taking the natural log of the odds ratio, which also yields the percentage change in the probability of moving,

$$M_i = \ln[P_i / (1 - P_i)] = Z_i = ß_1 + ß_2X_i + U_i \qquad (7)$$

Another commonly adopted probability model used in discrete binary choice analysis is the probit model, which follows a normal CDF and has the following form:

$$M_i = ß_1 + ß_2X_i \qquad (8)$$

In the probit model, the M_i regressand is derived from an unobservable mobility index that is explained by an individual's observed variables. Assuming normality and that there is critical index level of M*, such that if M_i is greater than M*, then the individual will migrate. It can be shown that the following is true:

$$P_i = Pr(M = 1 \mid X) = Pr(M^* <= M_i) = Pr(Z_i = ß_1 + ß_2X_i) = F(ß_1 + ß_2X_i) \qquad (9)$$

where $F(X)$ is the normal cumulative distribution function, and Zi is the standard normal variable. Taking the inverse of the CDF will yield the outcome for the regressand as well as the values for its estimates, and may be specified as:

$$M_i = F^{-1}(M_i) = F^{-1}(P_i) = ß_1 + ß_2X_i \qquad (10)$$

Like the logit model, the values of the ß coefficients in the probit model show the estimated effect of that variable on the individual's decision to move interprovincially conditional on the exogenous variables. The estimated values do not give the direct marginal effects or the probability of moving. I will follow the specification of equation

(10) in my regression analysis as it is similar to the approach used in the study by Robinson and Tomes (1982).

In analyzing the decision to migrate, perceived changes in earnings are among the key factors that drive the choice to move. The factors that generate the earnings potential of an individual are so numerous that some of the variables cannot be observed. Adding a wage differential variable to the migration choice analysis complicates matters in that it introduces self-selection bias. Self-selection occurs because individuals have characteristics that are unobservable, such as innate abilities or work ethics. These variables, which cannot be measured, complicate the estimation in potential wage differentials and produce estimates that are inaccurate. In the case of migration, individuals choose to either stay or move. As Robinson and Tomes note, because the choice of moving is made willingly by the individual and is not a random selection from the sample set, movers will self-select themselves into movers or non-movers category to maximize their utility. Those who decide to move will have an income that is different from the income they would have received should they had chosen to stay. Even with all other variables considered, such as university degree and family size, one cannot observe if the potential wages increase for the mover is due to the move itself or whether it because of other unobservable characteristic of the individual, such as work ethic or other innate abilities. For the stayers, one cannot observe what their earnings would have been had they moved. Likewise, for movers, one cannot observe what their earnings would have been had they stayed. In other words, self-selection makes it difficult to measure the causal-relationship between the difference in the wages of a mover and non-mover because of unobservable factors that influence the decision to migrate. Thus, estimating the determinants of wages on the self-selected sample set will produce biased and inconsistent results.

For the scope of this study, I will conduct a partial update to the study by Robinson and Tomes in 1982 using data from the 2001 Canadian Census. I will only update the first of their three-step estimating procedure. In other words, only the reduced form probit model will be examined. The second stage corrects for selection bias using the estimated mobility index from the first step to generate potential earnings for the movers and stayers. These estimated wages from the second stage would then be used in conjunction with the variables from the first step to form a structural probit model. However, the structural models are often not very robust because selection-bias correction depends largely on the model's specification, and the true model specification for an individual's migration decision is unknown. Although I do not complete the second or third step, the issue of selection bias and its possible remedies will be examined.

A common method for correcting the issue of self-selection bias is by including an additional variable commonly referred to as the inverse Mills ratio into the regression specification, as first proposed by Heckman (1979). Although there have been several modifications and updates to the original model, the method generally involve a two-step process in which a reduced form probit regression is first estimated. The estimated probit model generally has a specification similar to equation (9). The values of coefficients and regressand of the probit model gives the probability that the individual will move out of a given province.

$$P_i = Pr(M = 1 \mid X) = Pr(M^* <= M_i) = Pr(Z_i = \beta_1 + \beta_2 X_i) = F(\beta_1 + \beta_2 X_i) \quad (9)$$

In the second stage of Heckman's procedure, the estimated coefficients values from the first step are then used to create an additional explanatory variable, usually represented by λ, to correct for the problem of sample selection bias. In estimating the individual's potential earnings, a log earnings equation may be specified as:

$$\text{Ln } Y_i = X_i\beta + U_i$$

where Y_i is the underlying earnings, which is observed for only one of the two selected groups. For movers, only their new earnings are observed. Their counterfactual earnings had they stayed cannot be observed or directed measured. The opposite is true for stayers. X_i denotes the observed characteristics, β is a vector of estimated coefficients, and U_i is a normally distributed error term. The conditional expectation of earnings given that a person migrates is then:

$$E(\ln Y_i \mid X_i, M_i = 1) = X_i\beta + E(U_i \mid X_i, M_i = 1)$$

where X_i is the characteristics of an individual, β is the vector of estimated coefficients, and U_i is the normally distributed error term. Assuming jointly normal error terms for the mobility equation and the earnings equation,

$$E(\ln Y_i \mid X_i, M_i = 1) = X_i\beta + \rho\sigma_u \lambda(\beta_1 + \beta_2 X_i)$$

where ρ is the correlation between the unobserved factors that influence a migration decision and the unobserved factors that influences one's earning, s_u is the standard variance of U_i, and λ is the inverse Mills ratio. The inverse-Mills ratio is the ratio of the probability density function f(x) over the cumulative distribution F(x). Heckman suggests that not correcting for selectivity can essentially be regarded as a problem of omitted-variables. The resulting estimated potential wage gains for movers will likely be underestimated and overestimated for the stayers.

Aside from the issue of selection bias, there is also a problem with the window of observation. The timeframe in which the Census is conducted creates another problem with sample observations. As both Finnie (2001) and McDonald and Gray (2006) note, there is the issue of censored data because the Canadian Census is administered once every five years. The prolonged timeframe frame from which an individual's move is captured by the Census creates an issue of censored dependent variable. Thus, the interprovincial migrations that have occurred within the five year span will be not accounted for. In other words, individuals who make multiple moves within the five years timeframe in which the census is conducted will not be observed. More accurate measurement on the frequency of migration would enable the model to account for the differences in wage-experience profiles before and after migration. Information on individuals making multiple moves could also be used to separate the effects between the frequent moves and non-frequent movers. Unfortunately, as Robinson and Tomes (1982) point out, the data from the census do not allow for the incorporation of these refinements. The details of the problem will not be examined within the context of this study, but the end results are inefficient and inconsistent estimations.

Because this paper examines the interprovincial migration decision of an individual, a move is defined as an occurrence if an individual at the time of completing the 2001 Census indicates that he or she had lived in a different province 5 years earlier. Initially, the one year mobility status was chosen. But because of the limited number of observed interprovincial movers is less then one percent of the entire sampled population, the five year timeframe is used instead. The process of categorizing a mover from a non-mover for a particular province of interest is briefly discussed.

For each of the nine provinces, the sample is divided between movers and non-movers. Because mover and non-movers are both from the same province, the regional effects, such as environment and provincial unemployment rates, would be more similar. The regressand in the probit model captures the mover and non-movers for any one particular province. For example, someone who lives in Ontario and has not moved in the past five years, the dependent variable ONT will take on a value of 0. For someone who had moved out of Ontario, ONT will take a value of 1. In this study of interprovincial analysis, a mover is defined as someone who has moved across a provincial border within the past five years. To account for all observations, a non-mover includes all those who have not moved at all within the past 5 years, and also those who have moved within the same Census subdivision, intraprovincial movers, and as well as those who have lived outside Canada in a different country prior to the five years. Originally, the latter three groups were omitted in my analysis. However, as pointed out by McDonald, dropping such observations would result in data error, and thus the estimations would not be reliable or accurate. Dropping necessary observations in the analysis will cause values of the estimated coefficients to rise. In other words, there will be an overestimation in the individuals' propensity to migrate across provinces. The details for the sorting of movers and non-movers can be found in the Appendix.

The exogenous X_i variable is a set of variables that can potentially influence an individual's decision to move. For the purpose of this study, the X_i variables are:

$$X_i = \{AGE, AGE^2, MARRIED, WDIVSEP, FRENCH, BILANG, DEGREE, TRADE, YRSSCH, FAMSZ, JEW, CATH, VISMIN, GEN1, EI, RST\}$$

Following the specifications of Robinson and Tomes (1982), I use the following variable set in my analysis:

Age:	**AGE**; A scalar variable taken directly from the Census
Age^2	**AGE^2**
Marital Status:	**MARRIED**; a binary value of 1 if individual is married; and 0 otherwise **WDIVSEP**; binary value of 1 if widowed, divorced, or separated; 0 otherwise Reference group is single men
Language:	**FRENCH**; binary value of 1 if individual knows French; and 0 otherwise **BILANG**; binary value of 1 if individual knows both English and French; and 0 otherwise Reference group is individual knowing only English
Education:	**DEGREE**; binary value of 1 if individual has at least any University Bachelor's or equivalent degree and higher; and 0 otherwise **YRSSCH**; highest level year of schooling **TRADE**; binary value of 1 if individual has a trade certificate; and 0 otherwise
Family Background	**FAMSZ**; number of family members within the household **CATH**; binary value of 1 if individual is Catholic; and 0 for any other religion affiliation **JEW**; binary value of 1 if individual is Jewish; and 0 for any other religion affiliation **VISMIN**; binary value of 1 if individual is either Chinese, South Asian, Black, or Other visible minority (together composing about 13.3% of the Census respondents); and 0 otherwise **GEN1**; binary value of 1 if individual is a first-generation resident in Canada; and 0 otherwise
Other Attributes	**EI**; a scalar amount of employment insurance received from the Government **RST**; a binary value of 1 if individual is outside of the 19 major Census Metropolitan Area (population>100,000); and 0 otherwise
Experience:	5 years = **EXPR** = 20 years **EXPR** > 20 years

Cross-sectional micro data are obtained from the Public Use Microdata File of the 2001 Canadian Census. The Census file is representative of approximately 2.7% of the Canadian population and includes Canadian citizens, landed immigrants and also non-permanent residents of Canada. Of the 801,055 respondents to the 2001 Census, 24,570 individuals indicated a move across provinces or territories, which is captured through

Table 1

Regression outputs for the decision to migrate based on province of origin

Ontario

	5 < Expr < 20	P-Value	Expr > 20	P-Value
YRSSCH	0.01	0.427	0.038	0
Trade	-0.039	0.467	-0.075	0.035
Cath	-0.266	0	-0.243	0
Jew	-0.199	0.144	-0.455	0.001
VisMin	-0.148	0.01	-0.044	0.344
Degree	0.104	0.115	0.029	0.585
French	0.41	0.373	0.669	0
Bilang	0.547	0	0.458	0
Age	0.086	0.068	-0.027	0.001
Age^2	-0.001	0.093	0.0001	0.055
FamSz	-0.192	0	-0.059	0
Married	0.046	0.268	-0.022	0.57
WDivSep	0.026	0.762	0.123	0.003
Gen1	-0.204	0	-0.077	0.026
EI	0.00003	0	0.00003	0
RST	0.139	0	0.207	0
Cons	-2.685	0	-1.328	0
No. Obs	29,293		79,036	
Chi-Sqr	739.56		672.71	
P-Value	0		0	
Pseudo R2	0.0933		0.0577	

Quebec

	5 < Expr < 20	P-Value	Expr > 20	P-Value
YRSSCH	0.062	0	0.068	0
Trade	-0.181	0.016	0.006	0.91
Cath	-0.557	0	-0.558	0
Jew	-0.01	0.938	-0.247	0.018
VisMin	0.089	0.252	-0.009	0.892
Degree	-0.208	0.005	0.025	0.659
French	-1.493	0	-1.373	0
Bilang	-0.653	0	-0.509	0
Age	0.109	0.094	-0.052	0
Age^2	-0.002	0.112	0.0003	0.001
FamSz	-0.125	0	-0.047	0.001
Married	0.267	0	0.231	0
WDivSep	-0.104	0.473	0.2	0
Gen1	-0.185	0.014	-0.028	0.586
EI	-0.00001	0.411	0	0.276
RST	0.181	0.001	0.181	0
Cons	-2.506	0.004	-0.036	0.901
No. Obs	18,286		52,965	
Chi-Sqr	784.81		1386	
P-Value	0		0	
Pseudo R2	0.1668		0.1815	

British Columbia

	5 < Expr < 20	P-Value	Expr > 20	P-Value
YRSSCH	-0.003	0.802	0.0001	0.902
Trade	0.057	0.283	0.009	0.788
Cath	0.038	0.436	0.102	0.005
Jew	0.014	0.949	-0.053	0.777
VisMin	-0.282	0	-0.249	0
Degree	-0.116	0.108	-0.05	0.406
French	0.664	0.366	1.377	0.001
Bilang	0.325	0	0.352	0
Age	0.103	0.056	-0.045	0
Age^2	-0.002	0.055	0.0002	0.001
FamSz	-0.135	0	0.007	0.535
Married	0.249	0	-0.063	0.157
WDivSep	0.065	0.502	0.144	0.002
Gen1	-0.239	0	-0.159	0
EI	0.0001	0.085	0.0003	0
RST	-0.234	0	-0.143	0
Cons	-2.224	0.002	-0.205	0.403
No. Obs	10,067		28,484	
Chi-Sqr	332.15		441.87	
P-Value	0		0	
Pseudo R2	0.0547		0.0496	

Estimates for less-experience sample are listed on the left-hand side, while estimates for the greater-experience sample are listed on the right-hand side

Manitoba

	5 < Expr < 20	P-Value	Expr > 20	P-Value
YRSSCH	0.057	0.03	0.085	0
Trade	0.029	0.784	0.039	0.551
Cath	-0.139	0.067	-0.144	0.016
Jew	-0.693	0.147	-0.319	0.226
VisMin	0.099	0.471	0.085	0.45
Degree	0.08	0.504	0.031	0.741
French	-	-	1.008	0.114
Bilang	0.376	0	0.275	0.002
Age	-0.025	0.795	-0.013	0.441
Age^2	0.0007	0.678	0	0.934
FamSz	-0.129	0	-0.033	0.132
Married	0.07	0.417	0.164	0.06
WDivSep	-0.163	0.478	0.205	0.034
Gen1	-0.035	0.786	0.134	0.096
EI	0.00001	0.904	0.00001	0.355
RST	0.034	0.619	0.138	0.011
Cons	-1.234	0.337	-1.635	0
No. Obs	2,815		7,831	
Chi-Sqr	79.39		139.87	
P-Value	0		0	
Pseudo R2	0.0429		0.048	

Alberta

	5 < Expr < 20	P-Value	Expr > 20	P-Value
YRSSCH	0.043	0.015	0.051	0
Trade	-0.153	0.026	-0.236	0
Cath	-0.178	0.001	-0.17	0
Jew	0.186	0.634	0.427	0.044
VisMin	-0.021	0.81	0.065	0.376
Degree	0.061	0.504	-0.061	0.437
French	-	-	0.912	0.032
Bilang	0.52	0	0.496	0
Age	0.187	0.006	-0.03	0.009
Age^2	-0.003	0.01	0.0001	0.106
FamSz	-0.123	0	-0.049	0.001
Married	0.046	0.432	-0.15	0.007
WDivSep	0.113	0.321	0.123	0.034
Gen1	-0.13	0.127	0.1	0.056
EI	0.00003	0.011	0.00004	0
RST	0.272	0	0.444	0
Cons	-4.132	0	-1.0137	0.001
No. Obs	7,754		19,398	
Chi-Sqr	214.47		421.08	
P-Value	0		0	
Pseudo R2	0.0544		0.066	

Saskatchewan

	5 < Expr < 20	P-Value	Expr > 20	P-Value
YRSSCH	0.14	0	0.081	0
Trade	-0.151	0.117	-0.242	0.001
Cath	-0.295	0	-0.141	0.022
Jew	-	-	-	-
VisMin	0.058	0.762	-0.051	0.747
Degree	0.07	0.598	-0.105	0.351
French	-	-	1.332	0.09
Bilang	0.459	0	0.477	0
Age	0.163	0.1	-0.046	0.007
Age^2	-0.002	0.115	0.0002	0.069
FamSz	-0.157	0	0.014	0.545
Married	0.088	0.319	0.061	0.512
WDivSep	0.1001	0.606	0.307	0.002
Gen1	-0.1004	0.567	0.245	0.016
EI	0.000001	0.956	0.000001	0.464
RST	-0.197	0.005	-0.152	0.006
Cons	-3.673	0.005	-0.543	0.238
No. Obs	2,445		6,709	
Chi-Sqr	176.95		200.08	
P-Value	0		0	
Pseudo R2	0.087		0.0726	

New Brunswick

	5 < Expr < 20	P-Value	Expr > 20	P-Value
YRSSCH	0.036	0.483	0.074	0.014
Trade	-0.08	0.695	-0.038	0.792
Cath	-	-	-	-
Jew	-	-	-	-
VisMin	-0.051	0.921	-	-
Degree	-0.562	0.138	-0.187	0.525
French	-	-	-	-
Bilang	-0.381	0.009	-0.774	0
Age	-0.063	0.749	-0.009	0.817
Age^2	0.001	0.764	-0.00007	0.85
FamSz	-0.165	0.003	-0.054	0.314
Married	0.388	0.015	0.213	0.29
WDivSep	-	-	0.338	0.118
Gen1	0.049	0.892	-0.072	0.802
EI	-0.00007	0.08	-1E-06	0.465
RST	-	-	-	-
Cons	-0.69	0.793	-1.958	0.064
No. Obs	1,561		4,758	
Chi-Sqr	32.2		49.41	
P-Value	0.0007		0	
Pseudo R2	0.0728		0.089	

Nova Scotia

	5 < Expr < 20	P-Value	Expr > 20	P-Value
YRSSCH	0.096	0.001	0.087	0
Trade	-0.007	0.941	-0.092	0.281
Cath	-	-	-	-
Jew	-	-	-	-
VisMin	0.385	0.027	0.297	0.073
Degree	-0.047	0.717	0.005	0.971
French	-	-	-	-
Bilang	0.464	0	0.156	0.149
Age	0.223	0.055	-0.064	0.006
Age^2	-0.004	0.069	0.0003	0.1
FamSz	-0.193	0	-0.053	0.085
Married	0.081	0.436	0.053	0.624
WDivSep	-0.061	0.799	0.304	0.008
Gen1	-0.047	0.813	0.21	0.09
EI	-0.000002	0.128	-0.00004	0.024
RST	-0.011	0.888	-0.03	0.667
Cons	-4.501	0.004	-0.155	0.794
No. Obs	2,137		6,476	
Chi-Sqr	119.64		145.75	
P-Value	0		0	
Pseudo R2	0.0801		0.0871	

Newfoundland

	5 < Expr < 20	P-Value	Expr > 20	P-Value
YRSSCH	-0.019	0.595	0.031	0.211
Trade	0.051	0.694	-0.013	0.909
Cath	-	-	-	-
Jew	-	-	-	-
VisMin	1.168	0.135	0.541	0.208
Degree	0.05	0.798	-0.329	0.223
French	-	-	-	-
Bilang	0.128	0.623	0.559	0.021
Age	0.451	0.01	-0.054	0.163
Age^2	-0.009	0.009	0.0001	0.708
FamSz	-0.264	0	-0.166	0.001
Married	0.412	0.004	0.725	0
WDivSep	0.449	0.224	0.554	0.16
Gen1	-	-	0.342	0.177
EI	-0.000005	0.005	-0.00004	0.005
RST	-	-	-	-
Cons	-6.207	0.007	-0.002	0.999
No. Obs	1,258		3,745	
Chi-Sqr	66.36		84.02	
P-Value	0		0	
Pseudo R2	0.0895		0.1065	

the MOB5P variable. About 438,552 individuals never moved and 291,668 individuals either moved within the province or originally lived outside of Canada the previous year. The remaining 46,245 respondents failed to indicate their mobility status, and thus they were not accounted for in this study.

Following the procedure of Robinson and Tomes, I examine only the migration decision of men and separate the outcomes into two experience groups with no inferences to the behaviour of women. Experience is defined according to Robinson and Tomes (1982) study, which is the value in the difference of age minus years of schooling and minus 6. Deviating slightly from their original work, I examine only men over the age of 18. After female respondents and those under the age of eighteen were dropped from the sample, total number of observations in the sample set decreases to 291,442 individuals. Because Prince Edward Island and the Territories together compose of only 0.8% of the Census respondents, I do not include the two regions in my analysis. This reasoning follows the approach used by Robinson and Tomes.

Results and Implications

Please refer to Table 1

Two important points should be made prior to discussion of the results. First, the estimated values of the coefficients only show the direction of the effect that variable has on the decision to migrate, and does not give the marginal effect or the percentage change in the decision to migrate in response to a change in a regressor. Transformation of these estimated probit values will yield the corresponding marginal effects, but it is not performed in this study. Second, the term "significant" is used in cases where statistical significance is greater than 95% or if the *P*-values of the coefficients are below 0.05.

Consistent with conventional theories on human capital models, for nearly all provinces, the results indicate that greater years of schooling promote a positive and significant impact on the decision to move. The YRSSCH captures the effects of an increase in an individual's years of schooling. Interestingly, there is some difference in the way that years of schooling affect the two experience groups. Compared to the group with less experience, the group with greater experience indicate a slightly higher propensity to migrate as reflected in the estimated values of the YRSSCH variable. The results of Robinson and Tomes are similar, but the estimated values for their coefficients show that the group with greater experience had a reduced mobility rate as years of schooling increases. This difference in mobility rates among the group with greater experience is perhaps due to the different years in which the studies were conducted. I believe that over the past three decades, improved technological methods in communications and advancements in global capitalism have made it easier for individuals in 2001 to find jobs or other careers and move to that distant region that otherwise would not have been feasible back in 1971. In other words, there is greater integration of the present-day labour markets.

The TRADE variable estimates the probability that an individual with a trade certificate will move across provinces. There are mixed results in the values of the coefficients in terms of statistical significance and order of magnitude. However, in the provinces with significant estimates, the coefficients' order of magnitude is generally negative. The effects are more prominent in Alberta and Saskatchewan, where the coefficients values are negative for both experience level groups. The negative coefficient values suggest that having a trade certificate does not increase one's probability of moving. One possible reason would be that knowing a trade, which is usually specific to a certain industry, limits an individual's variety of potential job types. Thus, knowledge of a trade is not easily transferrable across different industries of work, and trade certificate may not always be recognized across all provinces. This reasoning is consistent with the study by Osberg, Gordon, and Lin (1994), who show that higher educated or trained individuals had a greater chance of moving across regions rather than across industries, while those with less training had a decreased rate to move across regions but increased rate to move across industries.

Two binary variables that indicate religious affiliations for Catholics (CATH) and Jewish (JEW) are included in accordance to the study by Robinson and Tomes (1982). The reference group is any other religious affiliation other than the two. The variables indicate the propensity that an individual from either one of the two particular religious groups will move across provinces. Consistent with Robinson and Tome's study, the statistically-significant negative value for both religious groups' estimated coefficients suggest that individuals from the two religious groups prefer to stay rather than move compared to the reference group. In the three eastern-Atlantic provinces, the CATH and JEW coefficients have missing values because of the perfect correlation that the variables have with other variables.

The DEGREE variable captures the likelihood that an individual, who has a minimum of a university Bachelor's degree or its equivalent and higher, will move.

Little inference can be drawn from the estimated value of coefficient for the degree variable because of a lack of statistical significance in nearly all provinces, which might be the result of correlation between the DEGREE variable and the YRSSCH variable. The outcome implies that the degree variable has negligible effects on the decision of an individual to move. Because the coefficient values for the DEGREE variable are unreliable and statistically insignificant, we do not need to be concerned by the fact that the signs of the estimates are unexpectedly negative for some provinces. Robinson and Tome's study support the common belief that higher education levels are associated with greater mobility rates, as indicated by the Degree coefficients having positive and significant values.

Two binary language variables FRENCH and BILANG capture the effects on interprovincial migration associated with knowing French and being bilingual. However, the definition of BILANG in this study deviates slightly from the definition used by Robinson and Tomes. In their study, the BILANG variable captures the individual's language spoken at home and their knowledge of either French or English. Because the same type of data on bilingualism was not available from the 2001 Census, the BILANG variable in this study is a simple binary measurement of whether or not an individual knows both English and French. Despite the difference in definition, the results are surprisingly similar. In the provinces where the variables have statistical significance, the positive coefficient values indicate that knowledge of French and being bilingual increases the possibility of migrating. The only province that is consistently different is Quebec. Similar to the outcomes of Robinson and Tomes, the negative and significant value of both French and BILANG suggest that unilingual francophones living in Quebec prefer to not to migrate. This phenomenon is not surprising because if one knows only French in Quebec, one would more likely stay in a French dominant province rather than move to an English dominant province where their unilingual ability would be of a great language barrier (Robinson and Tomes p. 499). For the three eastern-Atlantic provinces, the French variable is omitted from estimation by STATA because of the strong collinearity it has with other variables.

Nearly all migration studies include the impact of age on the decision to move. In this study, the estimated coefficient value of the AGE variable is a measurement on the effect of an individual's age on the decision to migrate. The AGE and AGE^2 variables indicate similar outcomes across almost all nine provinces. For the less-experienced group, the positive values for the AGE coefficient and negative value for the AGE^2 coefficient indicate that they are more likely to move, but at a diminishing rate. These results are consistent with those of Robinson and Tomes. However, for the greater-experienced groups, the results of this study differ from theirs. The negative and positive value of the AGE and AGE^2 coefficients, respectively, suggest that individuals with more experience have an increasing rate of non-mobility. Further interpretation would be that greater experience generally requires more years of work, which means that the group with more experience is also likely to be older in age. This inference is similar to the implications from the age variable of Finnie's (2004) study.

The individual's household structure plays a vital role in the decision to move, and is generally considered to be a barrier in the moving process. The barrier can be associated with the costs of moving. However, the direct cost associated with moving is often very difficult to observe. As Day (1992) indicates, there is "no specific data on the cost of moving from one province to another (p. 131)," as well as the amount of time and distance involved. While certain costs are not readily measureable, there are barriers to moving that can be observed. One indicator of a barrier to migration can be inferred by the value of the FAMSZ coefficient, which captures the impact of the individual's family size. The negative and statistically significant value suggests that individuals with a larger family are less likely to migrate. Along with an individual's family size, the marital status of an individual is also an important factor that influences a migration decision. With the reference group being single, results suggest that being married actually increases one's probability of moving, which is supported by the positive and significant values of the MARRIED coefficient. The estimated value of WDIVSEP coefficient suggests that single males over the age of eighteen, who were recently divorced, separated, or are widowers, have a higher tendency to move. Overall, the three estimating coefficients on the effects of family structure from this study have similar results to those of Robinson and Tomes.

Two variables GEN1 and VISMIN are added to the original model of Robinson and Tomes to estimate the interprovincial migration decision of foreigners to Canada. The coefficient value of the GEN1 variable reflects the effect that a first generation individual in Canada will move. According to the Census, the number of first generation immigrants to Canada totalled to 144,578. The VISMIN variable estimates the effect that an individual, who is either Chinese (3.4% of Census respondents), South Asian (3.1%), Black (2.2%), or other visible minorities (4.6%) will move. Results show the two coefficients having a negative value in the provinces where the estimates have statistical significance. This suggests that a first-generation individual or a visible minority in

Canada will have a lower tendency to move. One possible reason for this phenomenon is that recent foreigners to Canada, who have just incurred a hefty cost from moving to a new country, are just settling in and are not likely to move across provinces. This reason is supported by traditional and historical events where new immigrants congregate within a certain location amongst members of their own group after just arriving to a foreign country.

The Employment Insurance coefficient estimates the tendency that an individual who has received government employment insurance benefits will migrate across provinces. Employment insurance is a federal government funded social welfare program that provides temporary financial aid to residents based local labour market conditions. Although the magnitude of the effect is very small, the estimated coefficients values are positive and significant for all the provinces except for the three eastern provinces. This result would suggest that those who receive employment insurance have a positive tendency to move interprovincially. Similar results are also indicated by the findings of Day (1992). Thus, receiving employment insurance does motivate someone to migrate across provinces in hopes of better opportunities. However, we do not observe whether they moved before or after they had received EI benefits.

Lastly, the RST variable shows the estimated likelihood that someone from a rural region or small town will move across provinces. According the 2001 Canadian Census, there are approximately 304,444 respondents who lived outside of a metropolitan area that contained a population greater than 100,000. The positive and significant values of the coefficients across nearly all the provinces suggest that those living in a rural or small town are more likely to move than the base category. The exception is for those from

British Columbia and Saskatchewan, in which the opposite behaviour is implied by the negative coefficient values. For Newfoundland and New Brunswick, the missing values for the RST coefficients are the result of the observations coming mostly from regions with a population below 100,000 because St. John, NB, and St John's, NF are not identified in the public use Census data file. Although whether they move to an urban or another rural region is unknown, the result that individuals from rural regions have a positive tendency to migrate supports the findings of Mills and Hazarika (2001).

In summary, for each of the nine provincial estimates, the relatively large likelihood-ratio Chi-square values coupled with low p-values indicate that the models as a whole have statistical significance. The pseudo-R^2 all have relatively low values. In most econometric analysis, a low R^2 value would mean that the exogenous variables do not explain the outcome of the endogenous variable very well. In other words, the dependent variable has a low correlation with the independent variables. However, as mentioned by Gujarati, the dichotomous outcome of a probit or logit model makes it difficult to model a line through a set of observations that takes on two extremes. Thus, it is generally common to have a low R^2 value in binary discrete models, and its values cannot be directly compared to a R^2 value of a conventional liner model estimated with ordinary least squares.

Conclusion

The decision to relocate is an interesting facet of human behaviour that has great socio-economic impacts. Previous empirical studies have shown that there are disparities in the individual's motives for interprovincial migration; however, the end results pertaining to higher earnings seem to be a consistent empirical finding. Understanding the motive of an individual's migration decision will provide government agencies with insight in constructing policies that promote efficiency and social welfare. Following the methods of Robinson and Tomes, this paper examines the determinants of interprovincial migration using micro data from the 2001 Canadian Census by estimating a reduced-form probit model for the individual's mobility decision.

For the scope of this paper, the effects of potential earnings on the migration decision were not examined. The issue of self-selection is not accounted for in this study, but its problems and popular methods of correction are discussed. While there are minor disparities in the outcomes of individual coefficient values and statistical significance, the overall implication of this study suggests that over the past three decades, the major influences on an individual's decision to migrate have not experienced major changes, and their implications are quite similar to that of previous empirical works.

In future investigations, the inclusion of estimated earning-differential variables should be considered. Because the reduced-form probit estimates of this study have similar results with those of Robinson and Tomes, similar outcomes can be expected of a structural model that includes estimations of earning functions that are corrected for sample selection bias. Also, utilizing panel data would expand the empirical model to account for heterogeneity across individuals, which is not captured in the cross-sectional data from the census.

References

2001 Canadian Census Public Use Microdata File.

Borjas, George. "The Economic Analysis of Immigration." Handbook of Labor Economics. 1999, Vol. 3A, Chap. 28, Pages 1697-1760.

Cahuc, Pierre and Andre Zylberberg. Labor Economics. Cambridge, Massachusetts: MIT Press. 2004.

Card, David. "The Impact of the Mariel Boatlift on the Miami Labor Market." Industrial and Labor Relations Review. 1990, Vol. 43. Pages 245-257

Cebula, Richard J. "The Determinants of Human Migration." Lexington Books. Toronto. 1979

Day, Kathleen M. "Interprovincial Migration and Local Public Goods." The Canadian Journal of Economics. Vol. 25, No. 1. February 1992. Pages 123-144.

Finnie, Ross. "Who Moves? A Panel Logit Model Analysis of Interprovincial Migration in Canada." Applied Economics. Vol. 36, Issue 16. September 2004. Pages 1759-1779.

Gujarati, Damodar. Basic Econometrics. Boston: McGraw Hill. 2003.

Heckman, James. "Sample Selection Bias as a Specification Error." Econometrica. Vol. 47, No. 1. January 1979. Pages 153-161.

McDonald, James T. and David Gray. "Research on Interregional Migration in Canada: An Overview." University of New Brunswick. February 2006. Working Paper.

Mills, Bradford and Gautam Hazarika. "The Migration of Young Adults, from Non-Metropolitan Counties." American Journal of Agricultural Economics. Vol. 83, No. 2. May 2001. Pages 329-340.

Osberg, Lars, Daniel Gordon and Zhengxi Lin. "Interregional Migration and Interindustry Labour Mobility in Canada: A Simultaneous Approach." The Canadian Journal of Economics. Vol. 27, No. 1. February 1994. Pages 58-80.

Parks, R.W. "On the Estimation of Multinomial Logit Lodels From Relative Frequency Data." Journal of Econometrics. No. 13. 1980. Pages 293-303

Robinson, Chris and Nigel Tomes. "Self-Selection and Interprvoincial Migration in Canada." The Canadian Journal of Economics. Vol. 15, No. 3. August 1982. Pages 474-502.