

# **Skills Research Initiative Initiative de recherche sur les compétences**

## **A Critical Review of the Microeconomic Migration Literature**

Benoit Dostie (HEC Montréal)  
Pierre Thomas Léger (HEC Montréal)

Working Paper 2004 D-05

---

Human Resources Development Canada/Développement des ressources humaines du Canada  
Industry Canada/Industrie Canada  
Social Sciences and Humanities Research Council/Conseil de recherches en sciences humaines du Canada

---

**Working Paper Series / Collection Documents de travail**



Government  
of Canada

Gouvernement  
du Canada

Canada

In the context of the federal government's innovation strategy, Human Resources Development Canada (HRDC), Industry Canada (IC) and the Social Sciences and Humanities Research Council Initiative on the New Economy (SSHRC-INE) are partnering to design and fund a multi-year skill-related research program—the HRDC-IC-SSHRC Skills Research Initiative (HISSRI). The research is grouped into four themes:

- A. Labour Market and Skills Implications of Population Aging;
- B. Employer-Supported Training;
- C. Adjustments in Markets for Skilled Workers;
- D. International Mobility of Skilled Workers.

The HISSRI Working Paper Series provides a forum for the discussion of analytical issues related to the themes covered under the research partnership. Working Papers are circulated in the language in which they were written. The papers reflect the views of the authors and no responsibility for them should be attributed to HRDC, IC or the SSHRC. Comments on the papers are invited and may be sent directly to the authors.

Dans le cadre de la stratégie d'innovation du gouvernement fédéral, Développement des ressources humaines du Canada (DRHC), Industrie Canada (IC) et l'Initiative de la nouvelle économie du Conseil de recherches en sciences humaines (INE-CRSH) se sont associés pour concevoir et financer un programme pluriannuel de recherches sur les compétences, appelé Initiative de recherche sur les compétences de DRHC-IC-CRSH. Ce programme comprend quatre grands thèmes :

- A. les incidences du vieillissement de la population sur le marché du travail et la main-d'oeuvre spécialisée;
- B. la formation en entreprise;
- C. l'adaptation du marché du travail aux travailleurs spécialisés;
- D. la mobilité des travailleurs spécialisés dans le monde.

La collection Documents de travail de l'Initiative de recherche servira de tribune où seront abordées plusieurs questions analytiques liées aux thèmes susmentionnés. Les documents de travail sont diffusés dans la langue dans laquelle ils ont été écrits. Les opinions qui y sont exprimées sont celles des auteurs et n'engagent pas DRHC, IC ou le CRSH. Le lecteur est prié de faire part de ses commentaires aux auteurs.

# **Skills Research Initiative Initiative de recherche sur les compétences**

## **A Critical Review of the Microeconomic Migration Literature**

Benoit Dostie (HEC Montréal)  
Pierre Thomas Léger (HEC Montréal)

Working Paper 2004 D-05

---

Human Resources Development Canada/Développement des ressources humaines du Canada  
Industry Canada/Industrie Canada  
Social Sciences and Humanities Research Council/Conseil de recherches en sciences humaines du Canada

---

To obtain paper copies of the documents published under the HRDC-IC-SSHRC Skills Research Initiative, please contact:

Publications Officer  
Micro-Economic Policy and Analysis  
Industry Canada  
10<sup>th</sup> Floor, East Tower  
235 Queen St.  
Ottawa, Ontario K1A 0H5

Tel.: (613) 952-5705; Fax.: (613) 991-1261  
E-mail: [mepa.apme@ic.gc.ca](mailto:mepa.apme@ic.gc.ca)

Pour obtenir des exemplaires des documents publiés dans le cadre du Programme de recherches sur les compétences de DRHC-IC-CRSH, il suffit de s'adresser à :

Agents des publications  
Analyse de la politique micro-économique  
Industrie Canada  
10<sup>e</sup> étages, tour Est  
235, rue Queen  
Ottawa (Ontario) K1A 0H5

Tél.: (613) 952-5705; Fax.: (613) 991-1261  
Courriel: [mepa.apme@ic.gc.ca](mailto:mepa.apme@ic.gc.ca)



## **Abstract**

In this paper, we review the literature on microeconomic models of migration in order to better understand why some individuals migrate while others do not. The empirical role of demographic characteristics such as age, gender, education, marital status and employment status is reviewed with a specific focus on skills. The role of moving costs and destination attributes is also examined. Finally, we review the different methodologies that are appropriate for such microeconomic models.

## **Résumé**

Cet article présente une revue de la littérature sur les modèles microéconomiques portant sur la migration. Notre objectif est de mieux comprendre pourquoi certains individus migrent et d'autres non. Le rôle empirique des caractéristiques démographiques telles l'âge, le sexe, l'éducation, le statut marital et celui sur le marché du travail y est résumé avec une attention particulière sur l'impact des compétences. Nous y examinons aussi le rôle des coûts de mobilité et des caractéristiques des destinations. Finalement, nous présentons les différentes méthodologies appropriées à de tels modèles.



# 1 Introduction

The so-called brain drain has garnered much media attention of late. Although many reports have been alarming, a first look at the data suggests that the issue may be less dramatic. In fact, statistics show that only a very small proportion of active Canadians migrate each year (Finnie (2001)). Nonetheless, the Canadian government (not unlike many others in both developed and less developed countries) has been preoccupied by the potential loss of its more highly educated and/or skilled workers. This is because, from a public policy perspective, it is not only the number of Canadians who migrate that is of interest but also who in particular migrates. If those who migrate are the relatively productive, for example, then simply looking at net migration to determine the impact of migration may be misleading.

Moreover, the loss of highly skilled workers may have important consequences for a country's economy if returns to scales are particularly important in specialized high-skill sectors, where a critical mass of rare talent may be necessary (Hunt (2004)). If this is the case, policies which seek to encourage skilled immigration and discourage skilled emigration may be in order (Hunt (2004)).

For these reasons, the migration of highly-skilled workers is becoming an important factor in the world economy. However, our understanding of the determinants and effects of high-skilled migration is considerably less than our understanding of international migration (Regets (2001)). This fact is highlighted in Borjas (1999) review of the literature on immigration in which he states that:

“... the most important topic that has yet to be addressed by the immigration literature concerns the economic impact of immigration on the source country. A relatively large fraction of the population of some source countries has moved elsewhere. Moreover, this emigrant population is not randomly selected, but is composed of workers who have particular sets of skills and attributes. What is the impact of this selective migration on the economic opportunities of those remain behind? And what is the nature and impact of the economic links that exist between the immigrants in the host country and the remaining population in the source country”

Traditional analyses of migration have generally been based on aggregate flows. This approach, however, is often without sound micro-economic foundations. If the goal of a public policy is to affect the optimal response of individuals (with respect to their migration decision), then an analytical framework whereby the micro behaviour is

modelled explicitly is necessary in order to correctly evaluate the impact of such a policy.

Although most of the microeconomic literature focuses on comparing the outcomes of immigrants relative to their native counterparts (such as their wages or employment probability), there exist, nonetheless, several studies which examine the characteristics of migrants compared to other individuals who decide to stay put. It is on this later branch of the literature that we will focus.

The literature review is organized as follows. In the next section, we summarize the evidence on the determinants of migration with particular attention paid to disentangling the factors related to the individual (demographic characteristics) from those related to opportunities in the destination country. In this section, we also examine moving costs (which are related to the distance between the home and destination country) and, whether migrants are high-skilled. In section 3, we introduce different discrete-choice models which are appropriate to answering the above questions. We conclude by summarizing the state of knowledge and offering avenues for future research.

## **2 The decision to migrate**

The basic economic model of migration posits that individuals will migrate if the expected benefits of moving to an alternate location are greater than the expected benefits of remaining in their current location (net of transaction costs). Taken in its most basic form, the model suggests that individuals will migrate if they can expect to earn more in an alternate location than in their current location, where the choice of location will be the one that maximizes expected earnings. Viewed in this way, migration is simply an investment in human capital (Becker (1993)). That is, like education and training, individuals can use migration as a means of increasing their future earnings. Although such a basic model may be appealing, it has several limitations. Most notably, if individuals cared only about their income, then one would expect to see much more migration (either intra-regional, interregional or international) than is observed in the data.

In his seminal paper, Sjaastad (1962) separates and identifies the private costs and benefits of migration into money and non-money. The money costs include all financial costs such as the opportunity cost of travelling and finding a job in the new location. The non-money costs, on the other hand, include all psychic costs such as leaving friends and families and establishing new ties in a new community. With respect to the benefits of migrating, the non-money benefits include psychic benefits of being in a new location



(for example, moving to a large city and enjoying the new amenities) while the money benefits include potential gains in real income. In the following section, we examine these likely costs and benefits as well as how they (empirically) contribute to the migration and location choices of individuals.

Although early studies of migration concentrate uniquely on the individual's decision to migrate, the decision to migrate is likely to be a family affair. More specifically, given that the money and non-money costs and benefits of moving or staying are likely to be felt by all individuals in the family, the decision to migrate is unlikely to be made by one person alone (or based on one person's costs and benefits). In order to reflect this reality, Mincer (1978) augments the traditional individual-migration model to a family-migration one. That is, the family unit weighs the costs and benefits of migrating for all individuals in the household when making migration decisions. If all individuals in the family are made better-off by migrating, then the decision to migrate is equivalent to the independent migration choices of each individual. If, however, some individuals within the household benefit from migration while others do not, then the decision to migrate, the location choice as well as the effects of migration, are likely to be very different from those predicted by the simple individual-migration model.

Because both the aforementioned costs and benefits of migration are likely to depend on both individual and family characteristics as well as origin and destination specific characteristics, we examine them sequentially in the sections below.

## **2.1 Who? The impact of demographic characteristics**

In this section we examine individual and/or family-specific variables which may contribute to the migration decision. For each variable, we first describe why and how they are likely to effect migration decisions. We then provide empirical findings for each of the variables.

### **2.1.1 Age**

The negative relationship between age and migration is a long-standing one (Schlottmann and Jr. (1981)). From a purely economic perspective, one should expect younger people to be more mobile as they are likely to enjoy the benefits of moving (say, higher earnings) for a longer period of time. Some argue, however, that much of the negative relationship between age and migration is correlated with other life-cycle or career variables. For example, older individuals may be less likely to migrate not

because they are older per se but rather because they are more likely to have children, be employed, have familial obligations or have location-specific experience. Using US life-history data for males aged 30 to 39 (collected in 1969) Sandefur and Scott (1981), find that the effect of age on migration disappears once life-cycle variables (including marital status, family size and employment) are included (similar results are obtained by Axelsson and Westerlund (1998) using Swedish data). Furthermore, using American data, Shield and Shield (1993) find no significant relationship between either the wife's or husband's age on migration once such life-cycle and career variables have been included. The insignificant relationship between age and migration is not, however, unanimous across studies. In fact, several recent papers find some negative relationship between age and migration even when controlling for life-cycle and career variables. For example, Antolin and Bover (1997) (using Spanish data) estimate that the probability of migration for those aged 25-34 is greater than those aged 35-49, while those who are 50 years of age or older are much less likely to migrate relative to the same comparison group. Similar results are found in Pissarides and Wadsworth (1989) and Nivalainen (2004) using U.K. and Finish data, respectively.\* Although the negative relationship between age and migration may still be up for debate, what is clear is that the introduction of life cycle and career variables reduces the importance of age as a predictor of migration. We return to the role of these life-cycle and career variables below.

### **2.1.2 Sex**

Because many studies use data which include only males or couples, the direct effect of being female on the likelihood of migrating is often unestimable. Although the evidence may be limited, Mincer (1978) (using American Census Data from 1966-1971) finds that single women migrate less than single men. Mincer suggests that familial obligations of single women (i.e., ties to their parents and caregiving responsibilities) may be at the source of this difference. Using 1984 data from the UK's Labour Force Survey in a logit framework controlling for various personal and regional characteristics, Pissarides and Wadsworth (1989) also find that single women are less likely to migrate than both single men and married women.

---

\* Using intention-to-migrate survey data from four African countries in an ordered-probit framework, van Dalen, Groenewold, and Schoolrl (2004) find that older respondents state less

### **2.1.3 Marital Status and Family Size**

As discussed above, Mincer (1978) questions the study of migration from an individual's perspective and develops a model where the decision to migrate (and the choice of location) is extended to the family unit. Because the costs and benefits of migrating for both spouses must be taken into account when making migration decisions, the likelihood of migration should be smaller for married couples than for singles. Using American Census Data, Mincer finds a deterrent effect of marital status on migration. This result is confirmed by several other studies including Grave and Linneman (1979) and Sandefur and Scott (1981).<sup>†</sup>

Within the family-unit framework, several studies also find that the presence of children and family size also serve as impediments to migration (Robinson and Tomes (1982); Pissarides and Wadsworth (1989); Antolin and Bover (1997)). Nivalainen (2004) finds that it is not necessarily the presence of children that affects migration of families but rather the presence of school-aged children, where the age of the children is negatively related to the probability of migrating.

### **2.1.4 Education**

According to Greenwood (1975), more educated individuals should be more likely to migrate as education should lead to greater employment opportunities, increased information about alternatives and, potentially allow for greater ability to sever and establish new social ties. Furthermore, education, being a general resource (i.e., one that can easily be transferred from one employer to another and one geographical location to another), should also facilitate migration (Becker (1993)). This theoretical relationship between education and migration is widely confirmed by the data (Bartel (1979); Sandefur and Scott (1981); Tunali (1986); Pissarides and Wadsworth (1989); Antolin and Bover (1997); Mauro and Spilimbergo (1999); Zhao, Drew, and Murray (2000); Card (2003); Nivalainen (2004)). Notable exceptions, however, are Shield and Shield (1993) finding that only the wife's education has a significant effect on migration

---

intentions to migrate than their younger counterparts.

<sup>†</sup> van Dalen, Groenewold, and Schoorl (2004) find no significant relationship between marital status and the intent to migrate except for respondents from Senegal. Using Spanish data, Antolin and Bover (1997) find the reverse relationship where the likelihood of migration is smaller for singles. This result is not inconsistent with Mincer's hypothesis if single individuals live with parents or relatives (i.e., have familial obligations/ties). The authors believe that very significant ties are likely to exist in Spain because of strong family bonds.

and Robinson and Tones (1982) finding that education decreases mobility of Francophones in Quebec.

Another interesting result related to education is Chiquiar and Hanson (2002) finding that Mexican emigrants to the United States are more educated than non-migrants, even though the U.S.-Mexico wage gap is higher for the unskilled. This puzzling result may be due to greater moving costs for lower-skilled workers. In fact, many theoretical models predict that migrants will be more skilled when moving costs are high (Hunt (2004)).

### **2.1.5 Employment and Experience**

Unemployed individuals may be more willing to migrate than their employed counterparts for several reasons. First, unemployed individuals do not have to quit their job (forego income) and have no opportunity cost of searching for a new one. Furthermore, given that firm-specific experience may not be transferable (i.e., transportable to a new employer), employed individuals (especially those with a history with the same employer) may not wish to forego their accumulated firm-specific experience in order to move. Similarly, individuals who are self-employed should be less likely to migrate as they are likely to have non-transferable experience.<sup>‡</sup> Sandefur and Scott (1981) find that self-employed individuals are less likely to migrate than non-self-employed individuals. Furthermore, they find that a history with the same employer decreases the likelihood of migration. With respect to employment vs unemployment, Pissarides and Wadsworth (1989) find that unemployed heads-of-households are more likely to move than households with an employed head. Several studies also find that the labour force participation of females negatively affects the likelihood of migration for families (Sandell (1977); Antolin and Bover (1997); Nivalainen (2004)).<sup>§, \*\*</sup>

### **2.1.6 Language, Migration Experience and Family/Friends**

Although the individual and family characteristics discussed above are at the center of the empirical literature, several others have been examined.

---

<sup>‡</sup> On the other hand, employed individuals may benefit from within-firm transfers and thus may be more likely to migrate.

<sup>§</sup> Goss and Schoening (1984) find, however, that the likelihood of migration decreases as the length of unemployment/job search increases.

<sup>\*\*</sup> Suprisingly, Lin (1995) finds no significant relationship between receiving unemployment insurance (or social assistance) or receiving retraining through a federal program, on the likelihood of migration.

First, several studies have found a positive relationship between past migration and the likelihood of future migration. Whether or not this relationship is causal or simply reflects unobserved heterogeneity (such as taste for geographical mobility) is left to be determined.<sup>††</sup>

Second, language may play an important role in the decision to migrate, especially in a country like Canada. Robinson and Tomes (1982) find that unilingual Francophones are less likely to be outmigrants in New Brunswick and Quebec (both provinces that have important Francophone communities) while more likely to be outmigrants in Ontario and Manitoba. In Quebec, however, Bilingual Francophones are more likely to leave than unilingual Anglophones while bilingual Anglophones are less likely to leave than unilingual Anglophones. It is important to note that language affects migration through channels other than through wages.

Finally, the role of close family and friends may play a role as they serve as social ties. Although familial obligations such as those between parents and their adult children may be important, the role of close friends is found to be non-significant in Shield and Shield (1993).

## **2.2 Why? The impact of destination attributes**

In the previous section, we examined the role of individual and familial characteristics on the likelihood of migration. In this section we turn our attention to origin and destination-specific variables. Examining such variables is important because they are likely to directly affect the expected utility associated with residing in one location compared to another.<sup>‡‡</sup>

### **2.2.1 Unemployment, Job Growth and Income**

Several studies have examined the empirical importance of a variety of location-specific economic variables. For example, several papers have examined the importance of unemployment rates as a potential pull factor. If individuals are migrating, in part, for better economic opportunities, one should expect high-unemployment to experience outmigration while low-unemployment regions should experience immigration. Surprisingly, however, many studies find no significant effect of regional variations in

---

<sup>††</sup> Sandefur and Scott (1981) also find that negative duration dependence in migration, that is, individuals are less likely to migrate as the time spent in one area increases.

unemployment rates on migration decisions (Greenwood (1975); Pissarides and Wadsworth (1989). DaVanzo (1978) does, however, find that unemployment rates are important to the unemployed, i.e., unemployed individuals are more likely to migrate to low unemployment area.<sup>§§, \*\*\*</sup> Furthermore, Jaeger (2000) finds that employment-category immigrants are more likely to locate in areas with low unemployment and high wages (and growing demands for their skills). Finally, Day and Finer (2001) find the differences in Unemployment Insurance Policies (specifically, eligibility requirements related to the minimum number of weeks worked) are quantitatively not very important factors in individuals' decisions to migrate.<sup>†††</sup>

Economic opportunities in general may also play an important role in either reducing out-migration or increasing in-migration. For example, examining inter-metropolitan-area migration in the US, Knapp, White, and Clark (2001) find that job growth is an important element in retaining households. Furthermore, Fields (1979) finds that individuals are most likely to migrate where the availability of jobs is greater (measured by new hires, quits and layoffs). With respect to regional variations in income, several studies find that individuals are more likely to migrate to relatively high-income areas (Fields (1979); Davies, Greenwood, and Li (2004)).

Several papers have examined where new-migrants are most likely to locate and whether or not economic variables play a role in their decision. For example, Dodson III (2001) finds that increased welfare generosity is an important element in attracting new migrants across all types of migration (i.e., family sponsored, employment based, and refugees and asylees).

### **2.2.2 Non-pecuniary attributes (weather, crime, ethnic concentration, distance...)**

Although economic variables may play an important role in migration decisions, several non-pecuniary variables have also been shown to affect the location decisions. A good example of such a variable is the weather. In fact, days of sunshine is found to be an

---

<sup>††</sup> In the following section, the role of location-specific attributes should be interpreted in relative terms, i.e., the difference between host and source countries/regions variables.

<sup>§§</sup> Antolin and Bover (1997) also finds that regional employment has different effects depending on the employment status of the individuals and the presence of children.

<sup>\*\*\*</sup> Time-series results in Coulombe (2003) suggest that Canadian interprovincial migration is partly explained by differences in provincial unemployment rates and labour productivity.

<sup>†††</sup> By simulating the elimination of differences between eligibility rules of UI across provinces, Day and Winer (2001) find little effect on the total amount of interprovincial migration. They do, find however, that such elimination could lead to changes in migration patterns for some specific provinces.

important determinant in location choice in Knapp, White, and Clark (2001). These authors also find that police spending also plays a role in location choice (i.e., individuals are likely to integrate personal safety into their migration and location choice).

Furthermore, several papers have examined the role of distance in the location choice of individuals who migrate. As expected, the likelihood of migrating to a particular location decreases as the distance between the origin and destination increases (Fields (1979); Falaris (1987); Bartel (1989); Davies, Greenwood, and Li (2004)). As noted by Bartel (1989), this relationship may capture both psychic and social costs associated with longer moves. However, it may also include economic costs (i.e., the cost of relocating likely increases as the distance increases). It may also capture some information costs. That is, individuals may be less aware of the economic conditions (mentioned above) for areas which are farther away.

When examining the location decision of new migrants, several papers have found a significant role in ethnic concentration. That is, new migrants are more likely to locate to a particular area as the percentage of individuals of the same ethnicity increases (Bartel (1989); Jaeger (2000)). A similar result is found in the Canadian context by McDonald (2003).

### **2.3 Unobserved ability**

When looking at the impact of skills on migration, it is important to distinguish between observed and unobserved skills. Observed skills generally refer to observable individual-specific human capital variables such as education. Unobserved skills, on the other hand, refer to the set of skills and abilities which are unobservable to the econometrician (and are generally difficult to measure). Data requirements for studies on unobserved skills are more important as migrants must be observed long enough for the econometrician to infer unobserved skills or productivity.

In section 2.1.4, we documented the positive correlation between education and migration. Another measure used to proxy for skills (besides education) in several studies is the individual's pre-move wage. However, no consensus exists as to the impact of pre-move wages on the decision to migrate.<sup>†††</sup> Examining interstate migration

---

<sup>†††</sup> There exists a closely related literature that examines changes in wages after migration has occurred. Both early and more recent studies generally find that expected income gains from mobility are a significant factor in the decision to migrate (see Axelson and Westerlund (1998), Vijverberg (1995), Falaris (1987)). Another strand of the literature looks at wages and skills of

within Western Germany (with the German Socio-Economic Panel from 1984-2000) Hunt (2004) distinguishes between migrants who keep the same employer and those who change. Based on individual education levels and pre-move wages, she finds that same-employer migrants are more skilled than those who change employers. Borjas, Bronars, and Trejo (1992) report a similar positive impact of pre-move wages on the decision to migrate for internal U.S. migration. Bartel (1979), however, finds that wages have a negative effect on migration only in the case of those who quit their job before migrating.<sup>§§§</sup>

Using wages as a measure of skills may be problematic as many opposing forces may be at work. Vijverberg (1993) argues that higher earnings due to human capital investments will tend to discourage migration because of diminishing marginal returns to income. Moreover, high earnings may be due to a large number of factors including: (1) investments in human capital (experience, seniority and education); (2) unobserved heterogeneity including unmeasured skills or productivity; and (3) other local market conditions or institutional factors that affect wages.

With respect to unobserved skills, it is likely that individuals with positive unobserved heterogeneity will have a higher propensity to migrate. This is because they are also likely to exhibit ambition and perseverance (characteristics which may be necessary for geographical mobility). Tunali (1986) finds that workers who hold jobs requiring skills are found to be more mobile. Vijverberg (1993) finds that more productive workers (based on unobservable factors) are also more likely to migrate. Krieg and Bohara (1999), using data from the Panel Study of Income Dynamics (PSID) to differentiate between the observable and unobservable skills, finds that: (1) controlling for unobserved heterogeneity, high-wage individuals are less likely to migrate, while (2) controlling for observables, high-skilled individuals are more likely to migrate. Yashiv (2004) also finds evidence of positive self-selection based on unobservable for Palestinian workers in Israel. This limited evidence points toward unobserved skills as having a positive impact on the propensity to migrate.

---

immigrants compared to native workers. This literature finds in cross-sectional studies that being foreign born has a negative impact on wages but time spent in the host country affect wages positively (see Borjas (1999) for a survey of the many studies on this topic and the difficulties in interpreting these findings).

<sup>§§§</sup> Although few studies include information on individual wealth and its effect on migration, Nivalainen (2004) finds a positive relationship between income and short moves and a negative relationship between home ownership and migration. Similarly, Shield and Shield (1993) find a negative relationship between the husband's income and the likelihood of migration.



### 3 Methodology

In this section, we review how discrete-choice models firmly rooted in microeconomic theory can be used to study migration decisions. We start with dichotomic (or binary) models. We then turn our attention to more complicated choice models where many options are permitted. Finally, we review some simultaneous models of earnings and migration decisions.

#### 3.1 Dichotomic model

In its simplest form, the empirical model of migration defines the net benefit (costs minus benefits) of migration to be an individual-specific latent (or non-observed) variable  $y_i^*$  modelled as:

$$y_i^* = X_i\beta + \varepsilon_i , \quad (1)$$

where  $X_i$  represents a matrix of individual-specific explanatory variables that may include demographic characteristics. In this framework, it is common to control for spatial and temporal heterogeneity by including geographic and time-indicator variables.  $\varepsilon_i$  is the error term. Since  $y_i^*$  is not observed, the econometric model will be based on the observed migration decision  $y_i$  defined as:

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{otherwise} \end{cases} . \quad (2)$$

That is, the individual will migrate ( $y = 1$ ) if and only if the net benefits of doing so are positive ( $y_i^* > 0$ ). If we assume  $\varepsilon_i$  to be independent and normally distributed, the above model reduces to a probit model. If, however,  $\varepsilon_i$  follows the logistic distribution, (1) and (2) yield the logit model. Both the probit and logit are estimated by maximum likelihood (estimation procedures which most statistical packages provide).

Dichotomic models have been used by Hunt (2004), Antolin and Bover (1997),

Vijverberg (1993), Shield and Shield (1993)<sup>\*\*\*\*</sup>, Pissarides and Wadsworth (1989), Goss and Schoening (1984), and Bartel (1979). The usual critique of these models is that they do not distinguish between different reasons for migrating. For example, the impact of different demographic characteristics may be different if an individual moves for familial reasons than if the individual moves for job-related reasons. Furthermore, the determinants of migration are likely to be different for international than for national moves. As a result, interpreting the  $\beta$ -coefficients may be problematic. In the next section, we examine econometric models where the outcome variable,  $y_i$ , is allowed to take on more choices.

### 3.2 Multinomial Logit Models

Richer models of migration can be obtained by relaxing the aforementioned assumption that all migrations are identical (i.e.,  $y_i = 1$  for all migrants). Suppose instead that there exist  $j = 1, \dots, J$  types of migration choices. These choices may refer to destinations such as provinces (in the case of internal migrations) or countries (in the case of international migration). They may also refer to different types of moves such as long vs short distance migration or return vs first-time migration. These models also assume that individuals are able to assess the net benefits associated with each type of migration. In order to derive such a model explicitly, it helps to define  $y_{ij}^*$  as the utility level or net benefits that individual  $i$  would receive if he chose migration of type  $j$ :

$$y_{ij}^* = X_i \beta_j + \varepsilon_{ij} . \quad (3)$$

When doing so, however, the observation rule becomes slightly more complicated. To simplify, suppose that there are three types of migration ( $J = 3$ ). The observation rule is based on what type of migration is chosen by individual  $i$ ,  $y_i = \{1, 2, 3\}$  where for example

$$y_i = 2 \text{ if } \begin{cases} y_{i2}^* > y_{i1}^* \\ y_{i2}^* > y_{i3}^* \end{cases} .$$

Since only relative comparisons are made, it is impossible to identify  $\beta_j$ ,  $j = 1, 2, 3$ , where

---

<sup>\*\*\*\*</sup> More specifically, they use a proportional hazard on the conditional probability that a family

the usual practice is to normalize one vector to zero. If  $j = 1$  corresponds to the non-migration option, then one can normalize  $\beta_1$  to zero. By doing so,  $\beta_2$  and  $\beta_3$  are then interpreted as the net effects of explanatory variable  $x_i$  on choosing option 2 and 3 relative to option 1.

If we assume that the  $\varepsilon_{ij}$  are distributed extreme value, we obtain the familiar multinomial logit<sup>+++</sup> form where the probability of an individual choosing migration type  $j$  is equal to

$$\Pr[y_i = j] = \frac{\exp(X_i \beta_j)}{\sum_{k=1}^3 \exp(X_i \beta_k)} . \quad (4)$$

Given the probability associated with each type of migration, it is straightforward to estimate the  $\beta_j$ -parameters by maximum likelihood.

The most important challenge when using multinomial logit models is that they often include many parameters. Moreover, marginal effects for continuous explanatory variables in the multinomial logit take the following complicated form:

$$\frac{\partial \Pr(y_i = l | X_i)}{\partial x_{ik}} = \Pr(y_i = l | X_i) \left\{ \beta_{kl} - \sum_{j=1}^J \beta_{kj} \Pr(y_i = j | X_i) \right\} .$$

As a result, the value of the marginal change depends on all the parameters and the level of all variables in the model. Consequently, predicting marginal changes based on the value of the coefficient alone can be quite tricky.

Multinomial logit models have been used by Nivalainen (2004) who distinguishes between short-distance versus long-distance migration, Hunt (2004) who makes a distinction between same employer migrants, repeat and return migration, and DaVanzo (1983) who distinguishes between first-time or repeat migration.

### 3.3 Conditional Logit Models

The model described in (3) may be modified to incorporate choice-specific explanatory variables. Consider  $C_{ij}$  to be a matrix of explanatory variables describing the

---

will move from its current location given that the family is still residing at that location.

characteristics of choice  $j$  for individual  $i$ . In terms of the migration decision, these characteristics could be related to the fiscal regime, the unemployment rate, or even the weather conditions of the alternative destinations. Such a model is known as the conditional logit model<sup>†††</sup> and is defined as:

$$y_{ij}^* = C_{ij} \delta + \varepsilon_{ij} ,$$

where

$$\Pr[y_i = j] = \frac{\exp(C_{ij} \delta)}{\sum_{k=1}^3 \exp(C_{ik} \delta)} . \quad (5)$$

In its traditional form, the conditional logit model does not allow for individual-specific demographic information since such information is constant across choices. It is easy to see that any such information would cancel out from the probability in (5). In order to circumvent this limitation, one may interact the decision maker's characteristics with choice dummies:

$$X_{ij} = X_i D_j .$$

The above model thus becomes:

$$y_{ij}^* = C_{ij} \delta + X_i D_j \beta + \varepsilon_{ij} ,$$

or equivalently

$$y_{ij}^* = C_{ij} \delta + X_i \beta_j + \varepsilon_{ij} ,$$

where

$$\beta_j = D_j \beta .$$

---

<sup>†††</sup> See Schmidt and Strauss (1975) for an early application to occupational choices.

<sup>††††</sup> See McFadden and Train (2000) and Train (1993) for more complete treatments.

Finally

$$\Pr[y_i = j] = \frac{\exp(C_{ij} \delta + X_i \beta_j)}{\sum_{k=1}^3 \exp(C_{ik} \delta + X_i \beta_k)} . \quad (6)$$

The conditional logit model has been used by Davies, Greenwood, and Li (2004) to study interstate migration in the U.S. but without demographic characteristics. Jaeger (2000) uses micro-level admissions data from the Immigration and Naturalization Service to study locational propensities of legal immigrants across different metropolitan areas in the U.S. Bartel (1989) is the earliest study applying that kind of model on the decision to migrate and focus also on choice of metropolitan areas in the U.S.

### 3.4 Independence of irrelevant alternatives

Both the multinomial and conditional logit models rely on an assumption known as the independence of irrelevant alternatives (IIA). In the multinomial logit models, this means that

$$\frac{\Pr(y_i = 2)}{\Pr(y_i = 3)} = \exp(X_i [\beta_2 - \beta_3]) .$$

or, simply, that the probability of choosing 2 over 3 does not depend on any other outcomes that are available. In this sense, alternative outcomes are irrelevant. To understand why this assumption may be problematic, suppose that, following Long and Freese (2003), an individual must choose between a red bus and a car to get to work. Further suppose that the odds of taking a red bus relative to taking a car are 1:1. The IIA assumption implies that the odds will remain 1:1 between these two alternatives even if a new blue (but otherwise identical) bus is introduced. Thus, according to this assumption, the probability of driving a car can be made arbitrarily small by adding enough different colors of buses! More reasonably, we might expect that the odds of a red bus compared with a car would be reduced to 1:2 since half of those riding the red bus would be expected to ride the blue bus. Recent studies where this hypothesis is tested yield mixed results. Nivalainen (2004) finds that the IIA hypothesis holds for his data set. Similarly, Davies, Greenwood, and Li (2004) are unable to reject the presence

of IIA, but only with limited tests.

In terms of the conditional logit model, the IIA assumption refers to the fact that only the characteristics of alternatives 2 and 3 enter the odds ratio of choosing option 2 over 3:

$$\frac{\Pr(y_i = 2)}{\Pr(y_i = 3)} = \exp(\beta [C_{i2} - C_{i3}]) .$$

An obvious way to relax the IIA assumption is to use a different distribution for the error terms in (3). If one assumes that the error terms follow a multivariate normal distribution, then, the probability of choosing option 2 becomes:

$$\begin{aligned} \Pr[y_i = 2] &= \Pr(y_{i2}^* > y_{i1}^*, y_{i2}^* > y_{i3}^*) \\ &= \int_{-\infty}^{y_{i1}^*} \int_{-\infty}^{+\infty} \int_{-\infty}^{y_{i3}^*} f(y_{i1}^*, y_{i2}^*, y_{i3}^*) dy_{i1}^* dy_{i2}^* dy_{i3}^* . \end{aligned} \quad (7)$$

While this model does not suffer from the IIA assumption, it does suffer from complex numerical integration. In the presence of more than 3 or 4 choices, computing time can become prohibitive. This limitation explains why this option has not often been used. One example where such a model has been used is in Bolduc, Fortin, and Fournier (1996) multinomial probit model of location decisions of Quebec physicians.

An easier way to somewhat relax the IIA assumption embedded in (4) and (5) is with a nested logit model. In order to use a Nested logit model, one must make a priori assumptions about which alternatives are most closely related. For example, it might be reasonable to think of the migration decision as a three-step decision where the individual first chooses the country, then chooses the province within the country and, finally, chooses the region within the province. By doing so, it is possible to write the probabilities of choosing each region such that, conditional on choosing a particular province, the IIA hypothesis holds uniquely for the choice of regions.

To illustrate the model, suppose that an individual faces two decisions. First, the individual must decide on the country  $l$  to migrate to and then, must decide on the province  $j$  within the chosen country. Then, following Greene (2003), the probability of choosing province  $j$  in country  $l$  is given by:

$$P_{jl} = \frac{\exp(C_{ij} \delta + Z_l \gamma)}{\sum_{l=1}^L \sum_{j=1}^{J_l} \exp(C_{il} \delta + Z_l \gamma)} .$$

Note that

$$P_{jl} = P_{j|l} P_l ,$$

where

$$P_{j|l} = \frac{\exp(C_{jl} \delta)}{\sum_{j=1}^{J_l} \exp(C_{jl} \delta)}$$

and where the probability of choosing a particular country  $l$  is defined as:

$$P_l = \frac{\exp(Z_l \gamma + \tau_l I_l)}{\sum_{l=1}^K \exp(Z_l \gamma + \tau_l I_l)} ,$$

Finally, the inclusive value of country  $l$  is defined as:

$$I_l = \ln \sum_{j=1}^{J_l} \exp(C_{jl} \delta) .$$

It is worth noting that the IIA assumption must hold within countries. Also note that the conditional logit model is a special case of the Nested logit model when  $\tau = 1$ . Knapp, White, and Clark (2001) use a Nested logit model where the first step is in choosing whether to move within a Metropolitan Statistical Area (MSA), while the second step consists of choosing between the suburb or the central city (conditional on an interMSA move).

### 3.5 Simultaneous models

In order to investigate the impact of earnings and unobserved ability on migration decisions, one of the above models must be simultaneously estimated with earnings

equations. A general model of wage determination could be a one-factor analysis of covariance with repeated observations such as:

$$y_{it} = \mu + x_{it}\beta + \theta_i + \varepsilon_{it} \quad (8)$$

with

$$\theta_i = \alpha_i + u_i\eta, \quad (9)$$

where  $y_{it}$  denotes individual  $i$ 's (where  $i = 1, \dots, N$ ) (log) wage rate at time  $t = 1, \dots, T_i$ . Person effects are identified by  $i$  while time effects are identified by  $t$ .  $\mu$  denotes a constant,  $x_{it}$  denotes a matrix of demographic information for individual  $i$  at time  $t$ . Personal heterogeneity ( $\theta_i$ ) includes a measure of both unobserved ( $\alpha_i$ ) human capital and observed ( $u_i\eta$ ) human capital (or skills) which follow the worker from place to place.  $\varepsilon_{it}$  is the statistical residual.

Simultaneous models of migration decisions with some measure of earnings have been used by Krieg and Bohara (1999). These authors use a wage equation, similar to (8), simultaneously with a dichotomous model of migration. They do not, however, take advantage of the panel nature of their data set in order to estimate unobserved skills  $\theta$ . Their measure of unobserved skills is simply the predicted error term.

#### 4 Conclusion and avenues for future research

In this paper, we examine the role of both demographic and location-specific variables on the decision to migration and the choice of location. With respect to the demographic characteristics, the literature often finds a negative relationship between a person's age and their likelihood of migration (although the relationship is often weakened once life-cycle variables such as marital status and the presence of children are included in the analysis). Other important demographic characteristics such as the individual's sex, marital status and family size also appear to play an important role in migration decisions. For example, several papers find that single women are less likely to migrate compared to single males and married women. Furthermore, being married and the presence of children (especially the presence of school-aged children) are negatively



correlated with migration.

The literature also consistently finds a positive relationship between educational attainment and migration. Furthermore, several studies find that self-employed individuals, as well as those with greater job-tenure, are less likely to migrate. The literature also consistently finds that unemployed individuals are more likely to migrate compared to their employed counterparts. Finally, several other variables including language spoken and familial obligations are shown to be important determinants of migration.

In the above discussion, we also review the empirical evidence related to destination-specific attributes. Although, regional variations in unemployment rates does not (surprisingly) explain individuals location choices several other regional factors do. For example, variations in job growth, availability of jobs and income are found to be important elements in explaining location choices of migrants. Finally, the literature shows that non-pecuniary elements such as distance, weather and crime-rates may also be important elements.

A question which remains open is whether or not high-skilled individuals are more likely to migrate. In fact, there is little consensus as to what defines a high-skilled individual. Some authors equate high-skills with particular professional groups such as physicians, information technology specialists or university professors. Others define them more generally as individuals with high levels of education. Using the later definition, there is wide agreement as to the positive cross sectional correlation between high levels of education and the propensity to migrate<sup>§§§§</sup>. This not surprising, given that both education and migration reflect investments in human capital. More surprising is the document negative correlation between other forms of human capital such as age or experience, and migration<sup>\*\*\*\*\*</sup>. A third strand of the literature defines high-skilled individuals as high-wage or high-income individuals. We have already documented the problems associated with the use of this definition given that higher wages may result from a variety of factors including high level of human capital, local market conditions, institutional factors or unobserved heterogeneity due to unobserved ability.

Turning our attention to estimation, microeconomic models of migration are now

---

<sup>§§§§</sup> The positive correlation between education and migration may not be causal, i.e., it may simply reflect unobserved factors that lead to both a higher level of education and a higher propensity to migrate.

<sup>\*\*\*\*\*</sup> We know of no study which examines the link between the propensity to migrate and the accumulation of firm specific human capital, i.e., seniority.

firmly rooted in discrete-choice econometric models. While some restrictive assumptions are needed in order to keep estimation procedures simple, better algorithm and computing facilities should make the estimation of more general models such as the multinomial-probit and mixed-logit models more common in the near future. Nonetheless, there are still relatively few examples of simultaneous model where the migration decision is estimated jointly with other processes of interest such as wages or other investment decision in human capital<sup>++++</sup>. With respect to wages, this is surprising as there is a long tradition in labor economics of defining high-ability or high-productivity individuals as individuals with a higher wage than can be predicted based on observed characteristics. In addition to providing a conceptually clear definition of what is meant by being high-skilled, it would be interesting to determine whether such high-skilled individuals are also more likely to migrate. Doing so would help clarify the role of wages in the decision to migrate.

---

<sup>++++</sup> It should be noted that another reason for the lack of examples is the lack of appropriate longitudinal data sets.

## References

- Antolin, P. and O. Bover (1997). Regional migration in Spain: The effect of personal characteristics and of unemployment, wage and house price differentials using pooled cross-sections. *Oxford Bulletin of Economics and Statistics* 59 (2), 215–235.
- Axelsson, R. and O. Westerlund (1998). A panel study of migration, self-selection and household real income. *Journal of Population Economics* 11, 113–126.
- Bartel, A. P. (1979). The migration decision: What role does job mobility play? *American Economic Review* 69 (5), 775–786.
- Bartel, A. P. (1989). Where do the new U.S. immigrants live. *Journal of Labor Economics* 7 (4), 371–391.
- Becker, G. S. (1993). *Human Capital. A Theoretical and Empirical Analysis with Special Reference to Education*. Third Edition. The University of Chicago Press.
- Bolduc, D., B. Fortin, and M.-A. Fournier (1996). The effect of incentive policies on the practice location of doctors -a multinomial probit analysis. *Journal of Labor Economics* 14 (4), 703–732.
- Borjas, G., S. Bronars, and S. Trejo (1992). Self-selection, and internal migration in the United States. *Journal of Urban Economics* 32 (2), 159–185.
- Borjas, G. J. (1999). The economic analysis of immigration. In O. Ashenfelter and D. Card (Eds.), *Handbook of Labor Economics*, vol 3A, Chapter 28, pp. 1697–1760. Elsevier Science North Holland.
- Card, D. (2003). Canadian emigration to the United States. In A. G. C.M. Beach and J. Reitz (Eds.), *Canadian Immigration Policy for the 21st Century*, pp. 295–312. John Deutsch Institute for the Study of Economic Policy, Queen's University, Kingston.
- Chiquiar, D. and G. H. Hanson (2002). International migration, self-selection, and the distribution of wages -evidence from Mexico and the United States. Working Paper w9242, National Bureau of Economic Research.
- Coulombe, S. (2003). Internal migration, asymmetric shocks, and interprovincial economic adjustments in Canada. Working paper, Department of Economics, University of Ottawa.
- DaVanzo, J. (1978). Does unemployment affect migration? Evidence from micro data. *Review of Economics and Statistics* 60 (4), 504–514.
- DaVanzo, J. (1983). Repeat migration in the United States: Who moves back and who moves on? *Review of Economics and Statistics* 65 (4), 552–559.

- Davies, P. S., M. J. Greenwood, and H. Li (2004). A conditional logit approach to U.S. state-to-state migration. *Journal of Regional Science* 41 (2), 337–360.
- Day, K. M. and S. L. Finer (2001). Policy-induced migration in Canada: An empirical study. Working paper, Applied Research Branch. Strategic Policy. Human Resources Development Canada.
- Dodson III, M. E. (2001). Welfare generosity and location choices among new United States immigrants. *International Review of Law and Economics* 21, 47–67.
- Falaris, E. M. (1987). A nested logit migration model with selectivity. *International Economic Review* 28 (2), 429–443.
- Fields, G. S. (1979). Place-to-place migration: Some new evidence. *Review of Economics and Statistics* 61 (1), 21–32.
- Finnie, R. (2001). The brain drain: Myth and reality -what it is and what should be done. *Institute for Research on Public Policy: Choices* 7 (6), 3–29.
- Goss, E. P. and N. C. Schoening (1984). Search time, unemployment, and the migration decision. *Journal of Human Resources* 19 (4), 570–579.
- Grave, P. E. and P. D. Linneman (1979). Household migration: Theoretical and empirical results. *Journal of Urban Economics* 6, 383–404.
- Greene, W. H. (2003). *Econometric Analysis* (Fifth ed.). Prentice Hall, New Jersey.
- Greenwood, M. J. (1975). Research on internal migration in the United States: A survey. *Journal of Economic Literature* 13, 397–433.
- Hunt, J. (2004). Are migrants more skilled than non-migrants? Repeat, return and same-employer migrants. Working Paper 10633, National Bureau of Economic Research (NBER).
- Jaeger, D. A. (2000). Local labor markets, admission categories and immigrant location choice. Working paper, Hunter College and Graduate School, CUNY.
- Knapp, T. A., N. E. White, and D. E. Clark (2001). A nested logit approach to household mobility. *Journal of Regional Science* 41 (1), 1–22.
- Krieg, R. G. and A. K. Bohara (1999). A simultaneous probit model of earnings, migration, job change with wage heterogeneity. *The Annals of Regional Science* 33, 453–467.
- Lin, Z. (1995). Interprovincial labour mobility in Canada: The role of unemployment insurance and social assistance. Working paper, Human Resources Development Canada.
- Long, J. S. and J. Freese (2003). *Regression Models for Categorical Dependent*

- Variables Using Stata*. Stata Corporation: College Station, Texas.
- Mauro, P. and A. Spilimbergo (1999). How do the skilled and the unskilled respond to regional shocks. The case of Spain. Working Paper 46(1), IMF Staff Papers.
- McDonald, J. T. (2003). Location choice of new immigrants to Canada: The role of ethnic networks. In A. G. C.M. Beach and J. Reitz (Eds.), *Canadian Immigration Policy for the 21st Century*, pp. 163–195. John Deutsch Institute for the Study of Economic Policy, Queen's University, Kingston.
- McFadden, D. and K. Train (2000). Mixed MNL models for discrete response. *Journal of Applied Econometrics* 15 (5), 447–470.
- Mincer, J. (1978). Family migration decisions. *Journal of Political Economy* 86 (5), 749-773.
- Nivalainen, S. (2004). Determinants of family migration -short moves vs long moves. *Journal of Population Economics* 17, 157–175.
- Pissarides, C. A. and J. Wadsworth (1989). Unemployment and the interregional mobility of labour. *Economic Journal* 99 (397), 739–755.
- Regets, M. C. (2001). Research and policy issues in high-skilled international migration. A perspective with data from the United States. Working Paper 366, IZA.
- Robinson, C. and N. Tomes (1982). Self-selection and interprovincial migration in Canada. *Canadian Journal of Economics* 15 (3), 474–502.
- Sandefur, G. D. and W. J. Scott (1981). A dynamic analysis of migration: An assessment of the effects of age, family and career variables. *Demography* 18 (3), 355–368.
- Sandell, S. H. (1977). Women and the economics of family migration. *Review of Economics and Statistics* 59 (4), 406–414.
- Schlottmann, A. M. and H. W. H. Jr. (1981). Employment status and the decision to migrate. *Review of Economics and Statistics* 63 (4), 590–598.
- Schmidt, P. and R. P. Strauss (1975). The prediction of occupation using multiple logit models. *International Economic Review* 16 (2), 471–486.
- Shield, M. P. and G. M. Shield (1993). A theoretical and empirical analysis of family migration and household production : U.S. 1980-1885. *Southern Economic Journal* 63 (1), 768–782.
- Sjaastad, L. A. (1962). The costs and returns of human migration. *Journal of Political Economy* 70 (2), 80–93.
- Train, K. (1993). *Qualitative Choice Analysis. Theory, Econometrics, and an Application to Automobile Demand*. The MIT Press, Cambridge.

- Tunali, I. (1986). A general structure for models of double selection and an application to joint migration/earnings process with remigration. In R. G. Ehrenberg (Ed.), *Research in Labor Economics*, Volume 8, pp. 235–282. JAI Press Inc., Greenwich, Connecticut.
- van Dalen, H. P., G. Groenewold, and J. J. Schoorl (2004). Out of Africa: What drives the pressure to emigrate. *Journal of Population Economics* : forthcoming.
- Vijverberg, W. (1993). Labor-market performance as a determinant of migration. *Economica* 60 (238), 143–160.
- Vijverberg, W. (1995). Dual selection criteria with multiple alternatives migration, work status and wages. *International Economic Review* 36 (1), 159–185.
- Yashiv, E. (2004). The self-selection of migrant workers revisited. Working Paper 1094, IZA.
- Zhao, J., D. Drew, and T. S. Murray (2000). Brain drain and brain gain: The migration of knowledge workers from and to Canada. *Education Quarterly Review* 6 (3), 8–35.