Immigrant Adaptation in Multi-Ethnic Societies

Canada, Taiwan, and the United States

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5 Are Native "Flights" from Immigration "Port of Entry" Pushed by Immigrants?

Evidence from Taiwan

Ji-Ping Lin

INTRODUCTION

In light of the persistence and the emerging trend of international migration in the world, debates on immigration impact have never ceased and are becoming even more contentious in immigration-receiving countries (Borjas 2001; Massey and Taylor 2004; Smith and Edmonston 1998; Stahl 2003). The most addressed issues by relevant studies comprise two broad aspects. The first one focuses on immigration impact on the employment opportunities of domestic labor market and thus the resulted impact on the wage level of native workers. The other, within the spatial context, studies immigration impact on internal migration of the native-born populations (hereafter the native-borns). Either from the supply or demand side of manpower, both aspects of study are interrelated but hard to accommodate simultaneously except for a few studies (e.g., Borjas 2006; Card 2001).

The theme of research in this study is the impact of immigrant labor on internal migration of native-born labor force (hereafter native labor), aiming at ascertaining the relationship between immigration and internal migration of native labor and assessing the extent to which immigrants affect redistribution of domestic manpower. The study is inspired by the observed association between internal migration and immigration and the relationship of skill differentials between native populations and immigrants that have long been noted by a number of studies from major immigrants-receiving countries, particularly the United States (Bogue and Liegel 2009; Borjas 1987a; Card 1990; Filer 1992; Frey 1996, 2005; Frey and Speare 1988; Long 1988; Walker et al. 1992; Wright et al. 1997). Take the past trends in the United States for example, Frey (1996, 2005) finds (1) that based on the 1990 and 2000 U.S. censuses, in the 1985–1990 the large metropolitan areas served as major immigration ports of entry which were characterized by a "flight" of low-skilled internal migrants, and (2) that metropolitan areas that received modest gains from internal migrants attracted relatively few immigrants and were selective of the well-educated internal migrants; in 1995–2000 although there were some changes from earlier patterns, there is a continued out-migration of internal migrants with less education from most high immigration metropolitan areas. Bogue and Liegel (2009) also indicate that the main losers of internal migration are metropolitan areas or states that are least attractive to natives with lower education and more attractive to those with college education, but these trends of improving educational composition are largely reversed by low-skilled immigrants. By contrast, the major gainers of internal migration are intermediate-size metropolitan areas that enjoy various growths due to regional restructuring and economic growth.

In this regard, immigration has both advantages and disadvantages for receiving countries. Since it may help create or foster an existing "dual" economy, low-skilled immigrants tend to complement natives with higher educations or native professionals/managers, but they also compete for low-paying and informal jobs against and even substitute for low-skilled native workers (Piore 1979; Walker et al. 1992). It is thus generally hypothesized that a large and sustained influx of low-skilled foreign labor into a few immigration "ports of entry" might not only push out native labor within these "ports" but also tend to discourage in-migration flows of native labor from other domestic labor markets, leading to an essential population redistribution within the internal labor market. In the context of linked migration system between internal migration and immigration, it is theoretically expected that if the impact of low-skilled immigration on internal migration of native labor is distinct, the corresponding pushing effect on out-migration and discouraging effect on in-migration will be stronger for the low-skilled and less-educated native labor. However, because of the complementary effect of low-skilled immigration for the professionals and managers who in turn may intensify the in-flows of low-skilled immigrants into professionals/manager preferred destinations to provide the needs for personal services, the major immigration "ports of entry" are expected to have a retention effect on out-migration for native labor with higher educations and a pulling effect on in-migration for the comparable native labor outside these ports (Walker et al. 1992).

Relevant studies on the context of immigration impact on the geographic migration of the native-borns are mostly seen in the United States. Because scholars so far have not reached a consensus on whether immigration affects the native-born internal migration, the existing research findings turn out to be mixed or controversial. For examples, an earlier study by Manson and his associates (1985) on Mexican immigrants in southern California lends support to the notion that Mexican immigrants serve as complements to skilled in-migrants and as substitutes for the less-skilled local workers; Filer (1992) studies internal migration of 272 metropolitan areas in the United States, finding that the level of attractiveness for a specific metropolitan area is negatively associated with the concentration level of immigration; Walker et al. (1992) find that native blue-collar workers have been spatially displaced by immigration, but there is no evidence supporting the argument that the growth in white-collar employment in major large metros have stimulated a complementary immigrant in-flow to satisfy service needs from the expanding professional class posited by Sassen (1988); and the study by Winter-Ebmer and Zweimüller (1999) indicates that the displacement impact of immigrants on Austrian young native workers does exist but turns out to be minor.

Other empirical research stratifying the population in study by educational and skill level has lent support to the pushing effect of immigration on internal migration. For example, Frey (1996) and Frey et al. (1996) find that internal migration of American workers does respond to the presence of immigration. Frey and Liaw (1998), using the 1990 U.S. census data, find that low-skilled immigrants do affect the interstate migration of the U.S.-born low-skilled Americans. Their findings indicate that the pushing effects of low-skilled immigration on the departure process is much stronger than the corresponding discouraging and complementary effects in the destination choice process, and that the pushing effects of low-skilled immigration are selectively stronger on the low-skilled, the poor, the whites, and the older age groups. Bogue and Liegel (2009) suggest that low-skilled immigration is a key plausible explanation for unskilled Americans with a low rate of arrival and higher rate of departure from main losers of internal migration. Brücker, Fachin, and Venturini (2011) take another route for immigration impact study in Italy. Instead of focusing on immigration impact on the out-migration of the natives from main immigration gateway cities, they study whether immigrants "discourage" the in-migration of the natives from other regions into gateway cities. Their findings suggest that by controlling for the effects of unemployment and wage differentials, immigrant labor does discourage internal labor mobility significantly.

Nevertheless, empirical research reports no significant impact of immigration on native internal migration. Using the 1990 U.S. population census, Card (2001) explores the effects of immigrant in-flows on the labor market opportunities of natives and older immigrants. He finds that even after controlling for endogenous mobility decisions, inter-city migration flows of natives and older immigrants are largely unaffected by new immigrants. He further finds that immigration between 1985 and 1990 depressed the employment rate of low-skilled natives in major U.S. cities by 1% to 2% on average, and this negative impact becomes substantial in high-immigrant cities. White and Liang (1998) examine the impact of immigration on the labor market opportunities of the native-borns based on the U.S. Current Population Survey (CPS), finding that the states with high levels of recent immigration are less likely to retain Anglo workers or receive new Anglo interstate migrants, but this apparent substitution effect is partially offset by the presence of long-term immigrant stock. White and Imai (1994) indicate that there is no significant effect of immigrants on internal migration in the United States. By applying the 1980 and 1990 U.S. Census Bureau microsamples to three sets of regression models, Wright et al. (1997) find that net migration of the native-borns for metropolitan areas is either positively related or unrelated to immigration, and the net loss of native labor from large metropolitan areas is more likely the result of industrial restructuring instead of immigration. Thus, they claim no solid evidence in support of an effect of immigration on internal migration. Using the same data, Ellis and Wright (1999) subdivide native- and foreign-born migrants of metropolitan Los Angeles by national origin and ethnicity, finding that native- and foreign-born groups do channel into particular industrial sectors of metropolitan Los Angeles in 1985–1990. Moreover, based on the U.S. population census and using 94 metropolitan areas as the labor markets, Fairlie and Meyer (1997) examine whether the levels of black self-employment are lower in labor markets with a higher share of immigrants. Their findings suggest that immigration has no effect or only a small negative but statistically insignificant effect on black male or female self-employment.

Kritz and Gurak (2001), based on the 1990 5% Public Use Microdata Sample (PUMS), studied whether the native- and foreign-borns differ in their migratory response to high immigration in the United States. After taking the migratory response of the foreign-borns to immigration into consideration and controlling for state economic and regional context, their research results do not support the claim that internal migration of the U.S. native-borns is the response to recent immigration. Using the 1996 and 2001 New Zealand Censuses and being closely based on the empirical approach of Card (2001), Maré and Stillman (2010) find little support for the displacement effect of migrant in-flows on either the native-borns or earlier immigrants with similar skills. They further suggest that given the similarities between New Zealand and Australia with regard to immigration systems and migration behavior (Hugo 2006), the immigration impact in Australia should resemble that observed in New Zealand.

Because the aforementioned empirical results are inclusive, Ley (2007) stresses the spatial regularity of countervailing immigration, and net domestic migration flows may not be exclusively explained by labor market effects. He extends the analysis to Australian and Canadian main immigration "port-of-entry" cities of Sydney and Toronto, finding that the two flows of immigrants and domestic migrants are responding to different drivers. He stresses that domestic migrants leaving gateway cities are mainly triggered by housing market effects, although cultural avoidance of the natives can't be denied. In contrast, in-flows of immigrants into gateway cities are mainly related to co-ethnic networks, national immigration policy, and business cycle effects. Based on the Panel Study of Income Dynamics (PSID), Crowder, Hall, and Tolnay (2011) study the causal relationship between neighborhood immigration and native out-migration, suggesting that the association between neighborhood immigration and native out-migration can be attributed to the fact that immigrants tend to settle in neighborhoods in which natives are conducive to make out-migration. Ethnic flight thesis and local housing market competition are mediating factors in explaining the out-migration of whites and blacks, respectively.

In spite of inconclusive empirical findings, the research recognizes that the migration system of Taiwan during the period of 1996–2000 is very suitable for research in this regard. The main reasons are as follows. First, like the development history of the United States in the 17th to 19th centuries, Taiwan had a long historical tradition of migration, and the Taiwanese were seen to be as footloose as Americans (Campbell 1903; Knapp 1980). However, the population system and domestic labor market of Taiwan were closed to the world systems for nearly a century from the beginning of Japanese jurisdiction in 1895 until the early 1990s. Except for voluminous influxes of Chinese diasporas in the late 1940s due to the civil war of China, international migration was not crucial in affecting Taiwan's population system by the 1950s (Barclay 1954; Clark 1989). For the sake of economic development since the 1960s, Taiwan did not restrict immigration of ordinary foreigners, mostly professionals and managers, as well as their dependents from America and Japan and partly from Europe, but strictly banned low-skilled immigration from other countries. As a result of democratization and the onset of internal development toward a pluralistic system (Clark 1989; Copper 1988), Taiwan's domestic labor market started reopening to the world systems in the late 1980s. Moreover, because of the economic boom in the late 1980s that led to the formation of a dual economy (Ranis 1992), the economy of Taiwan was increasingly hampered by rising wage levels and shortages of native labor in the early 1990s. These endogenous changes finally forced the Taiwanese government to open up the domestic labor market to low-skilled immigrants (Lee and Wang 1996; Selya 1992; Tsai and Tsay 2004).

Second, the low-skilled foreign laborers are contract workers mostly from the ASEAN countries (Tsai and Tsay 2004). It is worth highlighting that the contract immigrant workers are selected from the lower tail of income distribution and from the lower hierarchy of socioeconomic status in the sending countries. When moving to Taiwan for work, they are paid by Taiwanese employers slighter higher than the legal level of minimum wage. Similar to Borjas (1987b), the migration process of low-skilled immigrants into Taiwan is negative selection. Moreover, it is worthy of stressing that the immigration destinations of contract workers in Taiwan were predetermined by their Taiwanese employers before their immigration (Tseng 2004; Tsai and Tsay 2004). In other words, low-skilled foreign laborers do not have any privilege to choose destinations before immigrating into Taiwan. In addition, they were not allowed to change their Taiwanese employers once moving to Taiwan until the year of 2007 due to the concern of human rights, suggesting that they were not able to make internal migration. As a result, the joint effects of destination choice before immigration and the internal migration after immigration for contract immigrant workers can be ignored in the selected period of research.

Third, before immigration grew in importance, it is worth highlighting a drastic change of internal migration in Taiwan in the early 1990s. Mainly because of regional economic restructuring and economic globalization in the late 1980s and early 1990s, the internal labor migration in Taiwan experienced a salient transition from a long-lasting net transfer of native labor into the dual north-south regions to a unidirectional net transfer into northern metropolitan areas (Lin and Liaw 2000). The effect of international migration was not crucial to this dramatic change. As illustrated by Figure 5.1, Taiwan officially opened up the domestic labor market for low-skilled immigrants in 1992. The number of low-skilled foreign laborers in Taiwan rose to about 350,000 by 2010, and the share of low-skilled foreign labor to native labor and to low-skilled native labor keeps at a rate of about 3.3% and 5.5% on average since the year of 2000, respectively. It is observed that the period of 1996–2000 had the most noteworthy growth in terms of volume and rate that was only a few years after the aforementioned prominent transition in native destination choice preference. By the end of 2011, contract foreign workers amount to around 426 thousands. In terms of the racial and ethnic background, they mostly come from Indonesia, the Philippines, and Thailand before the year of 2000; but Vietnam starts becoming a new source of immigration after 2001. For example, in 2000 23.8% of immigrant workers came from Indonesia, 30.1% from the Philippines, 43.7% from Thailand, and only 2.4% from Vietnam; in 2011 the corresponding share is 41.2% for Indonesia, 19.5% for the Philippines, 16.9% for Thailand, and 22.5% for Vietnam.

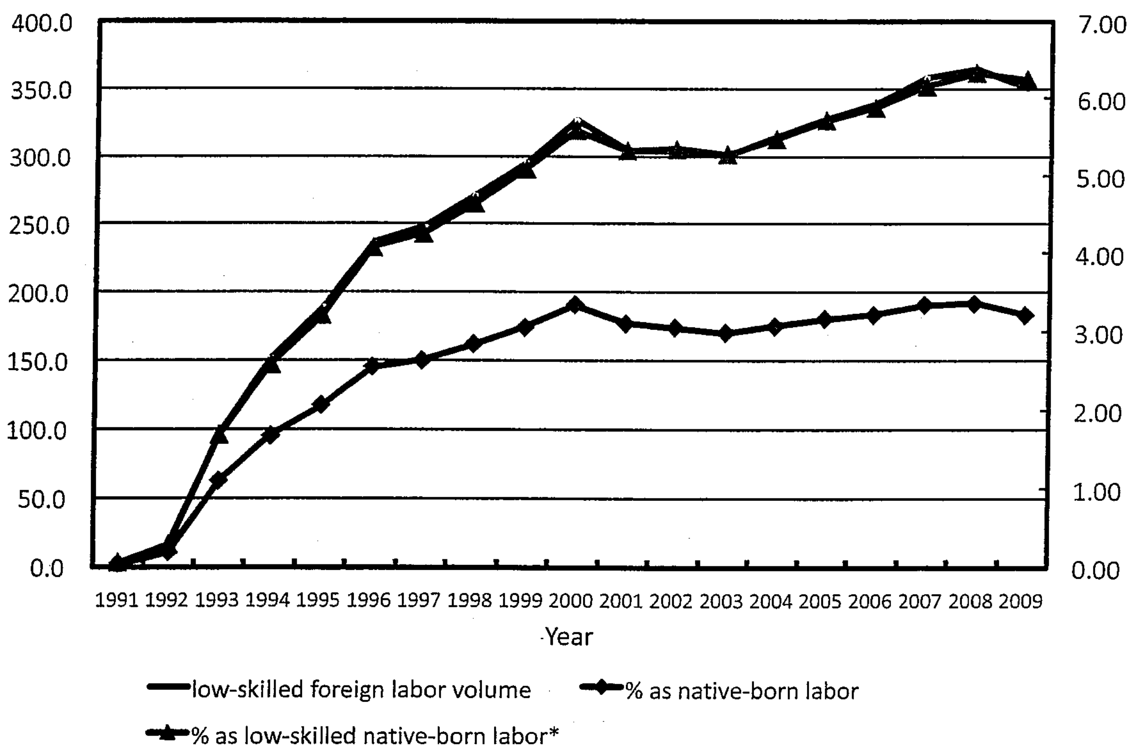

Figure 5.1 Low-skilled foreign labor volume and share as Taiwan native-born labor.

Fourth, the heterogeneity in the native and foreign populations in Taiwan is not as enormous as that observed in the United States. The reasons are as follows. Because the ordinary immigrants are not voluminous, a crucial note by Kritz and Gurak (2001) about the need to differentiate between the migratory response of the foreign-borns and the native-borns turns out to be unnecessary in the context of Taiwan. In addition, the study recognizes that a key methodological problem that is common in all such studies is the modeling of immigrant location decisions as exogenous. As a matter of fact, it is important to stress that the location decisions of immigrants are not exogenous, but instead are mostly determined by the same factors (e.g., income, employment opportunity, environmental amenity, social structure, cultural similarity, etc.) that determine migration of native populations. This problem suggests that the destination choice of immigrant arrivals needs to be properly instrumented while conducting immigration impact on the internal migration of the natives. Because low-skilled immigrants were not allowed to make internal migration and their destinations were predetermined during the selected study period, the aforementioned problem in this study can be ignored.

In effect, similar to the experiences in America (Massey 1995), recent immigration into Taiwan has three distinct features, i.e., a rapid increase in volume in a short period of time, being selective of the less-educated and the low-skilled labor, and being concentrated in a few immigration "ports of entry," mainly in the capital area and the economic heartlands of the country. The aforementioned development of migration systems suggests that Taiwan is an ideal "laboratory," and the period of 1996–2000 is a suitable period for studying immigration impact on native internal migration.

METHODOLOGY: A MICRO-MACRO LINK APPROACH

To assess the extent to which native labor responds to immigration and the extent to which domestic manpower redistributes due to immigration impact, the study contributes to derive the statistical distributions of aggregate out-migration, in-migration, and thus net flows of migration across domestic labor markets by linking them with individual-level migration probabilities that are estimated functions of a set of explanatory variables. First of all, suppose a domestic labor market consisting of I regions has N workers. For a specific region i within the labor market, the number of workers is N_i that can be further classified by G_i groups of labor. Workers between different subgroups of G_i are heterogeneous in individual characteristics and face different conditions of labor market, but workers within the same subgroup *of* G_i, say g, that has N_i^g workers share the same features in individual characteristics and labor market conditions, thus $N=\sum_{i=1}^{I}N_i=\sum_{i=1}^{I}\sum_{g=1}^{G_i}N_i^g$.[1]

Statistical Distributions of Aggregate Out-migration Flows

Because the N_i^g individuals in the group of labor g within region i are identical in individual characteristics and labor market conditions, let the shared common feature be represented by $\mathbf{X}_i^g$, and they are thus expected to have the same probability of making out-migration $Pr(\mathbf{X}_i^g)$. Thus, for a given i and g, let Y_i^g represent the number of N_i^g individuals departing from i, apparently $Y_i^g \sim b(N_i^g, Pr(\mathbf{X}_i^g))$. On the basis of neo-classical school of migration theories that acknowledge individual decisions of labor migration are mutually independent (Massey et al. 1993), the statistical distributions of $\{Y_i^g\}$ are thus mutually independent, although not identical for all i and g; in other words, $Y_i^g \overset{ind.}{\sim} b(N_i^g, Pr(\mathbf{X}_i^g))$ for all i and g. Apparently, the expectation of Y_i^g is $E(Y_i^g) = N_i^g Pr(\mathbf{X}_i^g) = \mu_i^g$ and variance is $Var(Y_i^g) = N_i^g Pr(\mathbf{X}_i^g)(1 - Pr(\mathbf{X}_i^g)) = \sigma_i^{g^2}$.

According to the *Central Limit Theorem* (*CLT*), if N_i^g is not very small, Y_i^g can be accepted to have a normal distribution with expectation and variance μ_i^g and σ_i^{g2}, respectively; or alternatively, $Y_i^g \overset{ind.}{\sim} N(\mu_i^g, \sigma_i^{g^2})$, and

$$\frac{Y_i^g}{N_i^g} \overset{ind.}{\sim} N\left(\frac{\mu_i^g}{N_i^g}, \frac{\sigma_i^{g^2}}{N_i^{g^2}}\right), \forall i, j.$$

Because any linear combination of normal random variables remains normally distributed, the number of workers departing region i,

$$Y_i^+ = \sum_{g=1}^{G_i} Y_i^g$$

is still normally distributed, leading to

$$Y_i^+ \overset{ind.}{\sim} N(\mu_i^+, \sigma_i^{+^2}), \forall i,$$

with the departure rate corresponding to i being distributed as

$$\frac{Y_i^+}{N_i^+} \overset{ind.}{\sim} N\left(\frac{\mu_i^+}{N_i^+}, \frac{\sigma_i^{+^2}}{N_i^{+^2}}\right), \quad N_i^+ = \sum_{g=1}^{G_i} N_i^g, \forall i.$$

Similarly, the total number of labor migrants

$$Y_+^+ = \sum_{i=1}^{I} Y_i^+$$

in the labor market can be inferred to be statistically distributed by

$$Y_+^+ \sim N(\mu_+^+, \sigma_+^{+^2}),$$

where

$$\mu_+^+ = \sum_{i=1}^{I} \mu_i^+, \quad \sigma_+^{+^2} = \sum_{i=1}^{I} \sigma_i^{+^2},$$

and the aggregate out-migration rate of the labor market in study,

$$\frac{Y_+^+}{N},$$

is thus distributed as

$$\frac{Y_+^+}{N} \sim N(\frac{\mu_+^+}{N}, \frac{\sigma_+^{+2}}{N^2}).$$

Statistical Distributions of Aggregate In-migration and Net Migration Flows

Only deriving the statistical distributions corresponding to the volume and rate of out-migration from a specific region is not sufficient. It is also important to derive the statistical distributions of in- and net migration flows among a set of potential destinations. First of all, let Y_{ij}^g represent the number of individuals who decide to move from region *i* to region *j*; note that

$$Y_i^g = \sum_{\substack{i=1 \\ j \neq i}}^{I} Y_{ij}^g.$$

Because any migrant from *i* has *I-1* potential destinations to choose from (note that the choice set of potential destinations may vary with migrants; only those migrating from the same region have the same set of choices of potential destinations), let $P_{ij}^g = Pr(\mathbf{X}_{ij}^g)$ represent the probability of Y_i^g migrants from labor group *g* and region *i* deciding to move into region $j \neq i$, with

$$\sum_{\substack{j=1 \\ j \neq i}}^{I} p_{ij}^g = 1.$$

Thus, with Y_i^g given, say, $y_i^g (y_i^g = 0,1,2,.. N_i^g)$, the conditional distribution of Y_{ij}^g given $Y_i^g = y_i^g$ has a multinomial distribution as:

$$Pr(Y_{ij}^g = y_{ij}^g; j = 1,2,\cdots I, j \neq i \mid Y_i^g = y_i^g) = \frac{y_i^g!}{\prod_{\substack{j=1 \\ j \neq i}}^{I} Y_{ij}^g!} \prod_{\substack{j=1 \\ j \neq i}}^{I} P_{ij}^g.$$

Note that if $i \neq i'$ or $j \neq j'$ or $g \neq g'$, then Y_i^g and $Y_{i'}^{g'}$ are mutually independent, Y_{ij}^g and $Y_{i'j'}^{g'}$ are also mutually independent, but $\{Y_{ij}^g\}$ are correlated for a given *i* and *g*. For simplicity, let Y_i^g and Y_i^g, $j \neq i$, respectively, represent the *i*-th and the *j*-th element of $\mathbf{Y}_i^g = (Y_{i,1}^g \ldots Y_{i,i-1}^g \; Y_i^g \; Y_{i,I+1}^g \ldots Y_{i,I}^g)$; let μ_i^g and Σ_i^g be the expectation and covariance matrix of $\mathbf{Y}_i^g$, respectively. According to the *CLT*, $\mathbf{Y}_i^g$ has an asymptotic multinormal distribution as N_i^g approaches infinity. Empirically, if N_i^g is large enough, the probability density function of $\mathbf{Y}_i^g$ can be regarded to be multinormally distributed by

$$\mathbf{Y}_i^g \underset{N_i^g \to \infty}{\overset{ind}{\sim}} N(\boldsymbol{\mu}_i^g, \boldsymbol{\Sigma}_i^g), \forall i, g.$$

Again, let

$$\mathbf{Y}_i^+ = \sum_{g=1}^{G_i} \mathbf{Y}_i^g, \quad \mu_i^+ = \sum_{g=1}^{G_i} \mu_i^g, \quad \Sigma_i^+ = \sum_{g=1}^{G_i} \Sigma_i^g,$$

the *CLT* tells us that $\mathbf{Y}_i^+ \overset{ind}{\sim} N(\boldsymbol{\mu}_i^+, \boldsymbol{\Sigma}_i^+), \forall i$ as $N_i^+ \to \infty$. Although deriving the distributions of $\mathbf{Y}_i^g$ and $\mathbf{Y}_i^+$ is not empirically useful, it serves as the base in deriving the statistical distribution for net migration volume and rate. Since the marginal distribution of a multinormal distribution remains normally distributed, suggesting that for a given *j*, $Y_{ij}^+ \sim N(\mu_{ij}^+, \sigma_{ij}^{+2}), \forall i, j \neq i$, where

$$\mu_{ij}^+ = \sum_{g=1}^{G_i} \mu_{ij}^g, \sigma_{ij}^{+2} = \sum_{g=1}^{G_i} \sigma_{ij}^{g2}.$$

Thus, the volume of migrants moving into region *j*,

$$Y_{+j}^+ = \sum_{\substack{i=1 \\ i \neq j}}^{I} Y_{ij}^+, \text{ is } \quad Y_{+j}^+ \sim N(\mu_{+j}^+, \sigma_{+j}^{+2}), \forall j, \ \mu_{+j}^+ = \sum_{i=1}^{I} \mu_{ij}^+,$$

and

$$\sigma_{+j}^{+2} = \sum_{\substack{i=1 \\ i \neq j}}^{I} \sigma_{ij}^{+2},$$

leading to the net migration rate of region *j* having the form of

$$\frac{Y_{+j}^+}{N_{+j}^+} \sim N\left(\frac{\mu_{+j}^+}{N_j^+}, \frac{\sigma_{+j}^{+2}}{N_j^{+2}}\right).$$

Procedures of Implementing Immigration Impact Analysis

The study has shown that the aggregate volumes and rates of out-migration, in-migration, and net migration, as derived from individual departure probabilities and individual conditional probabilities of choosing potential destinations, are essentially normally distributed. The above-mentioned statistical inferences indicate that two micro-models of migration must be constructed at first before implementing impact analysis on the migratory response of native labor to immigration. The first is the model dealing with the decision to migrate, and the other is the one dealing with destination choice behavior given a native worker decides to move. The first and the second micro-models in migration studies are called "departure model" and "destination choice model," respectively, and have been widely used in a number of studies (e.g., see Clark and Onaka 1985; Kanaroglou and

Ferguson 1996; Liaw 1990; Newbold and Liaw 1995; Pellegrini and Fotheringham 1999, 2002).

The research utilizes a two-level nested logit model based on discrete choice theory (Ben-Akiva and Lerman 1985; McFadden 1974) to formulate individual migration decision, with $P_i(o)$ denoting the probability of worker i departing from origin o and $P_i(d|o)$ representing the probability of i choosing d from the choice set D (the set of all possible destinations). The coefficient vectors of both models are estimated by the maximum likelihood method. The goodness-of-fit for a given specification of model is assessed by the statistic ρ^2 defined as $\rho^2 = 1 - L / L_o$, where L is the maximum loglikelihood of the specification in question and L_o is the maximum loglikelihood of the null model. Note that although this statistic is theoretically bounded between 0 and 1, a value of 0.2 can represent a very good fit (McFadden 1974).

Before conducting immigration impact analysis, a prerequisite is to determine the empirical specification of the preferred departure and destination choice models. The "preferred model" in the study refers to the model in which the estimated coefficients of explanatory variables are not only statistically significant but are also required to be substantively meaningful and consistent with existing theories. Given that the preferred models for departure and destination choice have been properly constructed, if immigration is found to be crucial in explaining both/either models, two steps are taken to assess the extent to which native labor respond to immigration impact. First, the study systematically increases and decreases the level of immigration in the departure and destination model by, e.g., 5%, 10%, 15%, etc., with the remaining explanatory variables being fixed. For each given level of change in immigration, the study then computes the departure probability and destination choice probabilities for each individual in the micro-data. Second, the study computes the expected volumes and rates of out-migration, in-migration, and thus net migration by integrating all individual probabilities of departure and destination choice based on the method of impact analysis mentioned above.

DATA AND SPECIFICATION

Data

The estimation of the models and the exercise of immigration impact analysis described earlier are mainly based on two broad categories of data sources. The first are compiled from the 1996–2000 micro-data of Taiwan Manpower Utilization Surveys (MUSs) that are utilized to control for the effects of individual characteristics. The MUS is a well-established large-scale survey conducted by the Taiwan Census Bureau in May of each year since 1978. Each MUS of 1996–2000, comprising around 60,000 individuals aged 15 and over, records abundant personal information on demographic characteristics, human capital, socioeconomic status, labor market participation and work experience, place of work and residence, labor mobility and job turnover, wage, etc. In contrast to the census data that use a five-year period to record migration, one advantage of using MUSs is that the definition of migration can be based on consecutive years, allowing us to avoid the risk of entailing return migration and multiple moves in a longer period. The MUS datasets are cross-sectional in nature and have been widely used in research undertaken throughout the Taiwanese academic community in general. It is worth emphasizing that in terms of the questionnaire design and sampling framework, MUSs are essentially similar to the U.S. CPS and the Canadian Labor Force Survey (LFS). Therefore, our research results are, to a large extent, internationally comparable. The second are collected from a number of official aggregate statistics ranging from the year of 1995 through 1999 that are used to control for the contexture effects of regional labor market. It is worth stressing that the measured time point of aggregate regional statistics is one year earlier than the micro-data of MUSs, aiming at controlling for the causal effect of labor market conditions preceding the incidence of individual migration and thus at avoiding confounding estimation results. The aggregate statistics of labor market conditions are termed as ecological attributes in the study.

The study adopts prefecture, similar to the U.S. county, as the spatial unit for defining individual migration and measuring ecological attributes (there are 23 prefectures in total, including 21 prefectures and pities, and 2 metropolises; see Figure 5.2). Reasons for utilizing a prefecture-level unit are twofold. One is that the ecological attributes that are theoretically important as controlled variables are only available at the prefecture level, while the other and most important is that each prefecture has its own distinctive labor market feature (e.g. urban, semi-urban, or rural) and that prefecture is the most suitable regional unit that enables us to eliminate most short-distance moves like residential mobility. Thus, an individual is defined as a migrant if her or his prefecture of work at the time of the survey is not identical to that of a year preceding the survey, otherwise as a stayer.

It is worth noting that migration has long been found to be a highly selective process in the sense that migrants are distinctly different from non-migrants in terms of demographic characteristics, human capital, socioeconomic and psychosocial status, etc. (e.g. Model 1997; Rogers 1979; Sjaastad 1962). The selective feature embedded in the migration process was formally noted at first by Thomas (1938) that migration selectivity is the differential responses of demographic structure of population to the spatial variation in utility, say, wage. Thus, as stressed by Greenwood (1975) and Greenwood and Hunt (2003), the study on migration differential, or migration selectivity, is an indispensible step for any migration research.

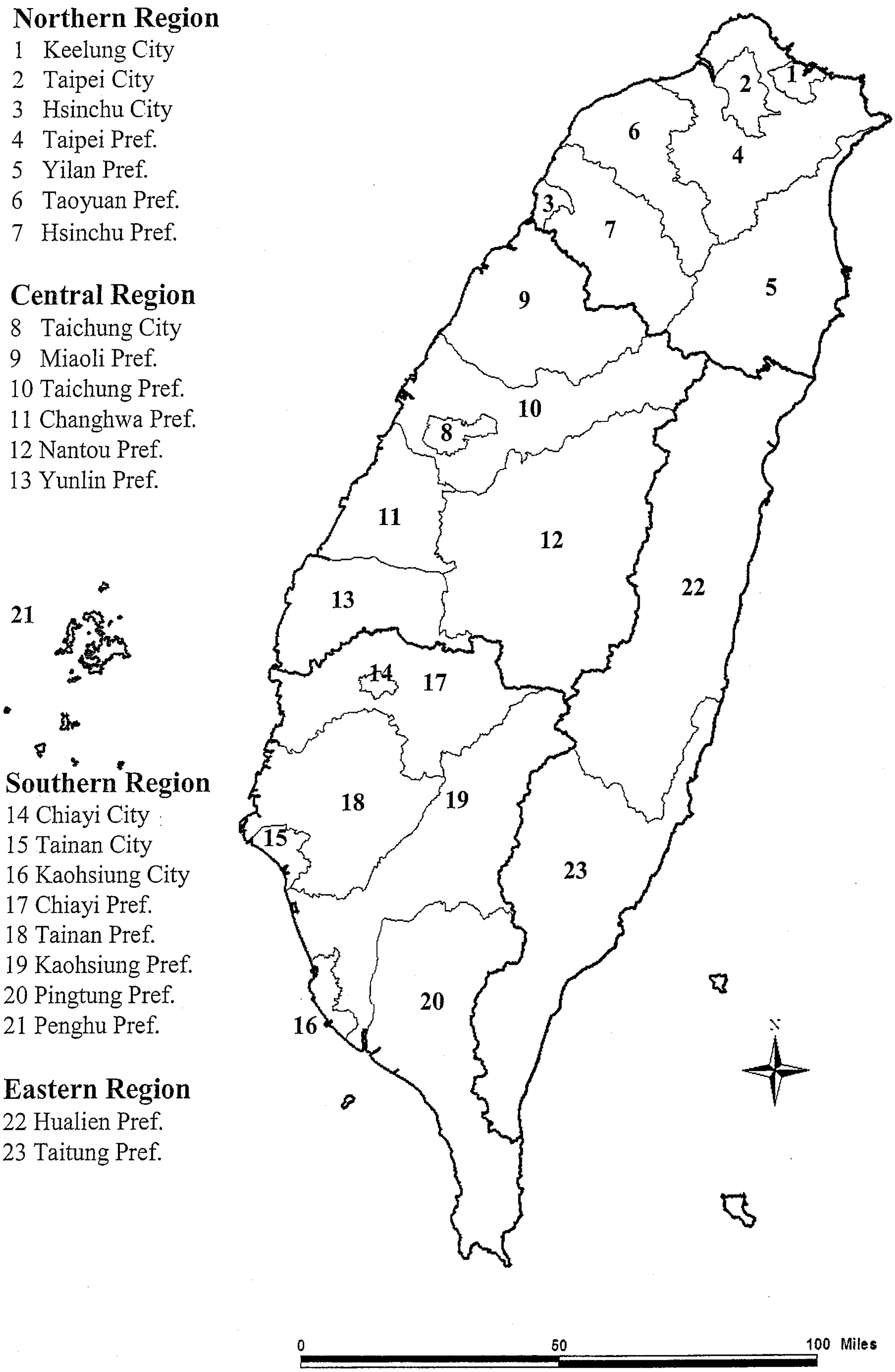

Figure 5.2 Regions and prefectures/cities.

The strategy of adopting a two-level nested logit model to realize the migration process is convenient for research, but the study also recognizes it may be associated with the problems of migration self-selection. The underlying reason is that the potential differences in latent individual characteristics between migrants and stayers may affect the propensity to migrate and that migrants are a self-selected subset of the population who might differ in many respects from those deciding not to migrate. It is thus important to deal with migrant self-selection problem, otherwise we may encounter the problem of biased estimated coefficients generated from, e.g., the idiosyncratic elements of origin and potential destination wage structures (Borjas et al. 1992; Detang-Dessendre et al. 2004; Nakosteen et al. 2008). It is not easy to accommodate this problem for empirical analysis. But as noted by Nakosteen et al. (2008) that migrant selection is by definition a phenomenon that takes place before or concurrent with the process of migration, it is problematic to use postmigration data such as earnings, suggesting that the realistic way to avoid the potential entanglement of migrant selection with labor market outcomes that occur after migration is to abandon postmigration information. As a result, the study avoids using postmigration information in the MUSs micro-data (e.g., individual wage), and the measured time point of ecological attributes must be one year preceding the corresponding MUSs.

Specification

Previous studies of native migratory response to immigration vary to a large extent in the specifications of the populations that respond to in-flows of foreigners. Since the study focuses on the impact associated with low-skilled foreign labor who are recruited by Taiwanese employers, the study recognizes the importance that the native population in study must be restricted to those whose worker status are the same as their foreign counterparts. As a result, the samples applied to the departure model are restricted to native-born individuals aged 16–64 who participate in the civilian labor force, with employers and the self-employed being excluded. Unfortunately, because the MUSs do not record information on the previous place of work for the unemployed and those not in the labor market a year preceding the survey, the study thus excludes both subsets from the MUS samples.

By definition, the qualified observations are further dichotomized into migrants and stayers. Using the variable of workplace a year preceding the survey as linkage variable, each qualified individual regardless of migrant/stayer status in the data of a given survey year is linked with the ecological attributes that are a year preceding the survey. As summarized in Table 5.1, the number of selected samples for research amounts to about 161,000, of which 2,827 individuals are observed to make labor migration. It is worth emphasizing that migration by definition in the study is based on the comparison between concurrent and previous workplace of prefecture,

Table 5.1 Size of Samples Selected from the 1996–2000 MUSs for Study

		Selected Samples		*Excluded Samples*		
Year	*Total Samples*	*Workers*	*Migrant Workers*	*Workers*	*Unemployed*	*Not in the LF*
Pooled 1996–2000	303,033	161,169	(2,827)	2,185	4,036	135,643
1996	60,371	32,264	(631)	806	736	26,565
1997	60,044	32,127	(534)	440	765	26,712
1998	61,142	32,585	(562)	422	733	27,402
1999	60,619	32,225	(551)	225	991	27,178
2000	60,857	31,968	(549)	292	811	27,786

suggesting that most local job-change moves and other types of migration due to residential consideration and schooling are not counted as migrant, and it is not surprising to see a relatively low proportion of migrants in the qualified samples for study. Table 5.2 provides some basic statistics derived from the sample utilized in the study by a few crucial individual characteristics by each year of the MUSs.

Table 5.2 Sample Statistics by Some Selected Variables Derived from the 1996–2000 MUSs

	Stayers			*Migrants*		
Variable	*n*	*mean*	*std. dev.*	*n*	*mean*	*std. dev.*
Pooled 1996–2000 MUSs						
Gender	161,169	1.4	0.5	2,827	1.4	0.5
Age (years)	161,169	38.5	12.0	2,827	30.9	9.0
Marital status	161,169	1.8	0.6	2,827	1.5	0.6
Child-rearing status	161,169	0.2	0.4	2,827	0.1	0.3
Educational level	161,169	5.0	1.8	2,827	5.8	1.6
Monthly wage (thousands NT$)	143,924	33.7	22.6	2,742	30.8	16.1
1996 MUS						
Gender	32,264	1.4	0.5	631	1.4	0.5
Age (years)	32,264	38.3	12.1	631	30.3	9.2
Marital status	32,264	1.8	0.6	631	1.5	0.6
Child-rearing status	32,264	0.2	0.4	631	0.1	0.3
Educational level	32,264	4.9	1.8	631	5.7	1.6

(continued)

Table 5.2 (continued)

Variable	*Stayers*			*Migrants*		
	n	*mean*	*std. dev.*	*n*	*mean*	*std. dev.*
Monthly wage (thousands NT$)	28,775	32.3	21.1	604	29.0	13.0
1997 MUS						
Gender	32,127	1.4	0.5	534	1.4	0.5
Age (years)	32,127	38.4	12.0	534	30.7	8.4
Marital status	32,127	1.8	0.6	534	1.5	0.6
Child-rearing status	32,127	0.2	0.4	534	0.1	0.3
Educational level	32,127	5.0	1.8	534	5.8	1.6
Monthly wage (thousands NT$)	28,648	32.8	21.6	516	30.1	13.3
1998 MUS						
Gender	32,585	1.4	0.5	562	1.4	0.5
Age (years)	32,585	38.5	11.9	562	31.2	9.1
Marital status	32,585	1.8	0.6	562	1.5	0.6
Child-rearing status	32,585	0.2	0.4	562	0.1	0.3
Educational level	32,585	5.1	1.8	562	5.8	1.6
Monthly wage (thousands NT$)	29,223	34.3	23.6	550	31.6	19.1
1999 MUS						
Gender	32,225	1.4	0.5	551	1.3	0.5
Age (years)	32,225	38.6	12.0	551	31.3	8.9
Marital status	32,225	1.8	0.6	551	1.5	0.6
Child-rearing status	32,225	0.2	0.4	551	0.1	0.3
Educational level	32,225	5.1	1.8	551	5.9	1.6
Monthly wage (thousands NT$)	28,601	34.2	24.1	541	31.9	18.1
2000 MUS						
Gender	31,968	1.4	0.5	549	1.3	0.5
Age (years)	31,968	38.7	12.0	549	31.3	9.1
Marital status	31,968	1.8	0.6	549	1.5	0.6
Child-rearing status	31,968	0.2	0.4	549	0.1	0.3
Educational level	31,968	5.2	1.8	549	5.9	1.6
Monthly wage (thousands NT$)	28,677	34.8	22.5	531	31.8	16.2

Notes:
Gender: male=1, female=2;
Marital status: 1=single, 2: married/cohabited; 3:divorced/separated; 4:widowed;
Child-rearing status: 0=no child, 1=with at-least one child;
Education: 1-3=primary schooling or less, 4=junior high, 5-6=senior high, 7=college; 8=university; 9=graduate

The data applied to the destination choice model are labor migrants who, as mentioned above, amount to 2,827 individuals. It is important to stress that in addition to internal migration, emigration is a reasonable alternative for a native-born migrant in response to immigration impact. Because such tremendous immigration impact is barely seen in the real world and our research data do not record information regarding international migration, the study thus does not take emigration into consideration, suggesting the number of potential destinations is 22 when an individual decides to move. The data applied to the destination choice model are constructed by pooling the linked data of each observed migrant's individual characteristics with the ecological attributes one year before migration for each of the 22 potential destinations. Since we must construct 22 records with respect to each potential destination for each observed migrant, the number of records applied to the destination choice model is thus equal to 62,194 (= 22 × 2,827). Moreover, two variables are included in order to control for the effects of migration costs and origin-destination migration barriers. The first is the Euclidean distance between population centers of the origin and a potential destination. The other is the indicator of contiguity, which assumes the value of 1, otherwise 0, if a specific origin and a potential destination share a common border.

The study in particular recognizes the importance regarding the selection of the measurement of key explanatory variables in assessing immigration impact. A number of studies utilize the absolute volume of immigrants within a domestic labor market to assess the extent of immigration impact (e.g., Frey 1996; Walker et al. 1992). However, some scholars like Wright et al. (1997), Card (2001), and Borjas (2006) et al. have questioned the appropriateness of this measurement, because the absolute count of immigrants is highly correlated with the size of the native labor force and the economic scale of the labor market. Thus, the measurement of the quantity of immigrant labor relative to native labor might be a more meaningful measurement. In addition, utilizing only the absolute volume of immigrants without regard to the size of the location could be odd, since it means that, for example, 1,000 foreigners amounting to 2% of a location's population of 50,000 in the departure model are expected to influence native departures in the same way as 1,000 foreigners in a location where they make up 5% of a population of 20,000. It suggests the need to consider the effect of immigration stock relative to that of the native-borns. The share of immigrants to the native-borns has been widely used in many studies to assess immigration impact (e.g., Altonji and Card 1991; Borjas 1987a; Card 1990; Grossman 1982; LaLonde and Topel 1991; Pischke and Velling 1997). In contrast, using immigration share is not without its shortcomings. For example, Card (2001) also notes that given the enormous heterogeneity between immigrants and natives, the share of immigrants in a locality may be too crude an index of immigrant competition for any particular subgroups of natives.

In effect, findings from the existing literature tell us that using either absolute or relative counts of immigrants has its own niches in study. Here the study uses a simple metaphor to highlight that both measurements might be potentially crucial in explaining immigration impact. If we consider the immigration impact on the migratory response of native labor as being analogous to the meteorite impact on the Earth, the scale of impact depends on both the mass and velocity of the meteorite that hits the Earth. Neither a tiny meteorite with surprising high-hitting speed nor a massive meteorite with very low-hitting speed will produce noticeable impact. As such, immigrant volume is analogous to meteorite mass and immigrant volume relative to native labor analogous to the impact speed. As a result, the study takes both immigrant volume and share of low-skilled immigrants to native labor into consideration as major explanatory variables.

The strategy of defining the geographic dimension for the labor market is another crucial dimension of concern for the study on immigration impact. Various studies have figured out that the measured impact of immigration intimately depends on the geographic definition of the labor market (e.g., Borjas 2006; Card 2001; Frey 2005).[2] To distinguish immigration impact, the study not only uses the categories of region and metropolitan area,[3] but also utilizes a category specified by the study is called the foreign labor intensity (FLI) region. The FLI regions are determined by the following steps. First of all, since immigration impact is an outcome of immigration, it is more plausible to use postmigration than premigration data to identify the spatial scale of impact. As a result, the study utilizes the micro-data of the 2000 Taiwan Population Census to classify various types of FLI regions based on the following steps: (1) the study computes the share of total low-skilled foreign labor to the total population of Taiwan μ_{fs}, and the share of low-skilled foreign labor to the population for each of the all 7,728 smallest administrative localities, $\{m_{fs}\}$, called "Chun-Li"; and (2) let σ_{fs} denote the standard deviation of $\{m_{fs}\}$ and $z_{fs} = (m_{fs} - \mu_{fs})/\sigma_{fs}$, the calculated $\mu_{fs} = 0.014$ and $\sigma_{fs} = 0.072$ in the study. A Chun-Li is categorized as low immigration intensity if its $z_{fs} < 0$, as some immigration intensity if $0 < z_{fs} < 1.96$, and as significant immigration intensity if $z_{fs} > 1.96$. Figure 5.3 illustrates the spatial pattern of Chun-Li by the level of z_{fs}.

By excluding the central mountain areas, the study thereafter uses Geographic Information Systems (GIS) to overlay the categorized Chun-Li's with the boundaries of metropolitan areas and prefectures, as demonstrated in Figure 5.3, which suggests that (1) the Taipei metropolitan area in northern Taiwan is characterized by having the highest volume of low-skilled foreign labor and having the highest proportion of Chun-Li's that are categorized as "some" and "significant" immigration intensity within the same

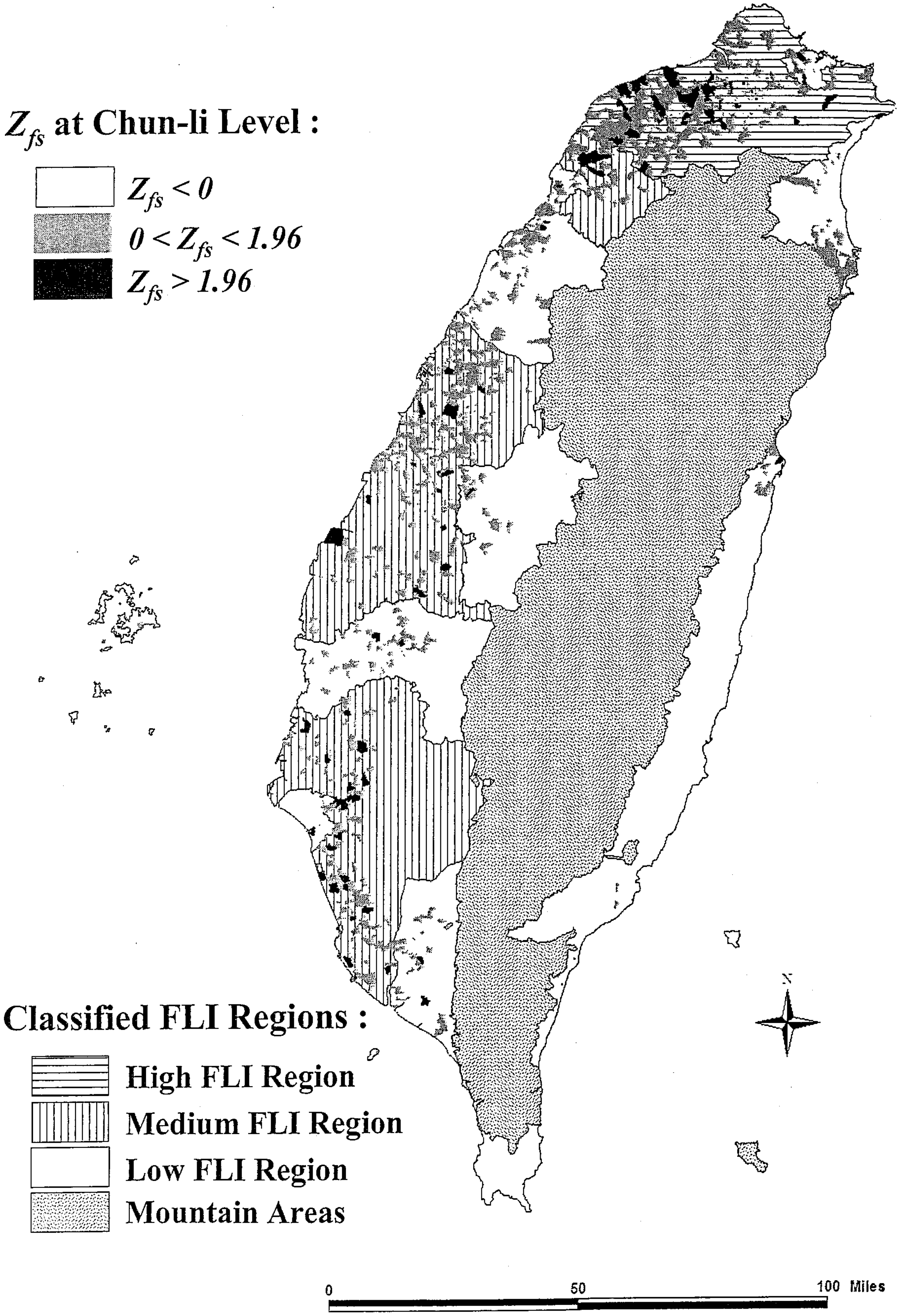

Figure 5.3 Distribution of low-skilled foreign labor relative quantity and classified regions of FLI.

area; and (2) Hsinchu City/Prefecture (known as Taiwan's Silicon Valley in the global information and communication technology [ICT] industry) in northern Taiwan, Taichung, and Kaohsiung metropolitan areas in central and southern Taiwan are classified by having the second highest volume of low-skilled immigrant and the proportion of Chun-Li's with "some" and "significant" immigrant intensity next to that in Taipei metropolitan area. Since the above-mentioned geographic areas can be classified by a prefecture-level unit that is used as a spatial unit of migration, the study consequently uses a prefecture-level unit to divide the domestic labor market of Taiwan into three broad categories: high FLI, medium FLI, and low FLI, as shown by Figure 5.3.[4]

In addition to controlling for the effects associated with the volume and relative quantity of low-skilled foreign labor and the FLI dummies, the study also controls for effects associated with other noteworthy ecological attributes, including population size as proxy for economic scale, population density as proxy for environmental amenity, rate of employment growth and unemployment as employment opportunities, prefectural government expenditure per capita termed as local finance level in the study and household disposable income level as proxy of regional income level, non-agricultural share of total employment as proxy for regional employment structure and urbanization level, and share of housing cost to total household income as proxy of living quality and amenity.

The data used for the estimation of departure model are the 161,169 individual samples in the data for study, while the data used for estimating destination choice model are the 2,827 individuals categorized as labor migrant by definition. The original weights are set at a level that will allow the sum of weights be equal to the size of the population in study. It is worth stressing that while estimating the model, if these weights were directly applied in estimation procedure, the magnitudes of the t-ratio would be artificially inflated, and the resulting statistical significance turns out to be meaningless. To avoid the artificial inflation, it is highly needed to use rescaled sample weights so that their sum is made to be equal to the sample size. In the study, rescaled sample weights are utilized while estimating the departure and destination choice models. For each sample, its rescaled weight Wrs is the original sample weight Ws scaled by a factor of $n / \Sigma Ws$ (i.e., $Wrs = Ws * n / \Sigma Ws$), where n is the sample size for study (161,169), and ΣWs is the sum of all original sample weights in the study data. Note that the sum of all rescaled sample weights is equal to the sample size n. The advantage of applying rescaled sample weight for model estimation is that information regarding original sample weight and sample size can be simultaneously incorporated into model estimation.

FINDINGS

Observed Patterns

Based on the pooled samples selected from the 1996–2000 MUSs, Table 5.3 summarizes the corresponding volumes and rates of out-, in-, and net migration of native labor and relative quantity of low-skilled foreign labor in the domestic market of Taiwan.[5] Taken as a whole, Table 5.3 uses three alternative definitions for the geographic areas encompassed by the labor market: regions, metropolitan areas, and FLI areas. Table 5.3 indicates that the weighted 1996–2000 average number of labor force in study amounts to 9.3 million that are about 95% of Taiwan's total labor force in the comparable period, and that the share of low-skilled foreign labor to native labor is of about 2.9%.

The first panel of Table 5.3 using region (see Figure 5.2) as the labor market indicates that northern region, the largest regional labor market, had the highest share of native labor (48.2%) and the highest share of low-skilled foreign labor within it (3.5%). In comparison with other regions, northern region is not only associated with higher out- and in-migration in terms of volume and rate but also associated with a net loss of native labor. Central and southern regions had a similar labor stock, with the central region having a higher share of low-skilled foreign labor than its southern counterpart. In spite of this, the rates of in-, out-, and net migration for the central regions resembled those observed in the southern region. The eastern region that serves as the marginal labor market had the lowest stock of labor force and the highest rate of net migration.

Using metropolitan areas as the labor market (see Figure 5.4), the second panel of Table 5.3 suggests that in general the share of low-skilled foreign labor within a metropolitan was negatively associated with the net migration rate of the metropolitan area, with the exception of the Hsinchu sub-metropolitan area. The observed pattern in the Hsinchu sub-metro was very noteworthy. The Hsinchu sub-metro has long been known as "Taiwan's Silicon Valley" and is one of the most crucial manufacturing and R&D centers of ICT industries in the world (Rubinstein 2007; Shih et al. 2007). Its stock of labor constituted only 4.0% of the Taiwan total labor force, but the share of low-skilled foreign labor within it was of 5.10%, which was higher than any other metropolitan areas. Moreover, it was also observed to be associated with the highest rate of net migration.

By contrast, the third panel of Table 5.3 presents results by the labor market classified by the level of low-skilled foreign labor intensity (see Figure 5.3). The results suggest that the share of local labor to total labor force and the share of low-skilled foreign labor within a local labor market derived from the labor market classified by the level of FLI are not as varied as those using the scale of either regions or metropolitan areas.

Table 5.3 Relative Quantity of Low-skilled Foreign Labor to Native-born Labor and Internal Migration of Native-born Labor by Region, Metropolitan Area, and Regional Level of FLI: Average in 1996–2000

Labor Market	*Native-born Labor (persons)*[(a)]		*Ratio of Lowskilled Foreign Labor to Native-born Labor (x100)*[(b)]	*Volume of Internal Migrants (persons)*[(a)]			*Rate of Internal Migration (%)*		
	Volume (persons) A	*Share of Labor Market (%)*		*Out-migration* B	*In-migration* C	*Net Migration* C - B	*Out-migration* B / A	*In-migration* C / A	*Net Migration* (C - B)/A
Taiwan Overall	**9,323,407**	**100.00**	**2.92**	**168,512**	**168,512**	**0**	**1.81**	**1.81**	**0.00**
Region[(c)]									
Northern	4,494,140	48.20	3.48	88,325	84,849	-3476	1.97	1.89	-0.08
Central	2,046,010	21.94	2.94	34,833	36,252	1419	1.70	1.77	0.07
Southern	2,578,673	27.66	2.02	42,217	44,113	1896	1.64	1.71	0.07
Eastern	204,583	2.19	1.82	3,137	3,298	161	1.53	1.61	0.08
Metropolitan Area[(d)]									
Taipei MA	3,749,152	40.21	3.38	76,037	71,836	-4201	2.03	1.92	-0.11
Hsinchu Sub-MA	372,222	3.99	5.10	10,184	11,326	1142	2.74	3.04	0.31
Taichung MA	1,084,837	11.64	2.65	23,406	22,759	-647	2.16	2.10	-0.06
Tainan MA	781,605	8.38	2.34	13,359	13,424	65	1.71	1.72	0.01
Kaohsiung MA	1,141,644	12.24	2.07	20,808	20,754	-54	1.82	1.82	0.00
Non-metropolitan areas	2,193,946	23.53	2.56	24,718	28,413	3695	1.13	1.30	0.17
Region by Level of Foreign Labor Intensity (FLI)[(e)]									
High FLI	3,613,819	38.76	3.66	73,272	69,619	-3,653	2.03	1.93	-0.10
Medium FLI	3,040,781	32.61	3.33	45,430	49,844	4,414	1.49	1.64	0.15
Low FLI	2,668,807	28.62	2.08	49,810	49,049	-761	1.87	1.84	-0.03

(a) Compiled from the selected samples in Table 1, with sample weight being applied
(b) Volume of low-skilled Foreign Labor comes from the 1996-2000 Annual Report on Labor Statistics, Ministry of Labor Affairs, Taiwan
(c) see Figure 5.2
(d) see Figure 5.3
(e) see Figure 5.1

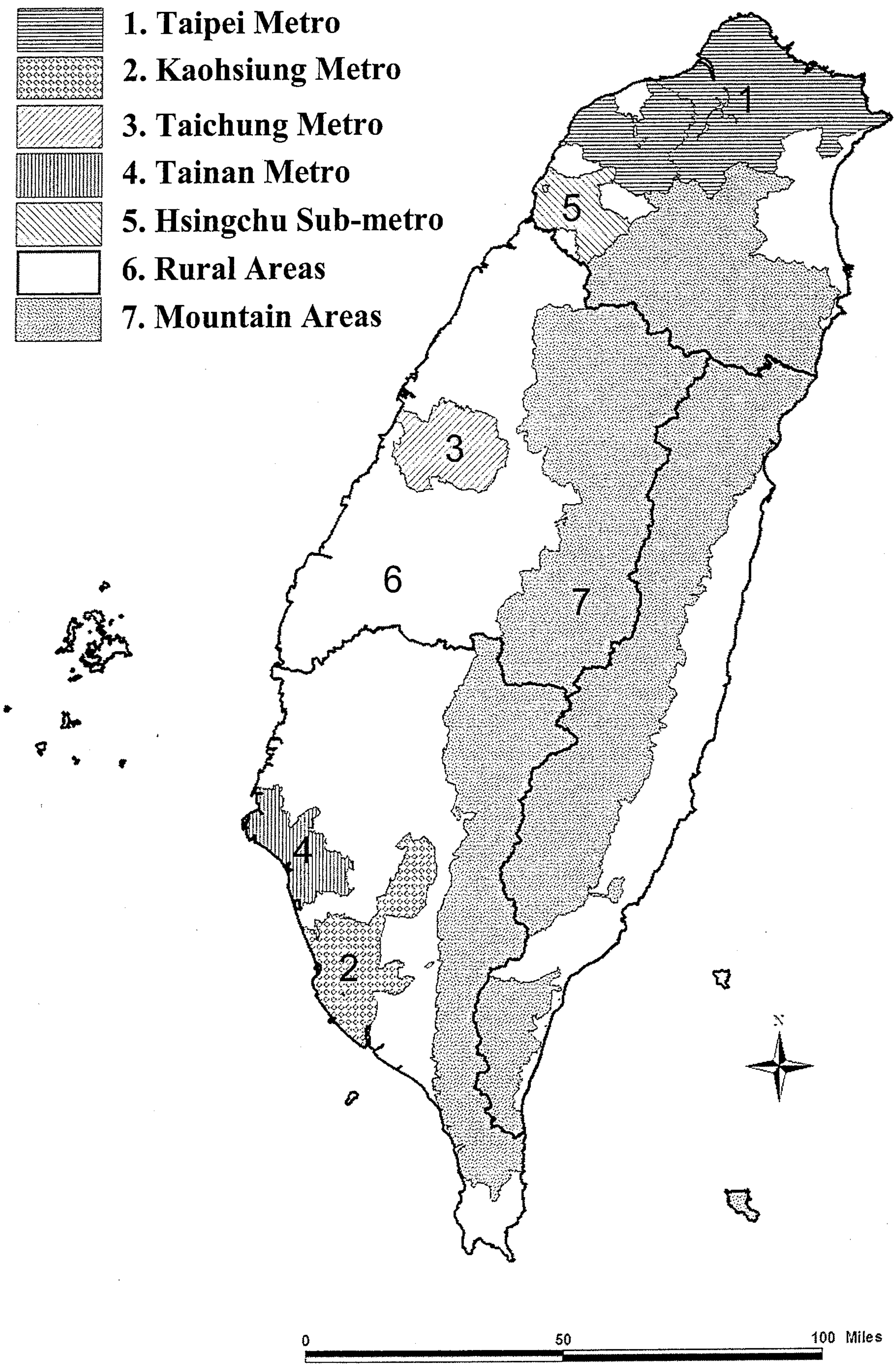

Figure 5.4 Metropolitan areas.

In terms of net migration volume and rate, the high FLI and medium FLI areas had the most noteworthy net loss and net gain of native labor migrants. The net gain of migrants in the medium FLI areas appeared to be at the expense of the net loss of migrants from the high FLI areas, and the observed pattern in the low FLI areas turns out to be minor.

Since low-skilled foreign labor is hypothesized to compete with and/or even substitute for native labor with similar skills, it is thus crucial to examine the migration pattern of native labor by educational level. Table 5.4 demonstrates the observed out-, in-, and net migration of native labor with different education in the labor market classified by the three categories of high, medium, and low FLI areas. In Table 5.4, "less education" refers to those with at most junior high education, "middle

Table 5.4 Internal Migration of Native-born Labor by Level of FLI: Average in 1996–2000

Labor Market	*Native-born Labor (persons)*[(a)]	*Volume of Internal Migrants (persons)*[(a)]			*Rate of Internal Migration (%)*		
	Volume (persons)	*Out-migration*	*In-migration*	*Net Migration*	*Out-migration*	*In-migration*	*Net Migration*
	A	B	C	C - B	B / A	C / A	(C - B) / A
Taiwan Overall	9,323,407	168,512	168,512	0	1.81	1.81	0.00
High FLI Overall(e)	3,613,819	73,272	69,619	-3,653	2.03	1.93	-0.10
Less Education	1,175,379	32,095	28,577	-3,518	2.73	2.43	-0.30
Middle Education	1,269,376	27,298	27,398	100	2.15	2.16	0.01
High Education	1,169,064	13,879	13,644	-235	1.19	1.17	-0.02
Medium FLI Overall	3,040,780	45,431	49,844	4,413	1.49	1.64	0.15
Less Education	1,432,123	14,333	18,433	4,100	1.00	1.29	0.29
Middle Education	1,051,414	18,691	18,621	-70	1.78	1.77	-0.01
High Education	557,243	12,407	12,790	383	2.23	2.30	0.07
Low FLI Overall	2,668,807	49,810	49,049	-761	1.87	1.84	-0.03
Less Education	1,172,136	16,769	16,187	-582	1.43	1.38	-0.05
Middle Education	921,021	19,917	19,887	-30	2.16	2.16	0.00
High Education	575,650	13,124	12,975	-149	2.28	2.25	-0.03

Note: Less eduction: at-most junior high education; middle education: senior high education; high education: at-least college education (a) and (e) , see Table 5.3

education" to those with senior high education, and "high education" to those having at least college education. The results suggest that (1) the observed net loss of migrants in the high FLI area (3,653 in volume and 0.10 in rate) were mostly due to net loss of those with less education (3,518 in volume and 0.30 in rate) , and (2) the observed net gain of migrants in the medium FLI areas (4,413 in volume and 0.15 in rate) were mostly due to the gain from those with less education (4,100 in volume and 0.29 in rate). In sum, although the high FLI areas that serve as the political and socioeconomic heartlands in Taiwan have long been fairly attractive for all nationals in general, the less educated migrants were more prone to make out-migration from the high FLI areas, particularly those with less education.

Estimation Results of Micro-Migration Models

Preferred Departure Model

The estimation of departure model aims at testing the hypothesized pushing effect of low-skilled foreign labor on native labor with similar skill and the hypothesized retention effect on native professionals/managers or native labor with higher education, with a set of crucial factors in theories and substance in explaining departure behavior being controlled. As stressed above, the study avoids using postmigration information such as personal wage in the hope of reducing biased estimation results. Variables of individual characteristics taken into consideration include gender, age, marital status, education, and other variables such as industry, occupation, and firm size that are measured one year before the survey. Attributes of origin include volume of low-skilled foreign labor, share of low-skilled foreign labor to native labor, economic scale, employment structure, income level, and employment opportunities. The study also utilizes a number interaction terms of individual characteristics with origin attributes, hoping to distinguish the differentials of individual response to a given labor market condition of origin. Through a rigorous process of model selection, Table 5.5 presents the estimation results of the preferred departure model.

We present the estimation results irrelevant to low-skilled immigration at first, then turn to discuss results regarding immigration effects. Regarding the effects of individual characteristics, Table 5.5 suggests that males are more migratory than females (0.3404 for the dummy variable *Male*), and the single and the separated (0.3162 for the dummy variable *Single* and 0.5995 for the dummy *Separated*) are more prone to making migration than the married and the widowed natives. The estimated results regarding age and educational effects are very reasonable and fall within theoretical expectation. The estimated coefficients for the variables *Ln(Age)* and *Age* (1.3304 and −0.9682, respectively) suggest that the age pattern of departure probability is convex.[6] The estimated age pattern is consistent with the so-called migration schedule pattern (Rogers 1979). Since the estimated coefficients increase with educational level (0.8888 for college and 1.0774 for university and above), it is also consistent with the well-known educational selectivity of migration in the sense that migration in general is selective of the better educated. In short, the effects of individual characteristics reasonably fall within theoretical expectations, suggesting that individual factors have been properly controlled in the preferred model.

Other individual variables including industry, occupation, job seniority, and firm size that are measured one year before the MUS are all taken into consideration while estimating the departure model. The separate estimated result with respect to each of these variables exhibits reasonable pattern and significant effect. For examples, workers in the tertiary sector are more footloose than those in secondary and primary sectors; professionals and managers are the most migratory sub-group in occupational hierarchy; job seniority exhibits an expected negative effect on the likelihood of departure, and workers of smaller firms are more prone to move than their counterparts working for larger firms. Because these variables are highly related to age and education, the incorporation of the aforementioned variables tend to produce perplexed educational and/or age effects. Since educational selectivity and age pattern of migration are the most fundamental variables to the departure model, they are not included in the preferred departure model.

As for the effects of origin attributes, the estimated results in Table 5.5 indicate that explanatory variables that are used to control for labor market conditions of origin have substantial effects on the departure probability for native labor. As stated above, the study utilizes volume of low-skilled foreign labor and their share to native labor to assess immigration impact of low-skilled foreign labor. It is worth noting that the variable for volume of low-skilled foreign labor and the variable for low-skilled foreign labor share to native labor are found to be highly correlated with respect to population size and local finance level. The variable for population size serves as the proxy variable for origin economic scale and the one for local finance level as the proxy for origin income level. When conducting modeling estimation, some estimation results, although significant, become odd or unreasonable when the aforementioned four highly inter-correlated variables are incorporated simultaneously into the departure model.

In light of the theoretical importance of origin economic scale and income level in accounting for departure decision of the natives and location distribution of foreigners, the study acknowledges that the variables of origin population size and local finance level must have higher priority of being selected into the model than the variables for volume and relative share of low-skilled foreign labor. As a result, we report the estimated results associated with the effects of origin economic scale and income at first.

First of all, the most noteworthy is the effect of origin income. Using the variable of local finance level (NT$10,000 per capita) as the proxy for origin

Table 5.5 Estimation Results of the Most Preferred Departure Model

Explanatory Variables	*Most Preferred Specification* Coefficient	*t-ratio*	*P-value*	*Variable Name*
Constant term	-5.0383	-21.8	< 0.0001	*Const*
I. Personal Characteristics of Native-born Labor				
Gender effect (refe. group : female)				
Male (if Gender = 1)	0.3404	8.6	< 0.0001	*Male*
Marital status effect (refe. group : married/widowed)				
The single (if marital status = 1)	0.3162	6.3	< 0.0001	*Single*
The separated (if marital status = 3)	0.5995	5.6	< 0.0001	*Separated*
Age effect (unit: 10 years of age)				
Ln (Age)	1.3304	3.4	0.0008	*LnAge*
Age	-0.9682	-7.6	< 0.0001	*Age*
Educational effect (refe. group : senior high and below)				
Vocational college (if education = 7)	0.8886	9.8	< 0.0001	*College*
University and graduate (if education >= 8)	1.0774	10.9	< 0.0001	*Univ-Grad*
II. Ecological Attributes of Origin				
Effect of Foreign Labor				
Professional and managerial native-born labor*Low-skilled foreign labor volume	-0.1772	-4.9	< 0.0001	*PMTP-PFor*
Agricultural workers (dummy) *Low-skilled foreign labor volume	0.1162	2.4	0.0162	*AgriFor*
Native-born labor of Taipei Metro *Low-skilled foreign labor volume	0.0966	4.7	< 0.0001	*TPPFor*
Effect of Housing Cost				
Share of housing cost to total household incomes	10.6473	9.1	< 0.0001	*Hus-CostR*
Effect of Income				
Local finance level (unit:10,000 NT$/per person)	-0.0978	-4.1	< 0.0001	*LocalFin*
Primary education and below (dummy) *Local finance level	0.1549	4.4	< 0.0001	*PriLFin*
Junior high education (dummy) *Local finance level	0.1673	6.0	< 0.0001	*JHiLFin*

(continued)

Table 5.5 (continued)

	Most Preferred Specification			
Explanatory Variables	*Coefficient*	*t-ratio*	*P-value*	*Variable Name*
Senior high education (dummy) *Local finance level	0.1783	7.2	< 0.0001	*SHiLFin*
Effect of Economic Scale				
Ln (Population size) (unit: million persons)	-0.2406	-6.1	< 0.0001	*LnPopn*
Effect of Employment Opportunity				
Unemployment rate (unit:%)	0.0789	2.6	0.0102	*UnempR*

Summary Statistics:

1. Number of samples for estimation = 161,169, including 2,827 migrants and 158,342 stayers
2. Loglikelihood: null model = -14,833, most preferred model = -13,990
3. d.f. = 17, Rho-square = 0.0568

income, the negative coefficient for the variable of local finance (–0.0978 for *LocalFin*) and the estimated coefficients for the interaction terms of local finance with various educational levels indicate that the effect of origin income level differs by educational level. Because the sums of its coefficient (–0.0978) with respect to the estimated coefficient for its interaction terms with primary education (0.1549 for *PriLFin*), junior high education (0.1673 for *JHiLFin*), and senior high education (0.1783 for *SHiLFin*) are all positive, the retention effect of origin income is limited to native labor with education of college and above, whereas the less educated native labor are more likely to leave high income areas. These findings are consistent with the observed patterns presented above. In accordance with theoretical expectation, the variable of origin population size as the proxy for origin economic scale exhibits negative effect on departure probability of the natives (–0.2406 for *LnPopn*).

The remaining origin attributes of origin housing costs and unemployment are all associated with substantively meaningful and significant positive effects for the departure process (10.6473 for *HuscostR* and 0.0789 for *UnempR*). In addition, the variable for employment growth and the theoretical inclusive variable derived from the preferred destination choice model are also included in the model for estimation. The estimated coefficients for both variables exhibit the expected effect but are not statistically significant. They are thus excluded from the preferred departure model.

With the most fundamental origin attributes being controlled in the departure model, the study now discusses the estimated results regarding immigration impact. Taken as a whole, probably due to the low proportion of individuals who are classified as labor migrants in the study data, the effects of low-skilled foreign labor are not as prominent as those associated with other explanatory variables. According to the estimated coefficients shown in Table 5.5 for the interaction terms of native professionals and managerial workers and agricultural workers with respect to the variable of low-skilled foreign labor volume (–0.1772 for *PMTPPFor* and 0.1162 for *AgriFor*, respectively), native professionals and managerial workers are significantly associated with less likelihood of making departure, whereas agricultural workers are more likely to depart from areas with a higher level of low-skilled foreign labor. Moreover, it is found that native labor for the Taipei metropolitan area is more likely to make out-migration than native labor outside theTaipei metropolitan area (0.0966 for *TPPFor*).

The estimated coefficients for both variables of the volume and relative share of low-skilled foreign labor are negative but not significant. The model also estimates the coefficients for the interaction terms of manufacturing workers and workers of various occupational skill levels with the variable for low-skilled foreign labor, finding that the estimated coefficients are either substantively meaningful but not significant or at times substantively odd but significant. These results thus are not considered to be included in the preferred departure. Findings from the preferred departed model suggest that the probability of a certain type of low- or less skilled native worker is more subject to the impact of low-skilled immigration, but the estimated results are not significant. This finding is mainly because the explanatory power has already been taken by the variable for the local finance level.

Preferred Destination-choice Model

The major categories of destination attributes taken into consideration to account for the destination choice behavior of native labor migrants include potential destinations' volume of low-skilled foreign labor, share of low-skilled foreign labor to native labor, economic scale, employment structure, income level, employment opportunities, and costs of moving to each potential destination. The study also utilizes a number of interaction terms of migrant individual characteristics with destination attributes to rationalize the destination choice preference of migrants. Through a rigorous process of model selection, the estimation results of the preferred destination choice model are summarized in Table 5.6. It is worth stressing that the estimation results regarding the share of low-skilled foreign labor to native labor and its interactions with migrant characteristics are not included in the preferred model. The main reason is that it is highly correlated with the variable representing destination income level.

Regarding the effect of low-skilled foreign labor, native labor migrants as a whole are less likely to move into destinations with a higher volume of low-skilled foreign labor, as suggested by the negative estimated coefficient for the volume of low-skilled foreign labor in at destination (–0.0420

Table 5.6 Estimation Results of the Most Preferred Destination-choice Model

Explanatory Variables	*Most Preferred Specification* *Coefficient*	*t-ratio*	*P-value*	*Variable Name*
Effect of Foreign Labor				
Volume of low-skilled foreign labor in a potential destination (unit: 10,000 persons)	-0.0420	-1.5	0.0668	*ForNoDest*
Native-born labor migrants choosing to move to Taipei Metro (dummy) *Volume of foreign labor in Taipei Metro	-0.1694	-7.7	< 0.0001	*TPPFor*
Native-born labor migrants in social services (dummy) ****ForNoDest***	-0.1040	-2.8	0.0026	*SclsFor*
Native-born labor migrants in tradtional manufacturing (dummy) *ForNoDest	0.1418	2.6	0.0047	*TradFor*
Native-born labor migrants with at-least college education (dummy) **ForNoDest*	0.0576	2.0	0.0228	CUGFor
Effect of Migration Costs				
Ln(Distance between Origin and a specific potential destination; unit: kilometer)	-0.9172	-28.8	< 0.0001	*LnDist*
Native-born labor migrants with at-least university education (dummny) ****LnDist***	0.3416	6.9	< 0.0001	*UnivDist*
Contiguity indicator between origin and a specific potential destination (dummy)	0.4100	5.6	< 0.0001	*ContInd*
Effect of Regional Economic Scale				
Ln (Population size in a specific potential destination; unit: million persons)	0.7324	14.3	< 0.0001	*LnPopn*
Effect of Regional Employment Stucture				
Share of the labor force not in the primary sector for a specific potential destination (unit: %)	4.4534	9.2	< 0.0001	*NonAgriR*
Native-born agricultural migrant worker (dummy) ****NonAgriR***	-13.4138	-11.3	< 0.0001	*AgrNAgr*
Native-born manufacturing migrant worker (dummy) ****NonAgriR***	-4.3351	-4.0	< 0.0001	*ManuNAgr*
Native-born construction migrant worker (dummy) ****NonAgriR***	-3.7075	-3.7	0.0001	*ConsNAgr*

(continued)

Table 5.6 (continued)

Explanatory Variables	Most Preferred Specification			Variable Name
	Coefficient	*t-ratio*	*P-value*	
Native-born migrant workwer in persoanl/social service (dummy) **NonAgriR*	-2.2395	-3.1	0.0010	*SclsNAgr*
Effect of Regional Income Level				
Native-born migrant worker with college education (dummy) *local finance level per capita for a specific potential destination	0.1249	3.1	0.0010	*ColLFin*
Native-born migrant worker with at-least university education (dummy) *local finance level per capita for a specific potential destination	0.2022	4.6	< 0.0001	*UniLFin*
Effect of Employment Opportunity				
Unemployment rate of a specific potential destination (unit: %)	-0.0759	-1.5	0.0668	*UnempR*
Native-born migrant worker searching for job search via government agency(dummy)* employment growth rate of a specific potential destination (unit: %)	0.0785	3.5	0.0002	*AdsEmpG*

Summary Statistics:
1. No. of native-born migrants = 2,827; No. of potential destinations for each migrants = 22
2. Log-likelihood of the null model = -7,625; Log-likelihood of the most preferred model = -5,630; d.f. = 18
3. Rho-square = 0.2617

for *ForNoDest*). It thus lends support to the hypothesized discouraging effect of immigration on the destination choice for native labor migrants. Moreover, the associated discouraging effect becomes further intensified in the Taipei metropolitan area, as indicated by the negative estimated coefficient (–0.1694) for the variable of *TPPFor* (Taipei Prefecture**ForNoDest*). However, native migrants with higher education are more capable of overcoming the discouraging effect associated with foreign labor volume than migrants with less education, as suggested by the positive estimated coefficient of the interaction term of migrants with at least a college education with foreign labor volume (0.0576 for *CUGFor*). However, it lends support to the attractive effect of low-skilled immigration on the in-migration of native migrants with higher educations.

Because a substantial proportion of low-skilled foreign labor is employed in manufacturing and social/personal services, it is reasonable to hypothesize that immigration impact is expected to be particularly significant for native labor in these industries. However, the findings in Table 5.6 do not fully support this hypothesis. The estimated coefficient for the interaction term of migrants in traditional manufacturing with low-skilled foreign labor volume has a positive coefficient (0.1418 for *TradFor*), suggesting that low-skilled foreign labor does not discourage in-migration of native labor in the traditional manufacturing industry. On the contrary, native migrants in the social and personal service industry are less prone to choosing destinations with a high volume of low-skilled labor (–0.1040 for *SclsFor*), lending support to the discouraging effect of low-skilled immigration on the in-migration likelihood of native workers in the social and personal service industry, mostly native servants providing elementary personal services like housekeeping, nursing care, etc.

In addition to the effects associated with low-skilled foreign labor, the most noteworthy are variables representing migration costs. As expected, the estimated coefficient for the logarithm of moving distance is not only negative (–0.9172 for *LnDist*), but it is also associated with a very significant t-ratio (–28.8). Besides, the estimated coefficient for contiguity is positive (0.4100), and the better-educated migrants are less subject to migration constraints (0.3416 for *UnivDist*). Another crucial variable in explaining destination choice is the economic scale of destination (*LnPopn*). As expected, the estimated coefficient is not only positive, but it is also very significant.

The model utilizes the variable of the share of the labor force not in the primary sector (*NonAgriR*) as the proxy variable to control for the effect of destination employment structure and urbanization level. The estimation results in Table 5.6 indicate that it is not only associated with a significant positive effect for the destination choice of migrant in general (4.4534 for *NonAgriR*, with a t-ratio of 9.2), but it also exhibits the differential effects in selecting migrants from different economic sectors, as suggested by the negative value (–8.9604) of the sum of its estimated coefficient (4.4534) with the coefficient for its interaction with agricultural migrant workers (–13.4138), and the sum of its coefficient with respect to the coefficient for its interaction with migrant workers in the manufacturing (*ManuNAgr*), construction (*ConsNAgr*), and social/personal service (*SclsNAgr*) industries (0.1184, 0.7459, and 2.2139, respectively).

The remaining crucial factors in the preferred model are income level and employment opportunity at destination. The model uses local finance level per capita as the proxy variable for the level of destination income. In accordance with theoretical expectation, the positive destination income effect increases with the educational level of migrants, as suggested by the estimated coefficients for its interaction with college-educated migrants (0.1249 for *ColLFin*) and university-educated migrants (0.2022 for *UniLFin*). In terms of the effects associated with destination employment opportunity, the unemployment rate at destination exhibits the expected negative effect, and labor migrants searching for a job through the assistance of a government agency are more prone to move to destinations with higher employment growth.

Aggregate Outcomes of Immigration Impact Analysis

This subsection demonstrates the extent to which native labor responds to low-skilled immigration derived from the aggregate outcomes of immigration impact analysis that uses the domestic labor market encompassed by the three categories of FLI areas. Based on the estimation results of the preferred departure and destination choice models, we calculate the individual probability of making migration and the conditional individual probabilities of choosing potential destinations for each sample in the data for study. After that, we thus compute the probability of moving to a specific destination for each sample in the data. The expected volumes for out-, in-, and thus net migration are thus derived by aggregating all individual probabilities of making migration and all individual probabilities of moving to a specific destination from all samples in the data.[7] To assess the extent to which native labor responds to a specific level of low-skilled foreign labor, the study at first rescales the volume of low-skilled foreign labor by a fixed factor, with the remaining explanatory variables in both micro-models of migration being held constant, then computes the resulting volumes and rates of out-, in-, and net migration of native labor.

Table 5.7 Migratory Responses of Native-born Labor to Changing Levels of Low-skilled Foreign Labor

Percentage Change in Low-skilled Foreign Labor Volume (%)	*Out-migration Rate (%)*			*In-migration Rate (%)*			*Net Migration Rate (%)*		
	High FLI (O1)	*Med FLI (O2)*	*Low FLI (O3)*	*High FLI (I1)*	*Med FLI (I2)*	*Low FLI (I3)*	*High FLI (I1)-(O1)*	*Med FLI (I2)-(O2)*	*Low FLI (I3)-(O3)*
-80	2.2282	1.5891	1.8916	2.1737	1.6392	1.7236	-0.0545	0.0501	-0.1680
-70	2.2015	1.5735	1.8916	2.1406	1.6392	1.7375	-0.0610	0.0657	-0.1541
-60	2.1744	1.5650	1.8880	2.1070	1.6407	1.7444	-0.0674	0.0757	-0.1436
-50	2.1492	1.5508	1.8844	2.0754	1.6436	1.7686	-0.0739	0.0928	-0.1158
-40	2.1231	1.5380	1.8808	2.0437	1.6407	1.7756	-0.0794	0.1026	-0.1052
-30	2.0985	1.5281	1.8808	2.0136	1.6421	1.7963	-0.0849	0.1140	-0.0845
-20	2.0748	1.5139	1.8664	1.9839	1.6392	1.8102	-0.0909	0.1253	-0.0562
-10	2.0507	1.5040	1.8664	1.9547	1.6421	1.8240	-0.0960	0.1381	-0.0424
0	2.0276	1.4941	1.8664	1.9265	1.6392	1.8379	-0.1011	0.1451	-0.0285
+10	2.0049	1.4799	1.8628	1.8992	1.6362	1.8517	-0.1057	0.1564	-0.0111
+20	1.9833	1.4685	1.8556	1.8715	1.6318	1.8690	-0.1118	0.1633	0.0134
+30	1.9617	1.4557	1.8520	1.8452	1.6289	1.8794	-0.1165	0.1731	0.0274
+40	1.9406	1.4472	1.8448	1.8204	1.6274	1.8898	-0.1202	0.1802	0.0450
+50	1.9209	1.4345	1.8412	1.7965	1.6245	1.9036	-0.1244	0.1900	0.0625
+60	1.9008	1.4245	1.8376	1.7722	1.6171	1.9140	-0.1286	0.1926	0.0765
+70	1.8812	1.4132	1.8376	1.7493	1.6156	1.9313	-0.1319	0.2024	0.0938
+80	1.8626	1.4033	1.8267	1.7270	1.6112	1.9417	-0.1357	0.2080	0.1150

In order to manifest the dynamic features of the migratory response of native labor to low-skilled foreign labor, the study conducts a series of simulation scenarios by systematically decreasing and increasing low-skilled foreign labor volume by 10%, 20%, 30%, 40%, 50%, 60%, 70%, and 80%, respectively. Based on the results of various simulation scenarios, the research then examines and compare how in-, out-, and net migrations of native labor change with different levels of low-skilled immigration. The detailed aggregate results of all simulation scenarios are summarized in Table 5.7. The study uses Figure 5.5.1, 5.5.2, and 5.5.3 to illustrate how native labor in the three categories of FLI areas respond to different levels of low-skilled foreign labor with respect to the rate of out-, in-, and net migration, respectively.

As demonstrated by Figure 5.5.1, the aggregate out-migration rate of native labor is negatively associated with low-skilled immigration volume for the high, medium, and low FLI areas. It is worth stressing that increasing immigration volume in the study shows no evidence of impact on lifting the out-migration of native labor. The negative association of low-skilled immigration on out-migration is mainly because the retention effect of low-skilled foreign labor on professional and managerial native labor outweighs

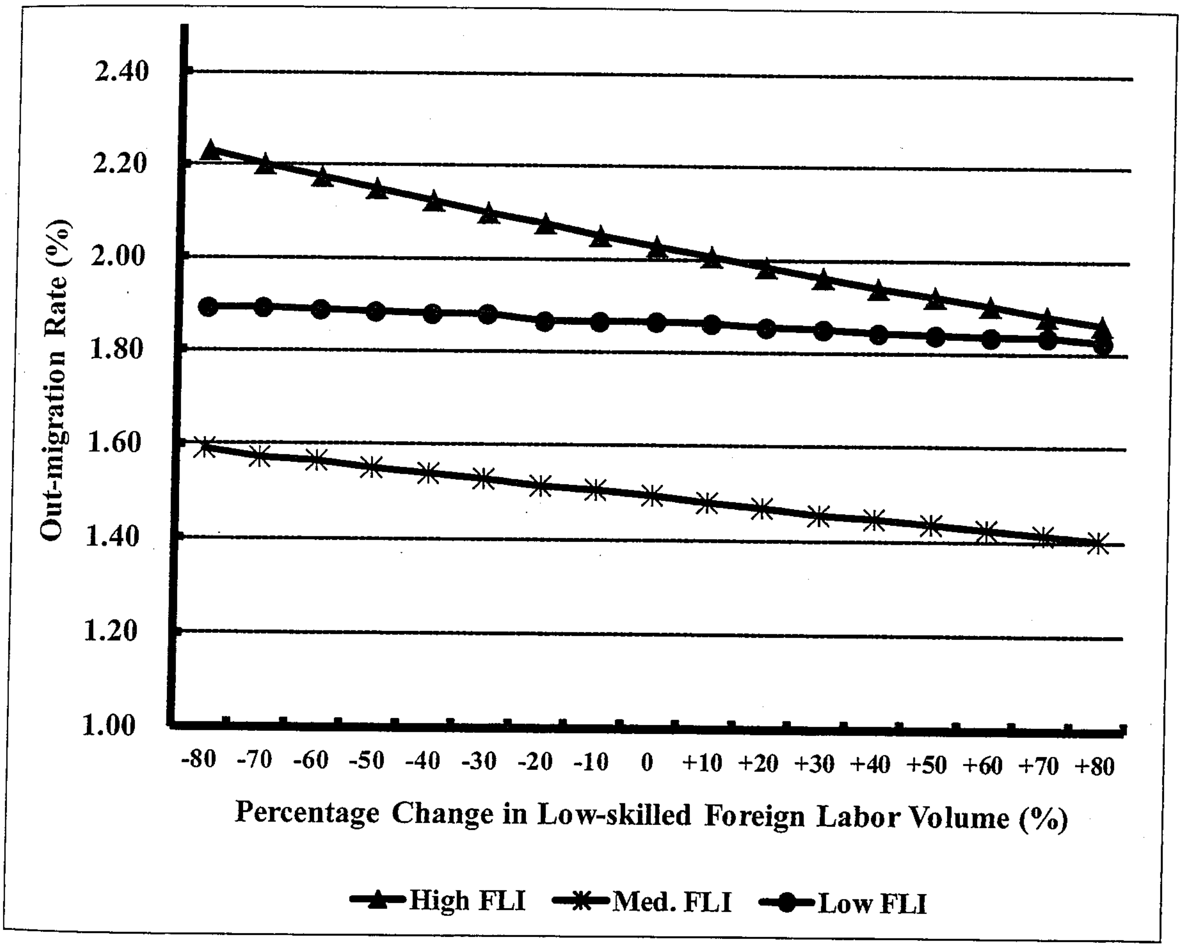

Figure 5.5.1 Immigration impact on the out-migration rate of native-born labor.
Source: see Table 5.7.

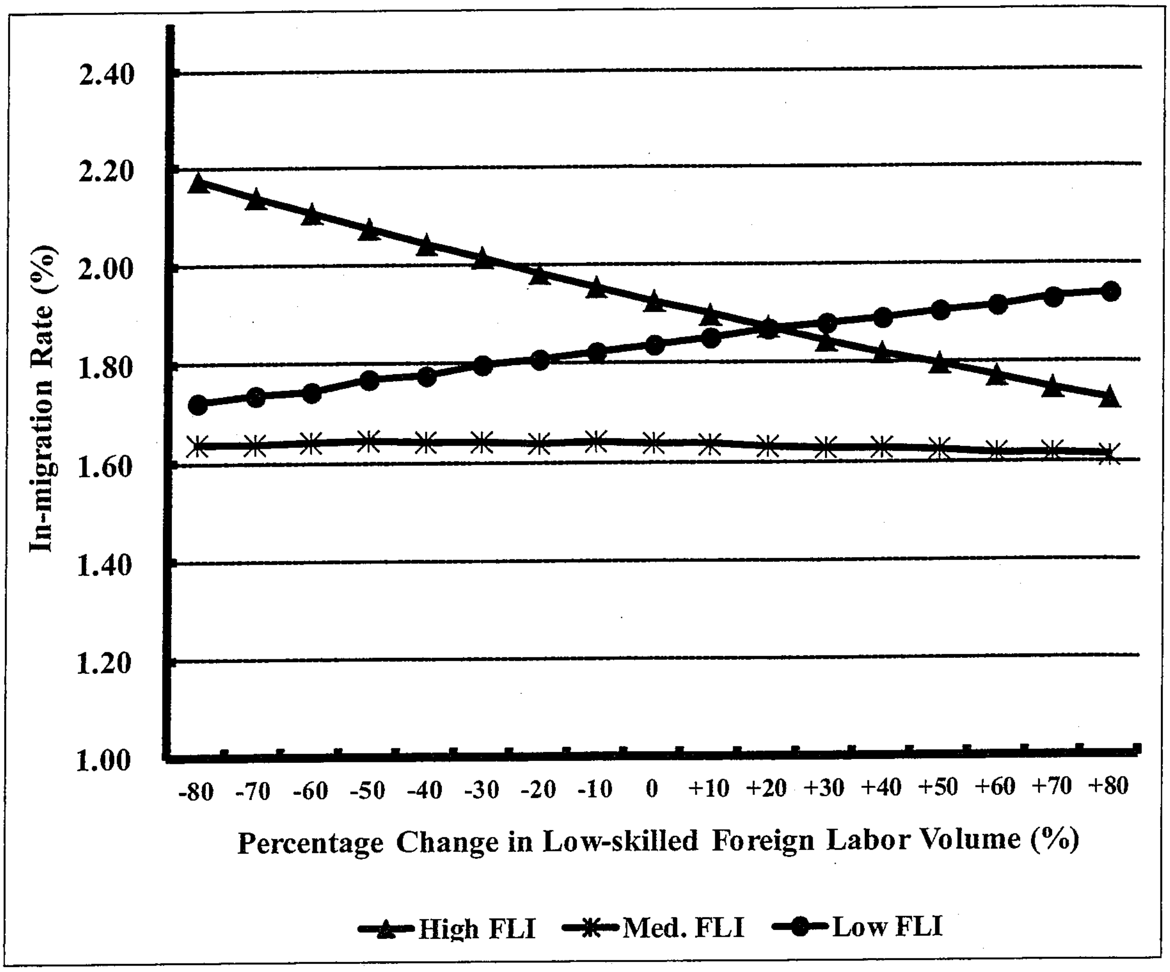

Figure 5.5.2 Immigration impact on the in-migration rate of native-born labor.
Source: see Table 5.7.

the associated pushing effect on low-skilled native workers in the departure process. In addition, although the preferred departure model does not exhibit a distinct effect of immigration for different FLI areas, the simulation results reveal a phenomenon that the aggregate negative association of low-skilled immigration on out-migration is more remarkable in the high and medium FLI areas, but it turns out to be minor in the low FLI areas. For examples, an increase of 10% of low-skilled foreign labor averagely leads to about 0.0228% decrease in out-migration rate for the high FLI areas, about 0.0116% decrease for the medium FLI areas, but only 0.0041% decrease for the low FLI areas.

Regarding the impact on the in-migration rate of native labor, Figure 5.5.2 illustrates that the aggregate in-migration rate of native labor is negatively and positively associated with low-skilled immigration volume for the high and low FLI areas, respectively. The most noticeable is that low-skilled immigration exhibits nearly no impact for the medium FLI areas. For example, an increase of the low-skilled immigration volume by 10% on average results in about 0.0279% decrease in the in-migration rate for the high FLI areas, about 0.0136% increase in in-migration for the low

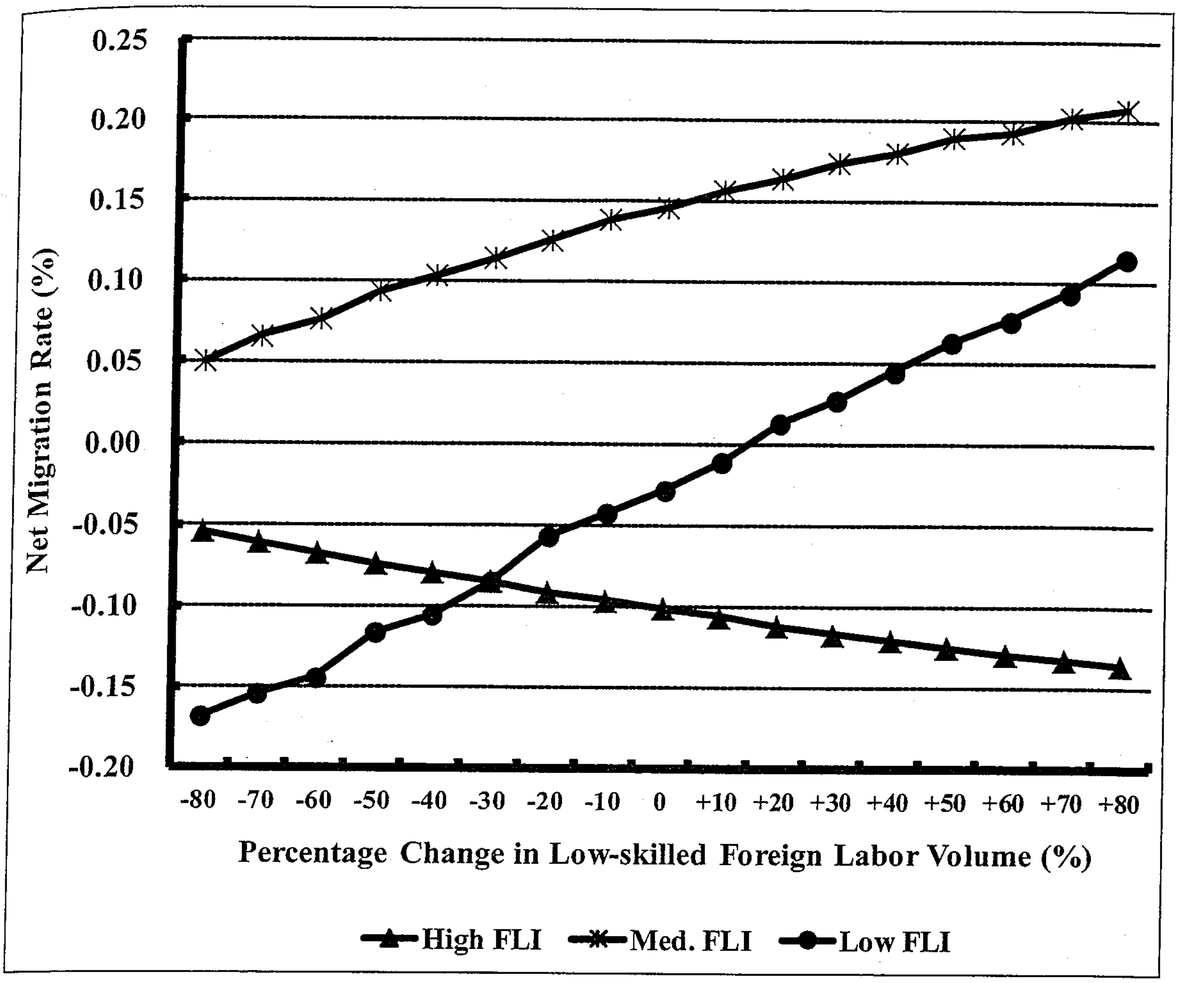

Figure 5.5.3 Immigration impact on the net migration rate of native-born labor.
Source: see Table 5.7.

FLI areas, but only 0.0017% decrease in in-migration for the medium FLI areas. In essence, the above pattern of impact is intimately related to the joint estimation results from the departure and destination choice models, particularly the results from the destination choice model, which suggests the low-skilled immigration volume exhibits an overall discouraging effect in the destination choice process for native labor migrants, and the corresponding discouraging effect is particularly salient in Taipei metropolitan area.

The overall impact of low-skilled immigration on the net migration rate of native labor is demonstrated by Figure 5.5.3, which is derived from the results of immigration impact on out-migration and in-migration. Figure 5.5.3 suggests that the overall immigration impact on the net migration of native labor is quite different for the high FLI areas and for the medium and low FLI areas: the aggregate net migration rate of native labor is positively associated with low-skilled immigration volume for the medium and low FLI areas but negatively associated with low-skilled immigration volume for the high FLI areas. Taken as a whole, it is found that an increase of 10% in low-skilled immigration volume on average will lead to about 0.0177%

and 0.0099% increase in net migration rate for the low and medium FLI areas, respectively, but about 0.005% decrease in net migration rate for the high FLI areas.

CONCLUSION

Based on various sources of datasets and the proposed method, the study has assessed the hypothesized effects of immigration on the redistribution of domestic manpower. Taken as a whole, research findings suggest that low-skilled immigration into Taiwan does influence the internal migration of native labor and the redistribution of domestic manpower. The research at first examines the observed patterns of internal migration, which show that areas with high concentration of low-skilled immigration were associated with a net loss of native labor, mostly the natives with less education, whereas areas with less concentrated low-skilled immigration were internal migration gainers that seemed at the expense of the net loss from high immigration concentration areas.

Findings from the departure model lend support to the retention effect of low-skilled immigration for native professionals and managers, whereas it only shows signs but insignificant pushing effect for native low-skilled labor; low-skilled immigration as a whole had a discouraging effect for all native labor migrants, and this discouraging effect was further intensified in the Taipei metropolitan area. Findings from the destination choice model also support the attractive effect of low-skilled immigration on the in-migration of native migrants with higher educations. The research does not find support that low-skilled foreign labor discourages in-migration of native labor in the traditional manufacturing industry, whereas a significant discouraging effect was found on in-migration likelihood of native workers in the industry of social and personal service who were mostly native servants providing elementary personal services such as housekeeping and nursing care.

The results of immigration impact analysis help illuminate the dynamic relationship between domestic manpower redistribution and immigration. Findings of immigration impact on native net migration are consistent with the conventional way of what we have been used to thinking about, but the underlying mechanisms derived from findings of immigration impact analysis tell us a story that is somewhat different from the conventional wisdom about immigration impact on native migratory responses. It looks plausible as a whole to find a negative association between the net migration of the native-borns and low-skilled immigration for the high FLI areas and a corresponding positive association for the low and medium FLI areas. In light of findings suggested by immigration impact analysis, it is worth emphasizing that for the high FLI areas, the positive association between immigration level and net migration of native labor is not produced by the pushing effect of immigrants on native labor; rather it mainly resulted from the negative impact of immigration on the in-migration that outweighs the corresponding negative impact on out-migration for native labor. On the contrary, the strong positive association between the net migration and immigration for the low FLI areas is mainly shaped by the positive immigration impact on in-migration and the negative immigration impact on out-migration, and the corresponding positive association for the medium FLI areas is the result of a fixed level of in-migration irrelevant to immigration impact and the negative immigration impact on out-migration.

In the end, although we observe a similar pattern of "flights" of native labor, mostly native migrants with less education, from major immigration "port of entry" on both sides of Taiwan and the United States, the underlying forces shaping immigration impact are somewhat different on both settings. For Taiwan, immigration tends to have more impact on native destination choice than on departure decision, which is different from the findings in the United States. In effect, immigration impact analysis regarding the impact on the net migration of native labor suggests "flights" of native labor are caused by immigration "pushes." But by jointly examining both impacts of immigration on native out-migration and in-migration, the research finds this is not the case in Taiwan. The observed native "flights" from high immigration concentration areas essentially are not mainly triggered by immigration pushing force; instead it mainly resulted from the negative impact of immigration on the in-migration, which outweighs the corresponding negative impact on out-migration for native labor.

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NOTES

1. N_i^g varies in magnitude with source of data. For example, N_i^g is equal to 1 if research data are the raw data of census, while N_i^g represents the weight of an individual respondent in a survey data. Another example is that N_i^g may represent the number of records for a sample of housing units with information on the characteristics of each unit and each person in it in the U.S. PUMS files.
2. For example, Borjas (2006) finds the so-called mirror-image patterns of immigration impact in the sense that as one expands labor market size, the

wage impact of immigration becomes larger, but on the other hand, the corresponding impact on native migration rate becomes smaller.

3. There are four officially defined categories of region, including northern, central, southern, and eastern. Taiwan's regions are legal administrative divisions (see Figure 5.2) similar to the U.S. census divisions. Originally defined by Taiwan's Directorate-General of Budget, Accounting, and Statistics (DGBAS) following the framework proposed by Speare et al. (1988), the metropolitan areas in the study are geographic entities that essentially resemble the United States' metropolitan statistical areas (MSAs) in definition. The main metropolitan areas by the order of scale are Taipei, Kaohsiung, Taichung, Tainan, and Hsinchu (see Figure 5.4)
4. With mountain areas being excluded, the high FLI area comprises Taipei City, Taipei Prefecture, and Taoyuan Prefecture; the medium FLI area consists of Taichung City, Taichung Prefecture, Changhwa Prefecture, Tainan Prefecture, Kaohsiung City, Kaohsiung Prefecture, Yunlin Prefecture, and Hsinchu City/Prefecture; and the low FLI area is the remaining prefectures (see Figure 5.3).
5. The sum of all sample weights for a specific year of MUS is equal to the number of population aged 15 and above. Since the samples for study (161,169) mentioned in "DATA AND SPECIFICATION" are selected and pooled from the 1996–2000 MUSs, the weight of each observation in the selected samples for study is thus scaled by a factor of one-fifth. The rescaled sample weights are utilized to derive the observed migration patterns of native labor. As a result, the presented figures in Tables 5.1–5.4 represent the average over the period of 1996–2000.
6. To allow for testing non-monotonic effect associated with an explanatory variable x, the study adopts the form $f(x) = a^*Ln(x) + b^*x$, where a and b are coefficients associated with $Ln(x)$ and x, respectively. The shapes of this function are much more flexible than those of the commonly used quadratic function. The qualitative properties of this function are as follows. First, if either a or b is zero with the other being non-zero, the effect of x is either positive or negative, depending on the sign of the non-zero parameter. Second, the effect of x is positive if both a and b are positive, whereas the effect of x is negative if both a and b are negative. Third, the effect of x becomes convex if $a > 0$ and $b < 0$ and concave if $a < 0$ and $b > 0$. Graphically, the exponential of $a^*Ln(x) + b^*x$ resembles a Gamma function.
7. The immigration impact analysis mentioned in "METHODOLOGY" is implemented by a set of complex Gauss programs developed by the author. Along with the aggregates of all individual expected probabilities of migration and all individual probabilities of choosing potential destinations, all relevant statistics derived in "METHODOLOGY" are also computed simultaneously while conducting the analyses. For the sake of simplicity, they are not presented in the study.

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