

“As soon as questions of will or decision or reason or choice of action arise, human science is at a loss.” – Noam Chomsky

Immigrant Retention in New Brunswick: an Analysis Using Administrative Data

by

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ABSTRACT

This paper examines immigrant retention using data contained in the New Brunswick (NB) Citizen Database also known as the Medicare Registry. To date, researchers studying immigrant retention in Canada have had only a few options for suitable data, and each data source is characterized by limitations in the collection process. These constraints limit the conclusions that can be drawn from these data sets. However, by demonstrating the utility and feasibility of an independent data source we are able to add new results to the existing literature. The outcome is an improved understanding of the factors underpinning immigrant retention in the host region and an assessment of the robustness of published results based on data from alternate sources. The principal objective of the paper is to improve current understanding of secondary migration patterns of NB residents. A positive outcome would be an increase in retention rates among vulnerable immigrant and refugee populations.

DEDICATION

I would like to dedicate this report to my wife (Lauren), my parents (Allen and Jean), my father in law (Chris), and my mother in law (Jean) for their advice, support, and encouragement.

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Introduction and Literature Review

With its relatively older population distribution and declining traditional industries in many (especially rural) areas, the Government of New Brunswick (GNB) has invested significant resources and effort to attract and retain immigrants and refugees NB. The objective of the Government's strategy is to increase the working-age population in the province and grow the economy. Given the fiscal challenges facing NB, developing a cost-effective approach to achieve these goals is vital, but evaluation is hampered by a lack of timely and accessible data. The main challenge facing NB, as well as the other Atlantic Provinces, is that new immigrants overwhelmingly choose to live in Canada's larger cities. According to a 2017 publication by the Atlantic Provinces Economic Council (APEC) only 8300 people immigrated to one of the four Atlantic Provinces in 2015 (APEC 2017). An additional challenge faced by smaller provinces like NB is that they have difficulty retaining the immigrants who do arrive. Some estimates find that the five-year retention rate for the Atlantic Provinces is approximately 50% (APEC 2017).

Evaluating retention using administrative healthcare data as an alternative data source to income tax records, landing records and other federal databases; provides timely and important information to provincial government policy makers. Additionally, this data source adds to the robustness of retention estimates across multiple distinct data sources. As policies aimed at increasing immigration and retention in the Atlantic Provinces and the country as a whole are introduced (such as the recently initiated

Atlantic Growth Strategy with its focus on skilled workforce/immigration, ACOA, 2017), the need for timely data to evaluate program success is crucial.¹

The Citizen Database (Medicare Registry) is one example of administrative healthcare data that offers a number of advantages. Importantly, the Medicare Registry captures everyone in NB who is enrolled in the province's universal health insurance program (Medicare). The vast majority of the population is enrolled and only certain narrowly defined groups, such as on-base military personnel and some categories of temporary residents, are excluded.² Termination or non-renewal of Medicare registration can be assumed to signify that the individual no longer resides in the province.

By examining retention rates with respect to citizenship status this study seeks to identify characteristics that correlate with migration patterns of the native-born, immigrant, and refugee populations in NB. Identifying differences in the migration patterns of these groups is an important part of developing informed public policy on immigration. Understanding these patterns will help set the priorities of immigration policy to improve the recruiting of immigrant populations with an increased likelihood of

¹ The most recent immigration action plan released by the Federal Government sets immigration levels for 2018-2020 that are the highest in recent history. See: https://www.canada.ca/en/immigration-refugees-citizenship/news/2017/11/news_release_growingcanadaseconomicfuture.html.

² Unlike the Census of Canada which records everyone present in a particular location as of the Census date, the Medicare Registry only captures individuals who have actually settled in NB for at least some period of time, as indicated by their registration in the Medicare system.

remaining in the province, particularly for immigrants admitted under special programs.³ Additionally, identifying immigrant and refugee groups vulnerable to onward migration, policy can provide the social support required to improve retention rates. This study benchmarks immigrant and refugee migration rates against native-born interprovincial migration rates, placing the retention rates in a context often lacking in the existing literature.

Migration Modeling

Migration models are developed to express complex, real-world processes mathematically. These models attempt to understand how different characteristics influence migration decisions and/or to ascertain the economic and social consequences of migration at the personal and regional levels. In general, economic migration models contend that spatial variations in utility (preferences) compel individuals to migrate, assuming that the migration is voluntary (Greenwood, 2005).

According to Greenwood (2005), migration models historically take one of two broad theoretical perspectives. The first is the disequilibrium perspective in which migration is driven by spatial differences in wages or income. In economic terms, utility maximizing agents are motivated to migrate to realize the differences in real wages based on a set of individual preferences. The second approach is the equilibrium perspective, which contends that spatial differences in wages are compensating and provide no

³ For example, the Federal Government recently initiated an Atlantic Growth Strategy with a focus on skilled workforce/immigration (ACOA, 2017).

motivation to migrate. Both approaches rely on the assumption that a spatial variation in utility exists and that individuals exhibit utility maximizing behavior. The distinguishing feature between the approaches is the source of variation in utility. The disequilibrium perspective assumes migration is conditional on wage and rent differences and the equilibrium perspective contends that migration is a result of location specific amenities such as: climate, environmental quality, transportation infrastructure and access to consumer goods and services (Greenwood, 2005).

Empirical models attempt to determine the relative importance of factors considered relevant to the decision to migrate. The propensity for migration as a function of age, education, source country, and marital status are a few examples of common demographic determinants. Beyond demographic characteristics, models often incorporate geography. Gravity models, for example, propose a relationship between the demographic force driving migration and the population density of the migrants' origin, the destination, and the distance between the locations, in analogy to Newton's Law of Gravity. Gravity models are commonly modified to include economic variables such as regional unemployment rates, income per capita, and other proxies to capture variation in the availability of amenities. These models typically estimate the probability of an individual moving between a defined origin and destination. Greenwood (2005) points out a common criticism of these models is that they fail to accurately measure the at-risk population susceptible to migration. For example, estimates are different depending on whether the at-risk population is measured at the beginning or end of the observation interval.

Currently migration decisions are most commonly presented as rational Human Capital Models (HCM). According to Gundels and Peters (2008) outmigration occurs either as part of optimal life cycle planning or due unsuccessful integration as a result of imperfect information about the host country. HCMs take the disequilibrium perspective and attempts to specify equations that calculate the present value of the difference in lifetime earnings for individuals if they migrate. Models may also include difficult to quantify factors such as an individual's utility (preference) for living in an area with low crime or proximity to recreation and entertainment opportunities. Thus the decision to migrate is based on a cost benefit analysis of the net returns to moving (Bodvarsson, 2015). However, such models rely on subjective terms such as internal discount factors for an individual's preference for present versus future consumption. A shortcoming of the HCM, identified by Greenwood (2005), is that they seldom accurately reflect real consumption wages or account for factors such as public services and tax rates.

Current Understanding of Secondary Migration

Secondary or onward migration occurs when an individual or family decides to relocate after initially settling in Canada. This relocation could occur intra-provincially, for example, from rural to urban areas. It could occur inter-provincially, for example when an immigrant arrives in one province but later moves to another province for employment or educational opportunities. It could occur internationally if an immigrant decides to return to his home country or move onward to a third country. The literature on secondary migration in Canada is generally presented in terms of retention rates based on determinates including citizenship status, source country, employment status,

education, age, business cycle, compatriot communities, and arrival cohort. Data sources for most migration studies have used Census data or the Longitudinal Immigration Database (IMDB). Recent work by Emery, McDonald and Balcom (2017) used linked immigrant landing records, temporary resident entry records and tax records to study retention rates of temporary residents in NB who convert to permanent residents and remain in the province. The study found that the conversion rate from temporary to permanent resident was high, but only 50% of the individuals that converted remained in NB after five years.

A widely reported finding on the secondary migration of immigrants and refugees is that return and onward migration decisions occur within the first two years of arrival. Aydemir and Robinson (2008) estimate a Canadian out-migration rate at 35% for immigrants two years after arrival. The bulk of those departing (60%) do so within the first year of arrival. A 2003 qualitative study estimated that 40% of refugees in Alberta moved between communities within the first few years of arrival compared to 21% of non-refugee Albertans, and 5 out of 6 who relocate do so within two years of arrival (Krahn et al., 2003). These findings highlight the importance of immigrant and refugee-receiving communities being prepared with support services and focusing retention efforts on the unique challenges faced by newcomers.

Current literature suggests that onward migration varies significantly by the source country of the immigrant and refugee. Aydemir and Robinson (2008) find that hazard rates (conditional probability) for return migration differ by source country but tend to converge to low levels after the first year, except for immigrants from the United States. Return migration rates for the United States remain noticeably higher than other

source countries many years after entry, a result consistent with internal migration being dominated by economic considerations. Many correlating factors complicate the interpretation of source country effects, limiting the conclusions that can be drawn from these observations.

Perhaps the most robust finding in the literature is the effect of employment on immigrant and refugee retention. Akbari and Sun (2006) find evidence that immigrants in Atlantic Canada will choose to settle in smaller areas if they can secure employment and an existing immigrant population already exists. Employment and educational opportunities were found to be among the most important factors contributing to the retention of newcomers in a 2003 study of refugees in Alberta. The Alberta city of Medicine Hat was highly successful at retaining refugees compared to similar cities because of the ability of newcomers to find employment (Krahn et.al, 2003). “If Canadian-born workers are unwilling to live in a community because of lack of economic opportunity, that location will be even less attractive to immigrants” (Krahn et al. 2003, p.20). Lee (2014) found that employment and earnings for Iraqi immigrants and refugees in the United States are significantly affected by the degree of Iraqi residential composition, ethnicity, and gender. This highlights the complex relationship between economic outcomes for immigrants and the existence of compatriot communities in host regions.

The literature indicates that young male economic immigrants are the most likely to migrate both internationally and inter-provincially. International migration represents a large proportion of secondary migration. Rates calculated by Aydemir and Robinson (2008) suggest that international migration may represent the largest proportion of

secondary migration in some instances. Interprovincial migration is often attributed to immigrants moving to the urban centers of Montreal, Toronto, and Vancouver in search of compatriot communities (Krahn, 2003). The literature often fails to draw a comparison between immigrant and native-born groups to see if the trend of urban migration differs by citizenship status. The role employment plays on inter-provincial urban migration is unclear. Krahn et al. (2003) indicate that migrants to the big three cities may fair worse in terms of economic outcomes than those who opt for second and third-tier cities. Factors influencing secondary migration are complicated and not necessarily dominated by economic considerations. It may be that several factors must coexist to attract or retain immigrant groups. Immigrant groups may consider different priorities in making their migration decisions. For example, some immigrant groups may make secondary migration decisions to maximize the utility of a family unit, while other groups focus on the utility of the individual or the head of the household. Broader societal changes such as the availability of air travel and the increasing prevalence of employment that relies on knowledge-based human capital may serve to lower the traditional barriers associated with return migration.

Data and Methods

The New Brunswick Institute of Research, Data and Training (NB-IRDT) houses a provincial administrative data center and acts as a data custodian at its location on the

UNB Fredericton campus.⁴ The Citizen Database is a longitudinal, administrative database that contains basic demographic and geographic information on all residents who have been issued a NB Medicare card and consequently is commonly referred to as the Medicare Registry. This project uses data from 1971, the date of the establishment of the database, through 2015, unless otherwise noted. Some results focus on more recent immigrants who arrived in NB for the first time after 2009. The first step in our analysis is to compare the completeness of the NB-IRDT Citizen Database to that of Immigration, Refugees and Citizenship Canada (IRCC), a federal database that contains immigrant-landing records by year of arrival and intended province of residence, to see if sample sizes correspond.

The Citizen Database contains information on an individual's date of birth, preferred language, gender, country or province of previous residence, year of arrival to the province, Medicare eligibility status, citizenship status, and postal code. Three dimensions define the cohorts in the study: citizenship status description, region of residence prior to migration, and arrival period. The source region is imputed based on country or province of previous residence for those not previously a resident in NB. This means that individuals who were previously enrolled in NB Medicare (issued a Medicare number), left the country, and then returned to NB would be counted as NB residents rather than as immigrants. Period of arrival is defined based on the first date of

⁴ This project received ethics approval from the UNB Research Ethics Board (REB# 2015-156).

registration in the NB Medicare Registry. Individuals already present in NB prior to 1971 are treated as native-born (NB-born).

The Citizenship Status Description variable is used to categorize individuals as either Canadian citizens or landed immigrants. The Region variable is used to indicate whether an individual is an international (source country) immigrant, an interprovincial migrant, or is NB-born citizen. Source countries are grouped as: Asia, EU/UK, Mideast/Africa, USA, Other, and UN. UN is used as a proxy for refugees and includes individuals whose previous country is listed as stateless.⁵ Year of Arrival is a variable used to control for unobserved time effects that influence migration decisions. Date of Birth is used to control for the effect of age on migration decisions.

Several data limitations are noted. First, Medicare data include information on the place of most recent previous residence, not country of birth. Thus, the origin of immigrants who initially arrived in other provinces and then subsequently moved to NB is unknown as are immigrants who came to Canada via a third country. Immigrants who are not yet citizens can still be identified as such based on the citizenship status variable but their region of origin is unknown. Those immigrants who gained citizenship before moving to NB will be indistinguishable from Canadian-born interprovincial migrants. In calculating retention rates, individuals moving to another province will apply for enrollment in that province's healthcare system and notification will automatically come

⁵ Although sample size restrictions preclude the disclosure of some categories of immigrants later in the paper we present results for the most common specific immigrant source countries.

back to NB that the person's NB Medicare number should be deactivated (typically there is a three-month waiting period to enroll in another province's Medicare system during which time the home province Medicare system continues to provide coverage). However for individuals leaving Canada, the date of exit will not be known, only that at regular renewal of a person's Medicare registration there was no re-registration submitted. Renewal occurs every three years (extended to five years in 2016) so that for emigrants from NB the analysis may overstate duration spent in NB by as much as three years. An additional limitation is that at the time of writing, data on region of previous residence and citizenship status are not yet available for individuals arriving in NB from another country after 2010. Thus, much of the empirical analysis is based on immigrants arriving in NB up to that year. A final but more minor limitation is that little is known about citizenship status, previous country or province of residence, and year of arrival for citizens issued an NB Medicare card prior to 1971. Consequently, all such individuals are treated as born in NB.

We employ both descriptive and statistical methods to provide insight into the patterns of population retention, namely, the likelihood of an immigrant remaining in NB. The provincial administrative data (Citizen Database) sample is first compared to the Federal administrative data available from IRCC. This comparison serves to assess the completeness of the provincial records. Second, Kaplan-Meier estimates of the survivor functions are used to construct the hazard rate by calculating the conditional rate of migration from NB and the cumulative proportion of immigrants staying in NB by the duration of stay in NB. The Kaplan Meier estimate is a non-parametric statistic used to estimate the probability of surviving a defined period of observation from time-to-event

data. These estimates can be helpful in the development of empirical model specification for statistical analysis (Kennedy, 2008, p.277).

Third, a statistical analysis is performed using a Cox Proportional Hazard (CPH) model. The CPH model consists of two parts, a baseline hazard function and a function representing time-invariant explanatory variables. The hazard function is then written as:

$$\lambda(t) = \lambda_0(t)\exp([x]\beta)$$

where $\lambda_0(t)$ represents the baseline hazard, x is a vector of observations of an individual's characteristics and β is a parameter vector (Kennedy, 2008, p.278). The shape of the hazard function is defined by the baseline hazard function and the covariates only shift the transition proportionally but cannot change its shape (Gundel, Peters, 2008). This analysis allows for the control of time invariant demographic characteristics that are assumed to be important to migration decisions such as age (year of birth), year of immigration, preferred language, and source country.

The statistical analysis estimates two CPH models where the dependent variable is the duration from arrival in NB (date as indicated by Medicare registration) to exit from the province. The departure event (exit) is the date at which Medicare registration is terminated in the administrative data. Observations are considered censored if the individual dies while in NB or is still registered in the Medicare system at the end of the sample period. This means the event (exit) was not observed during the sample period. The first CPH model estimates a hazard ratio on a sample limited to those who first registered for Medicare in NB at age 18 or older. The second CPH model includes only immigrants from countries with at least 200 arrivals and the specification includes an indicator variable for each country.

Results and Discussion

Sample Validation

An important consideration is the extent to which immigration identified by the Citizen Database correlates with landing records for immigrants collected by Immigration, Refugees and Citizenship Canada (IRCC). Immigrants to NB are considered to have ‘landed’ when they are granted permanent residency status in Canada. IRCC-reported statistics by province are based on intended province of residence but since permanent residency confers freedom of movement within Canada, there is no way to tell who actually moved to New Brunswick.⁶ It should also be noted that since there is a three-month waiting period before a new arrival can register for Medicare, the year in which permanent residency is granted is not necessarily the year that an immigrant actually arrives in Canada. Thus, there may be some misalignment of year of arrival between the data sources. In Figure 1 data is compared from both series by plotting the number of immigrants by year of landing (granted permanent residency) in NB, as indicated by IRCC records, against the number of immigrants who registered for Medicare according to the NB Citizen Database.

⁶ Identifying location of residence is done through linkage of the landing records with information on tax filers, specifically province of residence for tax purposes.

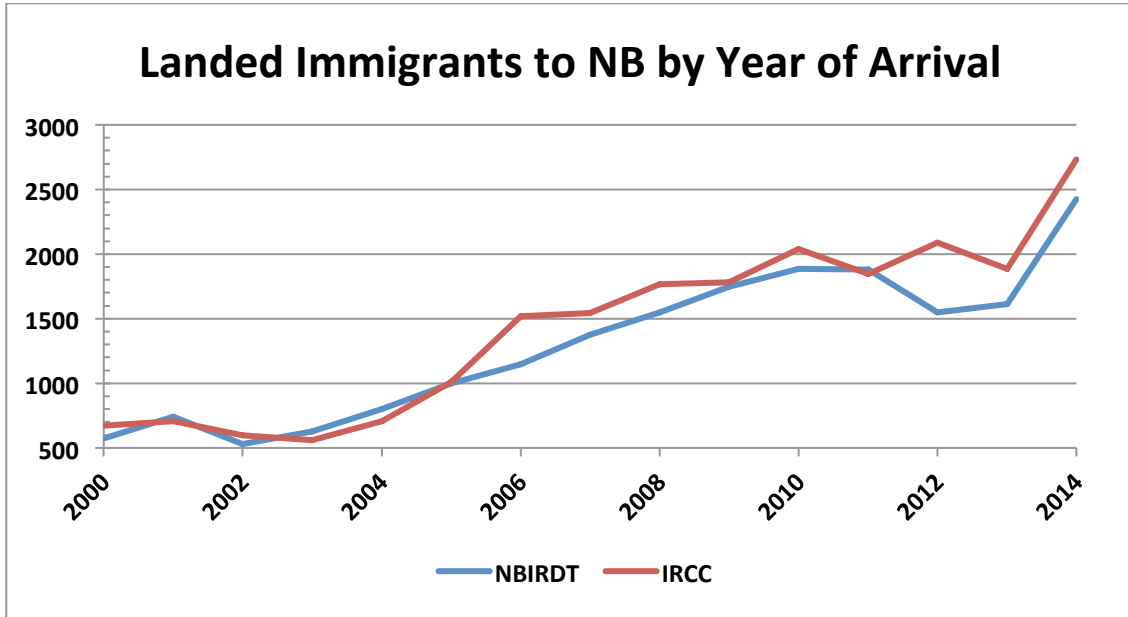


Figure 1 Comparison of Federal IRCC landing records and Provincial Medicare Registry of immigrant arrivals by year.

The two series are very close for 2000-2005. Although IRCC landing numbers are somewhat higher than Medicare registrations for 2006-2014, the trends are similar, including a substantial uptick in immigration in 2014. The only anomaly is in 2012 when landing records show an increase while Medicare registrations show a decrease. One possible explanation for the anomaly is beginning in November 2012 Canada began receiving high numbers of Syrian refugees. Refugees that arrived in November and December would be counted, as landing in 2012 with respect to IRCC data. This cohort

would not appear in the NB Citizen Database until 2013 due to the three-month waiting period for Medicare registration.⁷

Descriptive Statistics

Descriptive statistics for the NB Citizen Database variables are listed in Table 1. Information on average age at arrival, year of arrival by source region, and gender, along with sample counts is provided. The sample is all individuals born outside of NB who registered for Medicare for the first time after 1971 and were 18 or older when they did. The average age for all groups, except men from the USA, is between 34-39 at arrival, with most in the 35-37 range. Each immigrant group, except for those from the USA, arrived on average after 2000, reflecting the marked increase in immigration to NB and the country as a whole since 2000.

⁷ In conversation with officials from the Population Growth Division of the Province of New Brunswick, the anomaly in 2012 is to some extent attributed to a large number of provincial nominees who declined to move to NB. Thus these individuals appear in the landing records for NB but would not be registered for Medicare.

Table 1 Descriptive statistics for non-NB born residents who were over 18 at arrival.

Place of last Residence	Gender	Mean Age Arrived	Mean Yr Arrived	Observations
USA	Men	40	1999	3590
	Women	39	1998	4045
EU/UK	Men	38	2002	2820
	Women	36	2000	3180
Mideast/Africa	Men	35	2003	1720
	Women	35	2003	1455
Asia	Men	36	2005	2980
	Women	35	2005	3195
UN	Men	36	1990	290
	Women	34	1989	335
Other	Men	37	2008	6710
	Women	36	2008	6445
Rest of Canada	Men	37	2000	111865
	Women	36	2000	116200

Other figures not reported here, more than 65% of all immigrants to NB who could be identified in the Citizen Database arrived after the year 2000. For immigrants from non-traditional source countries, the percentages are much higher. For example, 82% of immigrants from the Philippines and from China arrived after 2000, as did more

than 98% of immigrants from Korea. More than 72% of immigrants to NB from the UK arrived after 2000. In contrast, less than 53% of immigrants from the USA arrived after 2000 as did about 43% of immigrants from Germany.

In Canada immigrants are far more likely than non-immigrants to reside in larger cities. Similarly, immigrants to NB are most likely to reside in NB's (comparatively small) urban centers. Figure 2 shows how immigrants in NB are distributed across the province by presenting the initial landing destination as measured by Census Subdivision (CSD) of all immigrants who first arrived in NB between 2000-2010, expressed for each CSD as the percentage of total arrivals who were first resident in that CSD.

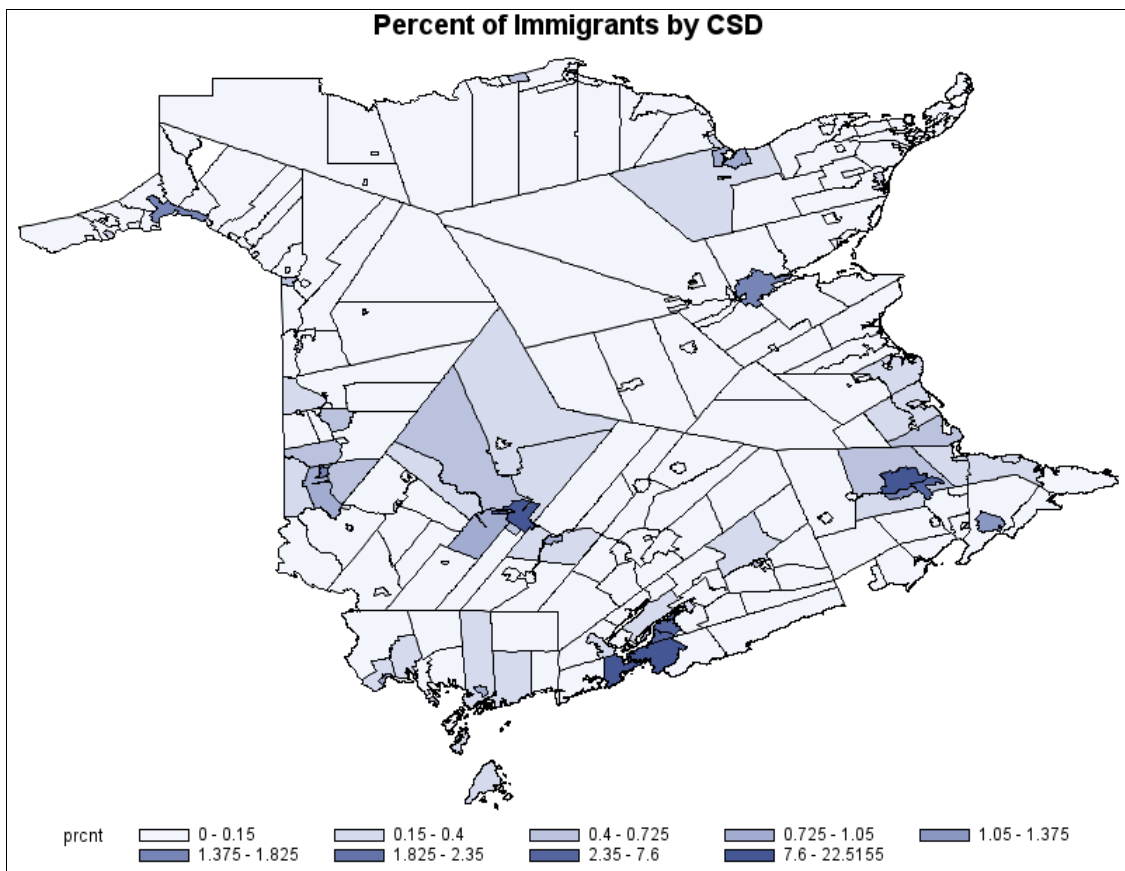


Figure 2 Immigrant proportion of total arrivals by CSD 2000 to 2010

The highest concentrations of immigrants arriving in NB are in the larger population centers of Saint John, Fredericton and Moncton, as well as surrounding areas. Smaller concentrations are in Miramichi in the northeast, Edmunston in the upper northwest on the Quebec border, and Woodstock in the western part of the province near the Maine (ME) border at Houlton, ME. Relatively few immigrants have settled initially in the rest of the province.

In the larger urban centers immigrants constitute a sizeable minority of the population but never higher than 15%. 5-10% of the populations of CSDs in the west of the province close to the Maine border are immigrants, although it should be noted that total population counts of many CSDs in NB are themselves quite small. Figure 3 shows the same immigrant population illustrated in Figure 2 but expressed as immigrant density per 1000 population. Immigrant density is calculated as a proportion of the total adult population in that CSD drawn from the 2006 Canadian Census of Population.

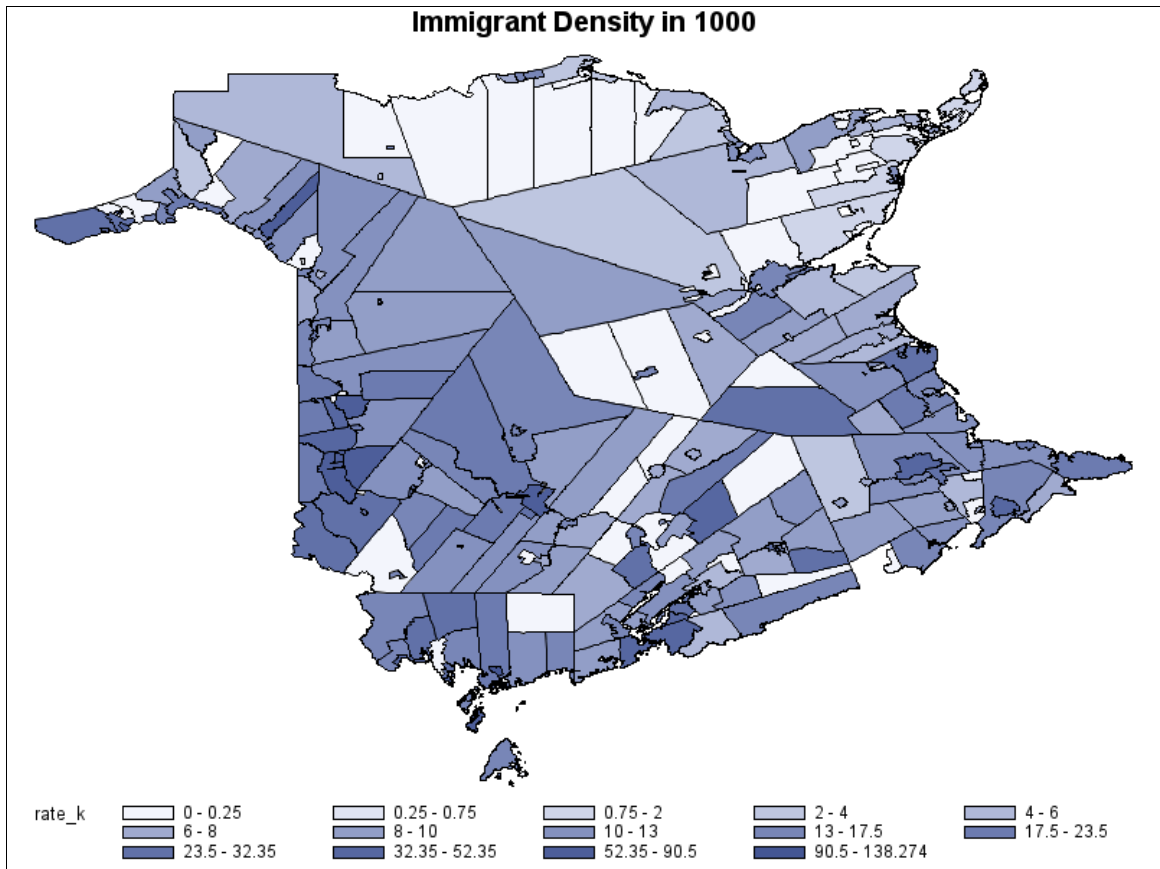


Figure 3 Immigrant proportion of total adult population by CSD

Preliminary estimates of retention are presented in two ways. First, crude out-migration rates by year can be computed as the number of people of a particular group leaving NB during the year divided by the total number of people in that group in the province at the beginning of the year. To illustrate, we define four broad age categories: Child (under 18), Young Adult (19 – 29), Adult (30 – 59), and Senior (60+). In Figure 4 we present annual out-migration rates by age category and previous region of residence, aggregated across the sample 2000-2010. Out-migration rates of NB-born individuals are included for comparison.

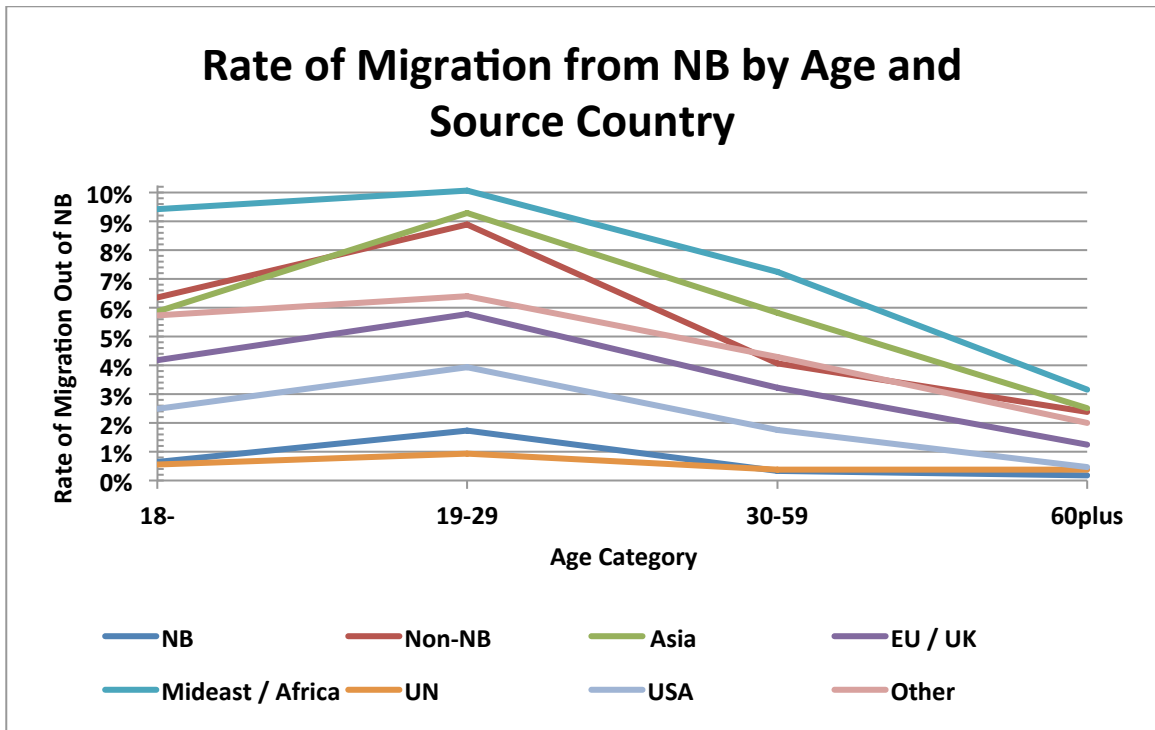


Figure 4 Annual out-migration rates in NB by age category and source region

As expected, out-migration rates are highest for young adults for all regional groups. For all adult age groups, immigrants from Africa/Mideast and Asia have the highest out-migration rates, followed by previous residents of other Canadian provinces (which could include immigrants, as noted earlier). All groups, except UN arrivals, have higher out-migration rates than native-born New Brunswickers. This result may be due to the earlier arrival period of the UN group. Similarly, immigrants from the US have the lowest out-migration rates among the regions, except for the UN classification, and these immigrants also, on average, have an earlier arrival period.

To present statistics up to 2014 sample size restrictions are overcome by more broadly defining groups as NB born, Non-NB (interprovincial migrants) and Immigrant. Figures 5 and Figure 6 present annual out-migration trends by year for NB born,

interprovincial migrants, and immigrants for the young adult (19-29) and adult age (30-59) cohorts.

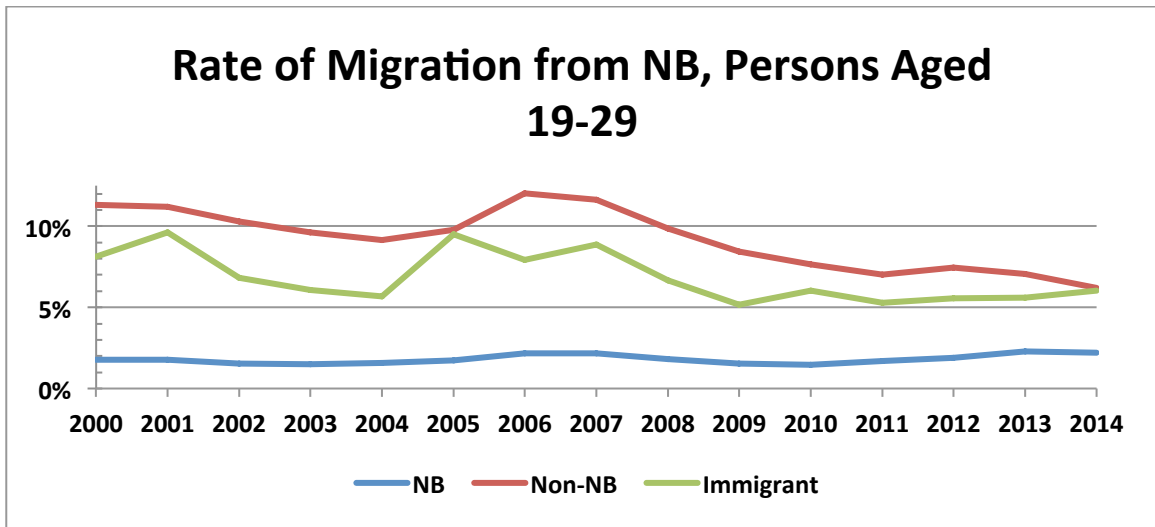


Figure 5 Annual out-migration rates in NB by year and source region for young adults (19-29)

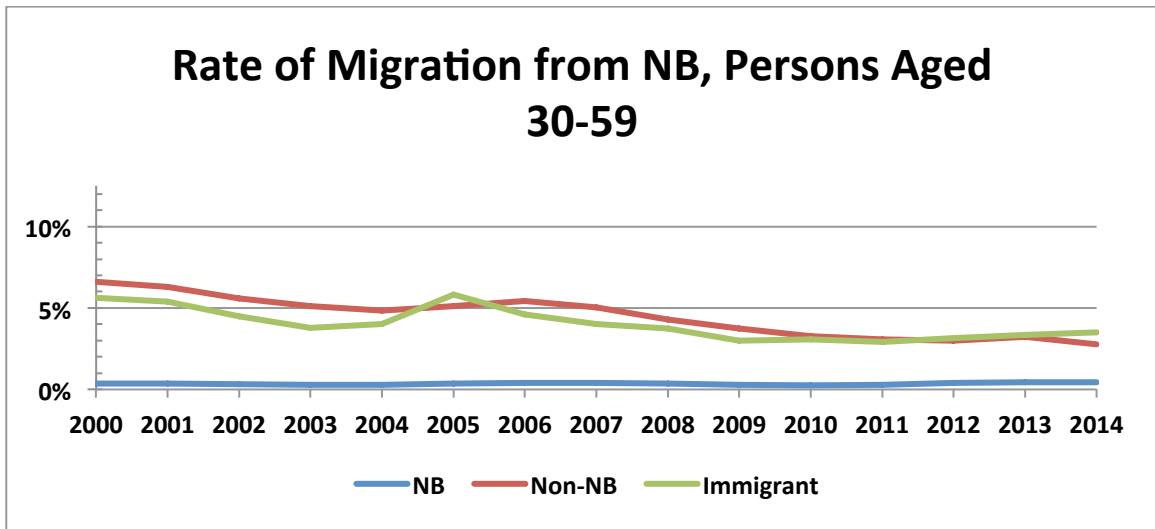


Figure 6 Annual out-migration rates in NB by year and source region for adults (30-59)

For both migrant groups, out-migration rates show evidence of cyclicity but also a general trend towards declining out-migration rates. For example, for the 30-59-age cohort, out-migration rates among immigrants and residents of other provinces decline

from around 6% in 2000 to 3% in 2014, compared to about 0.5% for people born in NB. Interestingly, the outmigration rates for immigrants and interprovincial migrants are similar and much higher compared to native-born New Brunswickers.

Kaplan Meier Empirical Survival Analysis

Kaplan Meier estimates are used to provide a descriptive illustration of the probability of survival by duration of stay in the host region (NB) for each immigrant source country cohort (Interprovincial movers and NB born individuals are provided for context). The plots do not control for any differences in characteristics across groups that might affect the likelihood of remaining in NB. Multiple movers are treated as additional observations. Data limitations prevent restricting the sample to those 18 and older at arrival when statistics are decomposed by both the region of last residence and years in New Brunswick, even though the parent almost certainly determines a child's migration decision. Data limitations further restrict the survival analysis to survival durations less than 15 years.

The conditional probability of remaining in NB by years in the province and region of last residence is plotted in Figure 7. Interprovincial migrants and NB-born residents are included to illustrate the behavior of Canadian born movers and provide context to the results for the immigrant cohorts. Residents of the USA and those immigrants classified as NB-born are the most likely to remain in NB, followed by immigrants from EU/UK and interprovincial movers. Immigrants from Asia are more likely to move, whereas immigrants from the Mideast are the most likely to move. After 5 years in NB, 70% of EU/UK immigrants remain in NB compared to 60% of people

from the Mideast. After 15 years, these figures remain at 70% for EU/UK immigrants and fall to 40% for immigrants from the Mideast.

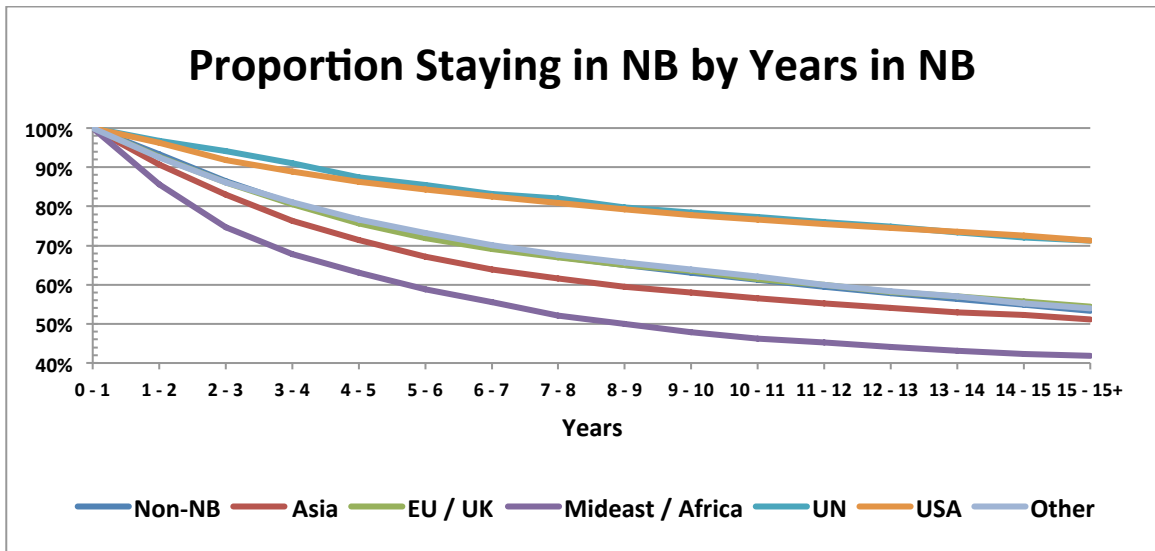


Figure 7 Kaplan-Meier conditional probability of remaining in NB by region of last residence

In Figure 8, similar results are reported but for the top 15 source countries by country of last residence. In this figure, the sample is restricted to those who arrived after 2000 to highlight the retention patterns of more recent immigrants.

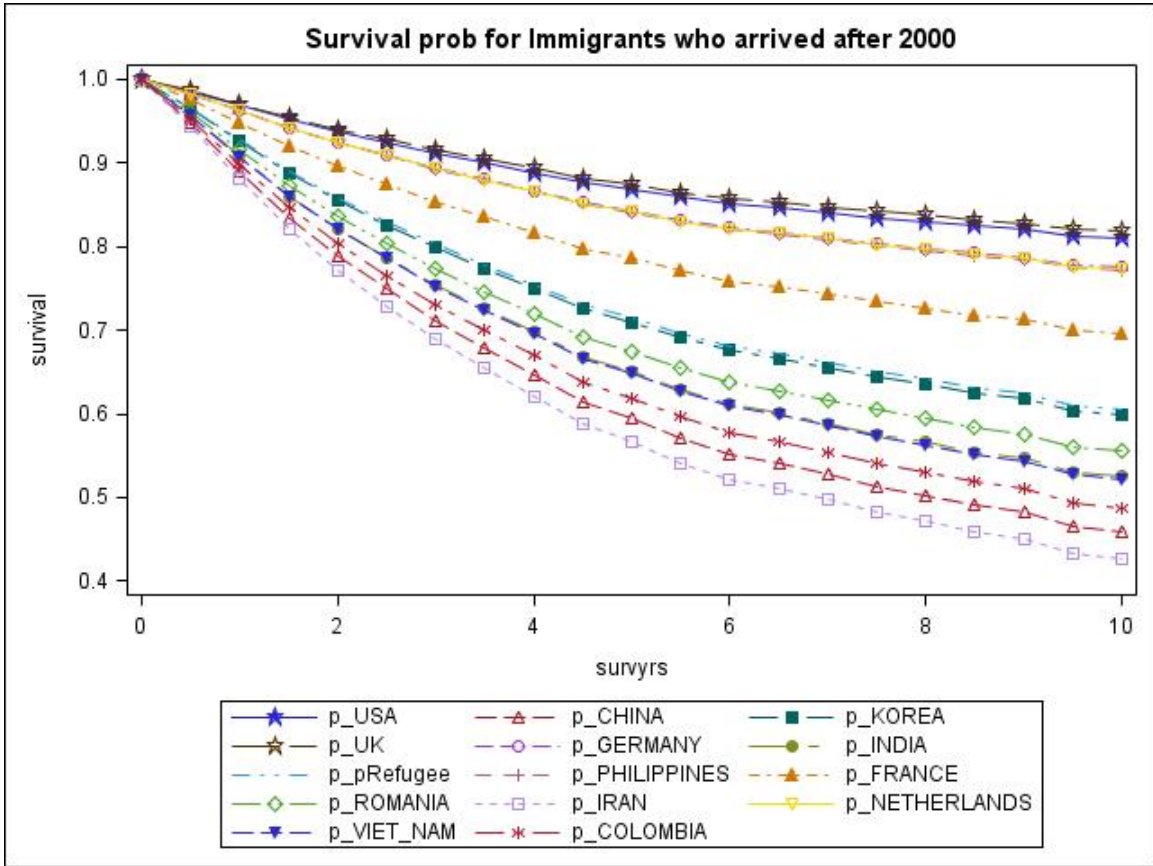


Figure 8 Kaplan-Meier cumulative probability of remaining in NB for immigrant arrivals after the year 2000 from the top 15 immigrant source countries

Consistent with Figure 7, immigrants from the USA, UK, Germany, and France were the most likely to remain in NB, while immigrants from Iran, China, Colombia and Vietnam were the most likely to have left. Refugee immigrants – defined on the basis of country of residence and year of arrival, in a place and a time of major geopolitical upheavals and large-scale migration – fall in the middle of the distribution of survival curves by country.

Cox Proportional Hazard Model Regression Analysis

Results from Cox Proportional Hazard (CPH) models are presented in the following tables. For ease of understanding, we restrict the sample to individuals who

moved to NB and omit NB-born residents. This allows us to measure duration of residence commencing with the date of arrival in NB, since there is no obvious entry date for the NB-born and we feel that using date of birth is not an appropriate comparison point. Thus, the key question for the analysis is whether immigrants from other countries are more or less likely to remain in NB than Canadian citizens moving to NB from other provinces, after controlling for other observable factors.⁸ The regression estimates the effects of a set of time-invariant covariates on duration, from arrival in NB until the individual leaves the province as indicated by termination of an active Medicare enrollment status. Individuals who die during the sample period or who are still in NB at the end of the sample are treated as right censored spells. Controls are included for age at arrival in NB, year of arrival in NB, gender, language preference, and region of last residence. The sample is limited to those who first registered for Medicare at age 18 or older. The focus of the discussion of results is on the estimated hazard ratio which gives the probability of leaving NB conditional on not having left or been censored to that point for the indicated group relative to the omitted or base case.. A hazard ratio greater than 1 means that the probability of leaving NB is relatively larger for the group of interest compared to the base case while a hazard ratio less than 1 has the opposite meaning. The base case (reference group) for both regressions is interprovincial Canadian citizens who migrated to NB. We present two CPH model regressions the first identifies immigrant

⁸ Other methods could include a selected age-sex sample of non-immigrants matched by immigrant's year of arrival in NB.

cohorts coarsely by region of last residence; results are presented in Table 2. The second model limits the sample to countries with at least 200 arrivals in an effort to examine the extent of heterogeneity within the defined regions.

Table 2 Hazard ratios calculated by the CPH model indicating the likelihood of onward migration of NB immigrants relative to Canadian citizens who moved to NB from other provinces.

	Parameter	Hazard Ratio	Pr > ChiSq
Region	USA	0.483	<.0001
	UN	0.336	<.0001
	Asia	1.229	<.0001
	EU/UK	0.914	<.0001
	Mideast/Africa	1.520	<.0001
	Other region	0.976	0.202
	Interprovincial	1	-
Medicare Language Preference	French	0.924	<.0001
	Unspecified	2.370	<.0001
Gender	Female	0.991	0.164
Arrival Decade	1970s	1.041	0.001
	1980s	1.596	<.0001
	1990s	1	-
	2000s	0.811	<.0001
	2010+	0.559	<.0001
Birth Decade	1930s	0.780	<.0001
	1940s	1	-
	1950s	1.183	<.0001
	1960s	1.306	<.0001
	1970s	1.470	<.0001
	1980s	1.723	<.0001
	1990s	1.906	<.0001

***Reference Category:** Region = Interprovincial, Gender = Male, Language = English, Arrival Decade = 1990s, Birth Decade = 1940s.

Period of birth results indicate, as expected, that younger individuals are more likely to leave NB than older ones, and the estimated hazard ratios increase

monotonically with decade of birth. After controlling for age, more recent arrivals are found to be relatively less likely to leave NB than arrivals in the 1980s and 1990s. Individuals arriving in the 2000s have an estimated hazard ratio of 0.811 (pval < .0001) and those arriving in the 2010s have an estimated hazard ratio of 0.559 (pval < .0001). For region of last residence, results are generally consistent with the descriptive statistics: measuring against the base case of interprovincial migrants, previous residents of the USA were significantly less likely to leave NB (hazard 0.483, pval < .0001) as were immigrants classified as UN refugees (hazard 0.336, pval < .0001). Residents of the UK and Europe, as well as 'other' regions, were no different than interprovincial migrants. Previous residents of Asia and the Mideast/Africa were more likely to leave NB (hazard 1.229 pval < .0001 and hazard 1.52 pval < .0001, respectively).

Table 3 presents selected results for a revised model where the sample includes only immigrants from countries with at least 200 arrivals and the specification includes an indicator variable for each country.

Table 3 Hazard ratios calculated by the CPH model indicating the likelihood of onward migration of NB immigrants, from selected source counties, relative to Canadian citizens who moved to NB.

Place of previous residence	Hazard Ratio	Pr > ChiSq
Other province	1	--
Australia	0.828	0.093
China	1.369	0.000
Columbia	1.093	0.376
France	0.822	0.015
Germany	0.866	0.002
India	1.152	0.029
Iran	1.363	0.000
Korea	0.824	0.000
Netherlands	0.505	0.000
Philippines	0.449	0.000
Refugee*	0.740	0.000
Romania	0.998	0.976
UK	0.467	0.000
USA	0.399	0.000
Vietnam	1.454	0.000
Other	0.894	0.000

Results indicate that there are three general groups of immigrants by arrival country – those relatively more likely to stay in NB (USA, Philippines, UK, Ireland, and Netherlands), those least likely to stay in NB (Vietnam, Iran, and China) and the rest somewhere between those two groups. These results are broadly comparable to the descriptive statistics on retention by country presented in Figure 8, implying that it is not differences in observable characteristics such as age, gender, language preference, year of arrival or duration in NB that underpins the pronounced variation in retention across countries. Repeating the analysis after conditioning only on individuals arriving after 2000 does not significantly change the results.

Summary and Conclusions

This paper used provincial administrative healthcare data (Medicare Registry) for residents of New Brunswick to investigate retention of immigrants in the province and, in particular, how retention rates vary by observable characteristics such as region of previous residence. A comparison of landing record data from IRCC and the provincial Medicare data shows that trends in new arrivals by year are quite comparable, with the exception of 2012, notwithstanding very significant differences in the method of collection, collation, and identification. The similar trends suggest that the Medicare data are a useful complement to analysis based on other data sources. Descriptive results indicate that previous residents of other countries and previous residents of other provinces are substantially more likely than native-born New Brunswickers to leave NB, but there is variation by place of previous residence. The most likely to leave (those with the lowest retention rate) are immigrants from Mideast/Africa and Asia while the least likely are immigrants from the US, and the outmigration rates of interprovincial migrants are comparable to those of immigrants from UK/Europe. It is worth noting that estimates of five-year retention are higher than figures that have been reported for immigrants to NB based on linked landing and tax records.

The statistical analysis is consistent with descriptive results and indicates substantial differences in the likelihood of an immigrant leaving NB by region of previous residence after accounting for factors such as year of birth, gender and year of arrival. Results also show that there has been a general trend to an increasing rate of retention over time, suggesting the presence of cohort effects reflecting factors making more recent immigrants more likely to stay, to provincial policy aimed at improving

retention, or both. Country-specific results indicated heterogeneity in retention within broader regions of origin though all specific countries considered were more likely to have higher likelihood of outmigration compared to the US. Preliminary evidence of refugees indicated that relative to immigrants from Asian countries they were relatively more likely to remain in NB.

Higher outmigration rates for immigrants from non-European countries may reflect a number of factors found to be important in the literature: limited career opportunities given the relatively small labor markets in NB, limited employment opportunities for spouses and other adult family members, and limited ethnic and social networks even in the urban areas given the relatively small proportion of immigrants and visible minority groups in NB. One policy prescription is to focus immigration attraction and retention efforts on NB's cities where employment and social network opportunities will be better than in the less urban areas of the province. Overall, retention rates for some groups of immigrants are reasonably high even in the context of initial settlement in a smaller, relatively rural province with comparatively small local ethnic networks.

One key limitation of administrative data is that only limited covariates are available so that exploring the applicability of alternative hypotheses is difficult. Future work will involve analysis of linked files that yield information on immigrant service use, family structure and other characteristics that might help identify what underpins observed differences in retention over time and by place of residence. For policy, this paper has demonstrated the utility of using administrative data for retention evaluation and these data will be used to evaluate the retention success of initiatives such as the Atlantic Immigration Pilot once Pilot participant data become available.

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