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## Demographic Documents

# Measuring Emigration in Canada: Review of Available Data Sources and Methods

by Julien Bérard-Chagnon

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## **List of acronyms**

ACS: American Community Survey

BCIS: Bureau of Citizenship and Immigration Services

CCB: Canada Child Benefit

CCTB: Canada Child Tax Benefit

CRA: Canada Revenue Agency

DEM: Demography Division

DEP: Demographic Estimates Program

DHS: Department of Homeland Security

IMDB: Longitudinal Immigration Database

IRCC: Immigration, Refugees and Citizenship Canada

LAD: Longitudinal Administrative Databank

NHS: National Household Survey

PUMS: Public Use Microdata Sample

RRC: Reverse Record Check

SASD: Social and Aboriginal Statistics Division

SGMUS: Survey of 1995 Graduates Who Moved to the United States

SIN: Social insurance number

SSD: Special Surveys Division

SSMD: Social Survey Methods Division

T1FF: T1 Family File

## Highlights

- Emigration is a very difficult demographic event to measure.
- Various data sources and methods can measure the number of emigrants:
  - The main Canadian sources are the residual method, the Reverse Record Check, tax data and the Demographic Estimates Program;
  - In addition, the American Community Survey and the Department of Homeland Security provide a measure of emigration to the United States;
  - These sources display very different advantages and limitations in regards to measuring emigration.
- The number of emigrants fluctuates greatly depending on the source examined:
  - The number of emigrants based on the Reverse Record Check goes from 450,000 to 600,000 depending on the census period;
  - The residual method provides a somewhat lower number, about 450,000 emigrants for each of the three periods;
  - The Demographic Estimates Program estimates provide a measure hovering around 450,000 emigrants;
  - Tax data provide a considerably lower number of emigrants than that of the other sources. This number is estimated at around 150,000 emigrants.
- Basic demographic characteristics also change depending on the source examined:
  - The Reverse Record Check permanent emigration estimates is higher than those of the Demographic Estimates Program and tax data;
  - Distributions by age, province of departure and sex are relatively similar. The main exception is for the residual method. That method provides negative numbers for some age groups and for Alberta;
  - The American Community Survey provides a considerably higher number of emigrants to the United States than those of the other sources. The Department of Homeland Security and tax data provide the lowest numbers of emigrants.
- According to the Demographic Estimates Program error of closure criterion, the estimated number of emigrants from the Reverse Record Check would be the most appropriate to measure that demographic event.

## Introduction

The fact that Canada is generally seen as a country of immigrants tends to obscure the opposite phenomenon, emigration. Every year, several thousand Canadians leave the country to settle elsewhere in the world. Throughout its history, Canadian emigration has raised major issues. The emigration of French Canadians in the second half of the 19th century until the middle of the 20th century and the departure of many highly qualified workers to the United States in the 1990s<sup>1</sup> are two emigration episodes that drew the attention of policy makers, researchers and the Canadian population in general. More recently, emigration continues to be an important issue, in particular because of the obligations that the Canadian government has towards its nationals who are living abroad and with respect to retaining immigrants that have recently been admitted to the country.

Although immigrants outnumber emigrants on an annual basis, the Canadian diaspora could reach 2.8 million (DeVoretz 2009), which represents just over 7% of the Canadian population.<sup>2</sup> Some demographic groups, such as recent immigrants, young adults and more highly educated individuals, are especially likely to emigrate (Finnie 2006, Zhao et al. 2000). Emigration selectivity is one of the reasons this phenomenon is an important demographic and socioeconomic issue for Canada.

There are some significant data quality issues involved in the study of emigration. Indeed, emigration is a particularly difficult phenomenon to measure (Jensen 2013). Because emigrants have, by definition, left Canada and are not required to report their departure, it is very difficult to track them in most Canadian data sources. Measuring emigration is challenging to the point where several countries that have population registers still find it difficult to measure this population accurately. For example, in the Netherlands, despite the legal obligation to declare emigration to local authorities, Statistics Netherlands noted that nearly one in three emigrants do not report their departure (Prins 2016). This is largely attributable to the fact that emigrants see no reason to report their departure, and that non-reporting emigrants enable local authorities who administer the registers to maintain the stability of their demographic numbers, which are often linked to many financial transfers between various levels of government (Poulain and Herm 2013).

Accurate measurement of emigration also requires clear concepts. However, defining what constitutes international migration is a complex exercise. The United Nations (1998) defines international migrants as persons who have changed their country of usual residence. In Canada, the concept of usual residence, and by extension the concept of migration, sometimes varies significantly depending on the source reviewed and as a result, emigration counts may not always be comparable.

Furthermore, the United Nations (1998) distinguishes two types of migrants: long term and short term. A long-term migrant is a person who moves to a country other than of his or her usual residence for at least one year, while a short-term migrant is a person who moves to another country of residence for at least three months, but less than one year, except in cases of obviously temporary trips such as religious pilgrimages.

Statistics Canada's Demographic Estimates Program (DEP) also distinguishes between permanent and temporary emigration in calculating its emigration estimates (Statistics Canada 2016a). Permanent emigration refers to Canadian citizens or landed immigrants who leave Canada to acquire permanent residency in another country, while temporary emigration refers to Canadian citizens and immigrants living temporarily abroad who have not maintained a usual place of residence in Canada. At the time of emigration, it is often impossible to determine whether the departure is permanent or not. However, this term is used here to distinguish these migrations from temporary departures. Obviously, these departures are not necessarily irreversible; emigrants can return to live in Canada. In both cases, departures refer to the fact that the emigrant's usual place of residence is no longer in Canada as defined in censuses.<sup>3</sup>

The nuance between a permanent and a temporary departure makes it more difficult to measure emigration. The distinction is often vague and it is not measured the same way by the various sources. In the Canadian context, many Canadian university students and workers temporarily leave Canada, often for the United States. These temporary departures appear to be largely underestimated in several Canadian data sources (Michalowski 1999).

1. This phenomenon is often referred to as the "brain drain."

2. Statistics Canada. [Table 17-10-0005-01, Population estimates on July 1st, by age and sex](#) (accessed on June 30, 2017).

3. The complete definition of usual place of residence is posted here: <http://www12.statcan.gc.ca/census-recensement/2016/ref/dict/pop126-eng.cfm> (accessed on March 15, 2017).

All these factors make it difficult to measure emigration accurately. However, several Canadian and international data sources can be used to measure this phenomenon. Although each source has its shortcomings, when used in conjunction with one another, they can provide a reasonable estimate of the number of emigrants and some of their basic demographic characteristics. Comparing sources can also provide a better understanding of the advantages and limitations of each one when it comes to measuring emigration. To our knowledge, no study has compared the various measures of Canadian emigration.

This paper attempts to fill this gap through the following means:

- Reviewing the main data sources and methods for obtaining estimates of emigration from Canada, including their advantages and limitations.
- Comparing the estimates from each data source and method in terms of the number of emigrants and a few basic demographic characteristics.
- Confronting the various measures of emigration for the computation of the DEP demographic estimates.

This analysis is performed from the standpoint of Statistics Canada's DEP and is part of the work done to maintain and improve the quality of the agency's demographic data. This program calculates monthly population estimates for Canada, the provinces and territories and some subprovincial levels.<sup>4</sup> The DEP also produces estimates of components of population growth, including permanent and temporary emigration. These estimates are broken down by age and sex. This standpoint influences the assessment of the various measures, the characteristics examined and the way the results are interpreted.

The first chapter introduces data sources and methods for measuring Canadian emigration. The second chapter compares these various measures with respect to some demographic characteristics used in the DEP. Finally, the third chapter assesses the accuracy of the number of emigrants from the various sources and methods using the error of closure of the DEP.

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4. It should be noted that although these estimates are calculated on a monthly basis, they are published quarterly.

## 1. Review of data sources and methods

Although the number of emigrants is very difficult to measure accurately, a number of data sources and methods provide a measure of the phenomenon. This chapter introduces the sources and methods compared in this study and their main advantages and limitations. To our knowledge they constitute the main measures of Canadian emigration. Only sources and methods that can be used to obtain comparable measures of emigration for the whole country are included here. For this reason, some provincial sources or sources that target only part of the population<sup>5</sup> are not presented.

### 1.1 Residual method

The residual method is a proven demographic technique. It simply involves isolating emigration in the demographic equation. By comparing the size of a demographic cohort at two points in time and subtracting the other demographic components, we are left with a residual that can be interpreted as the net emigration between these two points.

In the Canadian context, the number of emigrants calculated using this method for two consecutive censuses by province, age and sex could be computed as follows:

$$EMI_{t,t+5} = (AC_t - NPR_t - D_{t,t+5}) - (AC_{t+5} - NPR_{t+5} - B_{t,t+5} - I_{t,t+5} - RE_{t,t+5} - IN_{t,t+5} + O_{t,t+5})$$

Where: EMI: Emigrants;  
 AC: Census adjusted for net census undercoverage;  
 NPR: Non-permanent residents;  
 D: Deaths;  
 B: Births;  
 I: Immigrants;  
 RE: Returning emigrants (emigrants who return to Canada);  
 IN: Interprovincial in-migrants;  
 O: Interprovincial out-migrants.

The variables of the formula can be obtained through various methods. For this study, they were calculated as follows.

Starting and ending populations are calculated from two censuses, which are adjusted for net undercoverage, incompletely enumerated Indian reserves, and demographic adjustment at certain ages.<sup>6</sup> Deaths are calculated by applying a five-year probability of survival—taken from provincial and territorial life tables—to the starting population. The number of non-permanent residents, immigrants, returning emigrants and interprovincial migrants is calculated using data from the long-form census. Even though they are part of the census universe, non-permanent residents are excluded from starting and ending populations because they are not included in the Statistics Canada definition of emigrant due to the temporary nature of their stay in the country. Finally, births are obtained from the 0 to 4 age group in the ending census.

The residual method has several advantages. Having long been one of the only sources to measure migration, it has often been used in the past and its strengths and limitations in the Canadian context are relatively well known and accepted. The residual method was notably used by the Asia Pacific Foundation (DeVoretz 2009) to obtain the measure of the Canadian diaspora mentioned in the introduction.

Because it is based on censuses, the residual method indirectly provides a measure of emigration based on the concept of the usual place of residence. It also considers both permanent and temporary emigration. In addition, it can provide emigration estimates based on characteristics that are relatively stable over time or that vary predictably, such as country of birth, period of immigration (Michalowski 1991) or mother tongue (Malo 1981).

5. This notably applies to the Survey of 1995 Graduates Who Moved to the United States (SGMUS), which targeted only post-secondary graduates from a few graduate cohorts.

6. Although some authors continue to calculate residual estimates of emigration without adjusting census counts (for example, see Chen et al. 2009), Malo (1981: 72) recommends that these adjustments be taken into account because of the relatively large number of people omitted in censuses. See Statistics Canada (2016a) for additional information on census adjustments made for population estimates.

Because it is based on the demographic equation, the residual method was also used to study the effect of various types of intragenerational mobility on the size of a subpopulation. It was used in particular to examine ethnic mobility among Aboriginal peoples (Guimond 2009), linguistic mobility (Bourbeau et al. 2011) and religious mobility (Caron-Malenfant and Coulombe 2015).

The main limitation of the residual method is that its accuracy relies heavily on the quality of the measure of each of the other demographic components. In fact, the residual represents both emigration and the cumulative errors of the other elements of the method. Emigration is a typically a rare event. Therefore, the share from errors is generally not negligible in the residual (Jensen 2013).

The census data used to obtain most of the elements in the method are not exempt from reporting, imputation and coverage errors. For example, coverage of recent immigrants and non-permanent residents would be especially low in censuses (Statistics Canada 2015). Also, if the census coverage adjustment takes net undercoverage into account, it contains significant sampling variability (Statistics Canada 2015). Consequently, the residual method can sometimes produce less reliable results, such as negative emigration numbers for some demographic groups (Malo 1981).

Another important shortcoming in the residual method is its timeliness. This technique can only be used several years after the last census, when the adjustments for net undercoverage are available.

This method may also tend to produce somewhat lower levels of emigration because its universe excludes people who were absent at the beginning of the period, such as recent immigrants. If an immigrant lands after the starting census and emigrates before the next census, his or her departure cannot be captured by the residual method. Various studies indicate that this demographic group is more likely to emigrate (Finnie 2006, Aydemir and Robinson 2006).

Finally, it does not take into account the multiple migrations that may occur during the intercensal period. While these multiple moves are likely to be less frequent than those related to internal migration, they are nonetheless an important aspect of Canada's international migration dynamics.

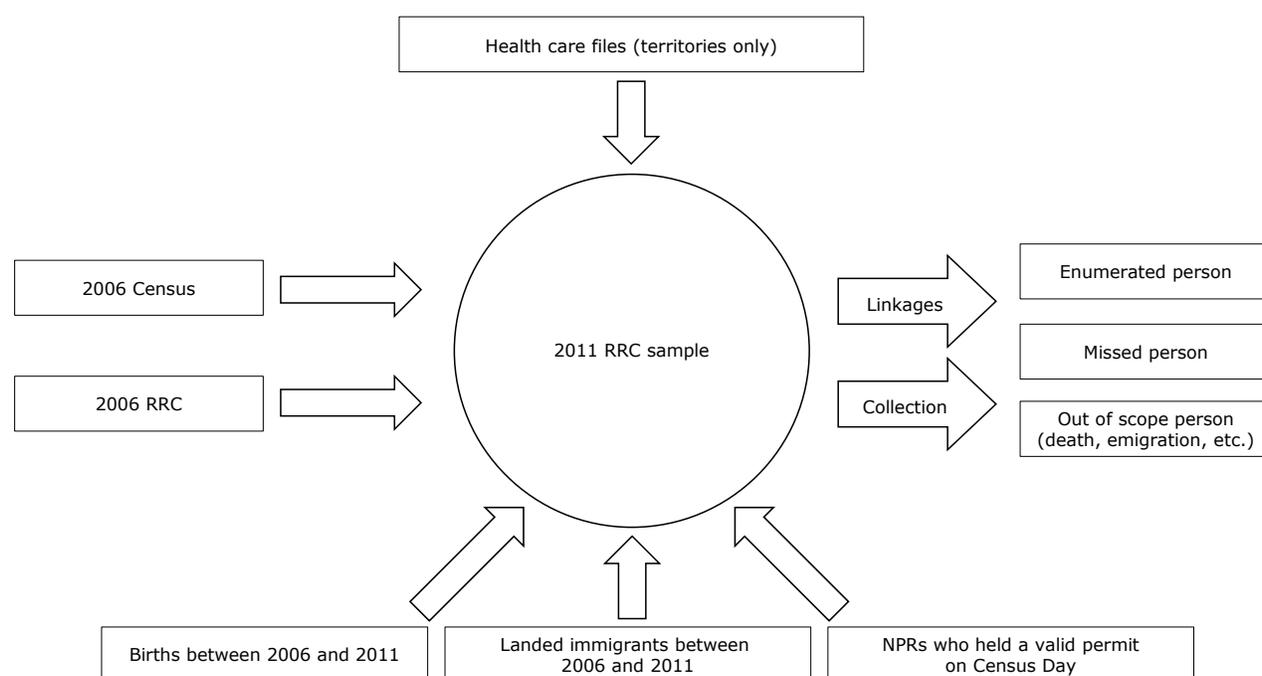
## 1.2 Reverse Record Check

Since 1961, Statistics Canada has been measuring the population coverage for each of its censuses through coverage studies (Dolson 2010). The Reverse Record Check (RRC) has been carried out to measure census undercoverage; it can also be used to provide emigration estimates.

The RRC is based on a sample independent from the census being assessed, and is constructed from different sampling frames. These frames represent people in Canada during the previous census (census frame and missed persons from the previous RRC frame), births, immigrants admitted since the last census and non-permanent residents whose permit is valid on Census Day. Health records are used as the only frame for the territories.

A representative sample<sup>7</sup> is drawn from these frames. The sample size of the 2011 RRC was around 70,000 persons. Each selected person is categorized as enumerated at census, missed or out of scope using record linkages and field data collection. The out of scope category includes deaths, non-permanent residents who have left the country and emigrants, who may be distinguished from one another.<sup>8</sup>

**Figure 1**  
**Process flow of the 2011 Reverse Record Check**



Source: Statistics Canada, 2015.

To our knowledge, the RRC is the only major Canadian survey that provides a direct comparable measure of emigration at several points in time. For this reason, at the end of each census cycle, it is notably used to evaluate the DEP estimates of emigration (Morissette and Bérard-Chagnon 2014). The RRC’s emigration estimates are also used to build the emigration assumptions of Statistics Canada’s demographic projections (Bohnert et al. 2015).

The RRC provides a measure of the number of emigrants based on the concept of usual place of residence for those who were still abroad on Census Day. Unlike the residual method, the RRC identifies the emigration of recent immigrants and young children because these populations are included in the RRC frames. However, like the residual method, it cannot measure multiple migrations that may have occurred during the period under study.

7. Note that returning emigrants who were not in the country during the previous census are not covered by the RRC. There were about 250,000 people in this group for the 2011 RRC.

8. For further details, refer to *Census Technical Report: Coverage, Census of Population, 2011* (Statistics Canada 2015).

The emigration numbers drawn from the RRC can be divided into permanent and temporary emigrants based on information regarding length of time since departure and intentions to return. Respondents who have left the country and do not intend to return or—if their intention is unknown—have left for two years or more, are classified as emigrants. Respondents who intend to return and have been away for less than six months, and respondents who have been away for more than six months but less than two years, and whose intention to return is unknown, are classified as temporary emigrants.

The RRC can be used to break down the emigrant population by basic demographic characteristics as well as other characteristics, such as mother tongue.<sup>9</sup> It also provides a standard error estimate of the number of emigrants from each province.<sup>10</sup> In some cases, the RRC can also be used to determine the emigrant's country of destination. This information was notably used to study the brain drain that occurred between 1996 and 2001 when a module was introduced to study this topic in the 2001 RRC (Grenier 2004).

The RRC's main limitation in terms of estimating emigration is sample size. Because emigration is a relatively rare event, and this survey is not focused on measuring it, emigration estimates calculated using this source are based on a small sample of respondents. For example, in 2011, the national emigration estimate was based on just under 400 respondents, while the temporary emigration estimate was based on about 150 respondents. As a result, the sampling error is relatively high, and it quickly becomes very difficult to break down the number of emigrants by their characteristics.

In addition to the usual limitations of survey data, Grenier (2004) noted two other important limitations of the RRC with respect to estimating emigration. Firstly, in the 2001 RRC, the information for just over 70% of emigrants was obtained by proxy, usually a relative. It is reasonable to assume that the quality of proxy responses tended to be lower than responses obtained directly from the sampled person, especially for the intention to return to Canada. Secondly, the non-response adjustment has a significant impact on the estimated number of emigrants. In 2001, final weights were 42% higher than initial weights for emigrants and 35% higher for temporary emigrants.

Due to the use of health records as a sampling frame for the territories, the measure of emigration cannot be produced using the RRC. Because they have left the country, most emigrants are no longer listed in health records on Census Day and cannot be tracked by the RRC. However, because of their small population, emigration from the territories is marginal.

Finally, RRC data are available only about two years after the census, which means that timeliness can also be a limitation.

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9. However, as far as we know, no published study has used the RRC data for this purpose.

10. In this study, confidence intervals were computed using an approximate method (SAS SurveyMeans procedure).

### 1.3 Tax data

According to the *Income Tax Act*, an individual must complete a tax return if there is tax payable for the tax year of the return (Canada Revenue Agency 2016).<sup>11</sup> This Act also applies to individuals living abroad if they earned income from Canadian sources, such as income from a capital gain. Individuals must also report their departure from the country to the Canada Revenue Agency (CRA) by indicating the day and month of departure in the appropriate box in the income tax return.

For tax purposes, an emigrant is a taxfiler who severs his or her social and economic ties to Canada (Duncan 2015). This is based on the individual's particular situation with respect their own and their family's place of residence (primary ties). If the taxfiler owns a residence in Canada that is available year-round or if their family continues to reside in Canada, the CRA does not consider this person an emigrant. Also, the CRA assumes that the severing of ties with Canada also involves breaking various secondary ties, such as maintaining a valid driver's licence or bank accounts in Canadian institutions. If a taxfiler maintains many of these ties, he or she may not be considered an emigrant for tax data purposes.

The following figure shows the box that must be filled by the taxfiler.

**Figure 2**

#### Section of the 2016 tax return where the taxfiler must put his departure date

If you **became** or **ceased** to be a **resident of Canada** for income tax purposes in **2016**, enter the date of:

entry     

 or    departure

**Source:** Canada Revenue Agency, T1 form for the 2016 taxation year.

For this study, tax data from the T1 Family File (T1FF) is used to produce a measure of emigration. This database essentially combines individual tax returns with Canada Child Tax Benefit<sup>12</sup> (CCTB) data. The T1FF covers approximately 95% of the Canadian population (Statistics Canada 2017).

If the information that taxfilers have emigrated is obtained directly from their tax return, the information for non-reporting persons, such as children, is drawn indirectly from the taxfilers' data. For example, if both parents of a family emigrate, the children are also considered to have emigrated. If only one parent emigrates, weighting is applied to the children, and half of them are classified as emigrants. A coverage adjustment is also made by comparing the T1FF population by province, age and sex with Statistics Canada population estimates. Non-permanent residents are excluded from the number of emigrants by identifying them with their social insurance number (SIN).<sup>13</sup>

There are many advantages to using tax data. They can be used to obtain an annual measure of emigration and break down emigrants by various basic demographic characteristics such as place of residence, age and sex. They are also used to calculate monthly emigration estimates based on the departure date. They are available about a year and a half after the end of the fiscal year to which they are related, which is sooner than data from the RRC and the residual method. In some cases, they also provide information on the country of emigration if the taxfiler has indicated a foreign postal address. Because of these advantages, some Canadian emigration studies use tax databases such as the Longitudinal Immigration Database (IMDB)<sup>14</sup> (Dryburgh and Hamel 2004) or the Longitudinal Administrative Databank (LAD)<sup>15</sup> (Finnie 2006).

11. Note that there are other conditions under which individuals must complete a tax return.

12. This program is now called the Canada Child Benefit (CCB). However, since the program change occurred in 2016 and the comparisons in this study are based only on census periods ending in 2011, the acronym CCTB is used to refer to these data.

13. Individuals are excluded if they have a temporary SIN, an individual tax number or a temporary identification number.

14. The IMDB is a database that combines linked T1FF files and immigration data to follow immigrants longitudinally.

15. The LAD is a longitudinal databank that comprises a 20% sample of the T1FF and the IMDB.

However, tax data have three main weaknesses. Firstly, the CRA's concept of emigration differs considerably from the one used by the DEP and the census. The tax definition of emigration is much narrower than the one used by many Statistics Canada programs, which is based on no longer having a usual place of residence in Canada. It is therefore possible to be an emigrant from the standpoint of the usual place of residence without being an emigrant for tax data purposes. The tax definition of emigration would be more akin to permanent emigration, since temporary emigrants may be less likely to sever all ties with Canada because they intend to return to the country in the future. Moreover, the departure date corresponds to the time when the filer cut his or her social and fiscal ties with Canada and not necessary to the time when he changed his usual place of residence. According to tax data, a filer could be an emigrant many years after having moved from the country.

Secondly, some studies point out that tax data may omit a number of departures because some taxfilers may fail to report their departure on their tax returns. Researchers who use tax data to study emigration must accept this limitation and focus on examining emigrant trends and characteristics (Finnie 2006, Dryburgh and Hamel 2004) or make extensive methodological adjustments (Aydemir and Robinson 2006).

Finally, the coverage of tax data, although generally quite high, is reduced for certain demographic groups that are more likely to emigrate, such as men in their twenties (Bérard-Chagnon 2008) and recent immigrants (Aydemir and Robinson 2006). This could lead to a moderate underestimation of emigration if non-filing individuals are more likely to emigrate than taxfilers.

#### **1.4 Demographic Estimates Program method**

Every quarter, Statistics Canada's DEP publishes population estimates for Canada, the provinces and territories, as well as some components of population growth. For purposes of the DEP, several sources are combined to produce monthly, quarterly and annual emigration estimates.

As noted in the introduction, the DEP distinguishes between permanent and temporary emigration.<sup>16</sup> For the purposes of this paper, unless otherwise indicated, DEP estimates combine the number of permanent emigrants with the number of temporary emigrants. Moreover, final estimates of emigration are used here.<sup>17</sup>

##### **1.4.1 Permanent emigration**

The number of permanent emigrants is obtained by combining the tax data from the CCTB and the T1FF with U.S. data from the U.S. Department of Homeland Security's (DHS) Office of Immigration Statistics. The CRA administers the CCTB program, whose purpose is to help eligible families meet the needs of their children aged 18 or younger through monthly allocations. The DHS provides data on Canadians who acquire permanent immigrant status in the United States.

Estimates of emigrant children and adults are calculated separately. The U.S. data are also used to distinguish between emigrants who have moved to the United States and those who have moved elsewhere in the world.<sup>18</sup>

The number of children who emigrate to the United States is drawn directly from DHS files. Children who have relocated elsewhere in the world are estimated based on CCTB recipients who have reported that they have left Canada, from which children listed in DHS files are subtracted. Various factors are applied to adjust the CCTB data, for instance, their coverage.

With respect to adults, DHS data are also used directly to estimate the number of emigrants to the United States. The number of adults who emigrate to the rest of the world is calculated by applying the rate of child emigration to the rest of the world to the adult population. An adjustment is also made to account for the fact that adults are more likely to emigrate than children.

Distributions by age and sex are based on the number of emigrants from the T1FF file, adjusted for coverage. The data are broken down on a monthly basis based on CCTB data for children and emigration dates in the T1FF file for adults. Also the quarterly distribution of adults who emigrate to the United States is based on DHS data.

16. The following two subsections summarize the techniques used by the DEP to estimate emigration. For further details, please refer to [Chapter 6 of Population and Family Estimation Methods at Statistics Canada](#) (Statistics Canada 2016a).

17. DEP emigration estimates can be preliminary, revised or final according to the timeliness of the sources used to compute the estimates.

18. However, the data published by Statistics Canada only cover all emigrants.

This method has two main advantages. First, it uses the assets of three complementary data sources to calculate a monthly, quarterly and annual emigrant population by age and sex for several levels of geography. The use of U.S. data is particularly appropriate because the United States is the main country of destination for Canadian emigrants (United Nations 2015). This approach is also used to calculate the estimated number of emigrants shortly after the reference date of the event. This is a major advantage for Statistics Canada because population estimates must be very current to meet the needs of the data users.

On the other hand, despite the combined use of various sources, the DEP method may tend to underestimate emigration (Morissette and Bérard-Chagnon 2014). This could arise from the fact that CCTB recipients, who receive monthly allowances, have no real incentive to report their departure. Also, the CCTB's concept of emigration is consistent with that of tax data, which both differ from that of the DEP. It is also assumed that the various adjustment factors on which the method is based can correct data deficiencies and that the indirect estimate of adult emigration based on children provides an accurate reflection of reality. These two elements increase the uncertainty of the method.

#### **1.4.2 Net temporary emigration**

Some emigrants live abroad on a temporary basis without maintaining a usual place of residence in Canada. Circular migration for work or study are good examples of this type of phenomenon. It is acknowledged that these migrations are especially difficult to identify in administrative data (Michalowski 1999). For this reason, the DEP calculates temporary emigration estimates in addition to permanent emigration estimates.

Temporary emigration is published in the form of net numbers. Departures are obtained using the RRC. This survey provides an estimate of the people who left Canada temporarily during an intercensal cycle and who are still abroad on Census Day.

The number of temporary emigrants who have returned to Canada is calculated by subtracting the number of returning emigrants in the last census<sup>19</sup> from the DEP estimate of returning emigrants from the previous census period. It is assumed that returns not captured by the DEP estimates are people returning from a temporary stay abroad.

Age and sex distributions used for temporary emigrants are the same as those used for permanent emigrants, and provincial distributions are based on the temporary departures from the RRC.

The measure of temporary emigration is based on several sometimes very strong assumptions. Temporary departures and returns are both based on data from a past period, not on current data. Moreover, they are assumed to be constant until the next census. RRC data on temporary emigration are also significantly limited by sample size as mentioned previously.

For this study, the estimates of temporary departures from the postcensal series are used. During the rebasing of the demographic estimates,<sup>20</sup> data on temporary departures in the postcensal series is replaced by that of the end of period RRC. For example, the 2006 RRC data is used for the 2006/2011 cycle. During the rebasing, these estimates are replaced by those from the 2011 RRC. The decision to use the estimates from the postcensal series was made for two reasons. First, the demographic estimates series computed using the end of period RRC is never published because its computation happens during the rebasing. Second, using temporary departures from the end of period RRC would blur comparisons to RRC data. The differences between the two sources would then only come from permanent emigration.

19. Or the 2011 National Household Survey (NHS). This number comes from information on the place of residence five years ago excluding recent immigrants and non-permanent residents.

20. Demographic estimates are rebased every five years to align them on census data adjusted for net undercoverage.

## 1.5 International data

A measure of Canadian emigration can be produced by examining data from other countries for which estimates by place of birth, country of citizenship or previous place of residence are available. However, an exhaustive review of data from all countries of the world is a daunting task involving several difficulties. The data for each country are not of the same quality, do not share the same concepts and are not available for the same period (Dumont and Lemaître 2006). As such, researchers who have used this approach tend to limit themselves to countries with large numbers of Canadian nationals for whom reasonably reliable data are available. While this approach is appropriate for examining the characteristics of emigrants, it is less appropriate for producing an accurate measure of the phenomenon as a whole.

Using data from censuses, population registers and surveys from most of the countries of the world, the United Nations (2015) revealed that, in 2010, the Canadian diaspora reached about 1.23 million persons. The vast majority of these immigrants, more than 800,000 people, lived in the United States. More than 20,000 Canadian nationals also lived in Great Britain, Australia, Italy and France.

Although these figures are limited by many factors, they nonetheless highlight the fact that Canadians are attracted to the United States. This is why two U.S. sources were added to the comparisons to examine Canadian emigration to the United States: the American Community Survey (ACS) and DHS.

### 1.5.1 American Community Survey

The ACS is an ongoing mandatory survey that replaced the U.S. Census long-form questionnaire after 2000. The ACS collects demographic and socioeconomic information on nearly 3.5 million U.S. households annually, and targets respondents at their place of residence if they have been living there for at least two months (Mather et al. 2005).

Canadian emigration to the United States can be estimated in two general ways based on the ACS. First, information on the place of residence one year ago can be used to identify people who have recently moved to the United States from Canada. However, this criterion mixes emigration with departures of temporary residents. For instance, an American who came to study in Canada (a non-permanent resident) and returned to the United States and a Canadian temporarily residing in the U.S. for work would be counted as emigrants using this approach. It should be noted that American citizens or people born in the United States can be identified and removed, but that this approach would omit a large number of emigrants. The place of residence one year ago is used by the U.S. Census Bureau (2016) to estimate the number of foreign-born immigrants.

Second, the country of birth allows identification of individuals born in Canada. This group can be broken down by year of entry in the United States to derive annual counts of emigrants.<sup>21</sup> Although it can be used to identify emigrants born in Canada, this criterion omits the emigration of Canadian citizens or permanent residents born in the U.S. or elsewhere in the world. And yet, this phenomenon is not insignificant. According to data from the National Graduates Survey, at the turn of the millennium, 20% of Canadian emigrants to the United States were not born in Canada (Boudarbat and Connolly 2013), while DHS<sup>22</sup> data suggested that this was the case for one-third of these emigrants. This criterion would therefore exclude a significant percentage of the Canadian emigrant population to the United States. In addition, they may be some reporting error or inconsistencies associated with the year of entry in the ACS (Van Hook and Bachmeier 2013). Migrants engaged in circular migration may find the year of entry question confusing and could plausibly report the year of their first move, last move or a year between.

In addition to basic demographic information, the ACS provides information on several socioeconomic characteristics of Canadian emigrants such as educational attainment or income. Also, it is an annual survey, so a measure of Canadian emigration is available every year.

On the other hand, since it is a survey, sample size may limit the study of a relatively rare event such as emigration. The measure of Canadian emigration according to the place of residence one year ago is based on approximately 800 respondents in the Public Use Microdata Sample's (PUMS) annual files. Furthermore, the ACS does not provide information on the emigrant's province of residence at departure.

21. Calculating migration flows from stocks requires some assumptions.

22. This data source is presented in the following subsection.

Another limitation of the ACS is that only information on American citizenship is available. It is not possible to identify the country of citizenship of individuals who possess a foreign citizenship. As a result, it is difficult to identify Canadian citizens to separate them from non-permanent residents.

Some studies also report that a number of snowbirds (i.e. Canadians who spend part of the winter in warmer states in the U.S.) may have responded to the ACS (Dion and Vézina 2010, Mather et al. 2005). Although these Canadians spend a large part of the year in the United States, their usual place of residence is still in Canada, and they are not included in the ACS target population. However, some snowbirds may have responded to the ACS questionnaire if they had been in their second residence for more than two months or misunderstood the instructions. Although it is very difficult to measure, data from 1999 suggests that the Canadian snowbird population in the United States and Mexico may range from 300,000 to 375,000 individuals (Coates et al. 2002). It should be noted that the enumeration of other short-term moves between Canada and the United States, for example to visit family members, could also contribute to an overestimation of emigration by the ACS.

PUMS data were used for purposes of this study. These data can easily be downloaded from the U.S. Census Bureau site.<sup>23</sup> They differ from ACS master file data in two ways. PUMS is a sample of the ACS that includes approximately 1% of households in the United States and Puerto Rico compared with 2.5% for the ACS (U.S. Census Bureau 2009a). In addition, in order to protect respondent confidentiality, additional processing is performed, for instance, to consolidate some categories that include few respondents and delete personal information such as names and addresses. Although the consolidation of categories does not affect this assessment, the fact that PUMS is a sample of the ACS increases the variability of calculated estimates. Annual PUMS data are usually available just under one year after the reference period. Margins of error have not been calculated because the tabulations presented here are the sum of the yearly files for 2006 to 2011.

In addition, only data from 2006 onward were used in this study because data prior to 2005 were produced as part of survey tests based on a very small sample with statistical techniques different from those used in subsequent cycles (U.S. Census Bureau 2009b).

Finally, the concept of place of residence one year ago was used to identify Canadian emigrants in the ACS, mainly because this criterion also includes Canadian emigrants not born in Canada.

### **1.5.2 Department of Homeland Security**

The Bureau of Citizenship and Immigration Services (BCIS) is a component of the United States Department of Homeland Security (DHS). It is responsible for processing immigration and citizenship data for the United States. This agency notably issues permanent and temporary resident permits similarly to Immigration, Refugees and Citizenship Canada (IRCC).

For the purpose of this study, we are limiting ourselves to individuals from Canada who have acquired the right to establish a permanent residence in the United States.<sup>24</sup> This definition is similar to that of permanent emigration. Individuals temporarily in the United States were excluded from this study because available U.S. data are aggregations of admission events instead of counts of individuals admitted to the United States (Teke and Navarro 2016). For this reason, the numbers obtained are far too large, because they include temporary moves, such as trips, which does not result in a change in the place of residence. The DHS reports that there could be about 100,000 Canadians in the United States under a temporary resident permit, excluding individuals with a usual place of residence in Canada (Baker 2016). The data are obtained from the tabulations that the DHS sends to Statistics Canada, usually one year after the reference period.

These administrative data have the advantage of providing a complete annual measure of permanent residence permits issued to emigrants from Canada. However, they cannot be used to measure multiple migrations. According to this source, a Canadian who established a residence in the United States in 1990, returned to live in Canada in 2000 and then again returned to the United States in 2010 will only be considered to have immigrated once, in 1990. This may cause an underestimation of migratory flows to the United States in the case of people who travel back and forth over a long period. Also, people considered by the United States to be immigrants from Canada are not necessarily considered by Canada to be emigrants. A number of them may also be non-permanent residents. Americans who resettle in the United States are not included in DHS data either, although they may be considered emigrants from a Canadian perspective if they are Canadian citizens or landed immigrants.

23. U.S. Census Bureau site, <https://www.census.gov/programs-surveys/acs/data/pums.html> (accessed November 23, 2017).

24. In the United States, immigrants are also known as green card holders.

## 1.6 Conclusion

Although emigration is very difficult to measure, several sources and methods can provide an idea of the number of emigrants and their characteristics. However, these sources generally have different definitions of emigration, and they all have their own advantages and disadvantages. The following table summarizes the sources and methods that have just been presented and their main characteristics. As we shall see in the next chapter, this has a considerable influence on the comparison of emigrant counts.

**Table 1**  
**Characteristics relating to the measure of emigration of the various sources reviewed in this study**

Characteristics	Sources					
	Residual Method	Reverse Record Check	Tax Data	Demographic Estimates Program	American Community Survey	Department of Homeland Security
<b>Population universe</b>	- Census universe minus population absent in the starting population.	- Census universe minus returning emigrants and territories.	- Taxfilers and their dependents.	- Mix of tax, administrative and census universes.	- Population residing in the United States for at least two months.	- Green card holders (permanent residents) in the United States.
<b>Concept of emigration</b>	- Usual place of residence is no longer in Canada (derived indirectly).	- Usual place of residence is no longer in Canada.	- Termination of fiscal and administrative ties with Canada.	- Mix of tax, administrative and census concepts.	- Place of residence in Canada one year ago.	- Acquisition of permanent residence in the United States by individuals from Canada.
<b>Type of emigration</b>	- Permanent and temporary without distinction.	- Permanent and temporary.	- Permanent.	- Permanent and temporary.	- Permanent and temporary without distinction.	- Permanent.
<b>Timeliness</b>	- More than 2 years after the reference date.	- More than 2 years after the reference date.	- One and a half years after the reference period.	- One year after the reference date.	- A little less than one year after the reference period.	- Usually one year after the reference period.
<b>Main advantages</b>	- Proven demographic technique; - Universe and concepts relatively close to those of the census.	- Direct measure; - Universe and concepts relatively close to those of the census.	- Annual direct measure; - Good population coverage.	- Very current monthly measure.	- Annual measure; - Wide range of characteristics.	- Official source for U.S. immigration; - Monthly measure.
<b>Main weaknesses</b>	- Residual includes the errors of the other components; - Less current data.	- Small sample size; - Less current data.	- Departure undercoverage; - Tax concept of emigration.	- High modelling level; - Many different sources and concepts; - Adult emigration partially derived from child emigration.	- Presence of people temporarily living in the United States; - Concepts different from those of the census; - Relatively small sample size.	- Does not take into account departures of U.S. citizens and individuals who have acquired a permanent residence permit in the U.S.

## 2. Comparison of sources and methods

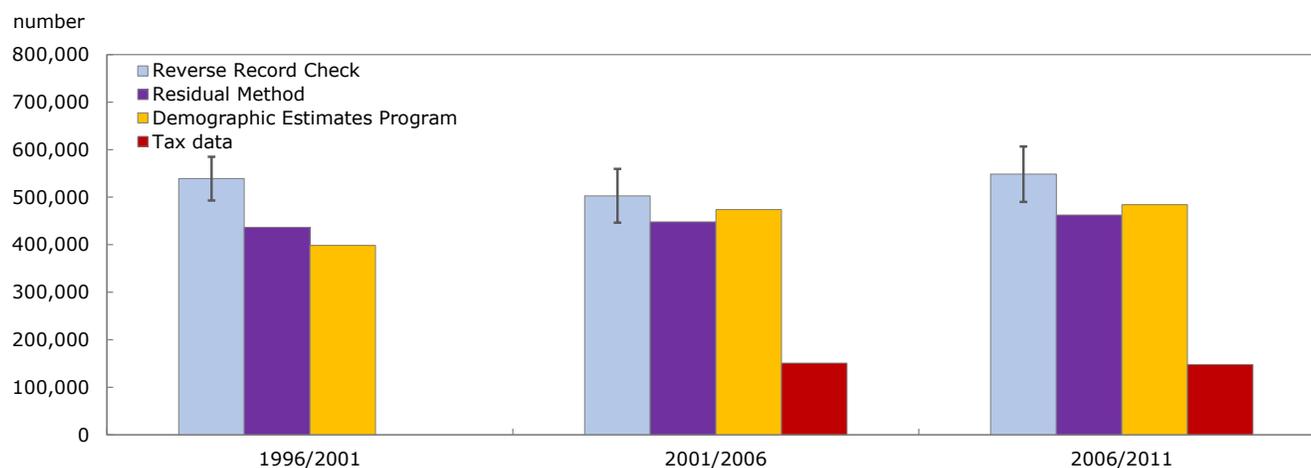
The previous chapter introduced several data sources and methods that provide an estimate of emigration. This chapter begins by comparing the total number of emigrants from these various sources and methods in three census cycles. Subsequently, the emigrant counts are examined for various characteristics of interest to the DEP: permanent emigration, month of event, province of departure, age and sex. Finally, emigration to the United States is examined based on Canadian and American sources.

### 2.1 Total number of emigrants

The following chart presents the total number of emigrants taken from the various Canadian sources discussed in the previous chapter.

**Chart 1**

**Number of emigrants by source or method, Canada, 1996/2001, 2001/2006 and 2006/2011**



**Notes:** Emigration numbers obtained using the DEP method are calculated by adding emigrants as of July 1 of the census year to the July 1 figures of the following census year. The confidence intervals of data from the RRC are computed at a 95% confidence level. Sampling variance of the 1996 RRC is only calculated for permanent emigration. RRC data exclude the territories.

**Sources:** Reverse Record Check (2001, 2006 and 2011), 1996, 2001 and 2006 censuses, National Household Survey (2011) (residual method), T1 Family File (2001 to 2010) (tax data), Statistics Canada (Demographic Estimates Program).

The total number of emigrants fluctuates greatly depending on the source examined. The number of emigrants based on the RRC goes from 450,000 to 600,000 depending on the census period. This level of emigration is higher than that obtained from other sources.

The residual method provides a somewhat lower number, about 450,000 emigrants for each of the three periods. The residual method is expected to produce a slightly lower number of emigrants because it does not take into account the departures of segments of the population that were not in the country at the beginning of the period, such as recent immigrants. This may provide a partial explanation of the discrepancy between the numbers calculated using this method and those of the RRC. The 2011 RRC data revealed that about 96,000 immigrants admitted between 2006 and 2011 and 35,000 young children were classified as emigrants or living abroad.<sup>25</sup> Removing these emigrants from the RRC emigrants reduces the discrepancy between the two methods for the 2006–2011 period, which decreases from nearly 88,000 individuals to about 45,000 individuals. This discrepancy is no longer statistically significant.

DEP estimates provide a measure ranging from 400,000 to 485,000 emigrants. These numbers, which include permanent emigration and temporary departures, tend to be lower than those of the RRC, but are comparable to those of the residual method. During the three cycles under study, DEP numbers were only within the confidence interval of the RRC numbers for 2001–2006. DEP estimates were also more than 20% lower than the RRC number for the 1996–2001 cycle although, being calculated annually, they took into account the multiple migrations that occurred between two censuses.

25. These numbers respectively represent emigrants from the immigrant and birth sampling frames.

These results also highlight the considerably lower number of emigrants based on tax data. The number, estimated at 150,000 emigrants for the two cycles for which data were available, is much lower than the number from other sources even if it includes the departure of dependents. This may be attributable both to significant conceptual differences in emigration between tax data and most of the other sources reviewed here, as well as potential undercoverage of departures.

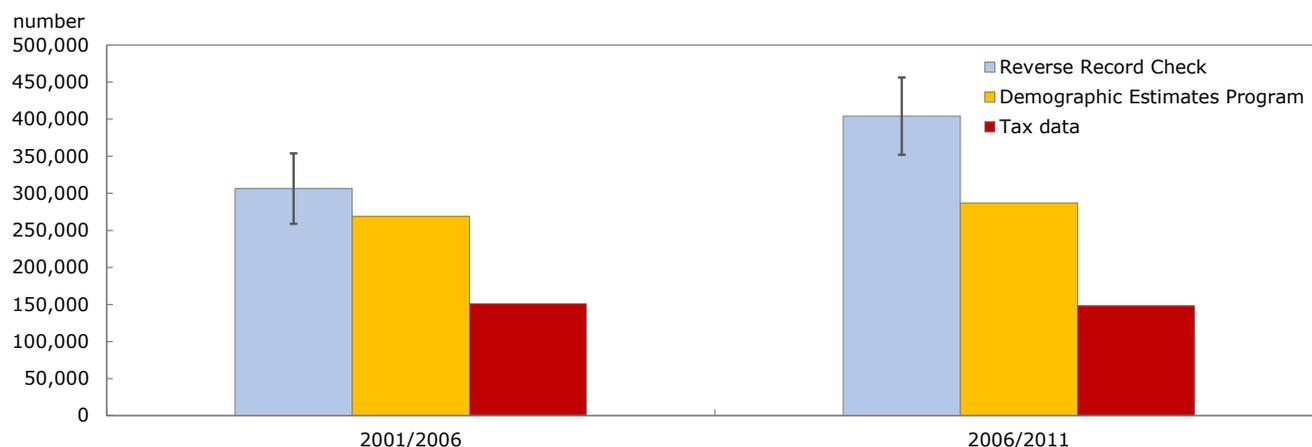
### 2.1.1 Number of permanent emigrants

Although the concept of emigration in tax data is very different from that of other sources, it may be somewhat akin to the concept of permanent emigration. Taxfilers must indicate their departure in their tax returns if they have severed their tax and social ties with Canada. An emigrant who leaves the country on a temporary basis would obviously be more likely to maintain ties with Canada while abroad and therefore not be an emigrant according to the tax data definition.

Yet, temporary emigration would then be a relatively important component of Canada’s international migration dynamics. According to RRC data, the only source that breaks emigration down into permanent and temporary emigration,<sup>26</sup> between 25% and 40% of emigrants are temporary emigrants.

The following chart continues the comparisons by confronting the permanent emigrant counts from the sources which can be used to directly measure them.

**Chart 2**  
**Number of permanent emigrants by source or method, Canada, 2001/2006 and 2006/2011**



**Notes:** Emigration numbers obtained using the DEP method are calculated by adding emigrants as of July 1 of the census year to the July 1 figures of the following census year. For the RRC and the DEP method, only permanent emigration is presented here. RRC data exclude the territories. RRC data confidence intervals are computed at a 95% confidence level.

**Sources:** Reverse Record Check (2006 and 2011), T1 Family File (2001 to 2010) (tax data), Statistics Canada (Demographic Estimates Program).

The discrepancy between the emigrant counts from tax data and estimates from other sources does not appear to be solely attributable to the fact that tax data would primarily provide a measure of permanent emigration. Tax data provide emigration counts that are still far lower than those produced through the RRC and the DEP method from Statistics Canada. For the two cycles under consideration, permanent emigrant counts from the RRC range from 250,000 to 450,000 versus 150,000 for tax data.

The DEP method also produces permanent emigrant counts that tend to be lower than those of the RRC. Although the 2001–2006 cycle estimates are closer to the permanent emigration figures from the RRC, they are still lower by more than 100,000 people for the 2006–2011 cycle, a statistically significant difference. Finally, emigrant counts produced through the DEP method once again exceed the counts based on tax data. This would indicate that including U.S. data and applying various adjustment factors produces a measure of permanent emigration based on tax data that is closer to that of the RRC.

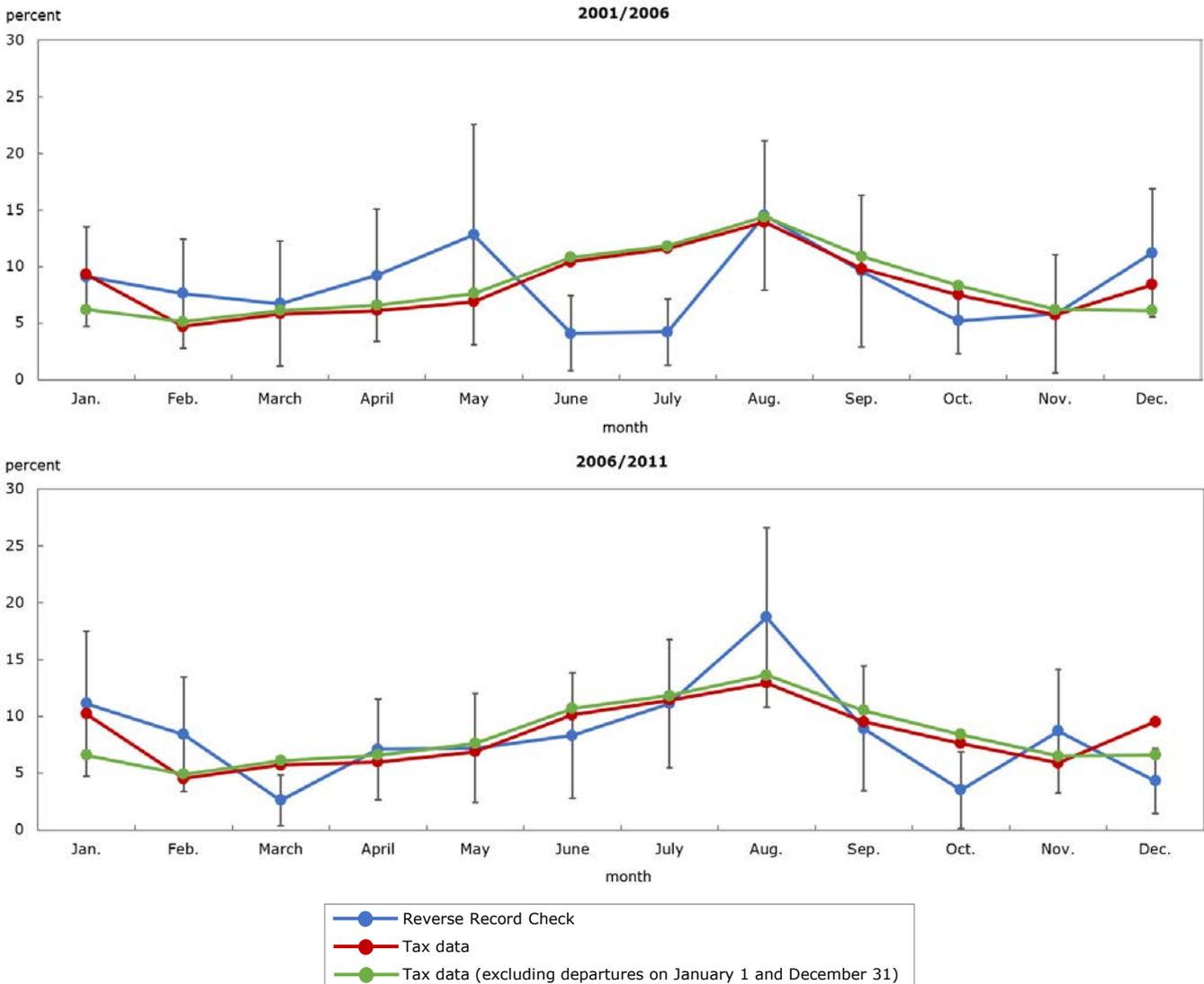
26. The DEP method also distinguishes between permanent and temporary emigration. However, this measure of temporary emigration is taken directly from the RRC data. As a result, this survey is the only source that can really measure this phenomenon. The chart in Appendix A breaks down RRC emigrant counts by type of migration.

## 2.2 Number of emigrants by departure date

The DEP calculates monthly emigration estimates. Tax data and RRC data can be used to break down the number of emigrants by departure date. This section compares the monthly distributions of emigrants from these two sources.<sup>27</sup>

**Chart 3**

**Monthly distribution (%) of emigrants by source, Canada, 2001/2006 and 2006/2011**



**Notes:** Tax data that exclude departures on January 1 and December 31 only target taxfilers and are not adjusted for coverage. RRC data are for emigrants who left before May 15, 2004 (RRC 2006) and before May 9, 2009 (RRC 2011). RRC data exclude the territories. RRC data confidence intervals are computed at a 95% confidence level.

**Sources:** Reverse Record Check (2006 and 2011), T1 Family File (2001 to 2010) (tax data).

27. Due to the way RRC information is collected, the number of emigrants cannot be broken directly down by year of departure. This situation is detailed in Appendix B. Also, monthly distributions produced using the DEP method are not presented here because they are drawn from CCTB and T1FF data, which are naturally very close to tax return data.

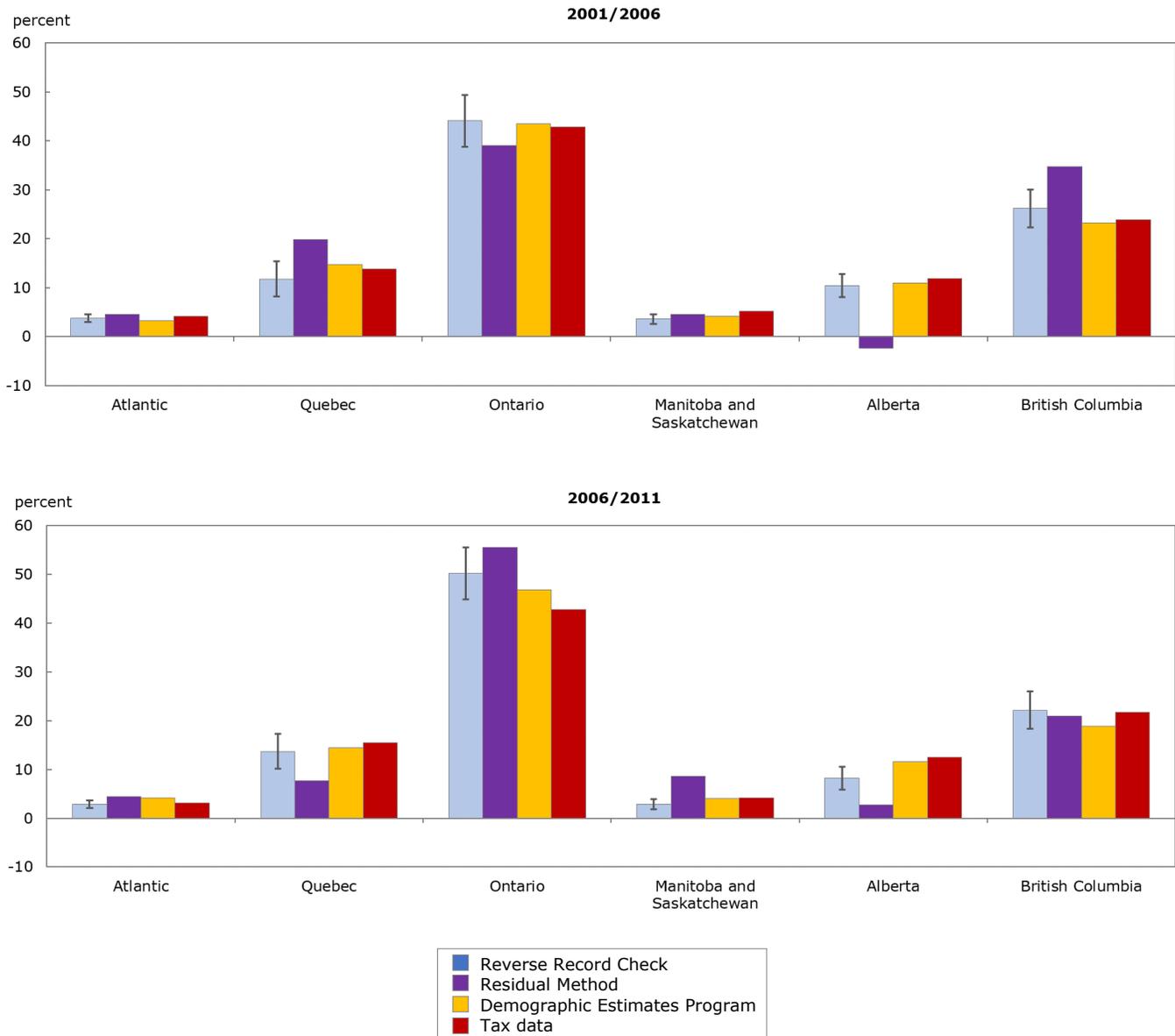
These charts reveal two things. Firstly, RRC data show greater monthly variability than tax data. The departure month is missing for about 70% of the RRC emigrants. As a result, sampling variability tends to be much more pronounced. This greatly reduces the potential of the RRC to measure monthly emigration. Tax data suggest that there are more departures during the summer period. This result could be reflective of a period of the year when temperatures and school holidays facilitate international moves.

Secondly, the relative magnitude of emigration in January and December in the tax data raises some questions. A closer examination of the daily distribution of emigration for these two months reveals that, on average, between the 2006 and 2010 fiscal years, about 8% of taxfilers listed December 31 or January 1 as their emigration departure date. It is very likely that some of these individuals entered these dates because they are the first and last day of the tax year, which could influence the items reported in their returns (Duncan 2015). If these emigrants are removed, the monthly distribution of tax data changes significantly. The percentage of taxfilers who left Canada in January or December decreases from about 10% to about 6%. Although some emigrants may have actually moved on both dates, the new distribution seems more appropriate.

### 2.3 Number of emigrants by province of departure

As shown in the following chart, emigrants' provinces of departure vary with the source or method reviewed.

**Chart 4**  
**Distribution (%) of emigrants by province of departure and source or method, Canada, 2001/2006 and 2006/2011**



**Notes:** Data are not provided for the territories because these figures are not available through the RRC, and the number of emigrants from the territories is very low according to all the other sources reviewed. Some provinces have been consolidated, also because of lower numbers. RRC data confidence intervals are computed at a 95% confidence level.

**Sources:** Reverse Record Check (2006 and 2011), 2001 and 2006 censuses, National Household Survey (2011) (residual method), T1 Family File (2001 to 2010) (tax data), Statistics Canada (Demographic Estimates Program).

The sources compared here revealed that almost two out of three emigrants came from Ontario or British Columbia. In addition, the RRC, the DEP method and tax data showed relatively similar provincial distributions. The largest discrepancy in absolute numbers for these two sources was for Ontario in the 2006–2011 cycle. Half of the RRC emigrants came from this province, versus about 42% according to the tax data.

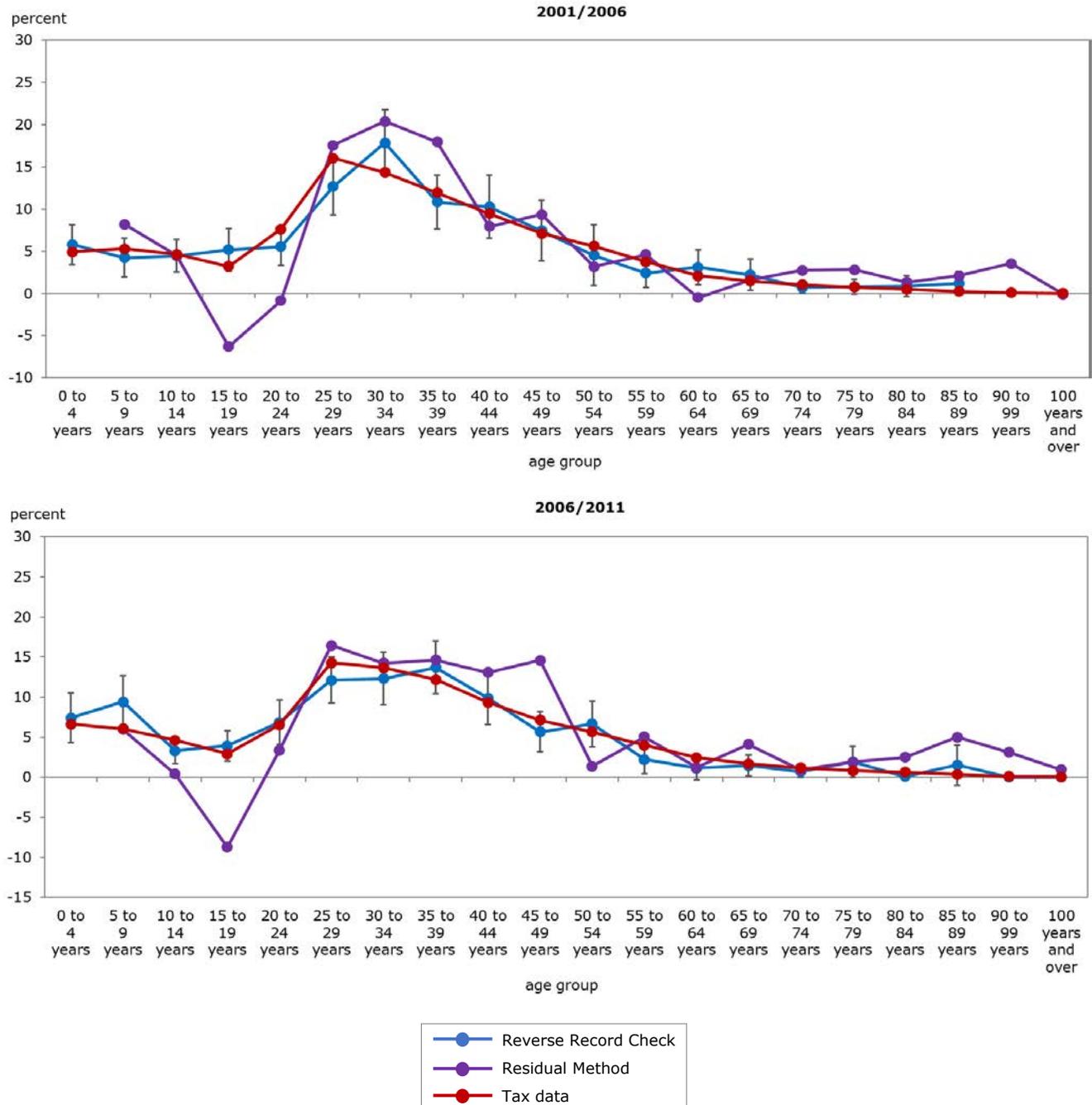
Some limitations of the residual method became apparent when examining the distribution of emigrants by province of departure. For the two cycles under consideration, the residual method produced a distribution of emigrants which sometimes differed significantly from those produced using the other approaches. For instance, it produced very low emigrant counts in Alberta, even negative ones for 2001–2006. This estimate persisted even though interprovincial migration, an essential component of Alberta's demographic dynamics, was taken into account. Conversely, this approach also showed a particularly high percentage of emigrants from Quebec and British Columbia in 2001–2006 and for Ontario in 2006–2011. It is likely that these differences are partially attributable to the inaccuracy of the various elements used to calculate these estimates.

## 2.4 Number of emigrants by age

The following chart presents the distribution of emigrants by age from the sources and methods under study.

**Chart 5**

**Distribution (%) of emigrants by age group and source or method, Canada, 2001/2006 and 2006/2011**



**Notes:** The distribution by age group of the DEP method is not provided here because it is calculated directly from tax data. The RRC age distribution stops at age 85 or older. The residual method does not produce emigration estimates for the population under the age of 5 at the end of the period due to the nature of this approach. RRC data exclude the territories. RRC data confidence intervals are computed at a 95% confidence level.

**Sources:** Reverse Record Check (2006 and 2011), 2001 and 2006 censuses, National Household Survey (2011) (residual method), T1 Family File (2001 to 2010) (tax data).

Overall, the sources compared showed relatively similar age distributions. Emigration peaked among people aged between 20 and 44 years old, and then decreased to very low numbers among the elderly. Emigration was also moderately significant for young children. The age structure of Canadian emigrants is relatively similar to that observed in some European countries<sup>28</sup> as well as for internal migration (Sergerie 2016) and immigration to Canada (Martel and D'Aoust 2016). It is also consistent with the period of the life cycle associated with entry into the labour market, university attendance and mobility in general.

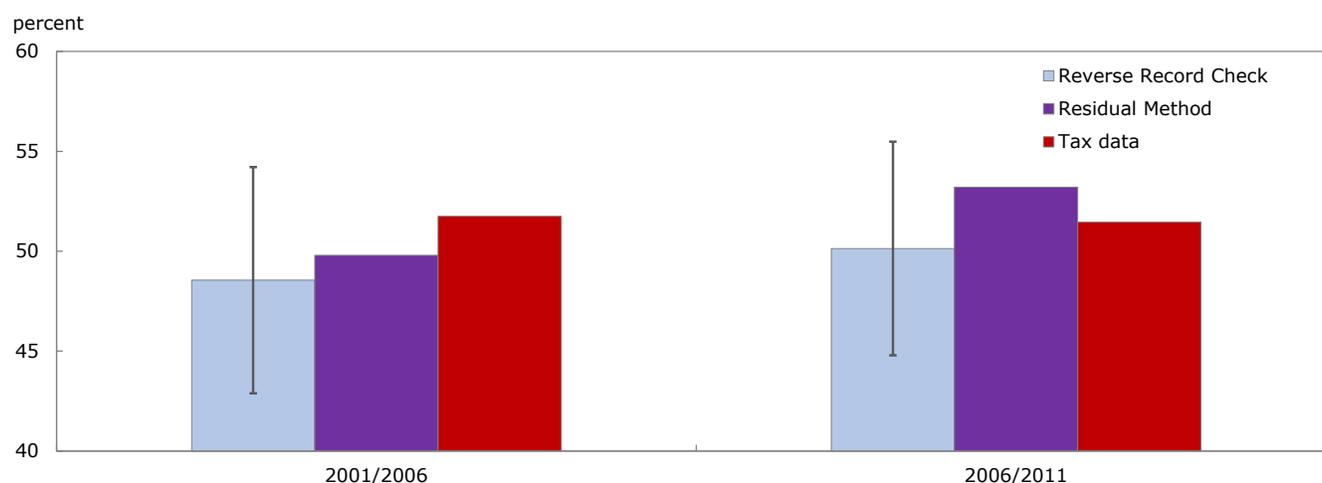
The residual method again produced a distribution that tends to differ from those obtained through other sources. This method produced a negative number of emigrants among people aged 15 to 19, 20 to 24, 60 to 64 and 95 to 99 in the 2001–2006 period and among people aged 15 to 19 in the 2006–2011 period. Also, emigration among the elderly was higher than in other sources. This too was probably attributable to a combination of measurement errors in the other elements of the method and a lower propensity to emigrate among some of these age groups.

In the two cycles studied, the distribution of emigrants from tax data is relatively close to that of the RRC. Tax data distributions are also smoother than RRC distributions due to the relatively small number of emigrants covered by the RRC.

## 2.5 Number of emigrants by sex

The following chart shows the sex distribution of emigrants for the sources and methods reviewed here.

**Chart 6**  
**Proportion (%) of male emigrants by source or method, Canada, 2001/2006 and 2006/2011**



**Notes:** The sex distribution from the DEP method is not provided here because it is calculated directly from tax data. RRC data exclude the territories. RRC data confidence intervals are computed at a 95% confidence level.

**Sources:** Reverse Record Check (2006 and 2011), 2001 and 2006 censuses, National Household Survey (2011) (residual method), T1 Family File (2001 to 2010) (tax data).

The three sources provided very similar sex distributions. Almost half of the emigrants were male in the two cycles reviewed here. This result is also consistent with those obtained using data from the Survey of 1995 Graduates Who Moved to the United States (SGMUS). They indicate that, taking into account the effect of a range of demographic and socioeconomic factors, sex is not statistically significantly correlated with the likelihood of post-secondary graduates moving to the United States (Boudarbat and Connolly 2013).

28. See Eurostat data for more information (<http://ec.europa.eu/eurostat/data/database>). These data, broken down by age, reveal that in the three European countries with the highest number of emigrants in 2014—Spain, Germany and France—emigration was higher among people aged 20 to 40 (accessed December 29, 2016).

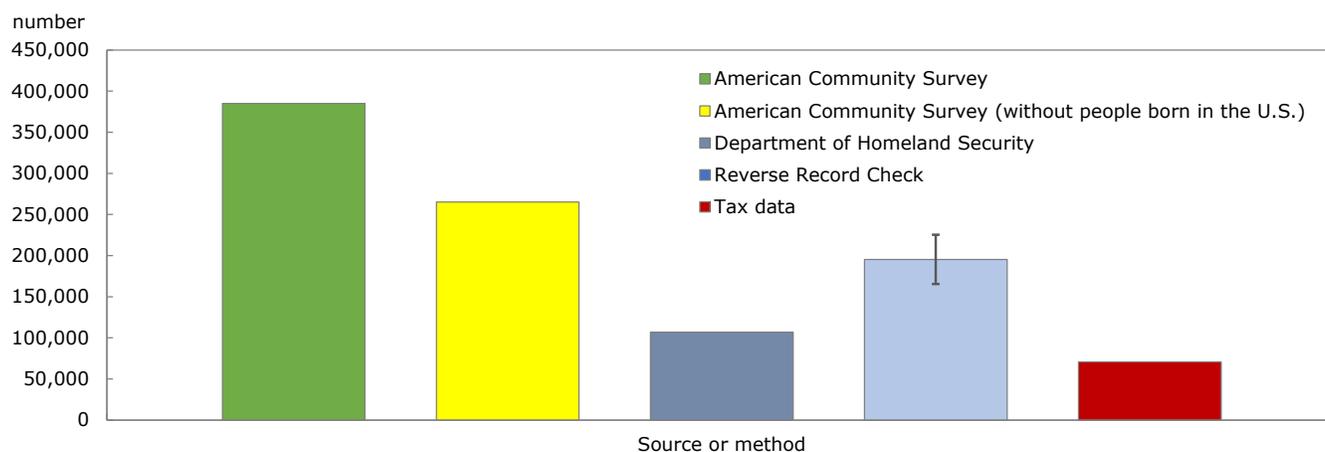
## 2.6 Number of emigrants to the United States

The United States is Canada’s main economic and social partner. It is therefore not surprising that they are also the main country of destination for Canadian emigrants. As we saw in the previous chapter, some U.S. data sources can be used to measure Canadian emigration to the United States. These sources can be compared with Canadian sources that break down emigration by country of destination to evaluate them from a different angle.

The RRC and tax data provide at least partial information on emigrants’ country of destination. The DEP method also distinguishes between emigration to the United States and immigration to the rest of the world when producing data. However, because this distribution is obtained by combining tax data and DHS data, the DEP estimates are not presented here.

**Chart 7**

**Number of emigrants to the United States by source or method, Canada, 2006/2011**



**Notes:** The numbers taken from the ACS for 2006 and 2011 are a fraction of the annual numbers to reflect the intercensal period. The DHS data are monthly. Emigrants from the RRC whose country of destination was unknown were allocated proportionally. Emigrants from the tax data who left to the United States include individuals who entered an emigration date and whose postal address was in the United States. Also, emigrants who had a Canadian postal address were allocated proportionally between the United States and the rest of the world. RRC data exclude the territories. The RRC data confidence interval is computed at a 95% confidence level.

**Sources:** American Community Survey (2006 to 2011), Department of Homeland Security (2006 to 2011), Reverse Record Check (2011), T1 Family File (2005 to 2010) (tax data).

The number of Canadian emigrants who migrated to the United States varied considerably between sources. ACS data indicated the largest number of emigrants by far, an estimated 375,000 individuals for the 2006–2011 period. As mentioned above, because the place of residence one year ago is used to identify emigrants, this group is likely to include large numbers of persons whose moves are not considered migrations based on Canadian concepts. Also, several annual files can be combined to take into account back-and-forth migrations, which is not the case for all the other sources reviewed here. However, even after subtracting emigrants born in the United States,<sup>29</sup> the ACS numbers, estimated at 250,000 individuals, are still higher than those from the other sources.

DHS data estimated that a little more than 100,000 emigrants came from Canada between 2006 and 2011. Three factors may explain the lower numbers from this source. These data produce a measure of permanent emigration only because they provide information on individuals who have been issued a permanent residence permit in the United States. They do not take migrations of U.S. citizens into account, nor potential pendular migrations between Canada and the United States as the permanent residence permit is acquired only once. Emigration to the United States is also often temporary. According to statistics from the SGMUS, over 40% of respondents who were still in the United States in 1999 intended to return to Canada (Bélair and Frank 1999).

29. Many Americans could be temporary in Canada. They could inflate the number of emigrants in the ACS.

The RRC indicated that a little less than 200,000 emigrants relocated to the United States between 2006 and 2011. These emigrants accounted for 35.6% of all emigrants from the RRC and almost 40% of permanent emigrants. It should be noted that just over 160,000 emigrants were permanent emigrants.

The tax data estimated a little over 70,000 emigrants, the lowest of all the sources compared here. These lower numbers are consistent with previous observations regarding the total number of emigrants from that source. It should be noted that the numbers from the tax data were similar to those of the DHS. In both cases, these sources measure permanent emigration. The tax data indicated that the United States was the destination country for 55.3% of emigrants, 20% higher than the figure provided through the RRC.

A review of the age structure and the state of residence of emigrants in the ACS bolsters the assumption that this figure includes several snowbirds. According to the ACS, nearly 30% of emigrants, more than a third of whom were born in Canada, were aged 55 or older compared with 10% or less emigrants according to the DHS, tax data or the RRC.<sup>30</sup> ACS data also indicated that between 2006 and 2011, over 60% of emigrants aged 55 or older resided in Arizona and Florida versus fewer than 12% of emigrants younger than age 55. These two states are known to host a large number of Canadian snowbirds.

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30. A chart comparing the age structures of the four sources presented here is provided in Appendix C. Note that the breakdown by state of residence is not presented, because this information was not directly available in other sources.

### 3. Measure of Canadian emigration

The first chapter presented various data sources and methods for measuring emigration. These sources and methods are based on different universes and concepts. The second chapter showed that while these differences lead to quite varied emigrant counts from one source to the other, distributions by province of departure, age and sex share certain similarities.

In light of these findings, this chapter aims to identify the source whose emigrant counts would be most appropriate for calculating population estimates. To this end, the impact of the numbers provided by each source and method on the errors of closure is examined by replacing temporary emigration estimates (for departures only) and permanent emigration estimates from the DEP with the various numbers analyzed. The error of closure measures the difference between postcensal population estimates and the census adjusted for net undercoverage. A positive error of closure means that the DEP estimates have overestimated the population. As mentioned in the previous chapters, at the Canadian level, the inaccuracy of population estimates is mainly attributable to an underestimation of emigration. This comparison obviously depends on the plausibility of this assumption. A part of the national error of closure comes from the sampling variance of the census net undercoverage estimates. Other components of demographic growth, such as returning emigrants and non-permanent residents, could also be linked to the Canadian error of closure. When postulating that the error mostly comes from emigration, a data source that reduces the error of closure is an indication that it provides emigration estimates that approximate real numbers for the country as a whole.

At the provincial level, the inaccuracy of the measure of interprovincial migration is added to the inaccuracy associated with emigration. Consequently, the resulting errors do not only reflect the effect of emigration. This limitation must be taken into account when interpreting the results.

The errors of closure of this report differ from the published errors for two reasons. Firstly, the DEP series is computed by taking estimates of temporary departures from the beginning of period RRC.<sup>31</sup> Secondly, the errors of closure used in this exercise are those computed by the DEP in 2013. They differ slightly from those computed in 2018 as a result of small methodological changes applied retrospectively to the DEP data.

This comparison focuses on total emigrant counts by province because distributions by age and sex are relatively similar between sources.

The following chart (on next page) shows the errors of closure that would have been obtained in 2006 and 2011 if the DEP had used the sources and methods reviewed. It should be reminded that the various measures used in this exercise replace both the permanent emigration and the departures from net temporary emigration estimates.

Due to the various levels of emigration, errors of closure vary, sometimes considerably, depending on the number of emigrants used.

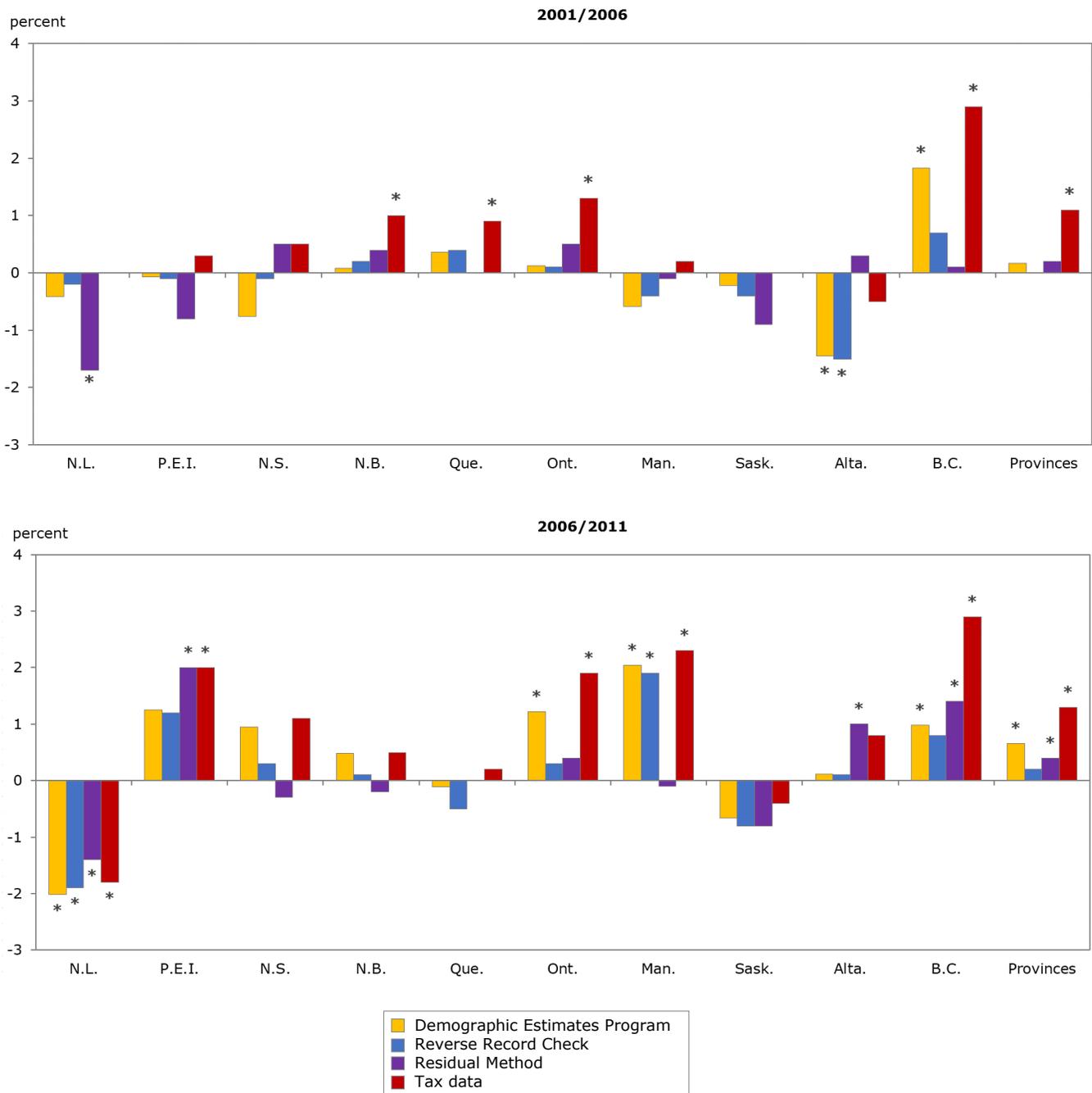
In 2011, when taking data on temporary departures from the RRC at the beginning of the period, the DEP errors of closure were statistically significant for four provinces and for the provinces as a whole. This was the case for two provinces in 2006.

For the 2001–2006 and 2006–2011 cycles, using RRC emigration data instead of DEP data reduces the error of closure for all provinces. The 2006 total error of provinces decreases from 0.2% to nearly 0.0% and the 2011 error decreases from 0.7% to 0.2%. Also, the 2011 error is no longer statistically significant when RRC figures are used. At the provincial level, only Newfoundland and Labrador and Manitoba still have statistically significant errors in 2011 when RRC figures are used. The 2011 evaluation of the demographic estimates showed that most of the error of closure of these two provinces came from interprovincial migration and the RRC sampling error, respectively (Morissette and Bérard-Chagnon 2014). For 2006, British Columbia's error is no longer statistically significant, which leaves Alberta with the only statistically significant error.

The residual method data reduce the error of closure of all provinces for 2011 (0.7% to 0.4%), but not for 2006. In 2006, the error of the residual method is similar to that of the DEP. The error remains statistically significant in 2011 and exceeds the RRC error for both periods reviewed. In terms of the provinces, Ontario's and Manitoba's errors are no longer significant when the residual method data are used. However, Prince Edward Island's and Alberta's errors increase respectively to 2.0% and 1.0% and become statistically significant. For the 2001–2006 cycle, Alberta's and British Columbia's errors are no longer statistically significant when the residual method data are used, but Newfoundland and Labrador's error increases from -0.2% to -1.7% and becomes significant.

31. It should be reminded that the published errors of closure are calculated by taking the estimates of temporary departures of the end of period RRC.

**Chart 8**  
**Errors of closure (%) by province and source or method, Canada, 2001/2006 and 2006/2011**



\* Statistically significant error of closure at a 95% confidence level.

**Notes:** The various measures compared here replace both the DEP emigration estimates and departures from net temporary emigration. The territories are excluded. The DEP errors are not the published errors because they use temporary departures from the RRC at the beginning of the period, also they are based on the errors computed in 2013 and not on those calculated in 2018.

**Sources:** Statistics Canada (Demographic Estimates Program), Reverse Record Check (2011), 2006 census, National Household Survey (2011) (residual method), T1 Family File (2006 to 2010) (tax data).

Because tax data provide a considerably smaller number of emigrants compared to other sources, the errors of closure tend to increase when tax data are used. The error of closure of all provinces increases from 0.2% to 1.1% in 2006 and from 0.7% to 1.3% in 2011. It is statistically significant for these two periods. In 2006, the New Brunswick, Quebec and Ontario errors become statistically significant when the emigrant counts from tax data are used. For 2011, although the errors tend to increase, only that of Prince Edward Island becomes statistically significant.

The results of this analysis suggest that the RRC's emigrant counts would be the most appropriate for calculating population estimates. In addition to producing a measure of the phenomenon that tends to reduce the errors of closure of population estimates, the RRC is based on a universe and concepts that are similar to those of the census. Although this exercise has several limitations, especially at the provincial level, results suggest that the accuracy of RRC counts compared with other sources for measuring emigration is relatively high.

## Discussion and conclusion

Emigration is a significant demographic event. However, measuring it is very challenging because emigrants are not required to report their departure. The purpose of this report was to compare various data sources and methods used to estimate emigration, by identifying their respective advantages and limitations, and comparing emigrant counts obtained from each. The analysis was done from the standpoint of the DEP and is part of the process to maintain and improve the quality of Statistics Canada's demographic data.

The assessment of the various emigration measures suggests that, according to the errors of closure criteria, the RRC provides the most accurate levels of emigration at the Canadian level for calculating population estimates for the 2001/2006 and 2006/2011 cycles. The RRC universe and concepts are similar to that of census and using RRC emigration numbers reduces errors of closure of population estimates. According to the RRC, the "real" number of emigrants may range from 450,000 to 600,000 for each five-year period between 1996 and 2011, about 100,000 emigrants per year on average. This number includes both permanent and temporary emigrants.

However, the measure of emigration produced by the RRC is only available several years after the census and therefore cannot be used to directly calculate current emigration estimates.<sup>32</sup> In this sense, the RRC does not provide a real alternative to the DEP for calculating postcensal population estimates. Using the RRC for this purpose would require using data from the previous census cycle. This type of approach would have many limitations in the sense that it could not totally reflect current emigration trends. Because of its relatively small sample size, the RRC is also a more limited source for breaking down the number of emigrants by province, age and sex.

For these reasons, tax data are also appropriate for measuring emigration for the DEP. Tax data are available annually and more quickly than data from the residual method and the RRC. In addition, tax data provide structures by province of departure, age and sex that are similar to those of the other sources. Due to the number of emigrants available in these data, the number of emigrants can be broken down by various characteristics and very small geographic areas. Such an exercise is very difficult to complete using data from the RRC or the residual method.

Tax data also provide monthly measures of emigration using emigration dates entered in tax returns. Although these distributions appear to be affected by some overreporting of departures on January 1 and December 31, they can be adjusted to account for this and generally reflect a reasonable seasonality for Canadian emigration.

Tax data also have some limitations. Their main weakness is that they produce substantially lower emigrant counts compared with the other sources. This is due to three factors. Firstly, the tax concept of emigration is not only much narrower than the concept used in other sources, but could also exclude temporary emigration. Secondly, it is likely that some taxfilers may not report their departure for various reasons. Finally, incomplete tax data coverage may slightly bias the data, especially for recent immigrants and young adults.

The residual method produces emigration numbers that reduce the error of closure of all provinces and are similar to those of the RRC. However, this analysis confirmed the method's relative lack of stability with respect to some smaller domains, which had been noted by various authors. Alberta's negative emigration between 2001 and 2006 and for some age groups are two prime examples of this situation. By its very nature and the fact that emigration is a rare event, the quality of the residual method relies heavily on the quality of the other elements in the demographic equation, which, of course, show some degree of inaccuracy. Adjustments to correct net census undercoverage may therefore be insufficient for some age groups, which may be part of the reason that this method produces negative emigrant counts at these ages. This method is nevertheless more robust for large aggregates and, as mentioned, produces a total number of emigrants which is very similar to the RRC number.

The comparison with U.S. data shed fresh light on the various measures of emigration. First, it reaffirmed the challenges of comparing international data whose universes and concepts are different. For instance, ACS data on the place of residence one year ago likely overestimate Canadian emigration due to a significant transient population and the inclusion of some individuals who are not emigrants according to Canadian concepts. On the other hand, information on the country of birth obscures the departure of U.S. or foreign-born citizens. The study of Canadian emigrants to the United States is a difficult exercise as a result of these limitations.

32. However, this approach is used to estimate temporary departures given that no other data source is available to measure that phenomenon.

This analysis also reaffirmed the underestimation of the DEP emigration estimates. This has an impact on population estimates because it contributes to overestimating the Canadian population. Calculating population estimates is a complex exercise that requires very current data. For this reason, it is difficult to directly use data from the RRC or the residual method for this purpose.

However, by using both CCTB and DHS data, applying various adjustment factors and taking temporary emigration into account, it is possible to get a measure of emigration partially based on tax data which, although still lower than measures produced through the RRC and the residual method, is closer to these sources' numbers than those based on tax data.

An accurate measure of emigration also requires clearly defined concepts. The sources reviewed here are based on concepts of emigration that are sometimes very different and refer to various demographic universes. These differences may account for most of the gaps observed in emigrant counts and characteristics. Also, the distinction between permanent and temporary emigration is unclear. Emigrants' intentions to return are sometimes vague when they leave Canada or may change subsequently. Frank and Bélair (1999) showed that almost 30% of post-secondary graduates who had relocated to the United States did not know whether they wanted to return to Canada. This finding provides an indication of how difficult it is to determine the return intentions of several emigrants and thus, to classify emigration as permanent or temporary.

The increasing number of data sources available to statistical agencies and researchers creates new opportunities to improve the measure of emigration. In this sense, big data could be a promising avenue. Private sector data, such as cell phone or credit card data, may help identify some emigrants or support other sources presented here. Border services data may also have some potential: they are used to estimate emigration in Australia (Trewin 2006). However, since Australia is an island country, departures are most likely easier to control. At any rate, in addition to the usual challenges associated with statistical measurement, there are also two challenges specific to emigration. First, we must distinguish between the high number of temporary moves, such as trips, and emigration, which is much rarer. Second, this data must be queried to identify the population likely to be regarded as emigrating from the standpoint of population estimates, i.e. Canadian citizens and immigrants whose usual place of residence is no longer in Canada.

Record linkages also provide options for comparing various measures of emigration. Linkages could be used to examine the characteristics of emigrants, for instance by adding the characteristics available in the censuses to the emigrants identified by the RRC or tax data or by directly comparing the measures of emigration from the various sources. These types of approaches could provide a better understanding of the dynamics of emigration to refine current methods.

The growing use of population registers also looks like a promising way to improve the measure of emigration. Increasing numbers of national statistical agencies, including Statistics Canada, are exploring this avenue to support or even replace traditional censuses (Poulain and Herm 2013, Statistics Canada 2016b). While the measure of emigration continues to be a major issue with respect to registers, the many statistical and operational benefits associated with registers could favour the development of better techniques for identifying emigrants.

Current data sources can also be used innovatively. In this regard, Statistics Canada is considering the possibility of using other tax data, such as taxfilers' mailing address and province of residence on December 31, to estimate emigration of taxfilers and model that of non-filers (Bérard-Chagnon 2016). As this study shows, these data have several promising advantages for producing emigration estimates despite the conceptual differences mentioned above. If this approach allows the production of emigration levels closer to those obtained through other methods and the reduction of errors of closure, the DEP could use it to calculate the number of emigrants.

Finally, it is critical that we continue discussions on refining the concepts of international migration. The increasing use of administrative data and some emerging migratory dynamics such as pendular migration raise several questions about demographic concepts and their measurement. Without a clear definition, it will continue to be difficult to produce a robust measure of a phenomenon as complex as emigration.

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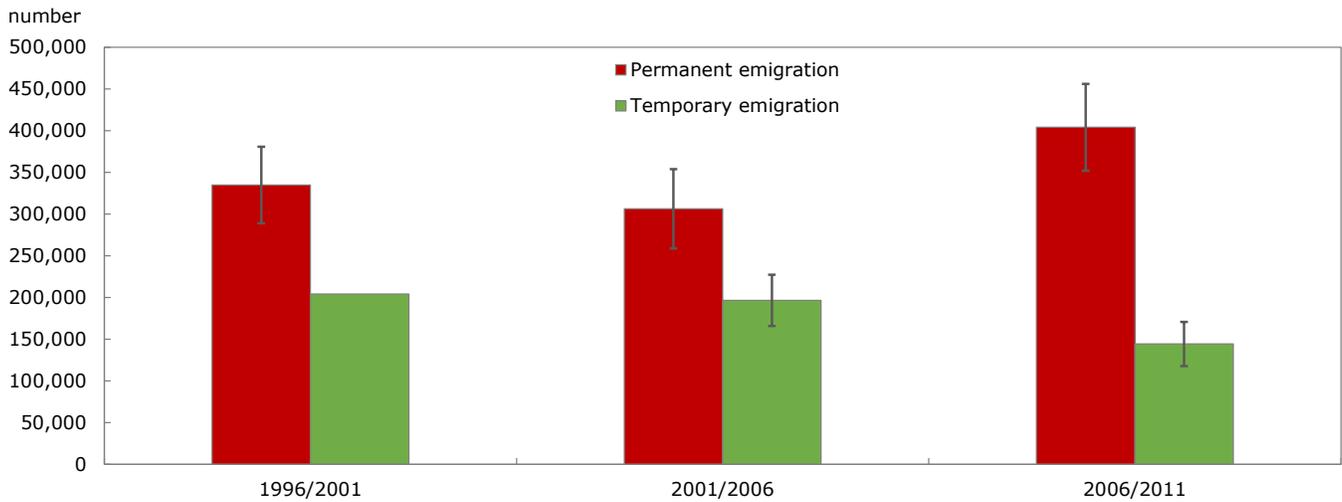
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## Appendix A

Chart A.1

Number of emigrants from the Reverse Record Check by type of migration, Canada, 1996/2001, 2001/2006 and 2006/2011



**Notes:** These data exclude the territories. Confidence intervals are computed at a 95% confidence level. The sampling variance of the 1996 RRC is only calculated for permanent emigration.

**Source:** Reverse Record Check (2001, 2006 and 2011).

## Appendix B

Question 23 of the paper version of the 2011 RRC questionnaire asked respondents to enter the day, month and year of their departure (or an estimated date).<sup>33</sup> However, this question was asked differently in telephone interviews. It was asked as follows:

*You said that your usual home on Census Day (May 10, 2011) was not in Canada. When did you leave Canada?*

*INTERVIEWER: If the exact date is not known, ask for the best estimate or give the categories.*

- 1. Between February 10, 2011 and May 10, 2011? (within 3 months before Census Day)*
- 2. Between November 10, 2010 and February 9, 2011? (between 3 and 6 months before Census Day)*
- 3. Between May 10, 2009 and November 9, 2010? (between 6 and 24 months before Census Day)*
- 4. On or before May 9, 2009? (2 or more years before Census Day)*

Subsequently, only emigrants who had left less than two years before Census Day were asked for their exact departure date (category 4). Because these two years overlap in categories 2 and 3, it is difficult to produce a number of emigrants for the two years prior to the census.

Also, the monthly distribution of departure dates can only be produced based on emigrants who had left at least two years before Census Day. Thus, the monthly distribution of departure dates for the 2006/2011 period is based only on emigrants who had left between the 2006 Census Day and May 9, 2009. It is assumed here that this does not bias the monthly distributions of emigration.

It should be noted that the vast majority of emigrants were interviewed by telephone.

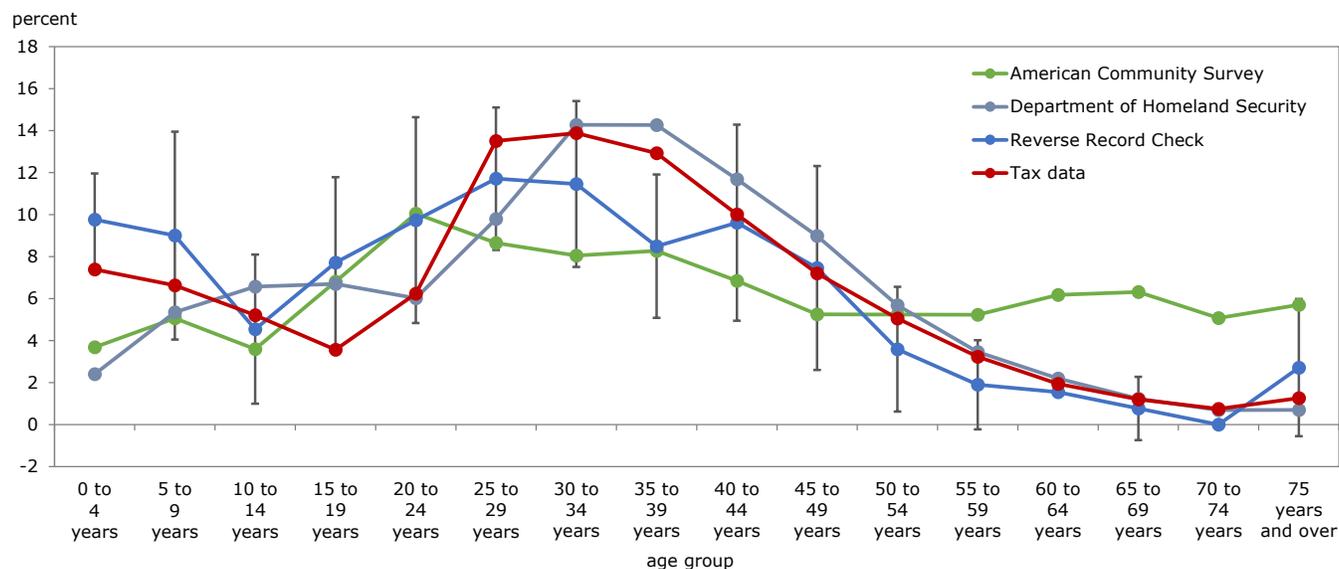
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33. It was question 12B of the paper version of the 2006 RRC.

## Appendix C

Chart C.1

Distribution (%) of emigrants who relocated to the United States by age group and source, Canada, 2006/2011



**Notes:** The numbers taken from the ACS for 2006 and 2011 are a fraction of the annual numbers to reflect the intercensal period. The DHS data are monthly. Emigrants from the RRC whose country of destination was unknown were allocated proportionally. Emigrants from the tax data who left to the United States include individuals who entered an emigration date and whose postal address was in the United States. Also, emigrants who had a Canadian postal address were allocated proportionally. RRC data exclude the territories.

**Sources:** American Community Survey (2006 to 2011), Department of Homeland Security (2006 to 2011), Reverse Record Check (2011), T1 Family File (2005 to 2010) (tax data).