A special methodology using a border crossing database for the estimation of international migration flows

Anne HERM[1] and Michel POULAIN[1,2]

1. Estonian Institute for Population Studies, Tallinn University, Estonia
2. IACCHOS, Université catholique de Louvain, Louvain-la-Neuve, Belgium

ABSTRACT

International migration is growingly important and data are needed for the related policies but not easily available because weak incentives for reporting migrations. In countries, where all border crossings are recorded in a centralised electronic database, international migrations can be identified. A methodology has been initiated for countries having a centralised database of border crossings. Methodology consists of: building up border crossing histories of every individual, and identifying entry-exit pairs to be defined as international migration events. For border crossing histories personal identification code, or combination of date of birth, sex, place of birth etc. are used. Migration is identified based on cumulative duration of stay. This methodology can be used for identification different categories of migrants, including circular migrants, and is particularly useful for estimating emigration of nationals. In the EU context it would help to identify immigrations of non-EU nationals into the Shengen area. The methodology is developed on the example of data of Cyprus, Lebanon Moldova and Seychelles.

INTRODUCTION

The following methodology has been initiated for countries managing successfully the control of their borders and having developed an exhaustive border crossing database based on the registration of individual data at border crossing (manual editing or optical

reading recognition, the latter allowing to a reduction of necessary steps) or recorded from later using border cards filled in by international passengers.

The methodology aims at estimating the yearly international migration inflows and outflows as well as some groups of travellers as visitors, temporary absent, short-term migrants and circular migrants. For the reference year T, all individual border crossings observed and registered over a three year period from year T-1 to year T+1 have to be considered. If the database covers N years of border crossing records, the statistics may be obtained for N-2 years excluding the first and the last years.

This solution strictly respects the UN and EU recommendations as far as the definition of international migration and the one of the country of usual residence are concerned.

The proposed methodology assumes that an administrative procedure for registration of border crossings exists in country. In order to implement the procedures of the methodology some specific rules have still to be followed, that are given in the recommendations for building up a border-crossing database.

The following successive steps has to be proceeded thereafter:
1) the validation and correction of data in the database,
2) the identification of international migrants and other types of travellers crossing the national borders, and
3) counting and producing statistics for each group and characterising the concerned persons.

1. Building up a border crossing database

It is important that all travellers crossing the national border will be recorded. That means exhaustive border registration in all border points of the country including recording nationals and frequent travellers. For every individual date of entry or exit, direction of travel (into or out of country) and some basic personal characteristics (citizenship, date of birth, sex, country of birth) should be collected in addition to the administratively important information, like passport numbers and validity.

All border crossings for the same person will be linked and associated with the basic characteristics of that person such as sex, date of birth, country of citizenship, number of passport and, if available, country of birth. A personal identification

number of national or personal code attributed to a foreigner when entering country may be used.

The keys for linking these records for the same person are the passport number, the country of citizenship, sex, name and surname and the complete date of birth. In some countries direct linkage between a given entry and the following exit is done directly by the border guards when the person leaves the country. However this linkage is not systematic for successive visits while for absences, exits followed by returns such linkage is often not done directly.

A special attention will be devoted to the completeness and the reliability of reconstructed personal itineraries (border crossing histories), i.e. sequences of entries and exits referring to the same individual. A validation and subsequent correction of the data is essential as the same person may be involved in two or more reconstructed personal itineraries and that situation may result in an overestimation of the number of international migrants.

2. Validation of the personal itineraries including all border crossings related to the same person

When the border crossing histories are composed, these have to be checked for occasional illogicality, like two or more successive entries or exits. Entries and exits that occurred during the same day has to be retrieved and excluded from the following work as they will not contribute for the calculation of duration of stay in or out of country. These entries and exits, however, can be useful for purpose of circular migration statistics.

- **Step 1: Identify and delete all couples of 'entry – exit 'occurring the same day. Doing so, the number of records will decrease largely.**

- **Step 2: Identify all double record concerning the same person crossing the border in the same direction more than ounce (generally these are two similar records) on a given day. Only the first records should be kept and the others should be deleted.**

All reconstructed personal itineraries resulting from the linkage of all entries and exits related to the same person and recorded in the database during the considered time period will be classified in three groups:

- <u>Personal itineraries including only one border crossing, either an entry or an exit</u>. Following the proposed methodology these persons would be automatically considered as international migrants but there is in fact a high probability that these persons have done other border crossings, these being included in a distinct personal itinerary. Both personal itineraries have to be joined in order to describe the whole border crossing history of that person.

- <u>The so-called "logical itineraries" where all border crossings (more than one)</u> linked to the same person are found in a logical suite which means that an entry cannot be followed in time by another entry and similarly for exits.

- <u>The so-called "illogical itineraries"</u> where at least two successive entries or exits are recorded without any exit or entry in between. These illogical itineraries have to be corrected by finding the missing border crossings or by adding fictive border crossings.

The complete validation methodology is based on similarities between individual characteristics and plausibility of the sequence of border crossings.

- **Step 3. Selecting all trajectories including a unique border crossing (either files I or O)**

- **Step 4. Among illogical trajectories, select all pairs of successive similar movements (either files II or OO). If there are three successive I or O, consider two pairs II or OO.**

- **Step 5. Link files I with OO and O with II. If the date of birth and the sex is the same and the date of the unique movement fits between the dates of the double similar movements, then the linkage will be done. If more than one linkage is possible, do of them on a random base. If there are more single records they will remain unlinked and if there are more pairs of similar movements, the corresponding trajectories will remain uncorrected.**

As a result of that validation phase there should remain a limited number of "illogical personal itineraries" excluding itineraries of single entries or single exits that were not involved in the validation phase and joined with other personal itineraries.

For the remaining illogical trajectories, additional entries or exits will need to be added the following rules are proposed:

- **Step 6. If two similar movements are separated by a maximum of 14 days, the second will be deleted.**

- **Step 7. For the remaining trajectories an entry will be added between two recorded exits eight days after the first exit for citizens and eight days before the second exit for non-citizens.**

- **Step 8. Similarly an exit will be added between two recorded entries eight days before second entry for citizens and eight days after the first entry for non-citizens.**

3. UN recommendations for the identification of international migrants

The following extracts from various UN recommendations are essential to understand the proposed methodology for identifying international migrants by using border crossing database:

From the _Principles and Recommendations for Population and Housing Censuses_ (UN, 2007)

1.463. It is recommended that countries apply a threshold of 12 months when considering place of usual residence according to one of the following two criteria:
(a) the place at which the person has lived continuously for most of the last 12 months (i.e., for at least six months and one day), not including temporary absences for holidays or work assignments, or intends to live for at least six months
(b) the place at which the person has lived continuously for at least the last 12 months (not including temporary absences for holidays or work assignments), or intends to live for at least 12 months.

From the _Recommendations on Statistics of International Migration, Revision 1_ (UN, 1998)

32. An international migrant is defined as any person who <u>changes his or her country of usual residence</u>. A person's country of usual residence is that in which the person lives, that is to say, the country he or she normally spends the daily period of rest.

Box 1. A <u>long-term migrant</u> is a person who moves to a country other than that of his or her usual residence for a period of at least a year (12 months), so that the country of destination effectively becomes his or her new country of usual residence.

Box 1. A <u>short-term migrant</u> is a person who moves to a country other than that of his or her usual residence for at least three months but for less than a year. Since these persons have their usual place of residence in another country, they should not be included in the count of the total population that usually resides in the country.

The differences between these two above mentioned criteria are underlined. For the first criterion, most of the last 12 months (i.e. at least six months and one day) have to be considered while the second request at least 12 months of residence. Both criteria exclude temporary absence for holidays or work assignments.

The recent *<u>EU Regulation on Community Statistics on Migration and International Protection</u>* proposes the following definitions:

(a) "Usual residence" shall refer to the place in which a person normally spends the daily period of rest. Temporary travel for purposes of recreation, holiday, visits to friends and relatives, business, medical treatment or religious pilgrimage shall not change a person's place of usual residence;

(b) "International immigration" shall refer to the action by which a natural person establishes his or her usual residence in the territory of the Member State for a period that is, or is expected to be, of at least twelve months, having previously been usually resident in another Member State or third country;

(c) "International emigration" shall refer to the action by which a natural person, having previously been usually resident in the territory of the Member State, ceases to be usually resident in that Member State for a period that is, or is expected to be, of at least twelve months.

4. How to follow these recommendations when identifying international migrants by using a border crossing database?

First of all it is important to mention that the proposed methodology is only based on objective information that is the effective duration of presence or absence in the country. These durations are calculated very precisely ex post by considering all dates of entry or exit as recorded by the border guards. Accordingly this methodology does consider neither the intention for the duration of presence or absence or the reason for entering or leaving the country. We are convinced that this is a strong aspect of this methodology as both intended duration of stay or absence and reason for moving are generally the weakest points in any data collection procedure on international migrations. Accordingly all border crossing, entries or exits are considered on the same base and it will be impossible to exclude *temporary absences for holidays or work assignments.* As a consequence the first criterion for identifying the place of usual residence is the most appropriate and more precisely the country of usual residence will be defined as the country where the person *has lived for <u>most of the last 12 months</u> (i.e., for at least six months and one day or 183 days within 12 months).*

Considering only the duration of presence or absence in the country an international immigrant will be identify as follows:

An <u>international immigrant</u> is a person recorded when crossing the National border
- who entered the country and has cumulated a minimum of 183 days of residence in the country during the twelve following months;
- who was not usual resident of the country when entering the country which means that he spent at least a cumulate duration of 183 days of residence outside the country during the twelve months before entering the country.

Similarly an <u>international emigrant</u> is a person recorded when crossing the National border
- who crossed the border and left the country and has cumulated a minimum of 183 days of residence outside the country during the twelve following months;
- who was usual resident of the country when leaving the country which means that he spent at least a cumulate duration of 183 days of residence inside the country during the twelve months before leaving the country.

International immigrants or emigrants will be counted at the time of entry or exit but their identification is only possible after a period that will vary between six and twelve

months after border crossing. Therefore the total number of international migrants for the year T will only be fixed at the end of the year T+1. In addition the first year of observation T-1 does not allow identifying international migrants but the data for the year T-1 is needed in order to define if the person concerned is or not a usual residence of the country recording the border crossing. Accordingly international migrants cannot be identified for the first and the last year covered by the database.

When a given entry or exit has been found to be an international migration all subsequent entries and exits occurring before to reach the accumulated threshold of 183 days of presence or absence (within the first year) will be ignored. Only the first exit after having accumulated 183 days of presence in the country will be the starting point for identifying a subsequent international emigration. Similarly the first entry after having accumulated 183 days of absence outside the country will be the starting point for identifying a subsequent international immigration.

Concretely this methodology does not allow registering more than one immigration and one emigration during a calendar year.

When entries and exits have not been validated as immigrations or emigrations, the following border crossing moves, respectively an exit or an entry, will be submitted as well to the same identification process.

As explained we have to wait until the end of the year T+1 in order to identify all international migrations to be enumerated during the first calendar year T. Concretely we will be able to identify international migrants of the year T (e.g. 2010) before the end of the year T+1 (e.g. 2011). Nevertheless, in order to provide figures for international migration as earlier as possible for the calendar year T, we suggest observing the situation on 1 July in T + 1 and using the following rules for identification of international migrants:

- Those who entered or left the country during the year T and have already accumulated their 183 days of presence or absence on 1 July T+1 will be considered among the international migrants for the year T.
- Those who did not succeed to reach the threshold of 183 days of presence after entry will be considered as immigrant if they are present in the country on 1 July T+1, while those who are absent at that date will not be considered as immigrants.
- Those who did not succeed to reach the threshold of 183 days of absence after exit will be considered as emigrant if they are outside the country on 1 July T + 1,

while those who are present at that date will not be considered as emigrants.

An alternative solution would be to consider the immigrations and emigrations that will be validated later between the 1 July up to the end of the year T+1 as part of the international migrations in T+1 even if the initial entry or exit was done during the calendar year T.

$$* \quad * \quad *$$

In conclusion, the suggested methodology allows producing statistical figures for international migrations before the end of the year T + 1 and even six months earlier is we introduce some assumptions. This methodology respects strictly the UN recommendations defining international migration as change of country of usual residence and the ones defining the country of usual residence as the country where the person spend most of the twelve months following the move. Following these recommendations an international migrant may be identified after only 183 days of continuous presence in the country or absence outside the country. That means that no more than one immigration and/or one emigration may be counted for a given person in a given calendar year. At maximum we may count one immigration followed by one emigration for a given year what cannot be possible if we use the definition of international migration and place of usual residence based on the criterion of at least twelve month of residence. Consequently, this methodology will count in average more international migrations that the other method. There is a possibility to increase the reference period and to consider for example 300 days and not 183 days. In this case only one migration may be counted per year but the migrant has the possibility for visits and holidays up to 65 days. Doing so the figure will be close to the one based on the 12 months residence rule but all students and workers would be included. The key advantage of this methodology is the fact that the weakest aspects in the definition of international migration are avoided, the problem of intention and the temporary presence or absence for holidays and work.

Even if the concept of **circular migrant** is currently used in the literature, there is no operational definition. In the framework of the use of border crossing database it is possible to identify circular migrant as those persons who spend several periods of time (between one and twelve months) in a given country with systematic return in MD between each pairs of these periods abroad.

Instructions for implementing this methodology are presented in Annex based on various concrete examples. When international migrants are identified and counted for

a given year the basic demographic characteristics of these migrants may be identified only by using border crossing databases.

## Annex. The implementation of the methodology

For a given person, consider the first border crossing of the year T (the border crossing for the first year T–1 will only be used in order to fix the country of usual residence). The methodology is based on the count of days spend in or outside the country backwards and forwards starting with the date of the border crossing concerned. We have to check which count reach first 183 days in or outside the country. This count should be done before and after the border crossing so that the person may be identified as international immigrant or international emigrant following the rules proposed hereunder.

The first consist in identifying international immigrant and international emigrants as presented in the figure hereunder.

INTERNATIONAL IMMIGRANT
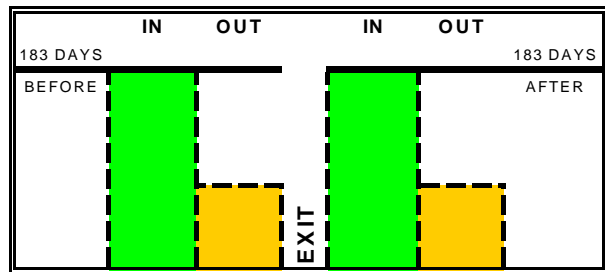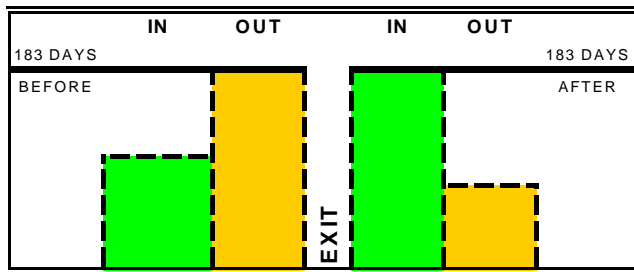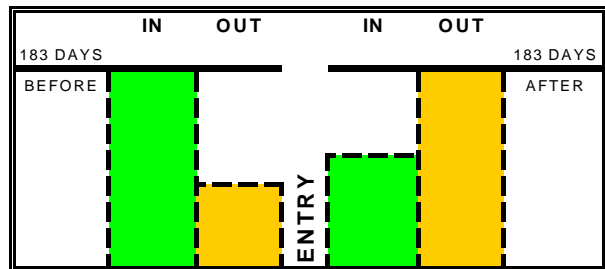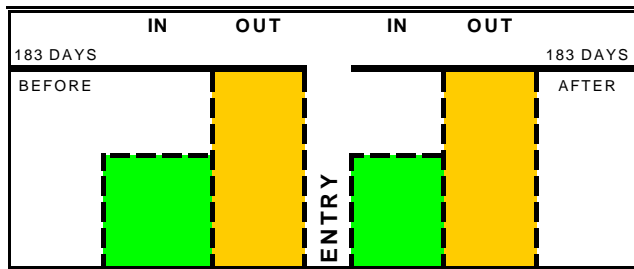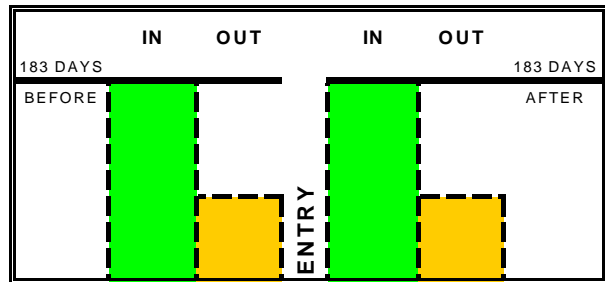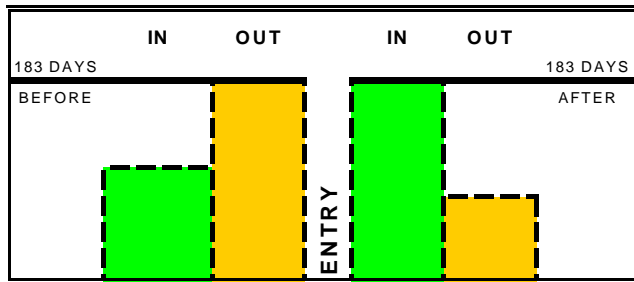
INTERNATIONAL EMIGRANT
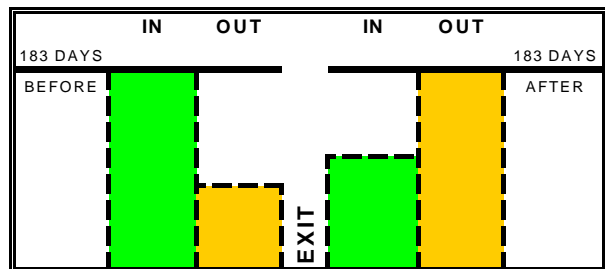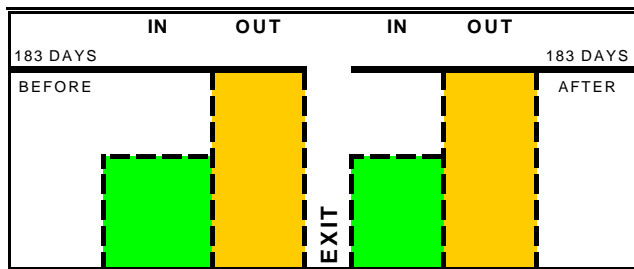
When an international immigration or emigration has been identified considering the criteria presented above, all subsequent border crossings until the threshold of 183 days is reached are ignored for identifying the following international migration. The next border crossing to be considered will be the first one after the 183 days criterion has been met. By definition it will be an opposed border crossing so that an emigration will

follow immigration and vice versa. During twelve months observation period a maximum of one immigration and one emigration may be identified.

All border crossing not identified as international migration will be considered for identification of short term migrants as well as visitors and excursionists.

ENTRY

COUNTING DAYS	Before entry : at least an accumulate count of 183 days in the country	Before entry : at least an accumulate count of 183 days outside the country
After entry : at least an accumulate count of 183 days in the country	If the duration of last stay outside the country was at least 90 days: **return of a short term emigrant**. If the last stay was shorter than 90 days: **return of an excursionist.**	INTERNATIONAL IMMIGRANT
After entry : at least an cumulative count of 183 days outside the country	If the duration of last stay outside the country was at least 90 days: **return of a short term emigrant**. If the last stay was shorter than 90 days: **return of an excursionist.**	If the duration of stay in the country after entry is at least 90 days: **entry of short term immigrant.** If the duration of stay in the country is less than 90 days : **entry of visitor**

EXIT

COUNTING DAYS	Before exit : at least an accumulate count of 183 days in the country	Before exit : at least an accumulate count of 183 days outside the country
After exit: at least an accumulate count of 183 days in the country	INTERNATIONAL EMIGRANT	If the duration of last stay in the country was at least 90 days: **return of a short term immigrant**. If the last stay was shorter than 90 days: **return of a visitor.**
After exit : at least an accumulate count of 183 days outside the country	If the duration of stay outside the country is at least 90 days: **Exit of a short term emigrant.** If the duration of stay outside the country is less than 90 days: **exit of an excursionist**	

In order to provide figures for international migration as earlier as possible for the calendar year T, we suggest observing the situation on 1 July in T+1. The following rules are proposed:

- Those entering or leaving during the year T and have already accumulated their 183 days of presence or absence on 1 July T+1 will be considered among the international migrants for the year T.

- Those entering during the year T and did not succeed to reach the threshold of 183 days of presence after entry will be considered as immigrant if they are present in the country on 1 July T+1, while those who are absent at that date will not be considered as immigrants.

- Those leaving the country during the year T and did not succeed to reach the threshold of 183 days of absence after exit will be considered as emigrant if they are outside the country on 1 July T+1, while those who are present at that date will not be considered as emigrants.

These estimations will be consolidated at the end of the year T+1.