



International Migration Estimates for the Republic of Moldova 2014-17.

Methodology and preliminary analysis

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List of abbreviations

NBS	National Bureau of Statistics of the Republic of Moldova
RM	Republic of Moldova
UNFPA	United Nations Population Fund
PHC	Population and Housing Census
GIBP	General Inspectorate of Border Police
PSA	Public Services Agency
SRP	State Register of Population
IDNP	State identification number of individuals assigned by the Public Services Agency for state record of population
DB	DataBase

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Executive Summary

International migration statistics are one of the main components for the calculation of population estimates and perhaps the more complex and challenging one from both a methodological and data-availability point of view¹. The importance of international migration is in particular evident in the case of the Republic of Moldova that has experienced significant international migration for many years and in particular since its separation from the former Soviet Union. NBS with the support of UNFPA and the SDC established a project to access the best available data on international migration, identify the proper methodology for calculating such estimates and prepare the basis that will allow the calculation of such estimates from now on. The present report contains a succinct explanation of the methodology that was used for the calculation of these international migration estimates together with the results obtained in terms of both migratory flows (immigration and emigration) and net migratory balances by age and sex and preliminary analysis of these results.

The first challenge when dealing with migration in general and international migration, in particular, relies on finding a convincing definition that can be implemented using available data to produce reliable internationally comparable estimates. Such definition should fully comply with the international recommendations and be based on the concept of place of usual residence. Following it, an immigrant is considered any individual who spent abroad more than a year before a border cross-movement and returned to the Republic of Moldova to stay for at least a year in RM, and similarly, an emigrant is considered any person who spent a full year in the Republic of Moldova before moving abroad to remain abroad for a full year. Of course, and according to the recommendations, short-term absences/presences are not considered when calculating the full year periods when the tolerance level was set to be 90 days meaning that in practice a full year is calculated as at least 275 days during the year. It should be stressed that the 275 days minimum stay (abroad or in the Republic of Moldova) is calculated in a cumulative mode meaning that they have not to be consecutive days during the year.

Another challenge regarded the identification of suitable data sources and a proper methodology that can be adapted to the available data. The production of reliable population estimates was considered urgent. The process of data source selection was limited in time but in the end, a suitable source that may be easily available every year and provide reliable international migration estimates in a relatively short period was found: the registration of cross-border international movements conducted routinely by the General Inspectorate of Border Police. Intensive checks have been conducted to confirm the suitability of the data from the point of view of quality and completeness.

After selecting the data source it was necessary to find the proper methodology for the calculation of reliable migration estimates in the shortest possible period. The selected methodology followed the principles delineated in a previous IOM project (2010) and added improvements that raised from a careful check of several samples of border-crossing data from recent years and the study of the experiences reported by other countries using border crossing data to develop migration statistics (like New Zealand, Georgia, and Israel). Using imputations (and exclusions) the selected methodology allowed convincing solutions to inconsistencies that may usually exist in this kind of data. These

¹ Introduction: Measuring International Migration: Theory and Practice, Hania Zlotnick, *The International Migration Review* Vol. 21, No. 4, 1987

inconsistencies may arise from data errors (during the collection and data processing or as a result of an individual using different documents or passports has not been identified as the same individual, more likely in the case of individuals with multiple citizenships) or as a result of unreported (missing) international movements (like in the case of international movements through the Transnistria region). Intensive checks and simulations have been conducted that verified the imputations and exclusions did not affect substantially the migration estimates.

After exhaustive checks have been conducted in several samples by NBS the required data set was finally defined by GIBP and the whole anonymized database with movements for the years 2013-2018 was received and processed by NBS for producing the estimates for the years 2014-2017. The resulting migrations estimates have been further checked for completeness and consistency over the four years and reliable international estimates for the Republic of Moldova have been **calculated for the first time**. These estimates allowed the calculation of population estimates for each of the years 2014-2017 that have been already published by NBS on its official website².

The general picture that arises from data on international mobility in the Republic of Moldova is of a highly mobile population with a large number of individuals spending long periods abroad. The Moldovan population experienced over the analyzed years strong migration flows of emigration and immigration (return migration) that result in a high negative migratory balance that has increased in the last couple of years.

The data shows that during the four years (2014-2017) analyzed about 40-57 thousand citizens of Moldova returned to the Republic of Moldova each year after residing abroad and between 70 and 79 thousand emigrated abroad. The Immigration stream was always smaller than the Emigration stream resulting in a negative migratory balance that increased from about -18 thousand in 2014 to about -39 thousand in 2017. The migration rates of Moldovan citizens over the four years period, show that emigration rates increased from 26 to 29 per thousand and immigration rates decreased from 20 to 15 per thousand resulting in a yearly net negative migration balance that increased from -6.4 in 2014 to -14.3 per thousand in 2017. Foreigner's migration rates were usually smaller, in particular their negative net migration rates ranging between -2.2 and -3.7 per thousand in the same period.

International migration rates by sex of Moldovan citizens show a changing pattern over the four years period. During the whole period, migration rates (in both directions, immigration and emigration rates) for males were higher than for women. However, the negative net migration rates were smaller for males than for women in the first two years and reversed to be higher for males than for women in the last two years. Migration in general and international migration, in particular, have usually a distinctive age pattern of high migration rates at young-adults ages together with relatively high migration rates for young children and low migration rates at other ages. This pattern is evident in the Republic of Moldova international migration. The mentioned age pattern for both sexes is present in both immigration and emigration rates and also in the net migration rates. At almost all age groups males have higher immigration and emigration rates than females and also that the rates changes were more prominent for men than for women.

Another prominent feature of Moldovan citizens to be noted is the large magnitude of both immigration and in particular emigration rates at young adult ages: emigration rates at age 20-24

² www.statistica.gov.md

arrive to a peak of 72 per thousand for males and 57 per thousand for females in 2017 and until the age of 35-39 they remain over 45 for males and over 34 for females. Immigration rates even being lower are also very high, getting their peak in 2014 - almost 51 per thousand for males 25-29 and almost 31 per thousand for females in the same age group. These high migration rates leave also high negative balances at young adult ages: in 2017 at age 20-24 males show a negative migratory balance of -47 per thousand, and females -39 per thousand. Meaning that the Republic of Moldova lost about 5% and 4% of the 20-24 age group (cohort) of males and females respectively in just one single year.

Summing up the number of (different) Moldovan citizens³ who spent abroad more than half a year at least once during the examined period 2014-2017⁴ we get about 720 thousand. In other words, about 26% of the Republic of Moldova's usually resident population spent at least once more than half a year abroad during this four years period. Moreover, about 41% of them (almost 300 thousand) did that more than once: 226 thousand did that twice, 67 thousand three times and about 5 thousand did that every year (4 times). When analyzing the migratory patterns of Moldovan citizens we find also that a significant number of Moldovan citizens oscillate over the (four) years between emigrant and immigrant (or return migrant) status: about 56 thousand both immigrated and emigrated at least once during the 4 years examined, some of them (4.6 thousand) migrated even 3 times and a few (216) every year.

The general picture we get is of a highly mobile population that large parts of it have a high and continued exposure to other societies and countries for relatively large periods of time. Such mobility and migratory patterns present a challenge to any definition of international migration since so many Moldovan citizens spend such large periods of time both in the Republic of Moldova and abroad.

The adopted approach for the measuring of migration estimates will allow NBS to produce current population estimates every year. Many improvements can and should be introduced in the future as far as proper resources will be made available. Still needs to be decided how to overcome the problem of the definition built-in delay (of slightly more than a year) in calculating migration estimates that arises from the need to have data for year T+1 (ex: 2019) for calculating migration estimates for year T (ex: 2018). The development of migration models based on partial data for T+1 or on time-series projections or other statistical methods will require significant efforts. Under these circumstances the recommended approach is to produce provisional estimates for the year T based on using the same net migration rates by age and sex calculated for the year before (T-1; ex: 2017) allowing so the calculation of provisory current population estimates for year T around May of the year T+1, and producing revised and final population estimates for year T on May of year T+2 (ex: 2020) when the movements data of T+1 will be already processed and respective estimates of migration by age and sex calculated. This approach of producing provisory and final estimates will allow overcoming a similar problem regarding the vital statistics data since also in this case the final data for the current year T is available in the final form several months (at least 3, usually more) after the end of year T+1.

³ It should be noted that this may be an underestimate since the Moldovan citizens referred here are identified Moldovan citizens from which have been excluded about 87 thousand for which there was missing data (that could not be statistically imputed), and as it was explained there exist also an unknown number of unidentified Moldovan citizens among the Foreigners

⁴ The calculations have been done for Moldovan citizens crossing the border during the years 2014-2017 and was calculated cumulatively, out of periods of 365 days before or after a given movement

It should be stressed that the relatively high negative migration balance may not have only negative consequences. It is obvious that in the short term the fact that the Republic of Moldova is losing such large numbers of young adults may have a negative influence on society and its economy. However, we should remember that many of those who leave the country for long periods of time also return very often and many send remittances to their families that remained in the Republic of Moldova. There is a lot more research that needs to be done to assess the impact these remittances may have on the Republic of Moldova society and economy. An important additional fact that should be mentioned is that the character of these migrations is not clear: are they permanent migration? The high number of return migrants of every age and sex group and the oscillating migratory status of some of them seem to indicate the opposite. If further research will confirm the temporary character of most of these migration flows then the exposure of so many Moldovan citizens to other cultures and societies may result in a long-term positive influence on the Moldovan society and economy.

Introduction

International migration statistics is one of the main components for the calculation of population estimates and perhaps the more complex and challenging one from both a methodological and data-availability point of view⁵. The importance of international migration is in particular evident in the case of the Republic of Moldova that has experienced significant international migration for many years and in particular since its separation from the former Soviet Union.

Even though for many years it has been known that the Republic of Moldova experienced significant negative migration balances, no reliable estimates have been available. The important effect that the international migration may have on population estimates become evident already when the results of the 2004 census have been analyzed. The results of the 2004 census show that since the 1989 census some part of the population that was not accounted for at that time in the available migration statistics left the country. The next (and last) census conducted in 2014 showed that current population estimates overestimate the population by almost 700 thousand inhabitants that seem to have left the country in the last decades⁶.

Following that it became clear that the production of reliable migration estimates is a must and NBS with the support of UNFPA and the SDC established a project to access the best available data on international migration and identify the proper methodology for calculating such estimates.

The first challenge when dealing with international migration is finding a proper internationally-comparable definition that can be implemented using available data to produce reliable migration estimates. The complexity of migration and its changing patterns in the last decades makes the selection of this definition far from the trivial endeavor. This complexity is reflected in the existence of only general international guidance on the best practice to be implemented, leaving a wide range of definition possibilities that must be sorted out and adapted to the available data and methodology and the local situation. The analytical process included empirical checks of different possibilities, at the end of them a suitable definition has been identified and adopted.

Another challenge regards the identification of suitable data sources and a methodology that can be adapted to the available data. There are different possible sources of data that can be used to calculate migration estimates. Since the production of reliable population estimates was considered urgent, the process of data source selection was limited in time but in the end, a suitable source that may be easily available to produce reliable migration estimates in a relatively short period of time was found: the registration of cross-border international movements conducted routinely by the General Inspectorate of Border Police.

After selecting the data source it was necessary to find the proper methodology for the calculation of reliable migration estimates in the shortest possible period of time. Some progress in this direction was done in the past during a consultancy supported by IOM (2010) that checked the possible use of this kind of data and even proposed a roadmap for calculating migration estimates. The selected

⁵ Introduction: Measuring International Migration: Theory and Practice, Hania Zlotnick, *The International Migration Review* Vol. 21, No. 4, 1987

⁶ Revised Population Estimates, 2014-2019, Final Report (NBS and UNFPA, 2020)

methodology followed the principles delineated at that time and added improvements that arose from a careful check of several samples of border-crossing data from recent years and the study of the experiences reported by other countries using border crossing data to develop migration statistics (like New Zealand, Georgia and Israel). Using imputations (and exclusions) the selected methodology allowed convincing solutions to inconsistencies that may usually exist in this kind of data. These inconsistencies may arise from data errors (during the collection and data processing or as a result of an individual using different documents or passports has not been identified as the same individual, more likely in the case of individuals with double citizenship) or as a result of unreported (missing) international movements (like in the case of international movements through the Transnistria region). Intensive checks and simulations have been conducted that verified the imputations and exclusions did not affect substantially the migration estimates.

Intensive checks have been conducted to confirm the suitability of the data from the point of view of quality and completeness. Since the volumes of data analysis involved were extremely large (more than 125 million records in total, about 50 million for the calculation of estimates for every single year) the checks have been done on small samples that have been used also to develop and check the complex computer programs that were needed for the calculation of yearly migration estimates by age and sex.

After exhaustive checks have been conducted in several samples by NBS the required data set was finally defined by GIBP and the whole anonymized database with movements for the years 2013-2018 was received and processed by NBS when proper adjustments have been introduced to speed up the processing time required for producing the estimates for each year (2014-2017).

The resulting migrations estimates have been further checked for completeness and consistency over the four years and reliable estimates for the first time were calculated. These estimates allowed the calculation of population estimates for each of the years 2014-2017 that have been published by NBS⁷.

The present report contains a succinct explanation of the methodology that was used for the calculation of these international migration estimates together with the results obtained in terms of both migratory flows (immigration and emigration) and net migratory balances by age and sex and some preliminary analysis of these results.

⁷ Revised Population Estimates, 2014-2019, Final Report (opp. cited) and data published in NBS databank site.

Methodological and technical aspects of the definition and calculation of international migration estimates

The definition of international migration

“Migration statistics are probably the most complex element in the field of social statistics, not only from an operational point of view but also from a conceptual point of view. While it is true that there are international definitions, it is not always easy to measure the strict concept of a migrant. Moreover, there are increasingly different forms of migration, and there is a variety of sources that provide a partial measurement of migration”⁸

The first challenge when dealing with migration in general and international migration in particular relies on finding a convincing definition that can be implemented using available data to produce reliable migration estimates.

The answer to the question on “who should be considered an immigrant/emigrant” is not trivial. Is a person who spends a year abroad to be considered an emigrant? Perhaps he/she went just for a couple of years to get a University degree or to be involved in a specific job and immediately after that this individual will return to the country of origin? Is one year enough to decide this person is an emigrant? Perhaps two years would be a better option? Or perhaps three years will be more accurate? It seems the longer the stay abroad the better but at the same time, from a practical point of view, using a longer period of time means waiting longer to decide on the migratory status of an individual and therefore to produce any statistics on migration, and this will be extremely inconvenient.

Fortunately, there are agreed international recommendations that provide general guidance and set up the limits for the period of time that should be used in the definition. On the face of it, the agreed general definition solves the problem.

To better understand this definition we should turn to the concept of ‘*usually resident population*’ that is based on the concept of ‘*place of usual residence*’⁹: “The ‘*usually resident population*’ of a country is composed of those persons who have their place of usual residence in the country at the census reference time and have lived, or intend to live, there for a continuous period of time of at least 12 months. A ‘continuous period of time’ means that absences (from the country of usual residence) whose durations are shorter than 12 months do not affect the country of usual residence”¹⁰. The definition sounds clear and simple¹¹ but when closely examined it is not so, in particular when we need to implement it. The first challenge regards the inclusion of “intentions”. It is very difficult to rely on intentions when implementing any measurement and in particular to get intentions data that can also be considered reliable. We may rescind this part of the definition and

⁸ Guidance on Data Integration for Measuring Migration, UNECE 2019, Chapter 6: Conclusions, paragraph 311, pp. 45

⁹ ‘*Place of usual residence*’ is “the geographic place where the enumerated person usually spends their daily rest, assessed over a defined period of time”. Recommendations for the 2020 Censuses of Population and Housing, UNECE, 2015, pp. 78, par. 392

¹⁰ Recommendations for the 2020 Censuses of Population and Housing, UNECE, 2015, pp. 78, par. 393

¹¹ The reference to the “census reference time” is because the definitions are usually developed and updated towards census rounds and it can be change to “in any specific point of time” without altering its validity.

that can be done without altering its validity. The second challenge hides behind the final clarification sentence that requires the exclusion from the calculation of the period of absence of “absences (from the country of usual residence) whose durations are shorter than 12 months”. A vacation of a couple of weeks abroad should not be taken into account to “break” the continuous residence request, but what is the “tolerance” we have to such kinds of vacations abroad? One month? Three months? Half a year?

When using the abovementioned “place of usual residence” as the basis for the measurement of migration both challenges become more evident. The last time such a definition was agreed upon and since then is considered the valid one was in 1998 in the *Recommendations on Statistics of International Migration, Revision 1* (UN, 1998). An international migrant is defined there as a person who changes his or her country of usual residence. 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. A long-term migrant 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” (there, par. 36)¹².

In practice, sticking to the recommendations on the implementation process requires a decision on what is going to be the tolerance level for “short term absences”. As we will see in the following chapters the differences arising from using different tolerance levels at the macro level, in particular regarding the migratory balance (that is the difference between the numbers of immigrants and the number of emigrants) are many times relatively small, however the difference in the magnitude of each flow (immigrants and emigrants flow) is pronounced: if we define immigrants/emigrants with a tolerance of a shorter period of time (ex: 30 days) for “short term absences” we will get smaller counts than if we tolerate longer periods (ex: 182 days) since tolerating a longer period will include persons being absent for the shorter period and others who spent more than it. In the next chapters, these differences in the case of the Republic of Moldova will be shown and analyzed.

After analyzing the available data the definition that was selected for international migration measurement in the Republic of Moldova fully complies with the international recommendations and is based on the concept of *place of usual residence*. Following it an immigrant is considered any individual who spent abroad more than a year before a border cross-movement and returned to the Republic of Moldova to stay for at least a year, and similarly, an emigrant is considered any person who spent a full year in the Republic of Moldova before moving abroad to remain abroad for a full year. Of course, and according to the recommendations, short term absences/presences are not considered when calculating the full year periods when the tolerance level was set to be three months (90 days) meaning that in practice a full year is in practice calculated as at least 275 days during the year. It should be stressed that the 275 days minimum stay (abroad or in the Republic of Moldova) is calculated in a cumulative mode meaning that they have not to be consecutive days during the year.

Identification of suitable data and methodology

¹² There is there also the definition of short-term migrant as “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” (there, par. 37). But this is less relevant for the calculation of population estimates that is the main objective of international migration calculations in our case.

There are different possible sources of data that can be used to calculate migration estimates. These data sources may be statistical surveys, population censuses, administrative data (and perhaps also what is referred to as big data) including some integration of the above-mentioned sources. Since statistical surveys collect information for a relatively small part of the population the use of survey data disaggregated by age, sex, and small population groups and geographical subareas is limited. Censuses may provide a better solution from this point of view but since they are conducted only once in a while (usually once in 10 years) they cannot be used to produce yearly estimates as they are usually required. Moreover, both above-mentioned sources may provide reliable information for migrants stocks in the country but they hardly can provide reliable and complete information for migratory flows, and in particular, emigration unless specific modules and collection methodology are added since emigrants are by definition not part of the surveys or census population. We remain then with administrative data as the main data source that can be considered the more suitable source for the analysis of international migratory flows. However administrative data directly connected with population migration is not always available in a reliable and complete form. Population registers are usually fed also with reports on migratory movements but the quality and completeness of reporting (in particular regarding emigration) are usually disappointing. Some countries collect relatively complete border crossing data based on the registration of individual movements of both citizens and foreigners. These countries may use these data, after proper checks and if necessary proper corrections, to calculate convincing reliable international migration estimates. The Republic of Moldova is one of these countries. Moreover, since RM maintains also a SRP it is possible to record-link individual data on border crossing of Moldovan citizens with the data in the SRP enriching the possibilities of analysis of these data.

Alternative data sources that have been considered include the integration of information from different administrative sources like the SRP, the educational enrolment registers, and others but it was concluded that just to check the completeness and quality of the possible derived migration data will require a significant amount of effort and time. Since it was imperative to find a solution for the estimation of migration estimates as soon as possible it was decided the border-crossing data is the more suitable for that.

After selecting the data source it was necessary to find the proper methodology that will permit the calculation of reliable migration estimates in the shortest possible period of time. Some progress in this direction was done in the past during a consultancy supported by IOM (2010) that checked the possible use of this kind of data and even proposed a roadmap for calculating migration estimates. The final methodology followed the principles delineated at that time and added improvements that were raised from a careful check of several samples of border-crossing data from recent years and the study of the experiences reported by other countries using border crossing data to develop migration statistics (like New Zealand and Georgia).

Implementation of the definition using border crossing data

The use of border crossing data presents challenges that need to be identified and solved to permit the use of these data to calculate reliable international migration estimates. The first challenge relies on the magnitude of the data on border crossing movements and the complexity of the calculations: Each year (during the period 2013-2018) there have been registered in the Republic of Moldova an average of about 21 million movements per year, and since to calculate migration estimates for a

specific year need to be considered movements of three consecutive years, that means processing each year an increasing number of movements from 48 million for calculating migration in 2014 to 60 million movements for 2017. Even with the strong computers available at NBS that requires effective programming to allow the processing of such amount of data in a reasonable period of time, in particular since the required calculations and correspondent validation checks required are across the whole set of movements of the same individual over three years: the year for which the migration estimates are calculated, the year before and the year after.

The processing itself begins with the calculation of the intervals of time taking place in the Republic of Moldova or abroad between any two consecutive movements and the cumulative addition of these intervals for each individual crossing the border during a period of one full year before and one full year after any specific movement of entrance or exit to/from the country. After this cumulative information is calculated any movement receives a migration status accordingly: if an individual spent more than 275 days abroad during the year before the movement and then more than 275 days in the Republic of Moldova this movement will be categorized as an immigration movement if during the year before this specific movement an individual spent more than 275 days in the Republic of Moldova and after it the individual spent more than 275 days abroad during the year following this movement then this movement will be as an emigration movement; in all the other cases this movement will be categorized as a non-migration movement. After that, the migratory status of each individual is calculated: any individual that had during the year for which the migration estimates are calculated at least one movement as an immigrant will be considered as an immigrant, any individual that has at least one emigration movement will be considered as an emigrant; if an individual has both immigrant and emigrant movements the individual will be categorized according to the last movement that has an immigration or emigration status. Individuals with no movements indicating a migration status will be categorized as non-migrants in the calculation year.

An additional challenge is connected with the treatment of “illogical itineraries”. Illogical itineraries are those cases when for a specific individual there are registered two consecutive movements in the same direction. Any entry to the country can be followed (or not) by an exit and it will be illogical to have two consecutive entries (or exits) without an exit (entry). These “illogical itineraries” may be the result of errors in the assignation of movements to a specific individual (the middle missing movement was not properly assigned to the individual) or that the individual crossed the border without being registered by the system (like in the case an individual left or entered the country through the Transnistrian border). In any case, these illogical itineraries need to be identified and an action taken to allow their incorporation or not into the calculations. In practice, it was decided to “impute” a new movement in cases that the illogical itinerary created an interval of less than 183 days. The imputed movement was inserted in the middle of the illogical interval allowing the incorporation of this individual into the migration estimates calculations. There were annually less than 2% of cases that have been imputed, and the average length of the imputed intervals was less than 30 days. About 19% of the individuals had at least one imputed interval but in most of the cases, the imputed intervals were of a few days (the average imputed interval was of 15 days). In extreme cases, when an individual has illogical intervals of 183 days or more, this individual was excluded from the calculations (less than 1% of the individuals crossing the border in any specific year). Exhaustive checks have been conducted

to verify as far as possible that such imputations and exclusions do not affect significantly the calculation of migration estimates¹³.

It is important to stress that the used methodology is based on objective information that is the effective duration of presence or absence in the country of persons crossing the border. These durations are calculated 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. This is a strong aspect of this methodology as both the intended duration of stay or absence and reason for moving is generally the weakest points in any data collection procedure on international migrations¹⁴. A disadvantage of the selected methodology is that to calculate the migration status of individuals crossing the border during a specific year T it is necessary to wait until the end of year T+1, and therefore migration final estimates are produced with a delay of more than a year (usually about one and a half years since it takes additional time to clean and process the data). For that reason, some countries use statistical models based on the history of migration statistics to forecast the expected migration and produce provisional estimates of international migration based on these estimates closer to the end of year T that are used to produce provisional current population estimates. Since this methodology is implemented in the Republic of Moldova for the first time there is not enough history on which to base forecasting models but some other solution has been implemented in the Republic of Moldova to produce provisional population estimates until the implementation of better forecasting models will be feasible.

The Data

The anonymized data was received from the General Inspectorate of Border Police in the form of two files. One file included movements done by individuals using a Moldovan document (referred later on as the Moldovan citizen's file), and the second included movements by persons using a foreigner document (referred later as the Foreigners file). The files have been ordered at the individuals' level by a unique ID, that was added to each individual and its movements after data anonymization. Moreover, the Moldovan's file included all the movements of persons that moved at least once with a Moldovan document even if they used foreign documents in other movements. The identification of these cases has been possible by record linkage using the name, surname, and full date of birth of identified Moldovan citizens in the Moldovan citizens' file and the individuals in the Foreigners file. It should be noted that in the original GIBP database these cases hold a PIN (unique Personal Identification Number or ID) that is generated by and serves the SRP records. The above-mentioned operations may have potential failures of mismatching and wrong no-matching.

The operations mentioned above were done by the GIBP before sending the files to NBS. Also, the Moldovan citizens' IDs have been sent to the SRP and returned with the registered rayon of residence. The rayon was added to the individuals' data and that allowed the records of persons registered in Transnistria to be excluded from the calculations.

The received files included the registered movements across the borders of the Republic of Moldova during the years 2013-2018: 74 million movements of identified Moldovan citizens (including

¹³ See more details in next chapter Imputations and exclusions

¹⁴ See: A special methodology using a border crossing database for the estimation of international migration flows, Michel POULAIN, (UCL-GéDAP, Belgium), IOM Moldova, September 2010

movements of about 496 thousand Moldovan citizens that their movements have been added to the Moldovan citizens file from the foreigners' file after record linkage) and 55 million movements of Foreigners (including movements of the above mentioned 496 thousand identified Moldovan citizens that used foreign documents for part of their movements and including an unknown number of unidentified Moldovan citizens using only foreign documents from the foreigners' files). In these files, there have been identified 2.7 million Moldovan citizens and 3.8 million Foreigners (including an unknown number of unidentified Moldovan citizens and excluding also the 496 thousand Moldovan citizens that their movements have been added to the Moldovan citizens' file). A large number of foreigners should not surprise since it includes any foreigner that entered the country at least once in the period 2013-2018 for visiting as a tourist or for business, together with the already mentioned unknown number of Moldovan citizens using foreign documents for border crossings that have not been identified as Moldovan citizens. Moreover, a returning foreigner visiting the Republic of Moldova with different foreign documents will be counted as a different individual. As it can be seen the average number of movements per person for Moldovan citizens is almost 28 over the 6 years meaning that on average each Moldovan crosses the border about 4.5 times a year. As expected, the number of movements per person is much smaller for Foreigners than for Moldovan citizens.

Table 1: Persons and Movements of (identified) Moldovan citizens and Foreigners, 2013-2018

	Unique persons	Movements	Movements per person
Total	6.4	128.3	19.9
Moldovans	2.7	73.7	27.6
Foreigners	3.8	54.6	14.5

As explained in the previous chapter the calculation of migration estimates for any given year requires also considering movements registered the year before and the year after. Therefore for each year, a triplet of years (ex: to estimate migration for the 2014 year, the data for 2013, 2014, and 2015 years is used) are considered (Table 2) and that means processing for each year about 50 million movements: 24 million movements of (identified) Moldovan citizens and 15-16 millions of Foreigners movements (It should be noted that part of the movements used in the calculation of two consecutive years overlap and it is also the case that persons moving during one year moved again the year after, therefore the total number of movements and persons in Table 1 is not the simple sum of the rows in Table 2).

The question of how to treat the Foreigners file was approached indirectly. It was hypothesized that net migration calculated from the file of Foreigners should be nil for real foreigners and should follow the patterns found in the Moldovan citizens' file for the unidentified Moldovan citizens in the file. If that is true, then any significant net migration should be attributed to the unidentified Moldovan citizens in the Foreigners file. After doing the calculations it was indeed found that net migration patterns in the Foreigners files were similar to the patterns found in the Moldovan citizens' file, like the negative migratory balance that increased sharply in 2016 and 2017 in both Moldovan citizens and Foreigners file or the net migration distribution by age that was also similar in both files. It was also

found that despite the number of persons in the Foreigners file being much larger than in the Moldovan citizens file the number of persons classified as migrants was smaller, in particular, the negative net migration balance of Foreigners was much smaller.

Table 2: Persons and Movements of (identified) Moldovan citizens and Foreigners, used for the calculation of yearly estimates 2014-2017 by year

	Foreigners			Moldovan citizens			Total		
	movements	persons	movements per person	movements	persons	movements per person	movements	persons	movements per person
2014	13.4	0.7	18.2	34.8	1.5	23.9	48.2	2.2	22.0
2015	15.1	0.9	16.3	36.7	1.6	23.6	51.8	2.5	20.9
2016	17.1	1.1	15.4	39.4	1.6	24.2	56.5	2.7	20.6
2017	18.7	1.2	15.4	41.1	1.7	24.2	59.8	2.9	20.5

There are some known or suspected challenges that will need attention in the future:

- Suspected mismatching with Foreigners file: some individuals have been found having movements with different sex (2,746 cases), and a few with different birth dates (79 cases) all these cases have been corrected. However, there may be other cases un-identified as mismatching (that they have the same sex and/or birth date) that have undetected errors.
- Suspected failed match with Foreigners file: An unknown number of movements of Moldovan citizens traveling with foreign documents may have not been identified in the Foreigners file even if they have movements in the Moldovan citizens' file.
- No identification of Moldovan citizens using only foreign documents: No attempt has yet been done to identify Moldovan citizens traveling with only foreign documents in the Foreigners file, this activity requiring additional time and effort record linkage at the individual level of persons from Foreigners file with the persons from the State Population Register.
- Missing registration of movements through the border with Ukraine via Transnistria region of Moldovan citizens that are not resident of Transnistria region: Movements through the border with Ukraine via the Transnistrian region border are not registered by the GIBP. Since residents of the Transnistria region are not included in the actual statistical counts, what is missing are only movements of persons that are not usual residents of the Transnistria region.

After some analysis has been done it was concluded that these challenges should not substantively affect the migration estimates since the methodology of imputation and exclusion used to deal with “illogical itineraries” (see next chapter) is expected to provide a convincing solution for most of these cases.

Processing and migrant status determination

Data processing once received the Moldovan citizens and Foreigners files included:

- Building the DB for each calculated year: For each year T for which migration estimates will be calculated the movements of the years T-1, T and T+1 have been selected. This DB is later referred to as a triplet.

- b. Identification of “illogical itineraries” – two consecutive entries or exits that require a movement in between them have been marked as illogical itineraries that require treatment
- c. Imputation of a missing movement between any two consecutive entries or exits
- d. Assignment of a date to the missing movement: the date assigned was the middle between the known movement’s dates. Extreme cases of individuals having a missing movement that if imputed will create artificial intervals larger than 91 days have been excluded from the calculations.
- e. Calculation of migrant status at the level of movements: for each movement, according to the selected period (threshold) it was decided if the number of days accumulated abroad/in the Republic of Moldova during the observation period (one full year in both directions) before and after indicate if the specific movement determines the individual should be considered an immigrant, an emigrant or a non-migrant. Several thresholds have been tested: 6, 9, 10, 11, and 12 months.
- f. Calculation of the migrant status of the individual: If an individual has at least one movement classifying the individual as emigrant it will be considered an emigrant for the calculated year, if the individual has at least one movement classifying the individual as immigrant it will be considered an immigrant. An individual may have more than one movement as emigrant/immigrant, and in this case, the number of times the individual was considered emigrant/immigrant is ignored. When a migrant has in the same year both immigrant and emigrant classified movements the individual is considered in this year both immigrant and emigrant. This classification does not influence the net migration counts but increments both the number of immigrants and emigrants.

Imputations and exclusions

As explained above individuals with illogical itineraries of less than 183 days between movements have been imputed an artificial movement in the opposite direction, that was attributed a moving date that was in the exact middle between the two consecutive same direction movements. Individuals with one illogical itinerary or more for which the distance between the two same direction consecutive movements was larger than 182 days have been excluded from the calculations.

The number of exclusions and the length of imputed intervals were relatively small as it is shown in Table 3. The number of exclusions amounted to less than 3% of the individuals when the imputations that affected almost 19% of the individuals were relatively small: most of the persons with imputed intervals have been imputed because of illogical itineraries of less than 92 days (meaning their imputed intervals were less than 46 days long) and less than 4.2% have been imputed because of illogical itineraries between 93 and 182 days (meaning that the largest imputed interval was of 47-91 days). Indeed a check conducted for 2015 showed that the average length of the imputed intervals was 15 days, with a large proportion (about 70%) of less than 7 days (data not shown here).

Table 3: Imputations by length of illogical itinerary imputed and Exclusions 2014-2017

	2014		2015		2016		2017	
	Mold.	For.	Mold.	For.	Mold.	For.	Mold.	For.

	Absolute numbers (thousands)							
Total persons per triplet	1,452.4	737.8	1,555.6	924.0	1,625.7	1,113.8	1,699.6	1,212.8
With illogical itineraries	301.0	114.1	248.1	129.6	251.7	165.9	258.5	175.6
Imputed - total	262.2	95.1	221.5	109.4	226.3	140.9	232.7	147.1
- all under 92 days	200.6	69.5	175.2	81.5	181.0	105.2	186.6	106.6
- on or more with 93-182 days	61.7	25.7	46.2	27.9	45.3	35.8	46.1	40.5
Excluded (at least one over 182 days)	38.8	18.9	26.6	20.2	25.4	25.0	25.8	28.6
	Percentage of Total persons per triplet							
With illogical itineraries	20.7%	15.5%	15.9%	14.0%	15.5%	14.9%	15.2%	14.5%
Imputed - total	18.1%	12.9%	14.2%	11.8%	13.9%	12.7%	13.7%	12.1%
- all under 92 days	13.8%	9.4%	11.3%	8.8%	11.1%	9.4%	11.0%	8.8%
- on or more with 93-182 days	4.2%	3.5%	3.0%	3.0%	2.8%	3.2%	2.7%	3.3%
Excluded (at least one over 182 days)	2.7%	2.6%	1.7%	2.2%	1.6%	2.2%	1.5%	2.4%
	Percentage of persons with illogical itineraries							
With illogical itineraries	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Imputed - total	87.1%	83.4%	89.3%	84.4%	89.9%	84.9%	90.0%	83.7%
- all under 92 days	66.6%	60.9%	70.6%	62.9%	71.9%	63.4%	72.2%	60.7%
- on or more with 93-182 days	20.5%	22.5%	18.6%	21.5%	18.0%	21.6%	17.8%	23.1%
Excluded (at least one over 182 days)	12.9%	16.6%	10.7%	15.6%	10.1%	15.1%	10.0%	16.3%

It should be noted that the imputation approach used (half of the illogical itinerary interval) is extremely simple, but the investment that would be required to develop and test a perhaps more accurate sophisticated approach would require information from a much larger number of years and more human and time resources than originally available for this project. In any case, intensive checks and simulations have been conducted that verified that the imputations and exclusions did not affect substantially the migration estimates. If resources would be available in the future it may be worthwhile to analyze, using data for a larger number of years, if and to what extent the migration estimates can be further improved using a more sophisticated imputation methodology.

The effect of threshold differences on migration estimates

The selection of the threshold (in a number of days) to be used to determine the migration status of an individual is to some extent arbitrary. This threshold represents the (cumulative) number of days out of the previous and next years, before or after a cross-border movement, that determines if a person should be considered a migrant: an individual spending more than the selected threshold abroad and after that more than this threshold in the Republic of Moldova would then be considered an immigrant, if the individual spent more than the threshold in the Republic of Moldova, and after that more than the threshold abroad then this individual will be an emigrant. Following the internationally agreed definition of migration the observation period is a full year backward and forward from any specific movement (border crossing). It was decided to use a symmetric approach (the same threshold required for emigrants and immigrants, and forward and backward) since a-priori a convincing justification to use a non-symmetric approach was not found.

The agreed internationally empirical migration definition to determine the migration status of an individual that can be synthesized into “one year excluding short movements” seems to indicate that

more than half a year (183 days or more) should be enough and perhaps the more appropriate threshold. However, it was found that at least in the case of the Republic of Moldova such a threshold generates a large number of cases that are defined as both immigrants and emigrants in the same year, because being the threshold relatively short such a situation is possible for persons moving often, and for these persons, their migratory status may not be clear. Cases of an individual considered immigrant (or emigrant) more than once in the same year are not problematic since that is common for persons moving several times a year and does not affect the individual's migratory status.

It is expected that the larger the threshold the smaller the number of persons that will be categorized as migrants in both directions.: If for example a full year abroad/in the Republic of Moldova is requested to be considered an immigrant/emigrant then there will be fewer migrants (both immigrants and emigrants) than in the case the request is of 275 (cumulative days) since there are persons who spent more than 275 days and less than 365 days in/out the country that will be categorized as migrants. The empirical finding that the net migration is also affected by the length of the threshold used is also expected since the larger the number of gross movements (in/out) the higher the propensity their difference will be larger. For example, when the requirement is 365 days out of 365 (in/out the country) to be classified as migrant we get in particular a significantly smaller net migration (in the Republic of Moldova that means a smaller negative balance) than when using shorter thresholds. The difference is more prominent between 365 and the smaller thresholds that produce more similar net migration results (even if as expected different and increasing with the length of the threshold).

It is clear that nowadays to request a continuous residence abroad/in-the Republic of Moldova of a continuous full year to determine the migratory status of a person is not acceptable since a person residing continuously in a place may spend some time in other places and still should be considered a permanent resident of the first place. The moment the continuous full-year request is rejected it is necessary to define how many days in another place would be allowed before this person usual place of residence is changed (i.e. this person is defined as a migrant) and that is to a great extent arbitrary and depends on the local situation and patterns of movements abroad.

Empirically the 183 days threshold is short for the observation period of one year (forward and backward) creates too many technical complications like many persons classified as both immigrants and emigrants in the same year. For example, when using the 183 days threshold more than 35,000 persons have been classified each year as both immigrants and emigrants during the same year compared with less than 2,000 persons per year when using the 275 days threshold. Therefore it was decided to choose the 275 days threshold allowing at least 3 months of "short movements" during the observation year to decide if the usual place of residence should be changed and the person should be classified as immigrant/emigrant. Why not the 305 or the 335 days threshold? The 335 and 305 thresholds allow only one or two months of 'short movements' and that looks too short and also the 335 produces similar results as 275 and it was preferred to allow a longer period of "short movements".

Table 4 presents data on the number of immigrants, emigrants, and the resulting migratory balance during the years 2014-2017 when using different criteria for defining migration. The difference relies on the requested number of days (the threshold) to be accumulated abroad or in the Republic of Moldova during the year before/after the movement that leads to an individual being categorized as

a migrant in any specific calculation year (2014-2017). The first row in each panel represents the definition where the threshold to acquire migration status is 183 days (just more than half a year): individuals that have accumulated in the year previous to one of their movements (during the calculation year) more than 182 days abroad and during the year after this movement more than 182 days in the Republic of Moldova will then be categorized as immigrants (or if former citizens of Moldova as return migrants) similarly, individuals that accumulated more than 182 days in the Republic of Moldova during the year before one of their movements (during the calculation year) and more than 182 days abroad during the year after this movement will be categorized as emigrants. Similarly, the calculations are done using thresholds of 275 days (~9 months), 305 (~10 months) 335 days (~11 months), and 365 days (the whole year). Table 3 is subdivided into Moldovan citizens and Foreigners (within the number of Foreigners there is an unknown number of unidentified Moldovan citizens that used only non-Moldovan documents to cross the border all over the years 2013-2018).

Table 4: Immigrants (Im), Emigrants (Em) and migratory balance (NET), defined using different thresholds, Moldovan citizens and Foreigners, 2014-2017

Threshold	2014			2015			2016			2017		
	Im	Em	NET	Im	Em	NET	Im	Em	NET	Im	Em	NET
Moldovan citizens												
183	148.6	159.8	-11.2	109.1	132.5	-23.5	93.1	142.2	-49.1	96.6	142.7	-46.0
275	57.0	75.3	-18.3	51.1	69.7	-18.6	40.3	77.8	-37.5	39.7	78.8	-39.1
305	36.1	54.2	-18.1	35.8	52.2	-16.4	28.5	57.8	-29.2	27.7	58.4	-30.7
335	22.1	37.7	-15.6	23.3	35.7	-12.4	18.7	38.8	-20.1	18.0	38.9	-20.9
365	9.7	16.1	-6.4	10.0	15.0	-5.1	8.3	13.9	-5.6	8.0	13.2	-5.2
Foreigners												
183	54.3	61.2	-6.9	64.9	68.1	-3.2	79.5	87.8	-8.3	82.4	94.0	-11.6
275	41.7	48.1	-6.4	54.5	57.2	-2.7	67.0	75.4	-8.4	70.0	80.3	-10.3
305	38.6	44.7	-6.1	51.7	54.1	-2.4	63.8	72.1	-8.3	67.1	76.7	-9.5
335	35.9	41.2	-5.4	48.9	50.7	-1.8	60.8	68.3	-7.5	64.1	72.8	-8.6
365	28.8	32.9	-4.1	42.8	42.2	0.6	53.0	58.9	-5.9	57.2	62.8	-5.6
Total												
183	202.8	220.9	-18.1	174.0	200.6	-26.6	172.6	230.1	-57.5	179.0	236.6	-57.6
275	98.7	123.4	-24.7	105.6	126.9	-21.3	107.2	153.2	-45.9	109.7	159.1	-49.4
305	74.7	98.9	-24.2	87.5	106.3	-18.8	92.3	129.9	-37.6	94.9	135.0	-40.2
335	57.9	78.9	-21.0	72.2	86.4	-14.2	79.5	107.1	-27.6	82.2	111.7	-29.6
365	38.5	49.1	-10.6	52.8	57.3	-4.5	61.3	72.8	-11.5	65.2	76.0	-10.8

An individual is defined as a migrant in a specific year is equivalent to say this individual changed his place of usual residence during this year. Because of different reasons (see before) the threshold of 275 cumulative days abroad or in the Republic of Moldova has been selected to define migrants for the calculation of the population estimates, however, to better understand migratory patterns in the Republic of Moldova we revert also to alternative definitions using different tolerance levels for the length of “temporary absences” that will be accepted to define a person as migrant or not. Indeed when using different thresholds to determine migration status means considering different tolerance

levels for periods of “temporary absences” from the original place of usual residence. For example, if the threshold 183 is used means that a person will be considered a migrant if accumulates just slightly more than half a year abroad or in the Republic of Moldova meaning we tolerate almost 6 months of “temporary absences” from the person place of usual residence before this person is moved to another place of usual residence and therefore considered as a migrant. If the threshold of 275 days is used means that we tolerate until 3 months of “temporary absences” from the person's place of usual residence before we move this person to another place, and similarly regarding the thresholds of 305 days and 335 days with 2 months and 1 month of tolerance. Using the threshold of 365 days means we do not accept any “temporary absence” at all: to change a person's place of usual residence we require this person to stay a continuous year in the new place after returning from living in the old place also for a continuous full year.

The data in Table 4 shows as expected that the number of migrants in both directions (Immigrants and Emigrants) is dependent on the threshold selected: the highest the threshold (and therefore our tolerance for “temporary absences” is lower) the lower the number of individuals that will be categorized as migrants in both directions. At the same time, it is evident that the effect of the threshold selected on the migratory balance is less marked. For identified Moldovan citizens (first panel) the number of migrants (immigrants or emigrants) ranges over the four years between 93 thousand and 156 thousand per year when using the 183 days threshold, it is reduced by about one half of it when using the 275 days threshold (ranging between 40 and 79 thousand per year) and so on when the threshold of 365 days yields migratory flows ranging between 8 and 16 thousand in each direction. Compared with these large differences in the magnitude of the migration streams the differences in net migration are much smaller: for the threshold of 183 net migration ranges between 11 and 49 thousand over the 4 years when for the threshold 275 the range is 18-39 thousand and it goes gradually down to 5-6 thousand for the 365 days threshold. In the case of the Foreigners, the differences in the migratory streams when using different thresholds are similar to the differences found for Moldovan citizens and the net migration differences are even smaller.

The migration patterns in the Republic of Moldova will require a much more in-depth analysis in the future when more years and data will accumulate, but, from the preliminary analysis done, it is evident that the migration patterns in the Republic of Moldova seem to challenge current migration definitions. The arbitrariness of the migration definitions is clearer when looking at the Republic of Moldova migration data.

There is no doubt about the fact the Republic of Moldova experiences in the last years (also before 2014) a significant migratory loss. The different thresholds (excluding the 365 days threshold that can be a priori rejected as a proper way to measure migration) yield negative net migration estimates that run between 18 to 25 thousands in 2014, between 14 and 27 thousand in 2015, between 28 and 58 thousand in 2016 and between 30 and 58 thousand in 2017. The differences are smaller for 2014 and 2015 but increase in 2016 and 2017. Even though the differences between thresholds in the number of net migrants amounts to several tenths of thousands, its effect on the current population estimates that average during the years around 2.7 million is not big. These findings also influenced the decision to use the 275 days threshold.

To be able to provide net migration estimates according to the international definition of migration intended for this purpose it was selected as what seems to be the best approach. The selected

approach took into account the internationally agreed definitions, the type and quality of data available and the need to be able to calculate similar migration estimates from now on to produce reliable current population estimates year after year. It seems this goal has been achieved with the adopted approach.

International Migration 2014-2017

The general picture that arises from data on international mobility in the Republic of Moldova is of a highly mobile population with a large number of individuals spending long periods of time abroad, a population which experiences strong migration flows of emigration and immigration (return migration) that result in a high negative migratory balance that has increased in last years.

High international mobility

The population of the Republic of Moldova is highly mobile. The number of identified Moldovan citizens¹⁵ that crossed the border in each of the observed years amounted to 1.5-1.7 million (Table 5). A such number of movers represents about 40% of the total number of the Republic of Moldova citizens registered in the SRP (slightly more than 4 million in 2019). It should be noted that this number includes not only Moldovan citizens resident of the Republic of Moldova but also Moldovan citizens that usually reside abroad (some of them since before our observation period) and just crossed the border to visit the Republic of Moldova.

Table 5: Number of persons and number of movements across the border for Moldovan citizens and Foreigners 2013-2018 (in millions)

	Moldovan citizens		Foreigners	
	Persons	Movements	Persons	Movements
2013	1.6	11.1	1.2	7.7
2014	1.5	10.8	1.1	7.4
2015	1.6	12.2	1.3	8.8
2016	1.7	13.2	1.5	10.1
2017	1.7	13.5	1.6	10.0
2018	1.6	13.0	1.7	10.5

Also, a similar number of individuals (1.1-1.7 million across the years) crossed the border using non-Moldovan documents, here referred to as 'Foreigners' despite the fact this group include also an unknown number of unidentified Moldovan citizens that used only foreign documents to cross the border. During the observation period (2013-2018) there were identified about 2.7 million Moldovan citizens that crossed the border at least once (part of them Moldovan citizens usually residing abroad since before 2013 who came to visit the Republic of Moldova) and 3.8 million¹⁶ Foreigners (among them an unknown number of unidentified Moldovan citizens using non-Moldovan documents in all their movements).

¹⁵ This number does not include an unknown number of unidentified Moldovan citizens that used only non-Moldovan documents when crossing the border and therefore have been included among the Foreigners, see explanation in previous Chapter: Implementation of the definition using border crossing data.

¹⁶ The number of Foreigners is suspected to be partially inflated since the same individual crossing the Republic of Moldova border for the second time with a different document (for example entering for the second time using a renewed passport that has a different number) may be wrongly considered as a different person and therefore counted twice. This partial inflation may also affect the count of immigrants and emigrants and affect in an unknown direction the number of net migrations of Foreigners.

Strong international migration streams

These intensive movements generate international migration flows in both directions (immigration and emigration) that are also very strong. Table 6 presents data about the number of immigrants, emigrants and the resulting migratory balance during the years 2014-2017 using the 275 threshold to define migrants¹⁷.

Table 6: Immigrants (Im), Emigrants (Em) and migratory balance (NET), Moldovan citizens and Foreigners, 2014-2017 (thousands)

	2014			2015			2016			2017		
	Im	Em	NET	Im	Em	NET	Im	Em	NET	Im	Em	NET
Moldovan citizens	57.0	75.3	-18.3	51.1	69.7	-18.6	40.3	77.8	-37.5	39.7	78.8	-39.1
Foreigners	41.7	48.1	-6.4	54.5	57.2	-2.7	67.0	75.4	-8.4	70.0	80.3	-10.3
Total	98.7	123.4	-24.7	105.6	126.9	-21.3	107.2	153.2	-45.9	109.7	159.1	-49.4

The data shows that during these four years about 40-57 thousand Moldovan citizens returned to the Republic of Moldova after residing abroad and between 70 and 79 thousand emigrated abroad (Table 6). The Immigration stream was always smaller than the Emigration stream resulting in a negative migratory balance that increased from about -18 thousand in 2014 to about -39 thousand in 2017. It seems also evident from the data that this increase in the negative balance was mainly the result of a decrease of about 15 thousand in the number of return migrants (immigrants) combined with a small increase of a few thousand in the number of emigrants. The foreigners have also large migratory streams¹⁸ that increased over the years but since the streams were much more similar in magnitude, the migratory balance, still negative, was smaller increasing from about 6 to 10 thousand across the same years. It should be noted that the foreigners' streams include movements of workers and tourists who came to the Republic of Moldova for short periods of time - and it is doubtful they may have any significant net migration balance, together with some movements of unidentified Moldovan citizens traveling with non-Moldovan documents - that are suspected to be the main responsible for this small negative net migratory balance.

Table 7 presents the migratory streams in terms of rates (per thousand) from the yearly population of the Republic of Moldova for both Moldovan citizens and Foreigners. Moldovan citizens' migration rates show that emigration rates increased over the four years period from 26 to 29 per thousand when immigration rates decreased from 20 to 15 per thousand resulting in a yearly net negative migration balance that increased from -6.4 in 2014 to -14.3 per thousand in 2017. Foreigner's migration rates were usually smaller, in particular their negative net migration rates ranging between -2.2 and -3.7 per thousand in the same period.

¹⁷ This is the threshold used to define migration and unless otherwise stated is the one used in the remaining of this chapter

¹⁸ See previous comment about the possibility that the migration of foreigners may be partially over counted.

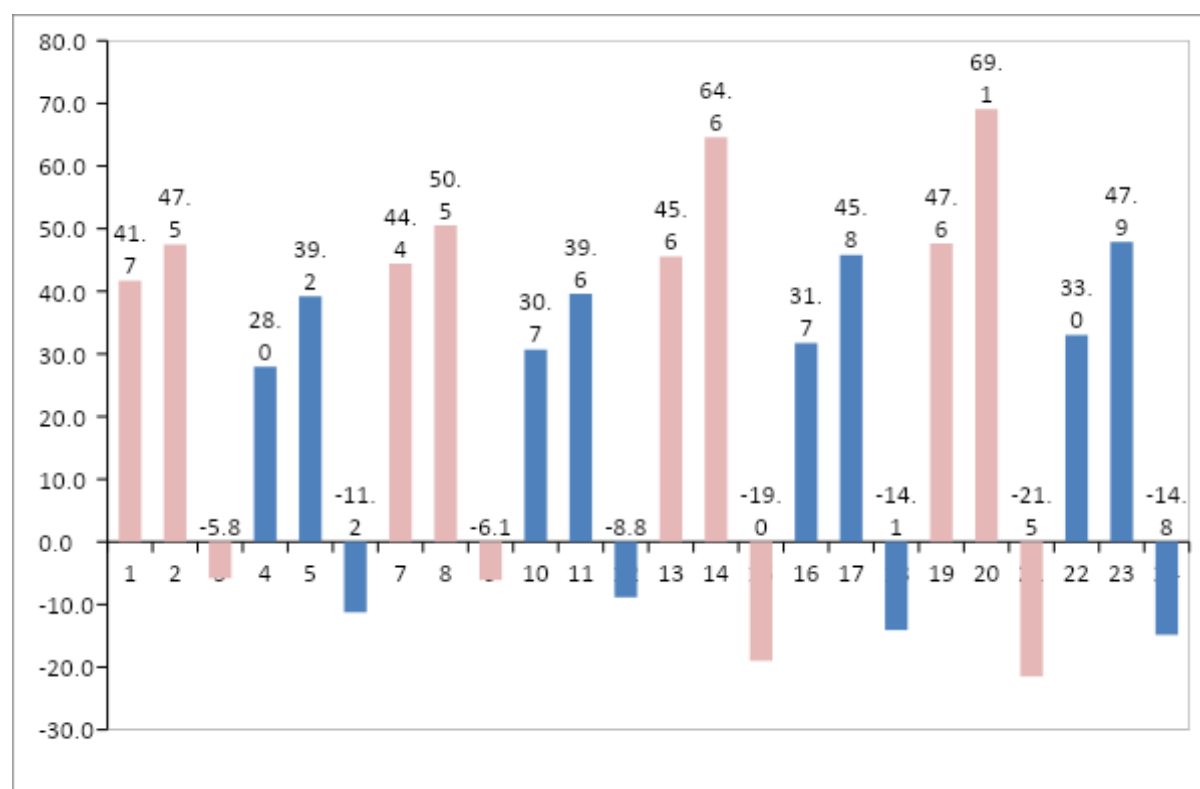
Table 7: Immigrants (Im), Emigrants (Em) and migratory balance (NET), Moldovan citizens and Foreigners, 2014-2017 (rates per thousand)

	2014			2015			2016			2017		
	Im	Em	NET	Im	Em	NET	Im	Em	NET	Im	Em	NET
Moldovan citizens	20.0	26.4	-6.4	18.0	24.6	-6.6	14.4	27.8	-13.4	14.5	28.7	-14.3
Foreigners	14.6	16.8	-2.2	19.3	20.2	-1.0	24.0	27.0	-3.0	25.5	29.3	-3.7
Total	34.6	43.2	-8.6	37.3	44.8	-7.5	38.4	54.8	-16.4	40.0	58.0	-18.0

Sex patterns of migration

International migration rates by sex in the Republic of Moldova show a changing pattern over the four years period (Graph1 and Table 8, last two rows). During the whole period migration rates (in both directions, immigration and emigration rates) for males were higher than for women, however, the negative net migration rates were smaller for males than for women in the first two years and reversed to be higher for males than for women in the last two years.

Graph 1: Immigrants (Im), Emigrants (Em) and migratory balance (Net), by sex, Moldovan citizens and Foreigners, 2014-2017 (rates per thousand in the Republic of Moldova population)

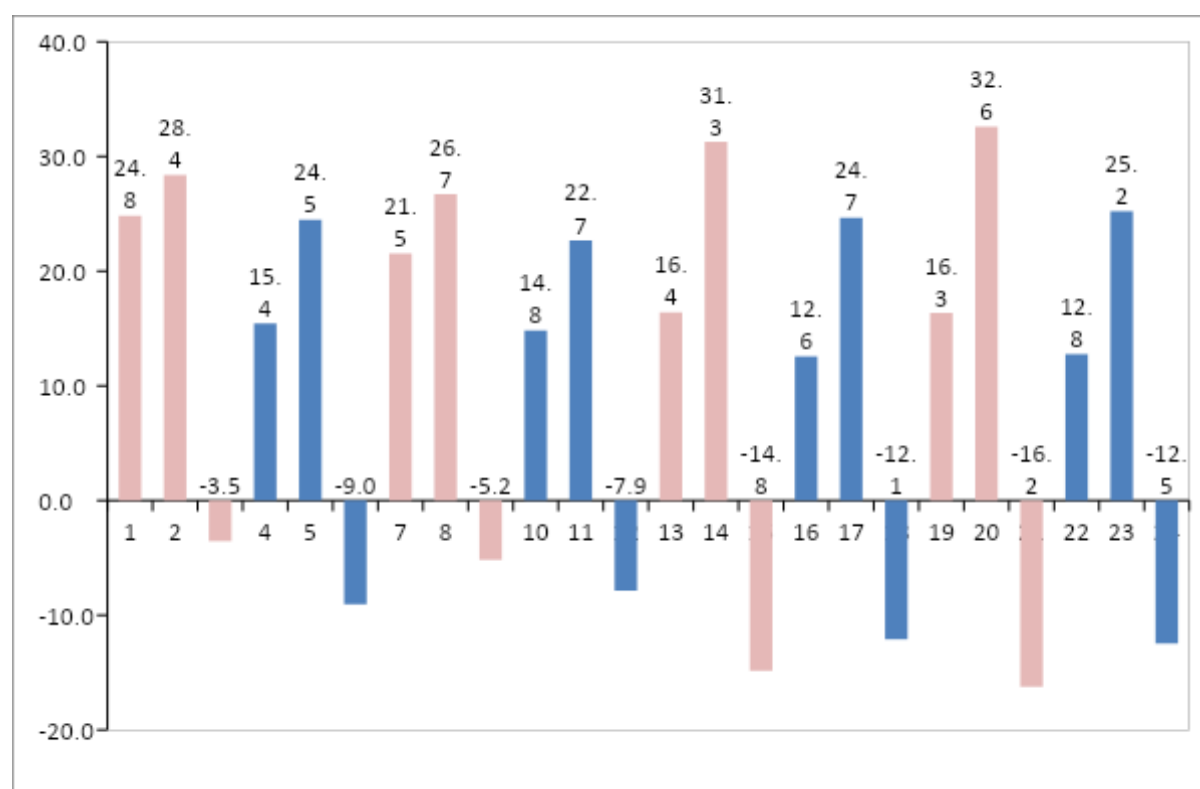


This reversal was the result of the combination of a sharp increase in male's emigration rates (from 47.5 in 2014 to 69.1 per thousand in 2017, Table 8 and Graph 1) together with a much smaller increase in male's immigration rates (from 41.7 to 47.6 per thousand) when females experienced smaller

changes: immigration rates for women increased from 28.0 to 33.0 per thousand and emigration rates increased from 39.0 to 47.9 per thousand. As a consequence of these different changes by sex the negative net migration that was higher for women than for males in 2014 (-11.2 compared with -5.8 per thousand for females and males respectively) reversed to be higher for males than for females in 2017 (-21.5 compared to -14.8 per thousand for males and females respectively).

International migration rates by sex of identified Moldovan citizens (Graph 2 and Table 8, first two rows) show the same changing pattern over the four years period as identified Moldovan citizens and Foreigners as a whole. During the whole period migration rates (in both directions, immigration, and emigration rates) for males were higher than for women however the negative net migration rates were smaller for males than for women in the first two years and reversed to be higher for males than for women in the last two years.

Graph 2: Immigrants (Im), Emigrants (Em) and migratory balance (Net), by sex, Moldovan citizens, 2014-2017 (rates per thousand in the Republic of Moldova population)



Foreigner's migration rates (Table 8, second panel) show a similar pattern as identified Moldovan citizens but the migration rates in both directions are smaller and in particular, the resulting negative migratory balance is much smaller for both sexes (supporting the adopted assumption that most migratory movements in the Foreigners file pertain to unidentified Moldovan citizens).

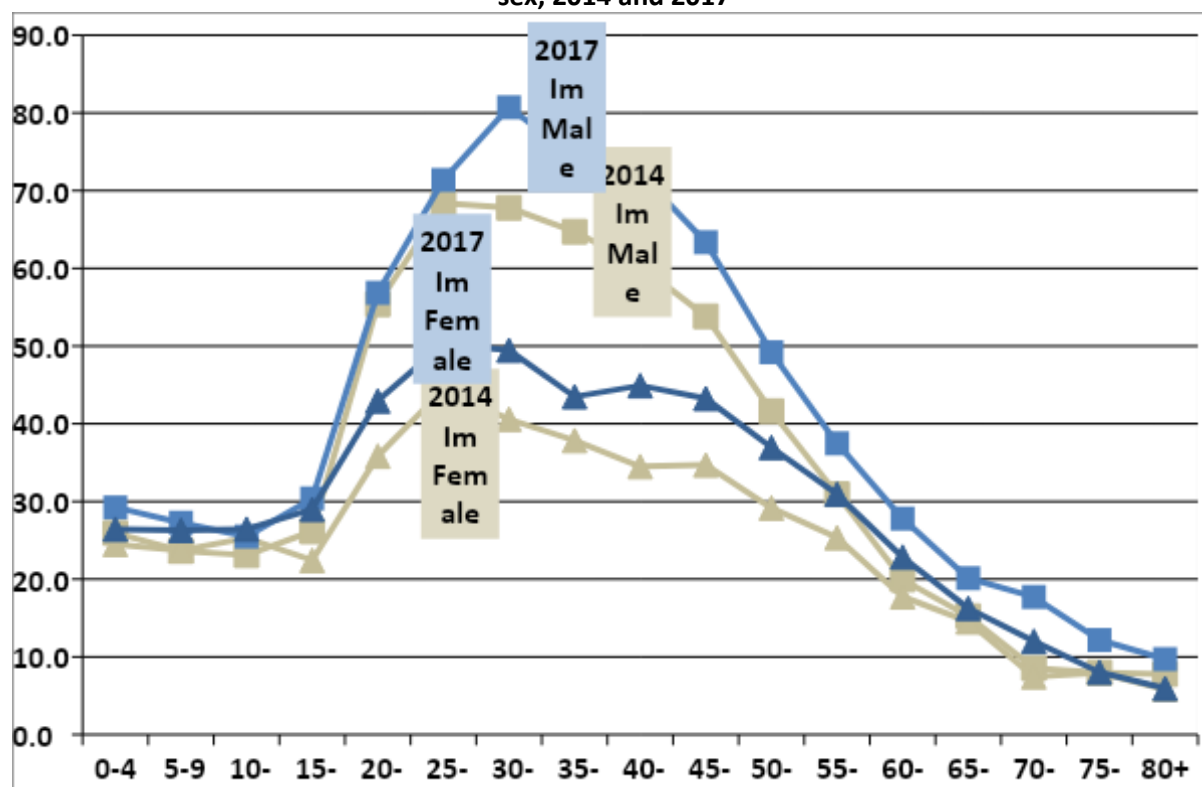
Table 8: Immigrants (Im), Emigrants (Em) and migratory balance (Net), by sex, Moldovan citizens and Foreigners, 2014-2017 (rates per thousand)

		2014			2015			2016			2017		
		Im	Em	Net	Im	Em	Net	Im	Em	Net	Im	Em	Net
Moldovan citizens	M	24.8	28.4	-3.5	21.5	26.7	-5.2	16.4	31.3	-14.8	16.3	32.6	-16.2
	F	15.4	24.5	-9.0	14.8	22.7	-7.9	12.6	24.7	-12.1	12.8	25.2	-12.5
Foreigners	M	16.9	19.1	-2.3	22.9	23.8	-0.9	29.2	33.3	-4.1	31.3	36.5	-5.3
	F	12.5	14.7	-2.2	15.9	16.9	-1.0	19.1	21.1	-2.0	20.3	22.7	-2.4
Moldovan citizens and Foreigners	M	41.7	47.5	-5.8	44.4	50.5	-6.1	45.6	64.6	-18.9	47.6	69.1	-21.5
	F	27.9	39.2	-11.2	30.7	39.6	-8.9	31.7	45.8	-14.1	33.1	47.9	-14.9

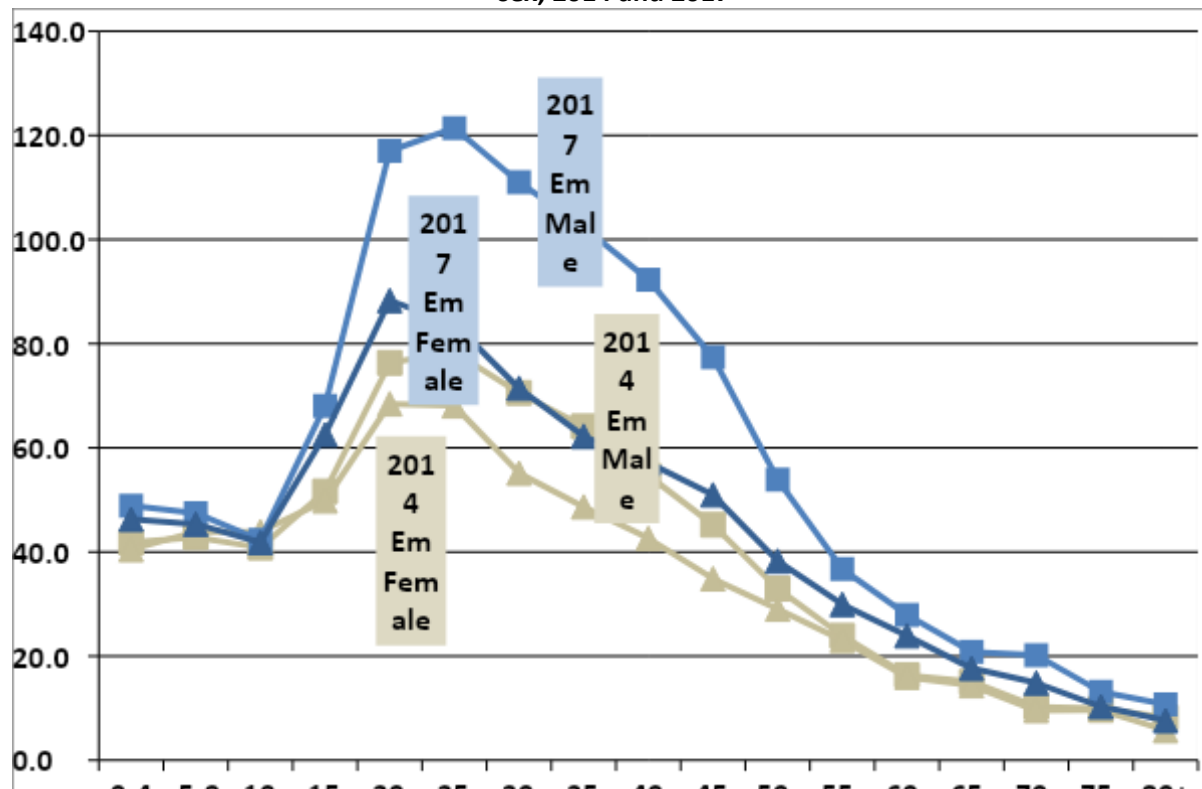
Age patterns of migration

Migrations in general and international migrations, in particular, have usually a distinctive pattern of high migration rates at young-adults ages together with relatively high migration rates for young children and low migration rates at other ages. This pattern is evident in the Republic of Moldova international migration. Graphs 3-5 present international migration rates by age groups and sex of Moldovan citizens and Foreigners for the years 2014 and 2017, Graph 3 presents immigration rates, Graph 4 presents emigration rates and Graph 5 presents the net migration rates.

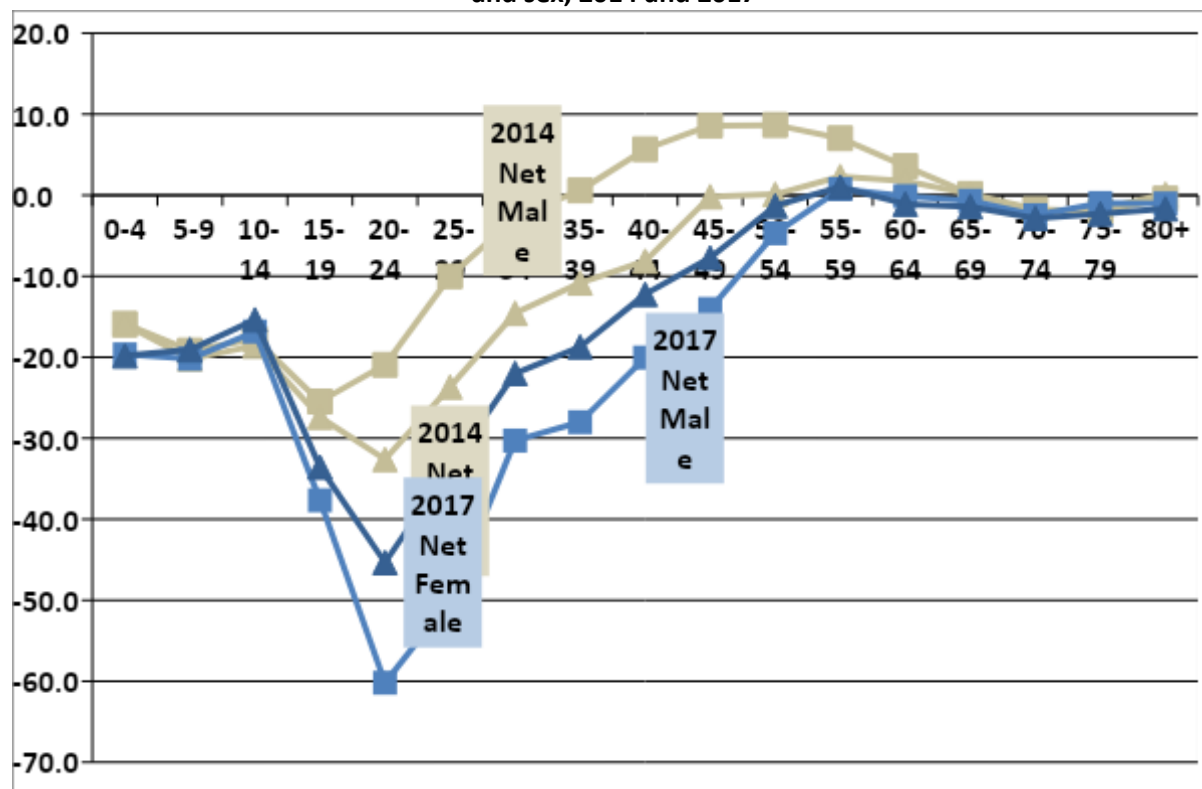
Graph 3: International Immigration rates for Moldovan citizens and Foreigners by age groups and sex, 2014 and 2017



Graph 4: International Emigration rates for Moldovan citizens and Foreigners by age groups and sex, 2014 and 2017



Graph 5: International Net-migration rates for Moldovan citizens and Foreigners by age groups and sex, 2014 and 2017

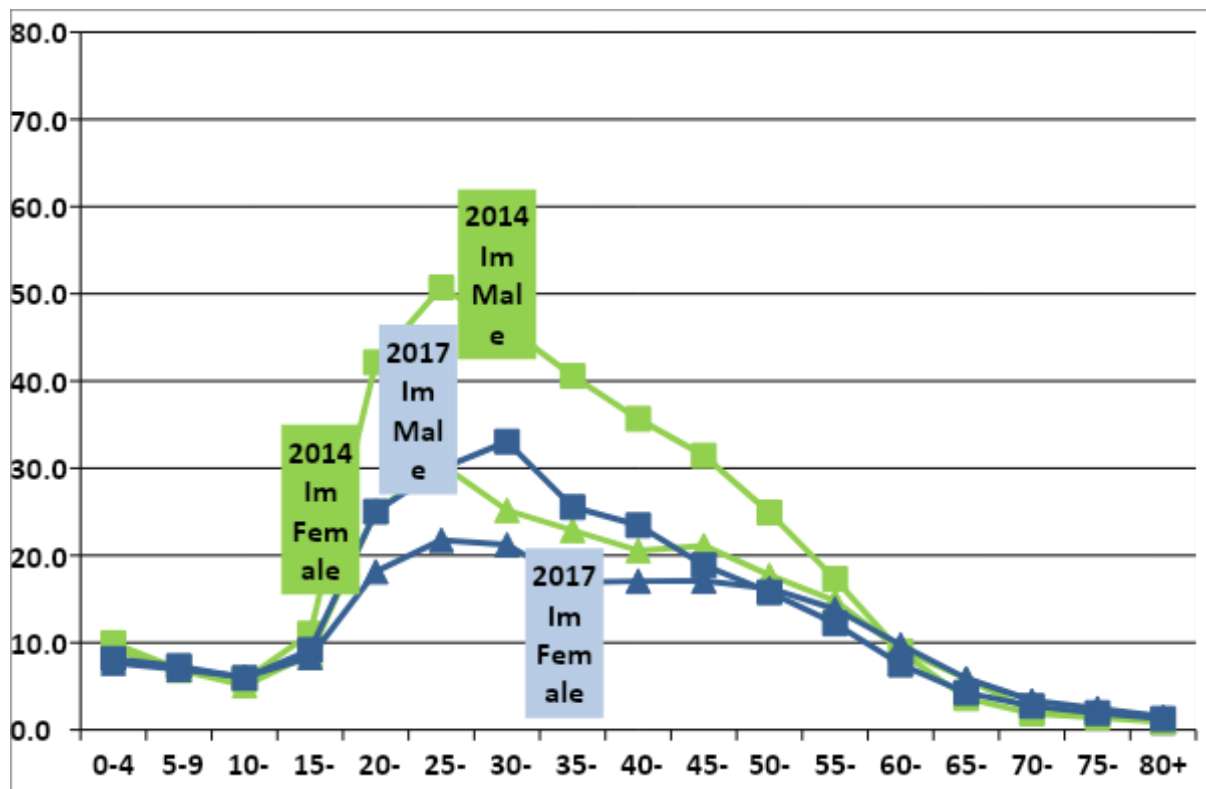


The mentioned age pattern for both sexes is present in both immigration and emigration rates and also in the net migration rates both in the year 2014 as in the year 2017 (and also in 2015 and 2016, data not presented here). The graphs illustrate clearly that at almost all age groups males have higher immigration and emigration rates than females and also that the rate changes were more prominent for men than for women. The Graphs illustrate also that the changes between 2014 and 2017 affected all age groups: A general decline was registered in immigration rates of both sexes (see Graph 3) and a general increase in emigration rates of both sexes too (Graph 4). The reversal in the net migration rates by sex is also evident (Graph 5) but now is possible to see that this reversal was to a great extent driven by a sharp decline in net migration rates of males that in 2014 had relatively high positive net migration at the range of 30-64 age groups. It seems that in 2014 (and 2015, data not shown here) the return migration rates of males were much higher than the emigration rates. This pattern disappears in 2017 (already in 2016, data not shown here) when net migration rates become negative for both sexes at least until the age of 50-54 and remain nil afterward.

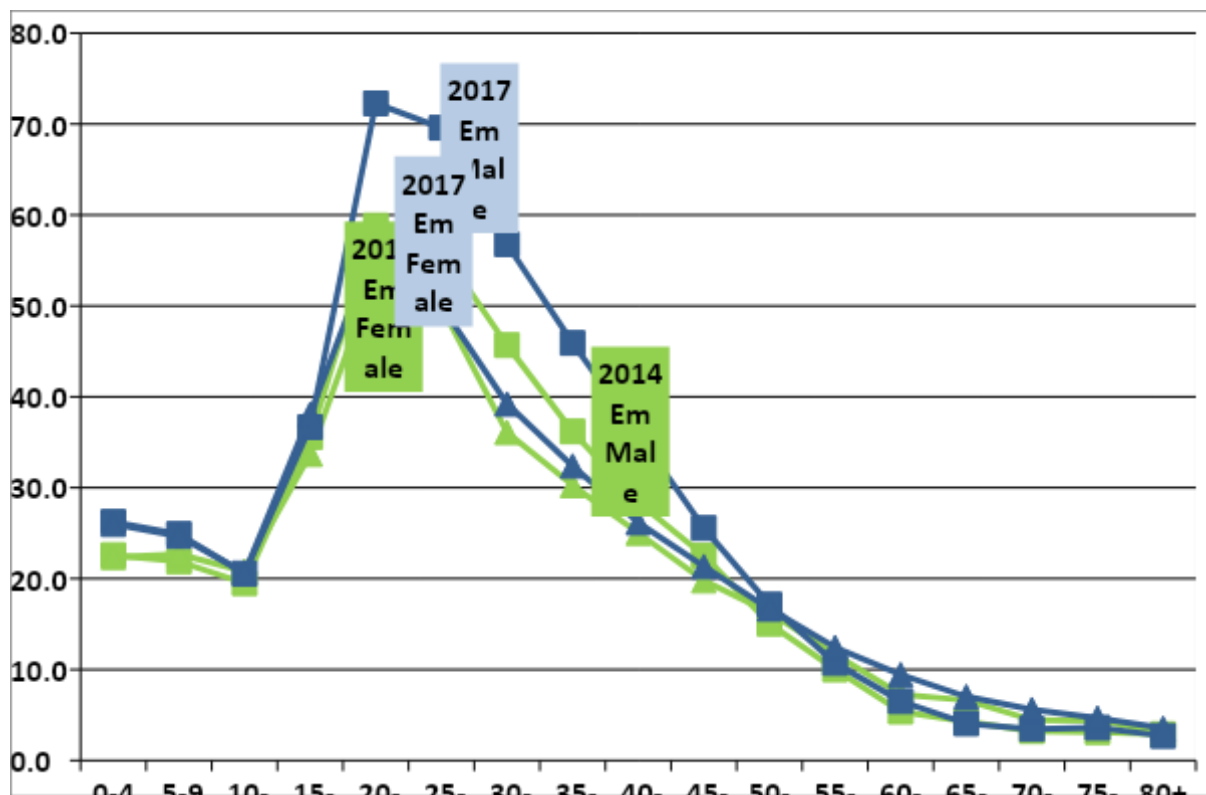
Another prominent feature to be noted is the large magnitude of both immigration and in particular emigration rates at young adult ages: emigration rates arrive at a peak of 121 per thousand for males at age 25-29 and 88 per thousand for females at age 20-24 in 2017 and until the age of 35-39 they remain over 100 for males and over 60 for females in 2017. Even if immigration rates are lower, they remain at a high level, getting the peak in 2017 - almost 81 per thousand for males 30-34 and 50 for females 25-29. These high migration rates leave also high negative balances at young adult ages: in 2017 at age 20-24 males show a negative migratory balance of -60 per thousand, and females -45 per thousand. Meaning that the Republic of Moldova lost about 6% and 4.5% of the 20-24 age group (cohort) of males and females respectively in just one single year.

Moldovan citizens show the same patterns by age (and sex) already observed for Moldovan citizens and Foreigners as a whole. Graphs 6-8 present international migration rates by sex, this time only for Moldovan citizens for the years 2014 and 2017, Graph 6 presents immigration rates, Graph 7 presents emigration rates and Graph 8 presents the net migration rates. Of course the magnitude of the immigration and emigration rates and to a lesser extent also the magnitude of the net migration rates is smaller, but the patterns by age and sex are identical to the ones above described for Moldovan citizens and Foreigners as a whole.

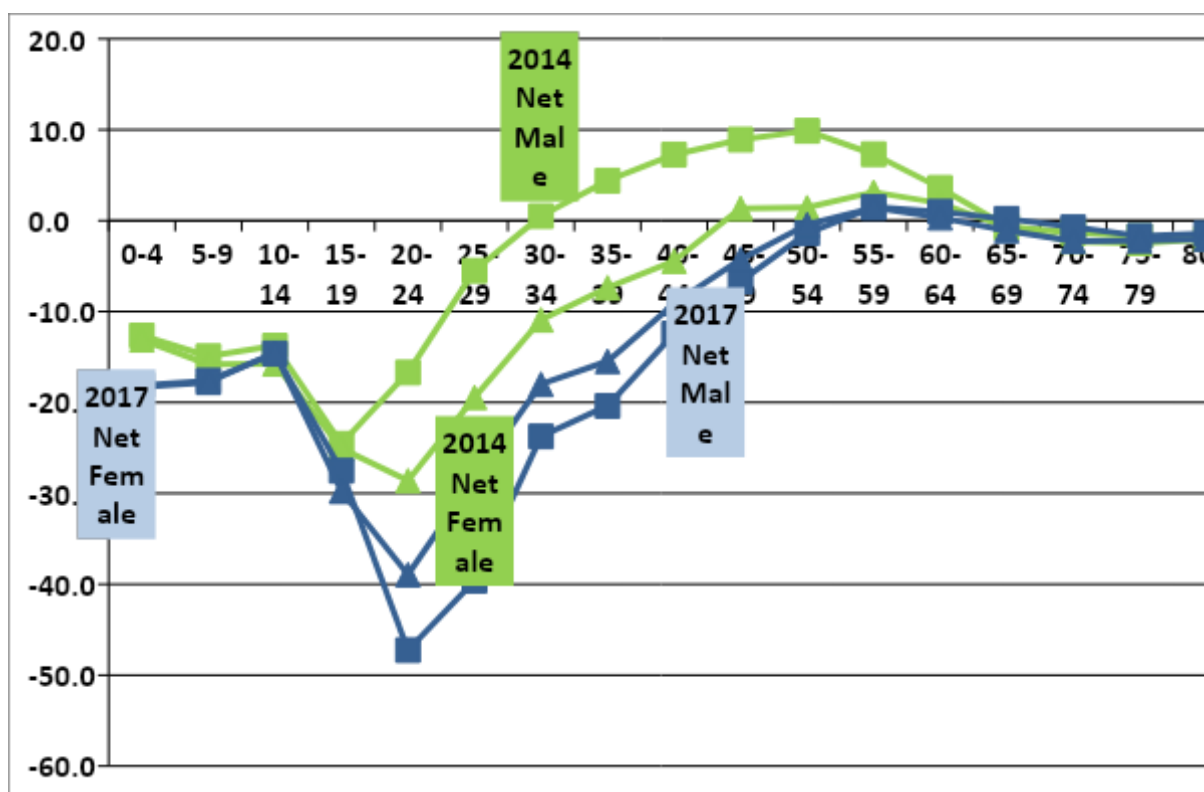
Graph 6: International Immigration rates for Moldovan citizens by age groups and sex, 2014 and 2017



Graph 7: International Emigration rates for Moldovan citizens by age groups and sex, 2014 and 2017

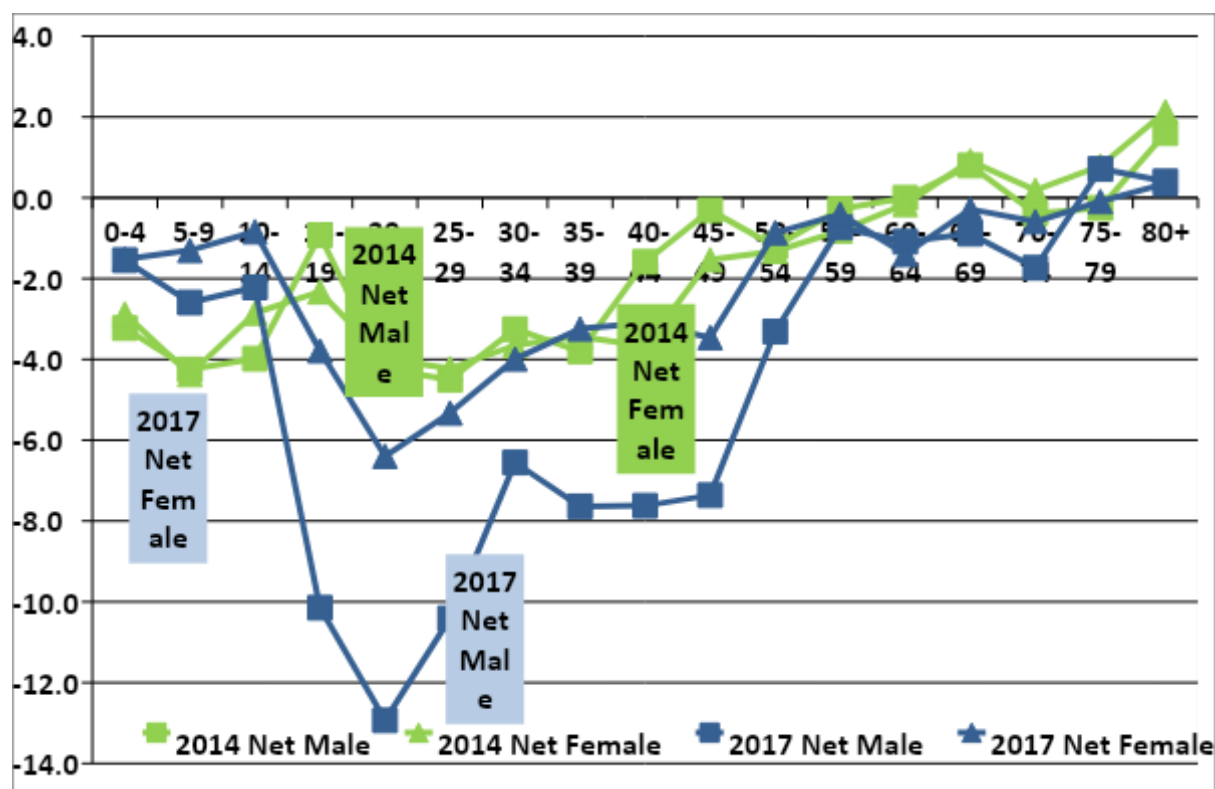


Graph 8: International Net-migration rates for Moldovan citizens by age groups and sex, 2014 and 2017



Foreigners present a slightly different pattern of smaller immigration and emigration rates than identified Moldovan citizens over the years when it was registered an increase in both rates and for both sexes (data not shown here), however their migratory balance even if negative and concentrated also at young adult ages is much more moderate as it can be seen in Graph 9. This seems to corroborate again the assumption that even if the raw migration streams (immigration and emigration) are mainly composed of Foreigners, the resulting small negative migratory balance that follows the age and sex patterns found in Moldovan citizens case are mainly the result of unidentified Moldovan citizens that crossed the borders using foreign documents and therefore have not been identified as Moldovan citizens and are considered as Foreigners.

Graph 9: International Net-migration rates for Foreigners by age groups and sex, 2014 and 2017



Moldovan citizens spend long periods abroad

Besides the high propensity to move across borders many Moldovan citizens stay abroad for large periods of time. For example, every year (Table 9) during the observation period 2014-2017 more than 310 thousand Moldovan citizens (more than 11% of the Moldovan population each year) spent more than half a year abroad, and more than 125 thousand spent more than 9 months abroad.

Table 9: Number of days spent abroad by usual residents of the Republic of Moldova 2014-2017

	183-274	275+	Total	
			183+	% of RM population
2014	212.4	131.2	343.6	12.0%
2015	189.0	128.3	317.2	11.2%
2016	185.2	125.6	310.8	11.1%
2017	191.0	127.0	317.9	11.5%
2014-17¹⁹	292.6	427.0	719.6	25.6%

Table 10: Number of Moldovan citizens who spent abroad more than half a year during 2014-2017 by number of times they did it

¹⁹ These numbers represent the number of different Moldovan citizens who spent abroad the stated number of days and therefore is not the simple sum of the yearly number of Moldovan citizens since many do that more than once (see text)

Number of times	183+ days abroad
once	421.8
2 times	225.5
3 times	67.3
4 times	5.1
Total	719.6

Summing up the number of (different) Moldovan citizens²⁰ who spent abroad more than half a year at least once during the examined period 2014-2017²¹ we get about 720 thousand (Table 10). In other words, about 26% of the Republic of Moldova's usually resident population spent more than half a year abroad during this 4 years period at least once. Moreover, about 41% of them (almost 300 thousand) did that more than once: 226 thousand did that twice, 67 thousand three times and about 5 thousand did that every year (4 times).

When analyzing the migratory patterns of Moldovan citizens we find also that a significant number of Moldovan citizens oscillate over the (four) years between emigrant and immigrant (or return migrant) status. Indeed about 56 thousand both immigrated and emigrated at least once during the 4 years examined, some of them (4.6 thousand) migrated even 3 times and a few (216) every year.

Conclusions

The general picture we get is of a highly mobile population that large parts of it have a high and continued exposure to other societies and countries for relatively large periods of time. Such mobility and migratory patterns present a challenge to any definition of international migration since so many Moldovan citizens spend such large periods of time both in the Republic of Moldova and abroad. If, for example, the threshold used to define migration was 183 days then about 26% of the Moldovan citizens would be considered migrants during a four-year period and not “only” 15% with the chosen threshold of 275 days.

Under these circumstances, the relatively high and increasing negative migration balance may not have only negative consequences. It is obvious that in the short term the fact that the Republic of Moldova is losing such large numbers of young adults is not positive and may have a negative influence on society and its economy. However, we should remember that many of those who leave the country for long periods of time also return very often and many of them send remittances to their families that remained in the Republic of Moldova. There is a lot more research that must be done to assess the impact these remittances may have on the Republic of Moldova society and economy. An important additional fact that should be mentioned is that the character of these migrations is not clear: are they permanent migrations? The high number of return migrants of every age and sex group

²⁰ It should be noted that this may be an underestimate since the Moldovan citizens referred here are identified Moldovan citizens from which have been excluded about 87 thousand for which there was missing data (that could not be statistically imputed), and as it was explained there exist also an unknown number of unidentified Moldovan citizens among the Foreigners

²¹ The calculations have been done for Moldovan citizens crossing the border during the years 2014-2017 and was calculated cumulatively, out of periods of 365 days before or after a given movement

and the oscillating migratory status of some of them seem to indicate the opposite. If further research will confirm the temporary character of most of these migrations then the exposure of so many Moldovan citizens to other cultures and societies may result in a long-term positive influence on the Moldovan society and economy.

Conclusions and recommendations for future work

Many improvements can and should be introduced in the future but in any case, the adopted approach for the measuring of migration estimates will allow NBS to produce current population estimates every year.

Still needs to be decided how to overcome the problem of the definition built-in delay (of slightly more than a year) in calculating migration estimates that arise from the need to have data for year $T+1$ for calculating migration estimates for year T . The development of migration models based on partial data for $T+1$ or on time-series projections or other statistical methods will require significant efforts.

Under these circumstances, the recommended approach is to produce provisional estimates using the net migration rates by age and sex calculated for the year before ($T-1$) allowing so the calculation of provisory current population estimates for year T around May of the year $T+1$ and producing the revised and final population estimates for year T on May of year $T+2$, when the movements data of $T+1$ will be already processed and respective estimates of migration by age and sex calculated. This approach of producing provisory and final estimates will allow overcoming a similar problem regarding the vital statistics data since also in this case the final data for the current year T is available in the final form several months (at least 3, usually more) after the end of year $T+1$.