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Quality assessment of European migration data

Deliverable 6.2



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Country abbreviations list

AT – Austria
BE – Belgium
BG – Bulgaria
CH – Switzerland
CZ – Czech Republic
CY – Cyprus
DE – Germany
DK – Denmark
EE – Estonia
EL – Greece
ES – Spain
FR – France
FI – Finland
HR – Croatia
HU – Hungary
IE – Ireland
IS – Iceland
IT – Italy
LI – Liechtenstein
LT – Lithuania
LV – Latvia
LU – Luxembourg
ME – Montenegro
MK – North-Macedonia
MT – Malta
NL – Netherlands
NO – Norway
PL – Poland
PT – Portugal
RO – Romania
SE – Sweden
SI – Slovenia

Quality assessment of European migration data

QuantMig Deliverable D6.2

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1 Introduction

As migration occupies an increasingly important place in the political and societal debates, models to predict future migration scenarios have become a valuable tool for researchers and policymakers alike. These projection models can clarify how migration flows may develop in the mid- and long-term under various circumstances and thus help anticipate the challenges and opportunities of future developments. These models, nevertheless, are only as good as the data they are built upon: the reliability of their predictions highly depends on the quality of cross-national datasets containing migration flows between countries and migrants' characteristics.

The production of cross-national migration datasets, however, is not an easy task. These datasets assemble migration data from different countries and, as such, they involve a great amount of upstream work in order to render the data from different sources complete and comparable. In Europe Eurostat has made important efforts in the last decades to harmonize migration data across European countries and produce good-quality and comparable datasets. Most notably, in 2007 Eurostat issued a new regulation aligning the measurement of migration in Europe (Regulation (EC) No. 862/2007 of the European Parliament and of the Council of July 11, 2007). Since then, EU countries are requested to use the UN recommendation (1998) and consider as (long-term) international migrants those individuals who move to another country for more than 12 months. This common measurement of migration—now used by many countries—has certainly contributed to the comparability of European cross-national datasets. However, many problems remain, pertaining both the comparability of migration data and the extent to which the data is complete. In order to analyse the data and in particular to prepare the data for modelling, it is crucial to have a good insight into how much information is available for which countries, what information is missing, and to what extent the information is coherent across countries.

The aim of this report is to assess the quality of migration flows data in Europe compiled by Eurostat between 2009 and 2019¹. The work is guided by two main questions: to what extent has comparability and completeness of Eurostat migration data between countries improved over time; and how are things standing now?

¹ We focused specifically on the immigration (migr_immi) and emigration (migr_emi) data tables of the Eurostat database, i.e., the tables reporting migration flows.

In order to evaluate the quality of Eurostat migration data we employ the same concepts used in the Integrated Modelling of European Migration (IMEM) project: we assess, on the one hand, *data completeness*—i.e., the level of disaggregation and missingness—and, on the other hand, *data comparability*—i.e., duration, undercount, coverage, and accuracy, as defined in the IMEM project (see Raymer et al. 2013; van der Erf 2010; Wisniowski et al. 2013). This evaluation focuses on data on migration flows in the EU and EFTA² countries between 2009 and 2019, which is the more recent period not covered by the IMEM project. It constitutes a preliminary step to prepare the data that will feed the QuantMig Bayesian hierarchical model for estimating migration in Europe.

This report is organised as follows. The next section (Background) discusses the problems that may arise in cross-national migration datasets and presents a framework to assess the quality of these datasets. The Methodology section describes how we used the framework to evaluate Eurostat data and presents the sources used. Next, in the Results sections we present a series of tables allowing an easy identification of the (in)consistencies in migration data for the different EU/EFTA countries over time. Finally, the last section (Summary and discussion) synthesises the data quality assessment and formulates some recommendations for the future.

2 Background

In order to understand migration patterns and trends, and to model and predict international migration, scholars rely on cross-national migration datasets reporting migration movements between countries. In Europe, such datasets are made available by Eurostat, which coordinates harmonised data collection from national statistical offices (NSOs)³—typically based on administrative sources or surveys—and then centralises, compiles and publishes these data in the form of country-level tables. While progress has been made to harmonize migration data and to improve the quality of these cross-national migration datasets, important issues remain. These issues that can be broadly categorized into two groups: data completeness and data comparability.

2.1 Issues of data completeness

Data completeness refers to the extent to which migration flows data is disaggregated by migrant's characteristics (namely next/previous country of residence, nationality, country of birth, age, and sex) and to the amount of missing data in these categories. For modelling purposes, researchers would ideally have data on all migration flows by origin and destination, that is, all immigrants by country of last residence and all emigrants by country of next residence. Models could be further enhanced if there is some granularity to the data: for instance, if additional information exists on migrants' nationality or country of birth, it is possible to capture in- and out-flows of nationals and third-country citizens. Furthermore, information on sex and age of migrants can bring additional refinement to the modelling (although these are not strictly essential since they can be modelled by other means). On the other side of the spectrum, as a minimum, data for modelling would at least

² The European Free Trade Association (EFTA) consists of Iceland, Lichtenstein, Norway, and Switzerland.

³ Contrary to EU member states, EFTA countries do not have a formal responsibility to report to Eurostat, although most of these countries do.

cover the most important migration corridors between countries and have little missingness for origin and destination of migrants within these corridors.

In practice, nevertheless, it is extremely difficult to compile cross-national datasets containing complete information on migration flows with fine-grained information about migrants—especially since the data highly depends on how the different NSOs collect and report their migration statistics. In the case of EU/EFTA countries, Eurostat provides separate data tables with yearly information (where data is available) on the number of immigrants and emigrants by previous/next country of residence, nationality, country of birth, age, and sex—but it is not possible to combine the data in cross-tabulations. Therefore, it is not possible, for instance, to assess the number of nationals and third-country citizens who moved residence from one country to another.

Another issue in terms of data completeness is the assessment of zero values. In fact, the zeros reported in migration datasets may indicate either that there was no migration between two countries (actual zero migrants); or that the information is missing and was coded “0” instead of “NA” (missing) or instead of leaving an empty cell. It is thus important to assess which zero values are likely to be actual zero values and which ones are not. For example, a value of zero in a given destination country is likely to be true if the total population of the origin country is very small. On the other hand, if disaggregated data by country of origin only contains zeros (rather than missings) while the total aggregated values are non-zeros, these can be assumed to be missing values and not actual zeros. Naturally, one must be careful with making these adjustments as certain values may be the result of statistical procedures by NSOs, which may not always be clearly indicated in the data documentation.

2.2 Issues of data comparability

The second group of issues pertains to the extent to which migration data is comparable between countries. In fact, cross-national datasets may even have an adequate level of completeness but still contain data that is not comparable. This is because national statistics offices may collect migration data in different ways, use different definitions, and countries may have different rules on the registration of new and old residents. These differences yield inconsistencies in migration data reported by different countries, which in turn poses a problem to projection models and may lead to unreliable prediction. Therefore, in modelling migration it is important to understand the problems in comparability in the data in order to obtain consistent migration flows that will produce reliable estimates. In this vein, previous modelling projects—namely IMEM—have put forward four independent concepts to assess and address the issues of comparability: duration, undercount, coverage, and accuracy (Raymer et al. 2013, Wisniowski et al. 2013).

Duration refers to the time definition that a country uses to determine after which period a (new) resident can be considered an immigrant. The standard in migration research is to follow the United Nations definition (1998), which indicates that a person who moves to a country other than that of their usual residence for at least 12 months should be considered a (long-term) migrant. For data comparability, it is important that countries consistently use the 12-month criterium: in fact, a country that uses a time criterium lower than 12 months will report a higher number of immigrants (since some of them will have left before the 12th month); in turn, a country that has a longer time criterium will report a lower number of migrants. Moreover, it is important that countries apply the 12-month rule the same way, since this definition still leaves some room for interpretation. For instance, some countries may consider as migrant someone who *intends* to stay more than 12 months; while other countries may only consider as migrants the new residents who *actually* stayed more

than 12 months. In Europe, since 2007 Eurostat recommends countries to report their migration statistics based on the 12-month definition (although it is not always clear for all countries whether their data refers to intended or actual migration). Of note, some countries use other duration criteria internally (e.g., 90 days/3 months) but still report to Eurostat using the 12-month definition.

Undercount refers to the part of the true migration flows that the data collection system fails to account for (Wisniowski et al. 2013). The failure to account for migrants depends on the rules for registration and de-registration in each country and on how effective countries are in enforcing these rules. Some countries may, for instance, encourage newcomers to register by granting them access certain rights or services; others may impose a fine for those who do not register after a given time since arrival. Different rules may hold for different migrant groups. In particular, immigrants coming from outside the EU have stricter requirements to register as they need a residence permit, whereas nationals or migrants from another EU or EFTA country may not face serious sanctions if they fail to comply with registration rules. Consequently, the undercount is unlikely to be uniformly distributed across all migrant groups: one can expect it to be higher in certain migrant groups than in others. The problem of undercount particularly concerns emigration flows given that countries tend to have the less strict reporting requirements when it comes to leaving the country (De Beer et al. 2010, Wisniowski et al. 2013). It becomes visible that the undercount of emigration is higher compared with the undercount of immigration when comparing the outflows from country A to country B with inflows of country B from country A: in most cases the immigration (inflow) statistics show a higher number than the emigration (outflows) statistics.

Coverage refers to the systematic bias that is the result of a migration data collection system that *by design* does not capture a certain group of migrants. Naturally, third-country undocumented immigrants cannot always be captured as their presence is unknown. In some cases, however there are groups of migrants that should be included in migration statistics but are not. Such groups often include asylum seekers, diplomats, international students, and in some cases also nationals who return to the country after having migrated, if these are not requested to report their return. Thus, the issue of coverage arises when a national statistical office does not have a data collection system in place to capture a particular type of migrant and therefore does not include that data in their statistics.

Finally, **accuracy** refers to the random error—rather than the systematic error—that is the result of the countries' data collection system. A dataset has a high accuracy if it measures precisely that what it intends to measure. Typically, register data is considered to capture migration more accurately than survey data, as the latter tend to suffer from sampling error. Yet, there may be quite some variation in the accuracy of registers, as some contain many more random errors in migrant registrations and de-registrations than others. The Nordic countries in particular are considered to have registers of the highest quality (van der Erf 2010). Some countries use mathematical modelling to improve the quality of their register data. There is much variation between surveys as well, as for instance, some elaborate surveys may be able to overcome some of the sampling error. In general, accuracy tends to be higher for immigration than for emigration statistics (Wisniowski et al. 2013).

Some examples allow to distinguish the concepts of undercount, coverage, and accuracy more clearly. A dataset may have many coverage issues and yet be very accurate, for instance if by design certain groups are not included in the statistics (e.g., students and refugees) while all the other groups of migrants are accurately measured. By contrast, the data might cover all different types of migrants including students and refugees (high coverage), but the estimated flows of these groups may not be reliable (low accuracy). Finally, whereas accuracy depends on the quality of data collection method, undercount refers to the systematic biases that occur because of, for example, regulations pertaining to migrants (de)registration. For instance, a register may make little errors in

capturing reported immigration (highly accurate), but because individuals are not incentivized to deregister, many emigration movements simply do not get recorded.

The four components of data comparability — duration, undercount, coverage, and accuracy — allow researchers to identify the potential problems in cross-national migration datasets and to adjust the data accordingly for use in migration models. In this sense, detailed information on how data is collected by the different national statistical offices is essential in order to establish to what extent data collection procedures differ between countries and to what extent certain migration flows may be over- or underestimated. Moreover, it is important that these concepts are well distinguished, as in modelling they are assumed to be independent from one another (Wisniowski et al. 2013).

3 Methodology

In this section we outline how we examine data completeness and data comparability of Eurostat data from 2009 to 2019.

3.1 Assessing data completeness

In the case of data completeness, we use the prepared files of the QuantMig deliverable 5.3 as the starting point. These files clean Eurostat data in terms of unrealistic zero values. The data is cleaned based on the following assumptions: (1) when disaggregated information indicates all or partially zeros, but totals indicate missing (i.e., “NA” or no entry; for simplicity we refer to missing value as NA), we assume that all values are missing; (2) when disaggregated information shows some non-zero and non-NA values, but totals indicate 0 or NA, we assume that the total value is NA. More information on this procedure can be found in QuantMig deliverable 5.3 (Aristotelous et al. 2021, forthcoming). On top of the procedures in QuantMig deliverable 5.3 we also consider zero values to be NA when only zero or missing values are available for the disaggregated country origin categories, whereas the total is a non-zero value. We then use the data as prepared by this procedure to assess the actual data completeness of the Eurostat data. Specifically, we assess the data completeness of the following data tables from Eurostat (as prepared by deliverable 5.3): `migr_emi1ctz`, `migr_emi3nxt`, `migr_emi4ctb`, `migr_imm1ctz`, `migr_imm3ctb` and `migr_imm5prv`.

On data completeness we show the following, separately for immigration and emigration: (1) how well data is disaggregated by country of origin/destination over the years 2009-2019; and (2) to what extent disaggregated data by age, sex and origin/destination is available over the years 2009-2019. We only consider entries that represent migration flows from single countries of origin (for immigration) and to single countries of destination (for emigration), and not migration flows from/to continents, regions, or groups of countries. This is because migration modelling requires disaggregation by single countries of origin/destination. Furthermore, we exclude all countries of origin/destination that have mostly missing across all Eurostat reporting countries. Specifically, we checked the number of years a country of origin/destination wasn't included in the different migration datasets (flows, citizenship, and country of birth). If the number of missing years was greater than five in every dataset the country was excluded. We indicate data completeness in four colours: green (complete data), orange (partly complete), red (highly or totally incomplete, but information on totals is available), and black (completely missing). In a first set of tables we assessed the completeness of migration flows by country of origin/destination: we consider reporting

countries to have complete or incomplete data when (in)completeness is lower than 2.5%. In a second set of tables we looked into the extent to which the data was disaggregated by age, sex, country of origin, or a combination of these: in these tables we consider data to be complete when a country has at least 95% of the information. Note that in this case we do not prioritize a certain disaggregation over another, but rather indicate which disaggregated tables are available or not for certain countries. Below we present tables for migration flows based on previous/next residence, but we also include the same tables with flows based on citizenship and country of birth in the Appendix.

3.2 Assessing data comparability

Regarding data comparability, given that we analyse the quality of Eurostat data, we naturally start by checking the Eurostat metadata. The starting point is the “migr_imm_i_esms” metadata document, obtained from the Eurostat online database (Eurostat 2021a), including information on time definition, sources, and coverage (in terms of asylum seekers and refugees). In particular, the “Break in series description” appendices contain information on when migrant definitions for the different member countries changed. Furthermore, the “demo_pop_esms” page contains information on how countries define their population and provides links to country-specific pages (Eurostat 2021b). While these metadata give extensive information on the data from the different NSOs, they have important limitations. First, the metadata is incomplete. For instance, the metadata only provides details on coverage and undercount for the most recent years, but little or no details in earlier years of data collection. Second, information appears to be imprecise. For instance, sometimes data is indicated as “reliable”, but there is no reference to how this conclusion was reached, and whether the evaluation was made by Eurostat or the national statistical office for that country. Thus, in order to obtain a more complete picture on data comparability over time, more information was to be gathered from other sources: the Eurostat methodological report of 2015 (Eurostat 2015), residence formalities (Your Europe 2021), EU legal migration fitness check (European Commission 2019) and in some cases specific information from national governments.

Of note, an additional difficulty in the search for information is that the terminology employed in the Eurostat metadata is not always consistent and does not exactly match the concepts we use in this report to assess data comparability. This is particularly the case of the terms “accuracy” and “coverage” which seem to be mixed in Eurostat documents. Moreover, information on what we consider issues of undercount is reported under the section “coverage” in the Eurostat metadata.

We assess factors related to duration, undercount, coverage, and accuracy from 2009 until 2019 (latest available data for most counties), to complement the IMEM project which studied data from 2002 until 2008.

Since there appears to be hardly any differences in migrant time definition for immigrants and emigrants in terms of data provided to Eurostat, we present one table for **duration**. We indicate the following, based on Eurostat (2021a) and Eurostat (2021b): (1) whether a country uses the 12-month definition as reported to Eurostat in 2009 and in 2019; (2) whether actual stay, intended stay or a combination of both is used in terms of the 12-month definition; (3) since what year countries report data according to the 12-month definition; and (4) whether the 12-month definition is also used for national population definition or whether it is converted when submitted to Eurostat (obtained through Eurostat methodological report, Eurostat (2015)).

For **undercount** we indicate rules on registration and deregistration for each of the countries. We create two separate tables with information on registration and deregistration. Naturally, the

registration requirement refers to undercount in terms of immigration and the deregistration to the undercount in terms of emigration. There is limited information on registration and deregistration over the years; the only information available is for 2013 (from the Eurostat methodological report – Eurostat (2015)), for 2017 (from the EU commission legal fitness checks – European Commission (2019)), and some recent information on residence formalities (Your Europe 2021). A limitation of these sources is that they mainly focus on third-country nationals and not on EU/EFTA nationals. Thus, unfortunately there appears to be little information that can help assess possible undercount issues related to nationals and EU/EFTA citizens. For registration we indicate: (1) whether or not there is an obligation; (2) the official time limit for registering; and (3) the available information on monetary sanctions for not complying to registration rules. Information on (1) and (2) is obtained from the Eurostat (2015) methodological report, whereas information on (3) is obtained from the Your Europe (2021) and government websites (see notes in table 4b). For deregistration we indicate: (1) whether there is an obligation to deregister (2) the official time limit for deregistration; (3) whether there is an obligation for third-country nationals to deregister; and (4) whether member states monitor the absence of third-country nationals. Countries that monitor the absence of third-country nationals may have a lower underestimation of third-country national emigration. Information for (1) and (2) are obtained from the Eurostat (2015) methodological report, whereas information for (3) and (4) are obtained from the EU commission legal fitness check.

For **coverage**, the most consistent information we could find relates to whether refugees and asylum seekers are included in the country’s statistics. In the “13.1 Accuracy” section of the Eurostat country-based “demo_pop_esms” metadata (Eurostat 2021b) we also found some information related to coverage of nationals, EU/EFTA citizens and third-country nationals for some member states.

For **accuracy** we indicate the data collection system used by the different countries, i.e., registers, survey, other (e.g., residence permits, census estimates), based on Eurostat metadata (Eurostat 2021a; Eurostat 2021b). We also indicate whether a country uses modelling (such as mathematical or econometric models) to improve their estimates. While these types of modelling may or may not improve the actual estimate of (im)migration, we consider the use of modelling as an indicator of a less accurate register compared to registers for which no such modelling is applied. We refer to registers that are combined with modelling as “register - hybrid”.

4 Results: data completeness and comparability

4.1 Assessment of data completeness

Table 1a and 1b display the availability of immigration and emigration data from 2009 to 2019 disaggregated by country of origin based on previous/next residence. There is quite some variation across the EU/EFTA countries in terms of completeness, with some having complete information (indicated in green), others only providing totals and no disaggregated information whatsoever (in red), some having only partial disaggregated information (in orange), and cases in which not even totals are available (in black). The countries that have complete information on country of origin for both immi- and emigration are Denmark, Estonia, Italy, Liechtenstein, Lithuania, Norway, Iceland, Finland, Slovenia, and Slovakia. Next, there are countries that have mostly complete data. Sweden appears to have missing information for some countries of origin for some years, but still data can

be considered quite complete. Netherlands has no data (disaggregated nor total) for emigration from 2009 to 2011, but is otherwise complete, whereas data in Belgium is missing for both immi- and emigration in 2009. Croatia, Bulgaria, and Switzerland provided complete disaggregated information on country of origin, apart from 2009 to 2010/11 (in which Bulgaria and Switzerland did not provide totals as well). Austria has varying completeness until 2014, but after that provided complete disaggregated information. There are some countries that provided disaggregated information, but for which completeness is low. Spain has consistently less than 50% completeness, even decreasing to 24% in more recent years. The UK has lower completeness, with only maximum 12% completeness and a lower percentage towards more recent years. France provided only 12% complete disaggregated information for country of origin from 2013 onwards. Ireland, on the other hand, provided complete information in 2009 and 2010, but has not provided disaggregated information ever since. The remaining countries (Romania, Poland, Portugal, Hungary, Germany, Greece, Czechia, Cyprus, Luxembourg, Latvia, Malta) provide no or almost no disaggregated information across all years.

Tables 2a and 2b indicate what specific disaggregated data is missing for respectively immigration and emigration. It is clear from these tables that, when disaggregated data is not complete (but also not completely missing) it is mainly because information on country of origin/destination is missing. For France and UK information is also missing for age, and in the case of emigration data in France there is no sex-specific information. In sum, when data is not complete, it is mainly because information on countries of origin/destination is missing, and second because disaggregated data by age is not provided.

For more details on data completeness covering different levels of disaggregation, see the Appendix.

Table 1a Data completeness: availability of immigration flows by previous country of residence

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	80	TOT	98	98	TOT	100	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
CZ	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DE	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	98	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	100	100	100	100	100	100	100
EL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	TOT	TOT	TOT	TOT	12	12	12	12	12	12	12
HR	98	98	98	98	100	100	100	100	100	100	100
HU	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IE	98	98	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IT	98	98	98	98	100	100	100	100	100	100	100
LT	98	98	98	98	100	100	100	100	100	100	100
LU	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
LV	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	0
MT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
NL	98	98	98	98	100	100	100	100	100	100	100
PL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	0
PT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
RO	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	0
SE	81	82	91	92	100	92	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	98	98	98	98	100	100	100	100	100	100	100
CH	NA	NA	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	100	100	100	100	100	100
UK	11	12	12	10	11	11	11	7	6	6	5

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table 1b Data completeness: availability of emigration flows by next country of residence

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	80	98	98	TOT	TOT	TOT	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
CZ	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DE	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	98	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	100	100	100	100	100	100	100
EL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	TOT	TOT	TOT	TOT	12	12	12	12	12	12	12
HR	TOT	TOT	98	98	100	100	100	100	100	100	100
HU	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IE	98	98	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IT	98	98	98	98	100	100	100	100	100	100	100
LT	98	98	98	98	100	100	100	100	100	100	100
LU	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
LV	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	0
MT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
NL	NA	NA	NA	98	100	100	100	100	100	100	100
PL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	0
PT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
RO	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	0
SE	97	73	92	98	100	100	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	98	98	98	98	100	100	100	100	100	100	100
CH	NA	NA	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	100	100	100	100	100	100
UK	9	10	8	8	8	7	7	7	5	4	5

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table 2a Data completeness: overview of the availability of disaggregated immigration data based on previous country of residence

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	d	NA			NA						
BE	NA										
BG	NA	NA	NA								
CY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CZ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DK											
EE											
EL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ES	d	d	d	d	d	d	d	d	d	d	d
FI											
FR	NA	NA	NA	NA	ad	ad	ad	ad	ad	ad	ad
HR											
HU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
IE			NA	NA	NA	NA	NA	NA	NA	NA	NA
IT											
LT											
LU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	d
MT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NL											
PL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ad
PT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	d
SE	d	d	d	d		d					
SI											
SK											
CH	NA	NA									
IS											
LI											
NO											
UK	ad	ad	ad	ad	ad	ad	ad	ad	ad	ad	ad

Sources: Own calculations based on Eurostat data

Legend:

NA: Disaggregated data not available

a: No age-specific data

d: Missing flows for more than 5% of origin/destination EU countries independent of aggregation by age and sex

Table 2b Data completeness: overview of the availability of disaggregated emigration data based on next country of residence

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	d			NA	NA	NA					
BE	NA										
BG	NA	NA	NA								
CY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CZ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DK											
EE											
EL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ES	d	d	d	d	d	d	d	d	d	d	d
FI											
FR	NA	NA	NA	NA	abd	abd	abd	abd	abd	abd	abd
HR	NA	NA									
HU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
IE			NA	NA	NA	NA	NA	NA	NA	NA	NA
IT											
LT											
LU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	d
MT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NL	NA	NA	NA								
PL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ad
PT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	d
SE		d	d								
SI											
SK											
CH	NA	NA									
IS											
LI											
NO											
UK	ad	ad	ad	ad	ad	ad	ad	ad	ad	ad	ad

Sources: Own calculations based on Eurostat data

Legend:

NA: Disaggregated data not available

a: No age-specific data

b: No sex-specific data

d: Missing flows for more than 5% of origin/destination EU countries independent of aggregation by age and sex

4.2 Assessment of data comparability

4.2.1 Duration

Table 3 shows information on the time criterion used for the migration data, as transmitted to Eurostat. It is clear that, already in 2009, the 12-month criterion was adopted by most countries. The exceptions are Belgium, which switched to the 12-month criterion in 2010; Croatia, switching in 2011; and Slovakia, indicating a shift in 2012. Estonia and Switzerland appear to be following the 12-month definition with some exceptions (see notes in table 3). In 2019 all countries had switched to the 12-month criterion. Many countries had been using the 12-month definition for a long period of time, but a substantial number of countries—including Austria, Czechia, Germany, Denmark, Hungary, Spain, Netherlands, Poland, Romania, Slovenia, Liechtenstein, and Norway—only adopted the 12-month criterion between 2007 and 2009, i.e., just after they were requested to do so by the EU regulation. France and Malta switched just before the new regulation in respectively 2006 and 2005.

While countries report to Eurostat according to the 12-month definition, many countries use other definition internally. It is relevant to know which countries use different definitions for national statistical purposes, as this means the data undergoes a conversion procedure before being submitted to Eurostat. Here we observe heterogeneity between countries, but also a lack of clarity. Some countries, including Austria, Denmark, and Norway, clearly use a different time definition for their own statistical purposes. For many countries including Belgium, Czechia, Germany, Italy, Netherlands, Slovakia, and Iceland this is unclear: from the information of the Eurostat Methodological report, these countries have “No” time definition. Finally, there is some variety in the exact interpretation of the 12-month definition. Most countries apply this definition in a mix of *intended* duration of stay and the *actual* duration of stay. Austria, Belgium, Denmark, Netherlands, Romania, Switzerland, and Norway only use the actual 12-month definition, whereas Finland, Sweden, Italy, Hungary, and the UK only use the intended 12-month definition. In sum, there has been overall great improvement in data comparability as most countries follow the 12-month time-criterion—many switching to new criterion already before 2009; however, more detail could still be added to the metadata in order to obtain a complete picture of how countries apply the duration criterion.

Table 3 Data comparability – *duration*: criterion used by countries (in months) to define migrants

	2009	2019	Actual/intended	Year change	National time criterium population ^a
AT	12	12	Actual	2007	3
BE	3 ^b	12	Actual	2010	unclear
BG	12	12	Actual and intended	2007	12
CY	12	12	Actual and intended	<1998	12
CZ	12	12	Actual and intended	2008	unclear
DE	12	12	Actual and intended	2009	unclear
DK	12	12	Actual	2008	3
EE	12 ^c	12	Actual and intended	unclear	12
EL	12	12	Actual and intended	unclear	12
ES	12	12	Actual and intended	2008	12
FI	12	12	Intended ^d	<1998	12
FR	12	12	Actual and intended	2006	12
HR	P ^d	12	Actual and intended	2011 ^d	12
HU	12	12	Intended	2008	12
IE	12	12	Actual and intended	<1998	12
IT	12	12	Intended	<1998	unclear
LT	12	12	Actual and intended	<1998	12
LU	12	12	Actual and intended	<1998	12
LV	12	12	Actual and intended	<1998	12
MT	12	12	Actual and intended	2005	12
NL	12	12	Actual	2009	unclear
PL	12	12	Actual and intended	2009	12
PT	12	12	Actual and intended	<1998	12
RO	12	12	Actual	2008	12
SE	12	12	Intended ^e	<1998	12
SI	12	12	Actual and intended	2008	12
SK	P	12 ^f	Actual and intended	2012	unclear
CH	12 ^g	12	Actual	2011	12
IS	12	12	Actual and intended	2009	unclear
LI	12	12	Actual and intended	2008	12
NO	12	12	Actual	2008	6 ^h
UK	12	12	Intended	<1998	12

Sources: Eurostat (2021a), Eurostat (2021b), Eurostat methodological report (2015)

Notes: ^a National time criterium is only based on Eurostat report, which in many cases indicates "No" definition. We indicate this as "unclear".

^b Definition is instant for emigration

^c In the case of the citizens of the Republic of Estonia and those of the EU, there is no way of knowing how long they plan to reside in the country, but if they are residents of Estonia as at the end of the year, they are considered as part of the population of Estonia, regardless of how long they have stayed in the country

^d 6 months with Nordic countries

^e According to Eurostat change to 12 months in 2008, but this info seems to suggest permanent residence definition (indicated by P) before 2011: <https://www.dzs.hr/Eng/DBHomepages/Population/Migrations/methodology.htm>

^f Unclear whether Slovakia reports according to 12-month definition in 2019 or permanent residence definition (indicated with P) as section 11.1 and 3.4.1 from the Slovakia demo_pop_esms metadata indicate considering permanent residents (rather than usual residents)

^g Switzerland had a 12-month definition except for immigrating nationals (instant definition) until 2011, after 2011 also immigrating nationals are according to 12 months definition.

^h Nordic countries less than or equal to 3 months

4.2.2 Undercount

Table 4a shows *registration* requirements and sanction for the different countries. Most countries require both third-country nationals and EU/EFTA citizens to register in a population register if they intend to stay for a certain period of time in that country (mostly more than 3 months). That is, there is an official obligation for immigrants to register. The countries that do not appear to have such requirements are France, Ireland, Portugal, and the UK (for Iceland there is no information). Not only do migrants have the obligation to register, but they are often obliged to register within a certain period of time. For some countries, including Austria, Bulgaria, Cyprus, Finland, Croatia, Netherlands, Poland, Romania, Sweden, and Slovenia, this is within a week or less after arriving in the country. For Norway, Slovakia, and Luxembourg it is 8 days, while for the other countries that have a registration obligation it ranges between 2 weeks and 3 months. Spain and Italy are exceptions since they do not appear to have an explicit limit. Given these requirements, it raises the question of the potential sanctions for individuals failing to register on time. Information on this is not readily available for most countries, but for countries for which we could find the information it appears to be between 120 to 350 EUR, with the exception of Cyprus and Portugal for which the fines can be higher.

Table 4b displays information on *deregistration* requirements and monitoring of third-country national absence. What is noticeable compared with table 4a is that fewer countries have a deregistration requirement. Bulgaria, Cyprus, Greece, Malta, and Romania appear to have no deregistration requirement, whereas in table 4a they did show a registration requirement. For some countries the information appears to be somewhat conflicting, which may be the result of some groups having to deregister, whereas others not. Belgium, Czechia, and Portugal appear generally not to have a deregistration requirement, but third-country nationals appear to have to deregister. On the other hand, for Germany, Spain, Croatia, Hungary, Italy, Poland, Sweden, and Slovakia there appears to be no requirement for third-country nationals to deregister. Finally, there are some countries that monitor the absence of third-country nationals. These countries are Belgium, Bulgaria, Cyprus, Finland, Lithuania, Luxembourg, Latvia, Romania, Slovenia, and Slovakia. Some countries do not monitor the absence but do remove third-country nationals from population registers, either systematically or on an ad-hoc basis. These countries are Germany, Czechia, Estonia, Spain, and Italy. Other countries either do not monitor the absence of third-country nationals or it is unknown whether they do.

Table 4a Data comparability – *undercount*: countries' rules and sanctions for registration

	Registration obligation	Time limit registration	Sanction cost
AT	Yes	3 days	200 EUR
BE	Yes	90 days	
BG	Yes	At arrival	
CY	Yes	7 days ^a	2560 EUR ^a
CZ	Yes	90 days ^b	~120 EUR
DE	Yes	3 months	
DK	Yes	5 days	
EE	Yes	1 month	No sanction cost
EL	Yes	90 days	
ES	Yes	no limits	
FI	Yes	7 days	
FR	No		
HR	Yes	2 days	
HU	Yes	90 days	
IE	No		
IT	Yes	no limits	
LT	Yes	7 days	
LU	Yes	8 days	
LV	Yes	90 days	
MT	Yes	1 month ^c	232.94 EUR ^c
NL	Yes	5 days	325 EUR ^d
PL	Yes	4 days ^e	
PT	No		400-1500 EUR
RO	Yes	2 days	
SE	Yes	7 days ^f	
SI	Yes	5 days	165-300 EUR
SK	Yes	8 days	
CH	Yes	14 days	
IS	N/A	N/A	
LI	Yes	not specified	
NO	Yes	8 days	
UK ^g	No		

Sources: Eurostat (2015), Your Europe (2021), government websites (see footnotes)

Notes: Registration obligation and time limit based on info 2013, unless indicated otherwise. "N/A" indicates no information is available.

^a Information from Cyprus government website, time limit for third country nationals and sanction info: <http://www.moi.gov.cy/moi/crmd/crmd.nsf/All/69E690A161D174D6C2257D2C0045750B?OpenDocument>

^b Changed to 30 days later, as indicated by information from residence formalities (Your Europe 2021)

^c Information from Malta government website on time limit and sanction: <https://www.gov.mt/en/Life%20Events/Pages/Residence%20Formalities/default.aspx>

^d Incorrect registration in population register can be fined up to 325 EUR, source: <https://wetten.overheid.nl/BWBR0033715/2019-02-03>

^e Information from Poland government website, time limit 4 days for third-country nationals, 30 for EU/EFTA citizens: <http://welcome.uw.edu.pl/during-your-stay/registration-of-address/>

^f Information from Sweden government website, time limit: <https://www.norden.org/en/info-norden/registration-swedish-population-register>

^g Information on situation before Brexit

Table 4b Data comparability – *undercount*: countries' rules and sanctions for deregistration

	Deregistration obligation	Time limit deregistration	Deregister obligation third-country nationals	Monitoring third-country
AT	Yes	3 days before departure	Yes	No
BE	No		Yes	Yes
BG	No		No	Yes
CY	No		No	Yes
CZ	No		Yes	No ^a
DE	Yes	Not specified	No	No ^b
DK	Yes	Not specified	N/A	N/A
EE	Yes	Not specified	Yes	No ^c
EL	No		No	No
ES	Yes	Not specified	No	No ^d
FI	Yes	Not specified	Yes	Yes
FR	No		No	No
HR	Yes	3 days	No	No
HU	Yes	Not specified	No	No
IE	No		N/A	N/A
IT	Yes	Not specified	No	No ^e
LT	Yes	Not specified	Yes	Yes
LU	Yes	Not specified	Yes	Yes
LV	Yes	Not specified	Yes	Yes
MT	No		No	No
NL	Yes	Not specified	Yes	No
PL	Yes	Not specified	No	No
PT	No		Yes	No
RO	No		No	Yes
SE	Yes	Not specified	No	No
SI	Yes	Not specified	Yes	Yes
SK	Yes	Not specified	No	Yes
CH	Yes	Not specified	N/A	N/A
IS	N/A		N/A	N/A
LI	Yes	Not specified	N/A	N/A
NO	Yes	Not specified	N/A	N/A
UK ^f	No		N/A	N/A

Sources: Eurostat (2015), European Commission (2019)

Notes: N/A indicates no information is available

^a Can be cancelled if purpose of residency does not match what is on residence permit

^b A matching of data between the immigration authority and the registration office is conducted annually

^c Only ad-hoc basis checks

^d Spain removes third-country nationals who fail to renew their registration after two years (see Bermudez and Brey 2017)

^e Changed when immigration authority informs register of departure migrant

^f Information on situation before Brexit

4.2.3 Coverage

Table 5 shows the coverage of certain immigrant and emigrant groups. The only systematic information that we could find in the sources was on whether migration statistics included refugees and asylum seekers (usually residing in the country for at least 12 months). All countries include refugees in their migration statistics except for Ireland and Norway, which only include them if they have a residence permit. With respect to the inclusion of asylum seekers there is more variation. Apart from Norway and Ireland, also Bulgaria, Czechia, Denmark, Finland, Hungary, Lithuania, Latvia, Malta, Poland, Sweden, Slovenia, Slovakia, Iceland, and Liechtenstein do not include asylum seekers in their migration statistics. For some countries there is also an indication of undercoverage for other groups of migrants or emigrants (as indicated in table 5). Czechia has a lower coverage of EU/EFTA immigrants and emigrants. Croatia and Hungary appear to cover the immigration and emigration of nationals less well. Finally, Romania has undercoverage on national and EU/EFTA emigration. However, information on specific undercoverage appears to not always be reported by NSOs, thus one cannot conclude that there is no undercoverage for the other countries.

4.2.4 Accuracy

Table 6 indicates the sources for the migration data from the different EU and EFTA countries. Most countries use register data to capture migration flows. Cyprus, Ireland, Portugal, and the UK use surveys, while France and Greece use some other sources for estimation. In addition, a number of countries use register data, but additionally use modelling to account for error or biases. We define this type as “hybrid” in the tables. Countries that have this hybrid source include Lithuania, Malta, Poland, Romania, and Bulgaria. Finally, Slovakia collects migration data using an exhaustive survey and therefore can be considered as having an accuracy close to a typical register.

Table 5 Data comparability – coverage: groups included in migration data by country

	Asylum seekers included	Refugees included	Nationals emigration	Nationals immigration	EU/EFTA immigration	EU/EFTA emigration	Third country nationals immigration	Third country nationals emigration
AT	Yes	Yes						
BE	Yes	Yes						
BG ^a	No	Yes						
CY	Yes	Yes						
CZ	No	Yes			Under	Under		
DE	Yes	Yes					Under	
DK	No	Yes						
EE	Yes	Yes						
EL	Yes	Yes						
ES	Yes	Yes						
FI	No	Yes						
FR	Yes	Yes						
HR	No	Yes	Under	Under				
HU	No	Yes	Under	Under				
IE	No	No						
IT	Yes	Yes						
LT	No	Yes						
LU	Yes	Yes						
LV	No	Yes						
MT	No	Yes						
NL	Yes	Yes						
PL	No	Yes						
PT	Yes	Yes						
RO	No	Yes	Under		Under			
SE	No	Yes						
SI	No	Yes						
SK	No	Yes						
CH	Yes	Yes						
IS	No	Yes						
LI	No	Yes						
NO	No	No						
UK	Yes	Yes						

Sources: Eurostat (2021a) Eurostat(2021b)

Notes: "Under" refers to a known under coverage of that particular group of immi- or emigrants. There is no information on undercoverage of third-country national emigrants, hence column is empty.

^a Emigration in general underestimated for Bulgaria, so we treat this as an issue of undercount when it comes to emigration

Table 6 Data comparability – *accuracy*: data collection systems by country

	Data Source
AT	Register
BE	Register
BG	Register - Hybrid
CY	Survey
CZ	Register
DE	Register ^a
DK	Register
EE	Register
EL	Other
ES	Register ^a
FI	Register
FR	Other
HR	Survey
HU	Register
IE	Survey
IT	Register
LT	Register - Hybrid
LU	Register
LV	Register
MT	Register - Hybrid
NL	Register
PL	Register - Hybrid
PT	Survey
RO	Register - Hybrid
SE	Register
SI	Register
SK	Register/Survey ^b
CH	Register
IS	Register
LI	Register
NO	Register
UK	Survey

Sources: Eurostat (2021a), Eurostat (2021b)

Notes:

^a Germany and Spain both have some unique accuracy issues, that are also dealt with to some extent, hence they are still classified as “register”. For more information, see the country specific demo_pop_esms (Eurostat 2021b) files in section 13.1 accuracy.

^b An “exhaustive survey”, carried out monthly, can be considered comparable to register.

5 Summary and discussion

This report assessed the quality of Eurostat's data on migration flows, focusing on EU/EFTA countries and the period 2009-2019. The quality assessment uses the framework put forward in the IMEM project: it evaluates both data completeness—i.e., the level of disaggregation and missingness; and data comparability—using the concepts of duration, undercount, coverage, and accuracy. These different dimensions of data quality were evaluated based on Eurostat metadata and ad hoc documents from national statistical offices. The results are presented in a series of tables showing the quality of migration data by country and the evolution over time (additional information is also available upon request). These tables will serve as a reference in the preparation of data for modelling within the QuantMig project and, more broadly, they will enable researchers to make better use of EU migration data.

Our assessment reveals an overall improvement in the quality of migration data in EU/EFTA countries in the last decade. In particular, the *comparability* of migration data improved substantially since 2010 in respect to the situation in the 2000s (as assessed in the IMEM project). In line with the new regulations implemented by Eurostat in 2007, most countries now use a common definition of migrants based on a duration of stay of more than 12 months. Coverage has also improved as countries include more groups of migrants in their statistics. In addition, more countries now collect migration data based on population registers, which should increase the accuracy of the data. However, when it comes to data *completeness* there have been improvements for some countries, but a decline in data completeness for others. Since around 2007-2008 there are fewer countries for which disaggregated data by country of origin is available. It is around the same time that Eurostat implemented new regulations and requirements concerning migration data. This suggests that while the EU regulations have improved overall data quality in terms of comparability, it may have (partly) led to lower data completeness as a number of countries have not provided disaggregated data ever since. On the other hand, total migration flows appear to be fully available for all countries, whereas in the past this was not always the case.

The main limitation of this quality assessment concerns the sources of information available to evaluate European migration data. While Eurostat makes a clear effort in presenting the metadata, much relevant information remains either unclear or missing. Furthermore, most documentation is based on the most recent situation of the data, whereas past information is unfortunately not available. Information in the Eurostat metadata is often *unclear*, mainly because of the lack of transparency of statistical methods used by national statistical offices to produce their migration data. In addition, some metadata is simply *missing*. This is the case, for instance, of the issue of undercount of migrants: Eurostat documents do not contain any information on the rules for (de)registration in the different countries, which is an important indication of whether immi- and emigration are likely to be unregistered in a country. In these cases of missing information, the only solution is to look for complementary information scattered in national statistics offices, which are not consistently available. Apart from data comparability, a more thorough investigation on data completeness is also a welcome addition. This report has used preliminary cleaning procedures to identify additional missing values, but a more thorough investigation could not only identify more unlikely missing or zero values in the data, but perhaps also unlikely non-zero, non-missing values. In this sense, this report should be regarded as starting point of an ongoing effort to reveal more data quality issues surrounding Eurostat data.

In conclusion, Eurostat's efforts to harmonize migration data in Europe in the past decades have clearly been fruitful: cross-national migration datasets have particularly improved in comparability. Data completeness could be improved if some countries that have been able to provide

disaggregated information before 2007 can start providing that information again to Eurostat. Efforts to harmonise the data further should obviously continue; but parallel to them, more attention should be given to the quality of metadata and to the transparency about how NSOs use their definitions, collect migration data, and how specific country regulations/laws (or lack thereof) affect the quality of migration data. A better knowledge on the way the data is produced in each country would be of much help to researchers, allowing them to better understand the limitations of the data and adjust their models accordingly. In this context, rather than seeking perfection in data quality (which is unlikely to be achieved), striving for *transparency* should perhaps become a priority in European migration statistics.

As mentioned above, this report should be regarded as an ongoing effort to better understand the quality of Eurostat migration data. We attempted to make it as complete as possible based on the sources that were available to us. The reader may contact the corresponding authors in case additional information is available. This will greatly help the ongoing efforts towards achieving an exhaustive picture of migration flows data in Europe.

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Appendix

Table A1 Data completeness: availability of immigration flows by previous country of residence disaggregated by age and sex

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	80	TOT	98	98	TOT	100	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
CZ	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DE	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	98	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	100	100	100	100	100	100	100
EL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
HR	98	98	98	98	100	100	100	100	100	100	100
HU	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IE	98	98	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IT	98	98	98	98	100	100	100	100	100	100	100
LT	98	98	98	98	100	100	100	100	100	100	100
LU	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
LV	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	0
MT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
NL	98	98	98	98	100	100	100	100	100	100	100
PL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
PT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
RO	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	0
SE	81	82	91	92	100	92	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	98	98	98	98	100	100	100	100	100	100	100
CH	NA	NA	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	100	100	100	100	100	100
UK	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ME	TOT	98	98	98	100	100	TOT	100	100	100	100
MK	100	100	100	100	100	100	100	100	100	100	100

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table A2 Data completeness: availability of immigration flows by previous country of residence disaggregated by age and sex

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	80	98	98	TOT	TOT	TOT	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
CZ	TOT	TOT	TOT	TOT	NA	NA	TOT	TOT	NA	TOT	NA
DE	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	98	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	100	100	100	100	100	100	100
EL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	NA	NA	NA	NA	NA	TOT	NA	NA	NA	NA	NA
HR	TOT	TOT	98	98	100	100	100	100	100	100	100
HU	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IE	98	98	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IT	98	98	98	98	100	100	100	100	100	100	100
LT	98	98	98	98	100	100	100	100	100	100	100
LU	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
LV	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	0
MT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
NL	TOT	TOT	TOT	98	100	100	100	100	100	100	100
PL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
PT	NA	NA	NA	NA	NA	NA	NA	NA	NA	TOT	NA
RO	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	0
SE	97	73	92	98	100	100	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	98	98	98	98	100	100	100	100	100	100	100
CH	NA	NA	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	100	100	100	100	100	100
UK	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ME	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
MK	100	100	100	100	100	100	100	100	100	100	100

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table A3 Data completeness: availability of immigration flows by citizenship

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	75	TOT	98	98	TOT	100	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
CZ	97	62	62	98	100	100	100	100	100	100	100
DE	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	97	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	100	100	100	100	100	100	100
EL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	TOT	TOT	TOT	TOT	12	12	12	12	12	12	12
HR	98	98	98	98	100	100	100	100	100	100	100
HU	65	98	98	98	100	100	100	100	100	100	100
IE	98	98	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IT	97	98	98	98	100	100	100	100	100	100	100
LT	96	96	96	98	100	100	100	100	100	100	100
LU	97	98	98	98	100	100	100	100	100	100	100
LV	TOT	TOT	TOT	TOT	TOT	100	TOT	TOT	100	100	100
MT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
NL	97	97	98	98	100	100	100	100	100	100	100
PL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
PT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
RO	98	98	98	98	100	100	100	100	100	100	TOT
SE	76	78	91	98	100	92	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	98	98	98	98	100	100	100	100	100	100	100
CH	98	98	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	99	100	100	100	100	100
UK	11	11	10	8	9	9	10	6	6	6	4
ME	TOT	98	98	98	100	100	100	100	100	100	100
MK	18	25	98	98	100	100	100	100	100	100	100

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table A4 Data completeness: availability of immigration flows by citizenship disaggregated by age and sex

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	75	TOT	98	98	TOT	100	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
CZ	97	62	62	98	100	100	100	100	100	100	100
DE	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	97	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	100	100	100	100	100	100	100
EL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	TOT	TOT	TOT	TOT	TOT	TOT	0	TOT	TOT	TOT	TOT
HR	98	98	98	98	100	100	100	100	100	100	100
HU	65	98	98	98	100	100	100	100	100	100	100
IE	98	98	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IT	97	98	98	98	100	100	100	100	100	100	100
LT	96	96	96	98	100	100	100	100	100	100	100
LU	97	98	98	98	100	100	100	100	100	100	100
LV	TOT	TOT	TOT	TOT	TOT	100	TOT	TOT	100	100	100
MT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
NL	97	97	98	98	100	100	100	100	100	100	100
PL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
PT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
RO	98	98	98	98	100	100	100	100	100	100	TOT
SE	76	78	91	98	100	92	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	98	98	98	98	100	100	100	100	100	100	100
CH	98	98	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	99	100	100	100	100	100
UK	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ME	TOT	98	98	98	100	100	100	100	100	100	100
MK	18	25	98	98	100	100	100	100	100	100	100

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table A5 Data completeness: availability of emigration flows by citizenship

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	73	0	98	98	TOT	100	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
CZ	TOT	TOT	TOT	TOT	TOT	100	100	100	100	100	100
DE	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	97	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	100	100	100	100	100	100	100
EL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
HR	98	98	98	98	100	100	100	100	100	100	100
HU	65	98	98	98	100	100	100	100	100	100	100
IE	98	98	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IT	97	98	98	98	100	100	100	100	100	100	100
LT	96	96	96	96	100	100	100	100	100	100	100
LU	97	98	98	98	100	100	100	100	100	100	100
LV	TOT	TOT	TOT	TOT	TOT	100	TOT	TOT	100	100	100
MT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
NL	97	97	98	98	100	100	100	100	100	100	100
PL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
PT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
RO	98	98	98	98	100	100	100	100	100	100	0
SE	65	67	91	98	100	100	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	98	98	98	98	100	100	100	100	100	100	100
CH	98	98	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	100	100	100	100	100	100
UK	6	7	5	5	6	4	3	4	4	2	2
ME	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
MK	98	98	98	98	100	100	100	100	100	100	100

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table A6 Data completeness: availability of emigration flows by citizenship disaggregated by age and sex

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	73	0	98	98	TOT	100	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	TOT	TOT	TOT	98	100	100	100	100	100	100	100
CY	NA	TOT	TOT	TOT	NA	NA	TOT	TOT	NA	NA	NA
CZ	NA	NA	NA	NA	TOT	100	100	100	100	100	100
DE	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	97	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	100	100	100	100	100	100	100
EL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	NA	NA	NA	NA	NA	NA	TOT	NA	NA	NA	NA
HR	98	98	98	98	100	100	100	100	100	100	100
HU	65	98	98	98	100	100	100	100	100	100	100
IE	98	98	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IT	97	98	98	98	100	100	100	100	100	100	100
LT	96	96	96	96	100	100	100	100	100	100	100
LU	97	98	98	98	100	100	100	100	100	100	100
LV	TOT	TOT	TOT	TOT	TOT	100	TOT	TOT	100	100	100
MT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
NL	97	97	98	98	100	100	100	100	100	100	100
PL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
PT	NA	TOT	NA	NA	NA	NA	NA	NA	NA	NA	NA
RO	98	98	98	98	100	100	100	100	100	100	0
SE	65	67	91	98	100	100	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	98	98	98	98	100	100	100	100	100	100	100
CH	98	98	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	100	100	100	100	100	100
UK	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ME	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
MK	98	98	98	98	100	100	100	100	100	100	100

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table A7 Data completeness: availability of immigration flows by country of birth

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	77	TOT	98	98	TOT	100	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
CZ	98	98	66	98	100	100	100	100	100	100	100
DE	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	98	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	100	100	100	100	100	100	100
EL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	TOT	TOT	TOT	TOT	12	12	12	12	12	12	12
HR	98	98	98	98	100	100	100	100	100	100	100
HU	98	98	98	98	100	100	100	100	100	100	100
IE	98	98	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IT	98	98	98	98	100	100	100	100	100	100	100
LT	98	98	98	98	100	100	100	100	100	100	100
LU	98	98	98	98	100	100	100	100	100	100	100
LV	TOT	TOT	TOT	TOT	TOT	100	TOT	TOT	100	100	100
MT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
NL	98	98	98	98	100	100	100	100	100	100	100
PL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
PT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
RO	98	98	98	98	100	100	100	100	100	100	TOT
SE	84	82	92	96	100	92	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	NA	NA	98	98	100	100	100	100	100	100	100
CH	NA	NA	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	100	100	100	100	100	100
UK	11	11	10	8	8	8	10	6	6	6	4
ME	TOT	98	98	98	100	100	100	100	100	100	100
MK	100	100	100	100	100	100	100	100	100	100	100

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table A8 Data completeness: availability of immigration flows by country of birth disaggregated by age and sex

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	77	TOT	98	98	TOT	100	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
CZ	98	98	66	98	100	100	100	100	100	100	100
DE	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	98	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	100	100	100	100	100	100	100
EL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	TOT	TOT	TOT	TOT	TOT	TOT	0	TOT	TOT	TOT	TOT
HR	98	98	98	98	100	100	100	100	100	100	100
HU	98	98	98	98	100	100	100	100	100	100	100
IE	98	98	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
IT	98	98	98	98	100	100	100	100	100	100	100
LT	98	98	98	98	100	100	100	100	100	100	100
LU	98	98	98	98	100	100	100	100	100	100	100
LV	TOT	TOT	TOT	TOT	TOT	100	TOT	TOT	100	100	100
MT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
NL	98	98	98	98	100	100	100	100	100	100	100
PL	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
PT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
RO	98	98	98	98	100	100	100	100	100	100	TOT
SE	84	82	92	96	100	92	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	NA	NA	98	98	100	100	100	100	100	100	100
CH	NA	NA	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	100	100	100	100	100	100
UK	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
ME	TOT	98	98	98	100	100	100	100	100	100	100
MK	100	100	100	100	100	100	100	100	100	100	100

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table A9 Data completeness: availability of emigration flows by country of birth

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	98	0	98	98	NA	100	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CZ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DE	NA	NA	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
DK	98	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	NA	NA	100	100	100	100	100
EL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HR	98	98	98	98	100	100	TOT	100	100	100	100
HU	98	98	98	98	100	100	100	100	100	100	100
IE	98	98	98	98	NA	NA	NA	NA	NA	NA	NA
IT	98	98	98	98	100	100	100	100	100	100	100
LT	98	98	98	98	100	100	100	100	100	100	100
LU	98	98	98	98	100	100	100	100	100	100	100
LV	NA	NA	TOT	TOT	TOT	100	TOT	TOT	100	100	100
MT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NL	98	98	98	98	TOT	100	100	100	100	100	100
PL	NA	NA	NA	NA	NA	NA	TOT	TOT	TOT	TOT	TOT
PT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RO	NA	NA	NA	NA	NA	NA	100	100	100	100	0
SE	75	79	92	98	100	100	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	NA	NA	98	98	NA	NA	NA	100	100	100	100
CH	NA	NA	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	100	100	100	100	100	100
UK	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ME	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MK	NA	100	100	100	100	100	100	100	100	100	NA

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table A10 Data completeness: availability of emigration flows by country of birth disaggregated by age and sex

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	98	0	98	98	NA	100	100	100	100	100	100
BE	NA	98	98	98	100	100	100	100	100	100	100
BG	NA	NA	NA	98	100	100	100	100	100	100	100
CY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CZ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DK	98	98	98	98	100	100	100	100	100	100	100
EE	98	98	98	98	NA	NA	100	100	100	100	100
EL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ES	41	41	41	41	42	42	24	24	24	24	24
FI	98	98	98	98	100	100	100	100	100	100	100
FR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HR	98	98	98	98	100	100	TOT	100	100	100	100
HU	98	98	98	98	100	100	100	100	100	100	100
IE	98	98	98	98	NA	NA	NA	NA	NA	NA	NA
IT	98	98	98	98	100	100	100	100	100	100	100
LT	98	98	98	98	100	100	100	100	100	100	100
LU	98	98	98	98	100	100	100	100	100	100	100
LV	NA	NA	TOT	TOT	TOT	100	TOT	0	100	100	100
MT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NL	98	98	98	98	NA	100	100	100	100	100	100
PL	NA	NA	NA	NA	NA	NA	TOT	TOT	TOT	TOT	TOT
PT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RO	NA	NA	NA	NA	NA	NA	100	100	100	100	0
SE	75	79	92	98	100	100	100	100	100	100	100
SI	98	98	98	98	100	100	100	100	100	100	100
SK	NA	NA	98	98	NA	NA	NA	100	100	100	100
CH	NA	NA	98	98	100	100	100	100	100	100	100
IS	98	98	98	98	100	100	100	100	100	100	100
LI	98	98	98	98	100	100	100	100	100	100	100
NO	98	98	98	98	100	100	100	100	100	100	100
UK	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ME	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MK	NA	100	100	100	100	100	100	100	100	100	NA

Sources: Own calculations based on Eurostat data

Notes: Green: 97.5% or more complete, orange: between 2.5% and 97.5% complete, red: less than 2.5% complete, TOT: totals available, NA: Totals not available

Table A11 Data completeness: overview of the availability of immigration data based on citizenship

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	d	NA			NA						
BE	NA										
BG	NA	NA	NA								
CY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CZ		d	d								
DE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DK											
EE											
EL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ES	d	d	d	d	d	d	d	d	d	d	d
FI											
FR	NA	NA	NA	NA	ad	ad	d	ad	ad	ad	ad
HR											
HU	d										
IE			NA	NA	NA	NA	NA	NA	NA	NA	NA
IT											
LT											
LU											
LV	NA	NA	NA	NA	NA		NA	NA			
MT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NL											
PL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RO											NA
SE	d	d	d			d					
SI											
SK											
CH											
IS											
LI											
NO											
UK	ad	ad	ad	ad	ad	ad	ad	ad	ad	ad	ad
ME	NA										
MK	d	d									

Sources: Own calculations based on Eurostat data

Legend:

NA: Data not available

a: No age-specific data

b: No sex-specific data

c: No age-sex-aggregated data

d: Missing flows for more than 5% of origin/destination EU countries independently of aggregation by age and sex.

e: Missing flows for more than 5% of origin/destination EU countries in age-sex-specific data

f: Missing flows for more than 5% of origin/destination EU countries in age-sex-aggregated data

g: Missing flows for more than 5% of origin/destination EU countries in sex-aggregated age-specific data

h: Missing flows for more than 5% of origin/destination EU countries in age-aggregated sex-specific data

Table A12 Data completeness: overview of the availability of emigration data based on citizenship

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	d	d			NA						
BE	NA										
BG	NA	NA	NA								
CY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CZ	NA	NA	NA	NA	NA						
DE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DK											
EE											
EL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ES	d	d	d	d	d	d	d	d	d	d	d
FI											
FR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HR											
HU	d										
IE			NA	NA	NA	NA	NA	NA	NA	NA	NA
IT											
LT											
LU											
LV	NA	NA	NA	NA	NA		NA	NA			
MT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NL											
PL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RO											d
SE	d	d	d								
SI											
SK											
CH											
IS											
LI											
NO											
UK	ad	ad	ad	ad	ad	ad	ad	ad	ad	ad	ad
ME	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MK											

Sources: Own calculations based on Eurostat data

Legend:

NA: Data not available

a: No age-specific data

b: No sex-specific data

c: No age-sex-aggregated data

d: Missing flows for more than 5% of origin/destination EU countries independently of aggregation by age and sex.

e: Missing flows for more than 5% of origin/destination EU countries in age-sex-specific data

f: Missing flows for more than 5% of origin/destination EU countries in age-sex-aggregated data

g: Missing flows for more than 5% of origin/destination EU countries in sex-aggregated age-specific data

h: Missing flows for more than 5% of origin/destination EU countries in age-aggregated sex-specific data

Table A13 Data completeness: overview of the availability of immigration data based on country of birth

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	d	NA			NA						
BE	NA										
BG	NA	NA	NA								
CY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CZ			d								
DE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DK											
EE											
EL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ES	d	d	d	d	d	d	d	d	d	d	d
FI											
FR	NA	NA	NA	NA	ad	ad	d	ad	ad	ad	ad
HR											
HU											
IE			NA	NA	NA	NA	NA	NA	NA	NA	NA
IT											
LT											
LU											
LV	NA	NA	NA	NA	NA		NA	NA			
MT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NL											
PL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RO											NA
SE	d	d	d			d					
SI											
SK	NA	NA									
CH	NA	NA									
IS											
LI											
NO											
UK	ad	ad	ad	ad	ad	ad	ad	ad	ad	ad	ad
ME	NA										
MK											

Sources: Own calculations based on Eurostat data

Legend:

NA: Data not available

a: No age-specific data

b: No sex-specific data

c: No age-sex-aggregated data

d: Missing flows for more than 5% of origin/destination EU countries independently of aggregation by age and sex.

e: Missing flows for more than 5% of origin/destination EU countries in age-sex-specific data

f: Missing flows for more than 5% of origin/destination EU countries in age-sex-aggregated data

g: Missing flows for more than 5% of origin/destination EU countries in sex-aggregated age-specific data

h: Missing flows for more than 5% of origin/destination EU countries in age-aggregated sex-specific data

Table A14 Data completeness: overview of the availability of emigration data based on country of birth

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT		d			NA						
BE	NA										
BG	NA	NA	NA								
CY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CZ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DK											
EE					NA	NA					
EL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ES	d	d	d	d	d	d	d	d	d	d	d
FI											
FR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HR							NA				
HU											
IE					NA	NA	NA	NA	NA	NA	NA
IT											
LT											
LU											
LV	NA	NA	NA	NA	NA		NA	cd			
MT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NL					NA						
PL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RO	NA	NA	NA	NA	NA	NA					d
SE	d	d	d								
SI											
SK	NA	NA			NA	NA	NA				
CH	NA	NA									
IS											
LI											
NO											
UK	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ME	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MK	NA										NA

Sources: Own calculations based on Eurostat data

Legend:

NA: Data not available

a: No age-specific data

b: No sex-specific data

c: No age-sex-aggregated data

d: Missing flows for more than 5% of origin/destination EU countries independently of aggregation by age and sex.

e: Missing flows for more than 5% of origin/destination EU countries in age-sex-specific data

f: Missing flows for more than 5% of origin/destination EU countries in age-sex-aggregated data

g: Missing flows for more than 5% of origin/destination EU countries in sex-aggregated age-specific data

h: Missing flows for more than 5% of origin/destination EU countries in age-aggregated sex-specific data