Immigration and the Prevention of Long-Run Population Decrease in Europe

Abstract

Between 2009 and 2018 the Total Fertility Rate fell in most European countries. In 2018 it was below replacement level throughout Europe. In the same year, net migration was positive in two-thirds of European countries. This paper examines whether sustained net immigration at current levels would be sufficient to prevent long-run population decrease. The results show that in several countries, most of which are located in northern or north-western Europe, net migration level has been consistently above 'replacement level': sustained constant net migration amount, and fertility and mortality rates would build a larger than current population. In contrast, for Italy and for all the Eastern European countries covered net migration has consistently been below replacement level. Finland, Norway and Switzerland are shown to have recently developed population decrease-promoting fertility-mortality-net migration combinations. However, the importance of net migration reduction and other changes, including fertility reduction, to the reversal of the long-run growth prospect differs from country-to-country. In contrast, the implication of constant fertility, mortality and net migration for Germany is shown to have changed from long-run population decrease to long-run zero growth. The feasibility of preventing long-run population decrease through change to net migration is discussed.

Introduction

In 2018 in every country in Europe the Total Fertility Rate (TFR) was below the (approximately 2.1) replacement level which in the absence of sustained immigration would prevent a long run population decline (Espenshade et al. 2004; Rindfuss 2016; Sobotka 2017; Gietel-Basten and Scherbov 2020; Matysiak et al. 2021). For most of these countries fertility has been below replacement for several decades. The prospect of population decrease is a concern for many European countries. In 2019 43 per cent of the European countries who responded to a United Nations Inquiry cited "countering long-run population decline" as a major underlying reason for their current immigration policy (UNDP 2019b). However, in roughly two-thirds of European countries net migration is positive (De Haas et al. 2019; UN 2019a). Moreover, in majority of European countries population growth remains positive (Eurostat 2021; UN 2019a). Is such growth matter of 'population momentum', that is a temporary artefact of the population age structure which has been built by the national history of birth rates, death rates, immigration and emigration? For each country, would sustained fertility at the current level eventually create a smaller than current population? Or, if sustained over time, would recent levels of net immigration propel long-run population increase? For each country, what is the critical level of 'replacement migration' which would prevent long-run population decrease, if fertility rates and mortality rates were to remain constant? And in the light of recent trends is the use of does the use of international migration to prevent population decrease appear feasible? This paper aims to use the answers to these questions to provide new perspective on recent population growth and net migration trends for European countries.

Fertility, Mortality, Migration and Population Growth Trends in Europe 2009-2018

The TFR is generally higher in Northern and Western Europe and lower in Southern and Eastern Europe (Rindfuss et al. 2016). Over 2009-18, the TFR decreased in roughly two-thirds of European countries and increased in the remaining one-third (Eurostat 2021; Table 1 for data for the countries on which this paper focuses). Fertility change was uneven both between regions and within regions. The largest reductions in TFR were in Northern European countries, more so in Iceland, Finland and Norway. The TFR also fell in North-Western Europe, especially in Ireland, United Kingdom (UK), Belgium and Netherlands. Trends for Southern European countries were mixed: the TFR for Italy fell to a very low level, whilst for Spain and Portugal it changed little. In contrast, over this period the TFR increased in most Eastern European countries, with the largest increases being for Hungary, Czechia, Slovakia, Latvia and Lithuania. Within Central Europe, the TFR also increased substantially in Germany and less so in Austria. However, there was little change in the TFR for Switzerland (Eurostat 2021).

Between 2009 and 2018 life expectancy at birth increased for all the countries of Europe, with the greatest increases generally being for Eastern European countries and the smallest increases being for Germany and the UK (Parr et al. 2016, Eurostat 2021; Table 1). Despite the greater increase, life expectancies at birth for the Eastern European countries remained below the European average.

In 2009 natural increase was positive in 62% of European countries (Eurostat 2021). The countries where it was negative were mostly in Eastern Europe, and also included Austria, Germany, Italy and Portugal. Between 2009 and 2018 the percentage in which natural increase was positive fell to 55%, with. Spain, Greece, Finland, Poland and Slovenia joining the list of countries with negative natural increase, and Austria leaving it.

Between 2009 and 2018 net migration to Europe as a whole was positive, with rates of net inflow to Northern and Western Europe countries tending to be higher than those to Southern European countries (Eurostat 2021; United Nations 2019). There was substantial migration out of Eastern European countries into Northern and Western European Countries, following the 2004 and 2007expansions of the European Union (EU) (Kahanec and Zimmermann 2016). In terms of absolute numbers, the two largest East European sources of emigration were Poland and Romania (Eurostat 2021). The outflow from Poland rose between 2009 and 2013, and then diminished somewhat between 2013 and 2018, whilst the outflow from Romania fell from 2009 to 2013 and then rose between 2013 and 2018 (Eurostat 2021). Emigration from the Baltic states reduced, whilst emigration from Bulgaria and Croatia increased. Emigration from Spain, Greece, Portugal and Ireland increased from 2009 to 2013, and decreased between 2013 and 2018.

Over 2009-18, Germany and the United Kingdom (UK) generally received the largest numbers of immigrants (Eurostat 2021). In 2015 the number of immigrants to Germany was unusually large, mainly due an upsurge in the number asylum seekers, most notably from Syria and, to a lesser extent, from Iraq and Afghanistan. Austria, Belgium and Denmark also experienced unusually large asylum seeker inflows in 2015, as did Sweden and Finland in 2016 (Pew Research Centre 2016; Hagelund 2020). Immigration to Spain fell steeply during a period of very high unemployment between 2009 and 2013 and thereafter recovered substantially, so much so that in 2018 it replaced the UK as Europe's 2nd largest destination for immigrants. Immigration to Greece, Portugal and Ireland also recovered from post-'Great Recession' lows. In contrast, immigration to Italy, Norway and Switzerland fell.

Over 2009-2018 net migration rate per 1000 population were generally highest for Luxembourg, the Central European countries (Switzerland, Austria and Germany) and the Nordic countries (Norway and Sweden). Belgium, Denmark, Netherlands France and UK experienced more moderate rates of net inflow, as did Italy. Most Eastern European countries generally experienced a net outflow, with the notable exceptions of Czechia, Hungary, Russia and Belarus. For Spain and Ireland a net outflow in the earlier part of this period was followed by a net inflow in the latter part.

In 2009 population growth was positive in all the countries in Northern, Western, Central and Southern Europe, except Germany and Iceland (Eurostat 2021). In contrast, population growth was negative in a majority of Eastern European countries[1]. Between 2009 and 2018 the population growth rate decreased in roughly two-thirds of the countries of Europe. In 2018 the list of European countries experiencing population decrease included Greece, Italy and Portugal, as well as in a larger number of Eastern European countries[2]. However, in contrast to their previous population decrease, the populations of Germany and Estonia grew (Table 1).

Net Migration and Long-Run Zero Population Growth for Populations with Below Replacement Fertility

A population which experiences constant fertility below exact replacement level, constant mortality rates and constant net immigration amount with a fixed age composition will converge to a stationary state (zero growth and constant numbers by age) (Espenshade et al. 1982; Espenshade 1983; Pollard 1973). The stationary population size (denoted P_A) which corresponds to sustained constant (absolute) net immigration by age and sex, constant age-sex specific mortality rates, constant below-replacement fertility rates and a constant sex ratio at birth at the levels observed for a particular population and time period (A) can be expressed as the sum of components corresponding to generations of migrants (Espenshade et aal. 1982; Schmertmann 1992):

[1] The exceptions are; Russia, Poland, Czechia, Slovakia, Albania, Kosovo, Montenegro, North Macedonia, and Slovenia.

[2] Poland, Kosovo and Montenegro had negative population growth in 2018.

$P_A = \sum_{i=1}^{\infty} P_{i,A}$ (1)

Where P_A denotes the total size of the stationary population, i is the migrant generation index, and $P_{i,A}$ the size of the ith migrant generation.

The calculation of the various generation sizes, and hence stationary population size, in this paper uses discrete approximations to formulae in Schmertmann (1992) which are readily calculated from widely-available national and international statistical agency data. The 'first generation' element in Equation (1) ($P_{1,A}$) is calculated by:

$P_{1,A} = M_A \sum_{j=1}^{2} \sum_{x=0}^{\omega} m_{x,j,A} e_{x,j,A}$ (2)

Where M_A denotes the constant annual total net migration for A, $m_{x,j,A}$ denotes the proportion of total net migration contributed by persons of age x (last birthday) and sex j (j = 1 denotes female and j =2 male) for A, $e_{x,j,A}$ is the (remaining) life expectancy for age x and sex j for A, and ω denotes the maximum age for that population.

The 'second generation' element in Equation (1) **(**$P_{2,A}$) is calculated by:

$P_{2,A} = M_A \sum_{j=1}^{2} s_{j,A} e_{0,j,A} \ \sum_{x=0}^{k} m_{x,1,A} \sum_{t=0}^{k-x} f_{x+t,A} \ {}_{t}p_{x,1,A}$ (3)

Where $f_{x+t,A}$ represents the age-specific fertility rate (per woman) for age $x+t$, ${}_{t}p_{x,1,A}$ denotes the probability of a female surviving from x to $x+t$, k denotes the upper limit of the female reproductive age range, $s_{j,A}$ denotes the proportion of births of sex j, and $e_{0,j,A}$ denotes life expectancy at birth for sex j.

For all i ≥2

$P_{i+1,A} = NRR_A \, P_{i,A}$ (4)

where NRR_A denotes the conventional Net Reproduction Rate for A. The sum of the sizes of the generation-indexed components for generations with indices 2 and above is the sum of a geometric series with initial term $P_{2,A}$ and common ratio NRR_A. Hence, substituting from Equation (4), Equation (1) can be re-expressed as:

$P_A = P_{1,A} + \frac{P_{2,A}}{(1-NRR_A)}$ (5)

Since, M_A is a scalar value used in the calculation of all the generation-indexed components ($P_{i,A}$) of stationary population size P_A in Equation (1), the *Replacement Level for Net Migration* ($M_{R,A}$) which in combination with the specified values for $m_{x,j,A}$, $e_{x,j,A}$, $s_{j,A}$, $f_{x+t,A}$ and ${}_{t}p_{x,A}$ would generate a stationary population size (P_A) equal to the actual population size for A (POP_A) is:

$M_{R,A} = \frac{M_A POP_A}{P_A}$ (6)

In population projection with constant fertility and mortality at the levels for A and net migration at the 'replacement level' for A ($M_{R, A}$) the size of population may initially depart from its initial (current) value due to 'population momentum' (i.e. the difference between its initial and ultimate age structure). However, over the long run will return to its initial value (POP_A). Under hypothetical stability of fertility, mortality and net migration all at the levels for A, the population size will converge to a stationary population size (P_A) which exceeds its initial value (POP_A) if and only if the total net migration (M_A) exceeds the *Replacement Level for Net Migration* ($M_{R, A}$) and will converge to a value of (P_A) below its initial size if and only if net migration below the *Replacement Level for Net Migration* ($M_{R, A}$).

The formulation of 'replacement migration' used here differs from that used in a controversial report published by the United Nations (UNDP 2000). UNDP (2000) found for Europe, European Union (EU), France, Germany, Italy, Japan, Republic of Korea, Russian Federation, and United Kingdom (UK) (but not for the USA), the level of net migration which would be needed to maintain a population at the maximum value attained in a projection with zero migration was considerably exceeded the net migration level then used in its medium variant, although for France, EU and UK the requisite level was within the range of recent experience. As Espenshade (2001) notes, the rationale for the UNPD (2000) method of calculation of replacement migration is unclear. The population benchmark used in this paper for calculating replacement migration, that is the current (real) population size, would appear to be a more pertinent consideration than the level which would replace a (hypothetical) future maximum size for population projection which assumes a (zero) level for net migration which differs from the recent experience (as used in the UNDP (2000) method). Also of note is that the levels of net migration (and fertility and mortality) for European countries have also changed substantially since the time of writing for UNPD (2000). Moreover, the number of populations considered by UNDP (2000) is relatively small.

This paper compares the actual values of net migration for 20 European countries for individual years from 2009 to 2018 to the corresponding *Replacement Levels for Migration* ($M_{R, A}$) for the country and year (as per Equation (6)). The data were sourced from the Eurostat website (Eurostat 2021). The choice of countries and years covered was restricted to countries for which all the requisite data inputs for calculating the *Replacement Level for*

Migration ($M_{R,A}$) were available from the Eurostat website at the time of writing and to countries and years for which fertility was below replacement level (NRR less than one)[3] [4].

Results

Northern Europe

For all the Northern European countries the replacement levels of net migration generally increased over time, due to the reductions in fertility. Despite the increase in their replacement level, net migration remained consistently above replacement level in Sweden and Iceland (Figures 1 and 2). Both populations have grown in recent years (Table 1). Were fertility, mortality and net migration to remain constant at the values for any of the years covered for these countries, further population growth would result over the long run: the recent population growth in these countries should not be seen merely as a temporary artefact of population age structure. For 2018 the ratio of net migration to the replacement level for Sweden was 2.9: with constant fertility, mortality and net migration at the levels for 2018 the population of Sweden would grow towards 2.9 times its 2018 size (Equation 6). Despite its being very low (just 202 persons), net migration for Iceland 2012 marginally exceeded replacement level. The very low level for replacement migration in this year is due to the TFR (2.04) being only marginally below replacement. Even though subsequent reductions in the TFR for Iceland increased the replacement level of net migration, the gap between actual and replacement net migration levels widened, and so much so that in 2017 net migration was 4.8 times replacement level: under constant fertility, mortality and migration at 2017 levels over the long run the population would increase towards 4.8 times its 2017 size.

In 2009 net migration for Norway was 7.6 times replacement level (Figure 3). Post-2009 the gap between the two narrowed progressively, due to a combination of a reduced TFR (and hence increased replacement migration level) and reduced net migration. In 2018 net migration was 10% below replacement level (Hagelund 2020). Whilst in 2018 Norway's population was still growing, albeit more slowly than in 2009, under constant fertility, mortality and migration, it would eventually fall (10%) below its 2018 size.

[3] Iceland was not covered for 2009 and 2010 because fertility was above replacement level. Replacement migration level is undefined for such fertility levels.
[4] An Excel spreadsheet used for calculating the replacement level of migration is freely and publicly from the author's website.

Between 2009 and 2018 net migration for Finland was relatively stable (Figure 4). However, its relationship to replacement level was transformed by a reduction in the TFR which was the second largest in Europe over this period (exceeded only by that for Iceland) (Table 1). Largely due to this reduction, the replacement level for migration nearly tripled, and post-2014 net migration was below replacement. In contrast to the prospect of a fairly modest population reduction for Norway, the implication of constant fertility, mortality and migration, at the 2018 levels for Finland is of population falling towards 35% of its 2018 size.

Although the TFR for Denmark in 2009 was only slightly lower than those for Sweden and Norway, its net migration for this year only slightly exceeded replacement level (Figure 5). This difference was largely due to Denmark's more restrictive immigration policy (Hagelund 2020). The relationship between net migration and its replacement level fluctuated. Between 2010 and 2013 a decrease in the TFR propelled the replacement level above the actual net migration. In 2015 net migration numbers were swelled by a large inflow of asylum seekers, and above the replacement level (Pew Research Centre 2016). With the adoption of more restrictive immigration policies, net migration subsequently fell below replacement level (Hagelund 2020). The much higher replacement level for net migration for 2018 is due to unusual age-sex distribution of the very small net in this year[5].

Benelux Countries

Decreases in TFR contributed to increases in the replacement levels for Belgium, Netherlands and Luxembourg. For Luxembourg net migration exceeded replacement level by a considerable margin for all years for which the requisite data were available (Figure 6), whilst for Belgium it did so more narrowly (Figure 7). For Netherlands net migration fell below replacement level in 2012 and 2013, but subsequently increased steeply to return to above replacement level over the latter part of the period considered (Figure 8). For all three countries the implication of constant fertility, mortality and migration at 2018 levels is further population growth.

Central Europe

In 2009 Germany has a very low TFR of just 1.35 births per woman (Table 1). With its economy still weak and unemployment rate still high, a legacy of the reunification and the

[5] In 2018 the proportion of net migration formed by females of reproductive age was much lower. With reduced numbers of births per migrant, much larger numbers of migrants are needed to generate a given stationary population size.

end of the cold war, net migration was also low and far below (just 18%) replacement level (Figure 9; Green 2013). Post-2009, as its economy recovered, net migration increased. The increasing TFR and older pattern[6] of fertility contributed to increases in the replacement level post 2011[7]. In 2015 a huge spike in immigration in 2015, linked to a large inflow of asylum seekers, raised net migration to 2.5 times the replacement level. Despite its subsequent reduction, net migration remained marginally above replacement level. Not only have the increases in TFR, life expectancies and net migration between 2009 and 2018 changed Germany's actual population growth from negative to positive but also continuation of the 2018 patterns would further increase its population size over the long run (albeit only slightly).

Between 2009 and 2018 the TFR for Switzerland remained low, at approximately 1.5 births per woman (Eurostat 2021). Despite this in 2009 its rate of net migration, then one of the highest in Europe, was far above (1.8 times) replacement level (Figure 10). From 2009 to 2018 net migration fell rapidly, with substantial reductions both pre-2014, the year in which a referendum proposing to limit immigration from the European Union was narrowly passed, and post-2014 (Randall 2016). So great was the reduction that in 2018 net migration was just 20 per cent of its 2009 level, and below replacement level (by 23%)[8].

Italy

Expressed as a rate per 1000 population, the replacement level for net migration for Italy is higher than for the Northern and Western European countries considered, because Italy's TFR is lower (Table 1). Despite the high level for the latter, in 2009 and 2010 net migration for Italy was virtually identical to replacement level, due to the then large inflows of arrivals by boat (Figure 11; Hermanin 2017). Due to the reduction in the TFR for Italy (from 1.45 in 2009 to 1.25 in 2018), the replacement level for net migration increased considerably, whilst net migration fell considerably. In 2018 net migration for Italy was just 35% of replacement level.

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[6] With an older age pattern of fertility, the number of local births which results from a specified number and age-sex distribution of net migration will be greater. Hence the sizes of P_i for $i \geq 2$,will be greater.

[7] The decrease in the replacement level for net migration between 2009 and 2011 is due females forming an increased proportion of the (increased) net migration. Unlike males, females affect the calculations of births. Accordingly, when the proportion of net migration formed by females is higher, a smaller total net migration equates the stationary population size with the real population size.

[8] The reduction to male net migration between 2009 and 2018 was greater than the reduction to female net migration. Since only females affect the calculation of births, with a higher proportion of females, less migration less migration is needed to replace the population. Later ages at birth and increased life expectancies also contributed to the reduction in the replacement level for net migration,

East-Central Europe

For Hungary, Czechia and Slovakia, net migration was positive but below replacement level for all the years considered (Figures 12-14). For Hungary and Czechia net immigration increased substantially over the latter part of the period considered. However, over the same time periods, the replacement levels for net migration also generally increased[9]. Thus, whilst in 2018 the populations of Czechia and Slovakia increased slightly, continuation of fertility, mortality and migration at the levels for this year (or indeed for any of the other years considered) would result in considerable population reduction over the long run. For Poland net migration was negative over 2009-2017[10]. Whilst positive, the net migration for 2018 was far below (only 21%) replacement level (Figure 15).

Baltic States

For Estonia net migration was negative over 2009-14 and positive over 2015-2018. However, even over the latter period, it remained below replacement level (Figure 16). Whilst the increases to its TFR, life expectancies and net migration transformed previously negative growth into positive growth over 2015-18, such growth would be temporary in the absence of a further increase in one or more of fertility, mortality and net migration. With constant fertility, mortality and net migration the population of Estonia would decrease towards 75% of its 2018 size. For Latvia and Lithuania net migration remained negative and below replacement level for all the years considered (Figures 17 and 18). Increases in the TFR and life expectancies decreased the replacement level.

South-Eastern Europe

Similar to Latvia and Lithuania, for Bulgaria and Croatia net migration was negative for all years considered (Figures 19 and 20). Since the values of both the first-generation component (P_1) and second generation (P_2) component of the stationary population (P) are both negative, the implication of constant fertility, mortality and migration is that population size would fall to zero over the long run.

[9] The increases in replacement levels occurred despite increases in TFR and life expectancies which, other things equal would have decreased the replacement level of net migration.

[10] In 2017 an overall negative net migration for Poland was the product of positive net migration in the young child ages and in the old ages and negative net migration by young and middle-aged adults. The values of both P_1 and P_2 are positive because the positive net migration in the child ages is multiplied by higher values of life expectancy and post migration births than the negative migration for the adult ages. Scaling negative Hence scaling overall negative net migration equates the TSP with actual population. The proportionate distribution of net migration in 2017 is however very different from other years.

Conclusion

The feasibility of preventing long-run population decrease through sustained change to immigration differs from country-to-country within Europe. For a considerable number of European countries the number of migrants needed to offset population decline is less than or comparable to recent past experience. For a range of Northern and Western European countries (Sweden, Iceland, Belgium, and Luxembourg) throughout 2009-2018 the long run implication of constant fertility, mortality and net migration is considerable population growth: net migration is consistently above the 'replacement level'. The prevention of long-run population decrease would merely require prevention of decrease of one or more of fertility, life expectancy and net migration to levels considerably lower than those observed over 2009-18. For Netherlands continuation of fertility, mortality and net migration at 2018 levels would also generate considerable growth and for Germany it would in the long run generate a slightly larger than current population. However, for both these countries a reversion of net migration to the lower levels observed in some of the years within the 2009-17 period, if sustained, would generate long-run population decrease. The populations of Switzerland and Norway would decrease moderately under constant fertility, mortality and net migration at 2018 levels. However, for both countries reverting to and sustaining of net migration at any of the levels of the 2009-2016 period would produce long run population increase, if neither fertility nor life expectancy decreased. For all the aforementioned countries the use of net migration to prevent long-run population decrease would appear perfectly feasible.

In contrast, for some of the Eastern European countries (Bulgaria, Croatia, Lithuania) constant fertility, mortality and net migration in any of the combinations between 2009-18 which would reduce the population to zero in the long run. For Czechia, Hungary, Slovakia the long implication of constant fertility, mortality and net migration in any of the combinations observed between 2009 and 2018 is a reduced (but non-zero) population size. The same applies for Italy for the fertility-mortality-net migration combinations over 2011-2018 and for Estonia for those over 2014-18. For Finland a large reduction in fertility has transformed the implication of continuation of net migration (and life expectancies) from modest population growth to substantial population decrease. For all these countries, if fertility and mortality were to remain constant at 2018 levels, substantial and sustained increases in net migration would be needed to prevent long run population decrease. However, when viewed on a per 1000 (2018) population basis, the replacement levels for net migration for these countries are not without precedent: viewed on a per capita basis, the replacement migration levels of net migration for Italy and the Eastern European countries covered in this paper are below the replacement levels which for Iceland, Norway, Sweden and Luxembourg for several of the years between 2009 and 2018 (and for Germany in 2015). Whether these countries, especially the Eastern European countries which are generally poorer, would be willing and able to sustain net migration at the rates which have been observed in Northern and Western European countries, which are generally richer and therefore more attractive to immigrants, may be another matter.

The prevention of long-run population decrease is not synonymous with increase to net migration: it could, in theory at least, be achieved either by increase to fertility or by increase to life expectancy. However, for those European countries for which long-run population decrease appears in prospect, increase to net migration would appear to be a more feasible way of equating net migration and the (net migration) replacement level within a short time frame than either fertility or mortality change. Parr (2021) demonstrates the critical levels of fertility (the 'With Current Migration Replacement Levels') which in combination with sustained positive[11] net migration and mortality at the concurrent levels would generate long-run zero population growth for a range of countries, including several European countries. However, in view of the lack of convincing evidence of large and sustained increases to fertility having been achieved by public policy, for the Eastern and Southern European countries the With Current Migration Replacement Levels would appear unattainable (Gauthier 2007; Parr and Guest 2011; Frejka and Zakharov 2013; Jones and Hamid 2015). Since it generally occurs only gradually, the closure of large gaps between net migration and replacement level over short time horizons also would appear implausible.

[11] Strictly speaking, net migration which generates a positive value for P_2.

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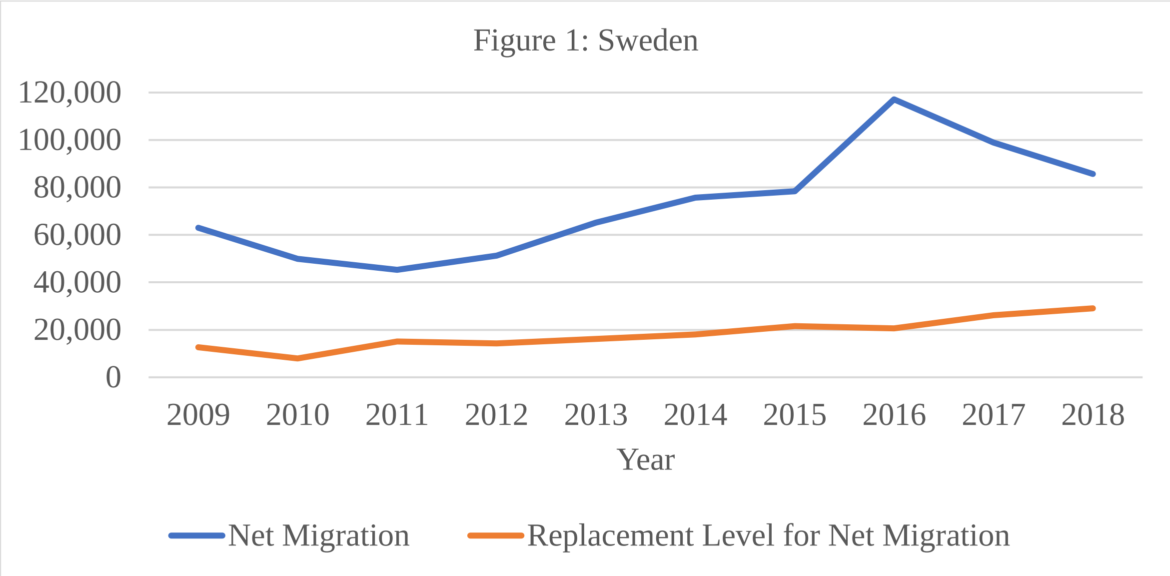
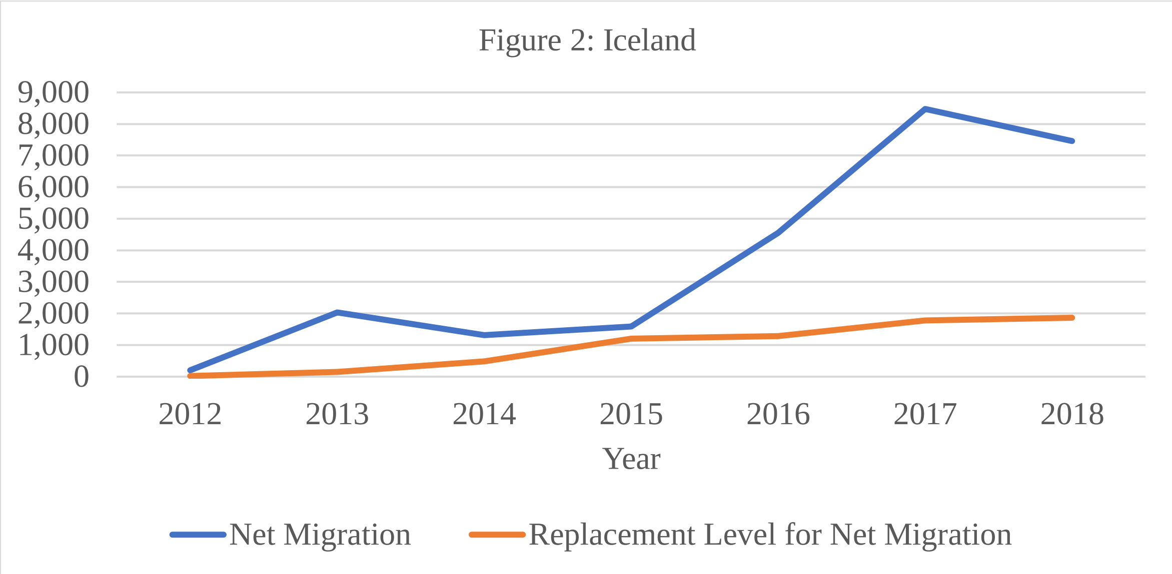
Figure 1: Net Migration and Replacement Level for Net Migration for Sweden 2009-18



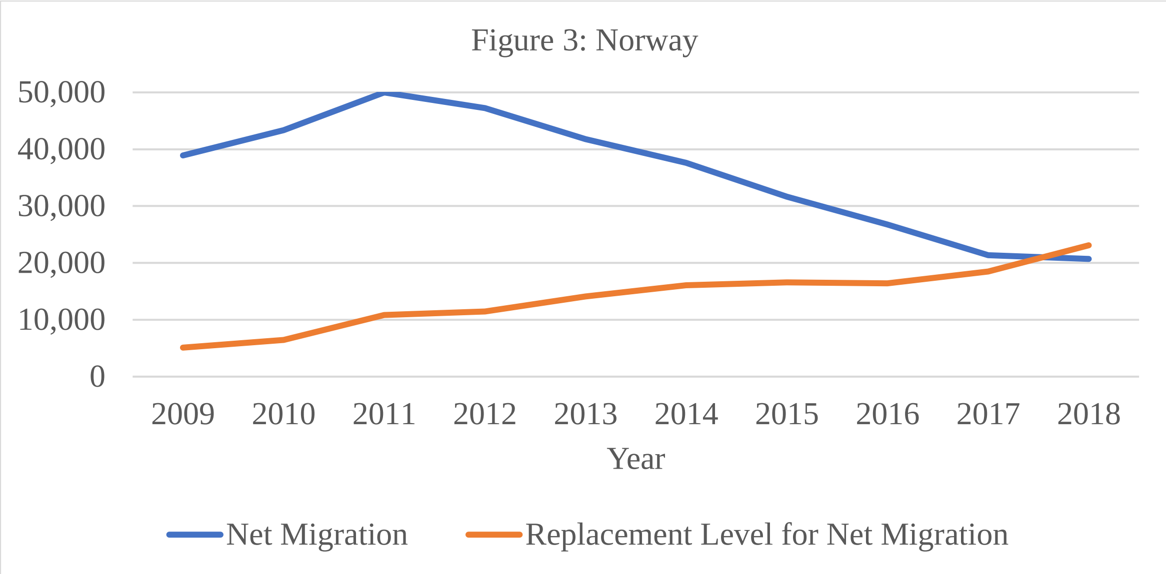
Source: Author’s calculations based on Eurostat (2021).

Figure 2: Net Migration and Replacement Level for Net Migration for Iceland 2012-18



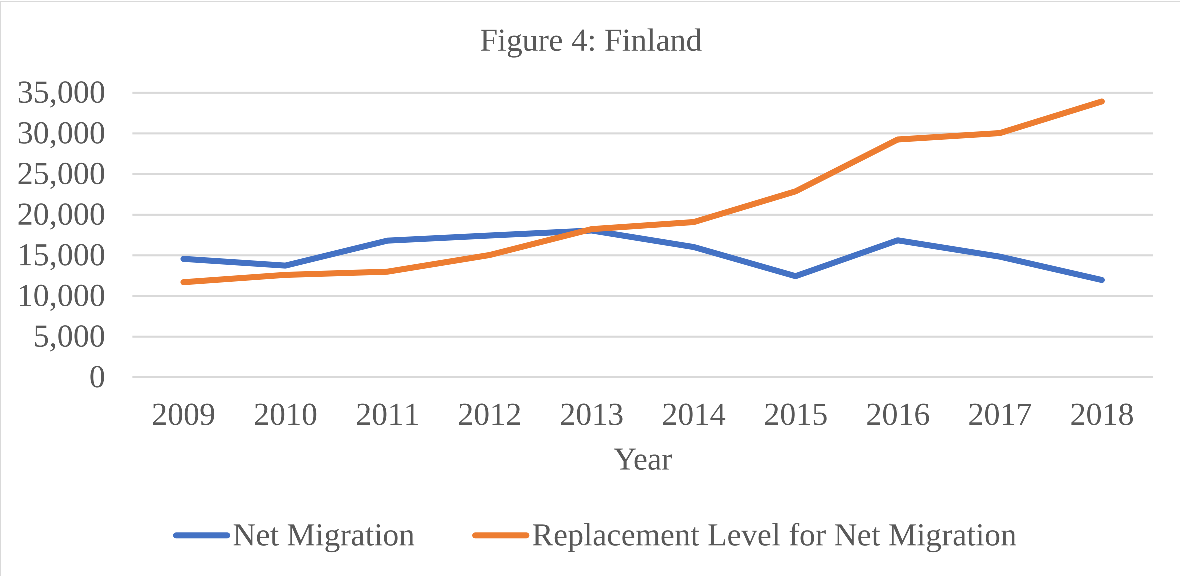
Source: Author’s calculations based on Eurostat (2021).

Figure 3: Net Migration and Replacement Level for Net Migration for Norway 2009-18



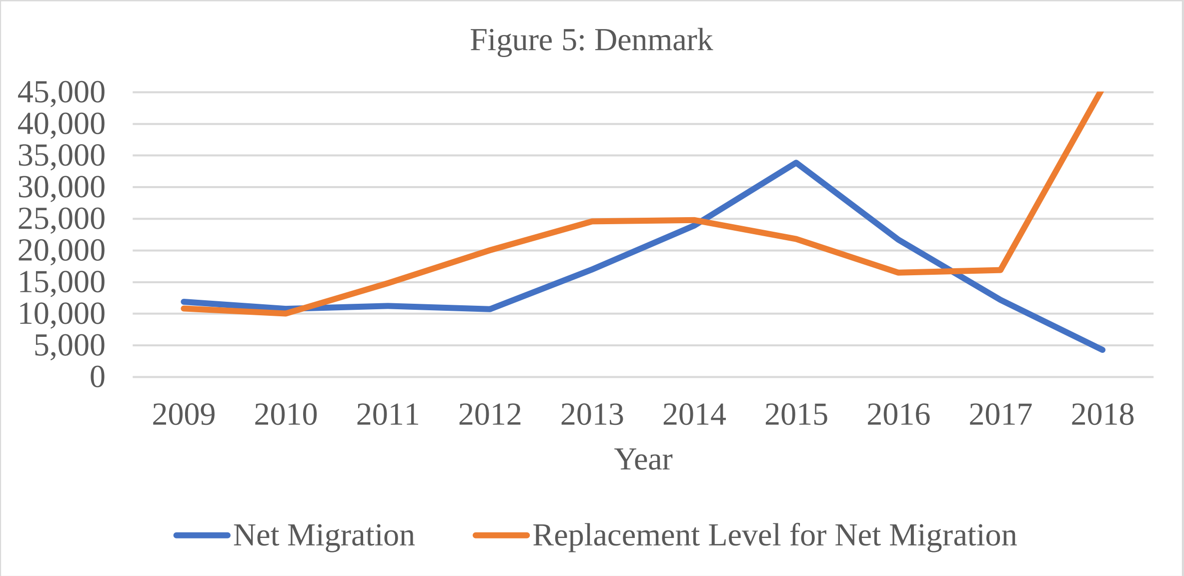
Source: Author's calculations based on Eurostat (2021).

Figure 4: Net Migration and Replacement Level for Net Migration for Finland 2009-18



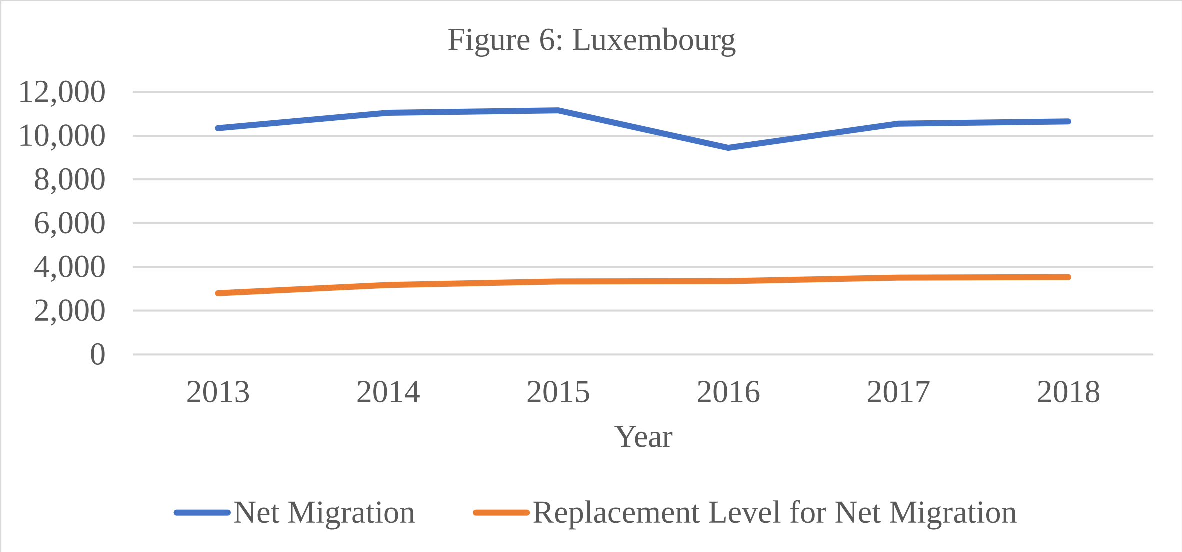
Source: Author's calculations based on Eurostat (2021).

Figure 5: Net Migration and Replacement Level for Net Migration for Denmark 2009-18



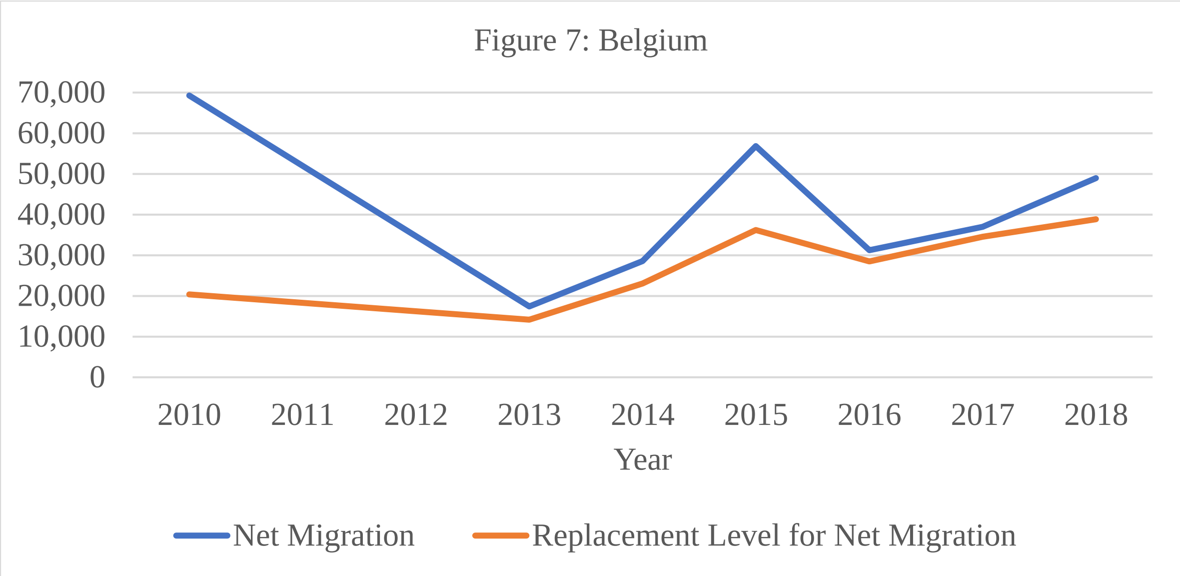
Source: Author's calculations based on Eurostat (2021).

Figure 6: Net Migration and Replacement Level for Net Migration for Luxembourg 2013-18



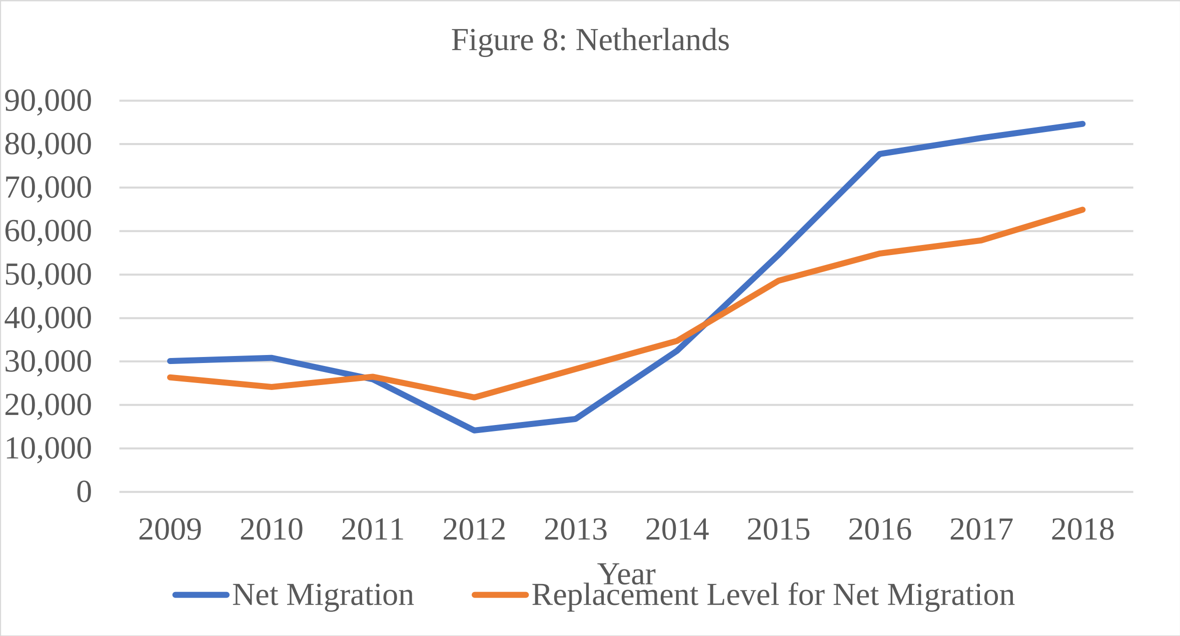
Source: Author’s calculations based on Eurostat (2021).

Figure 7: Net Migration and Replacement Level for Net Migration for Belgium 2009-18



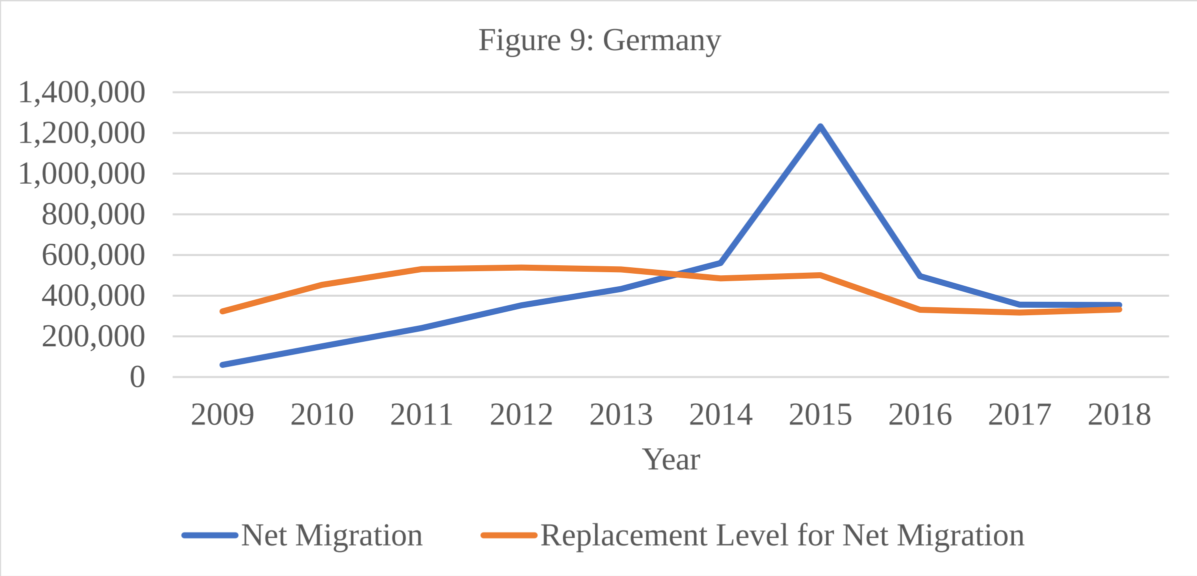
Source: Author's calculations based on Eurostat (2021).

Figure 8: Net Migration and Replacement Level for Net Migration for Netherlands 2009-18



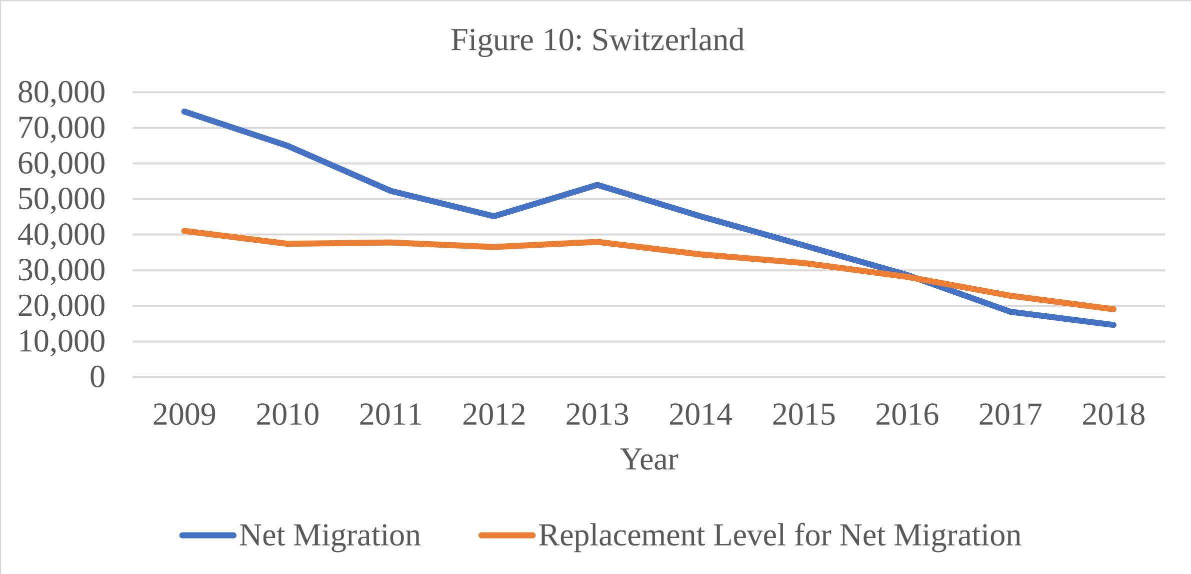
Source: Author’s calculations based on Eurostat (2021).

Figure 9: Net Migration and Replacement Level for Net Migration for Germany 2009-18



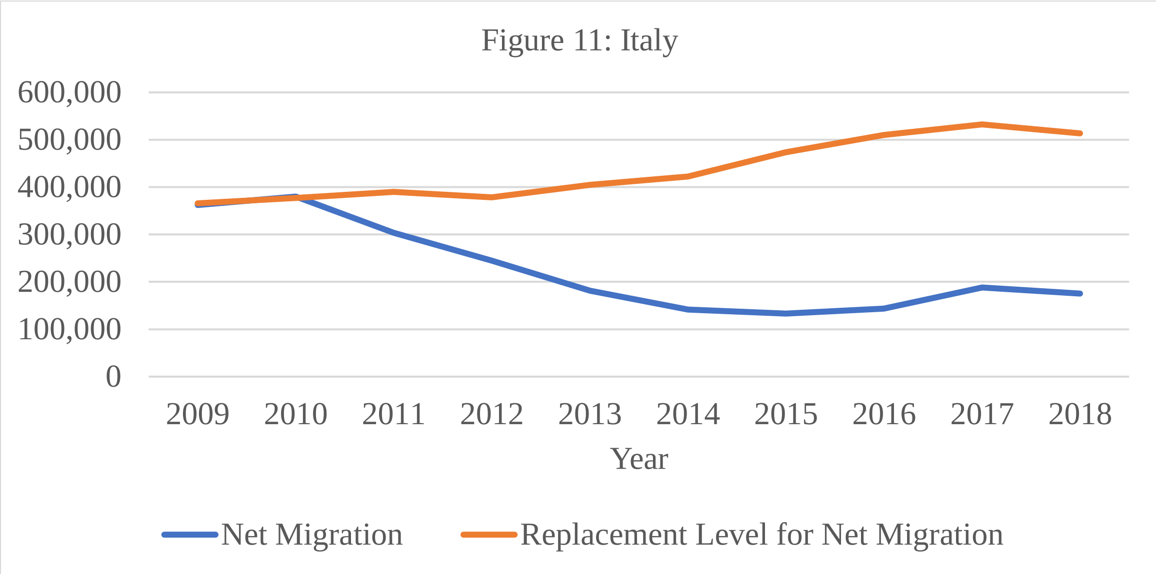
Source: Author's calculations based on Eurostat (2021).

Figure 10: Net Migration and Replacement Level for Net Migration for Switzerland 2009-18



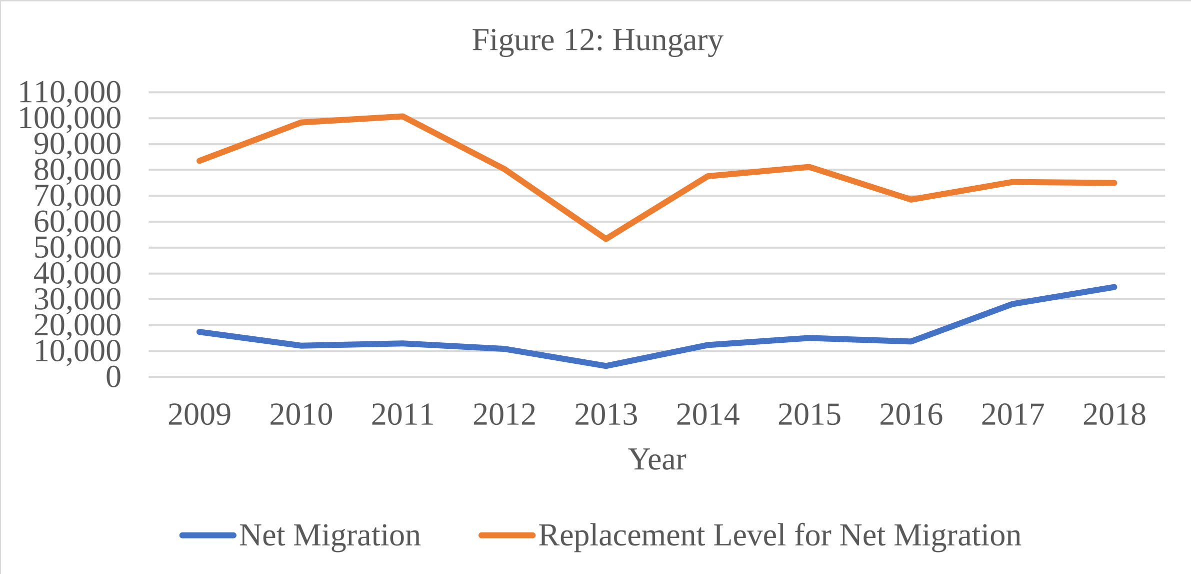
Source: Author's calculations based on Eurostat (2021).

Figure 11: Net Migration and Replacement Level for Net Migration for Italy 2009-18



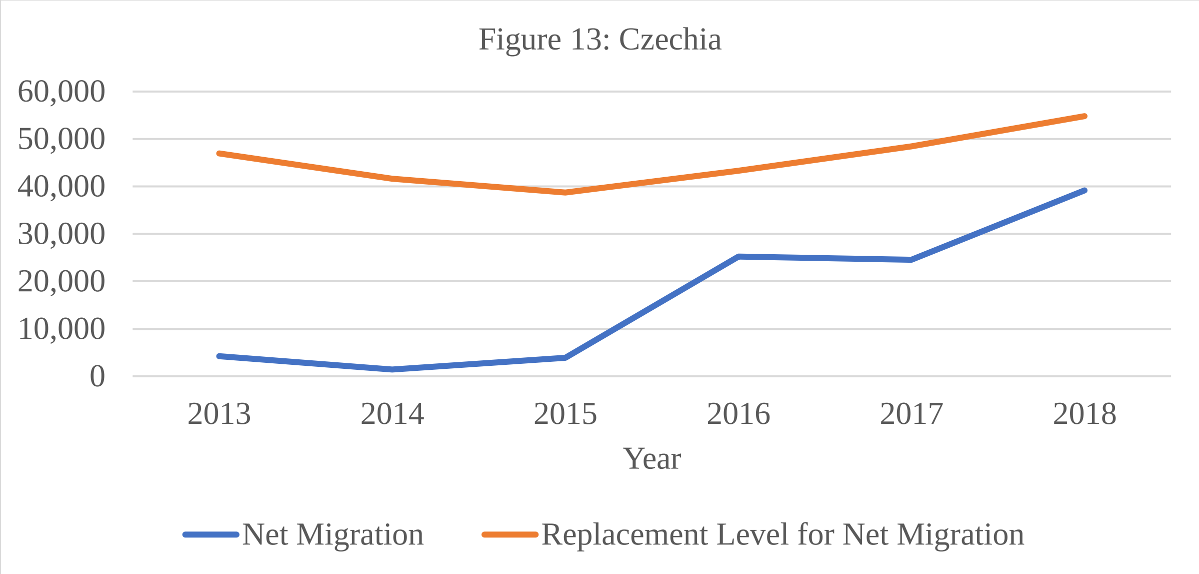
Source: Author’s calculations based on Eurostat (2021).

Figure 12: Net Migration and Replacement Level for Net Migration for Hungary 2009-18



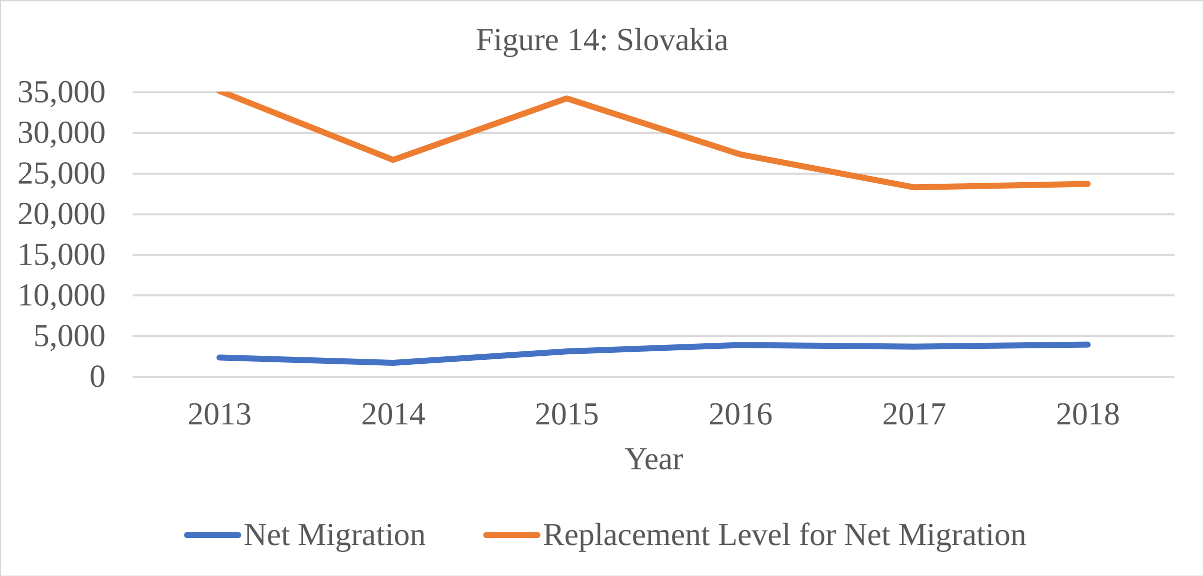
Source: Author's calculations based on Eurostat (2021).

Figure 13: Net Migration and Replacement Level for Net Migration for Czechia 2013-18



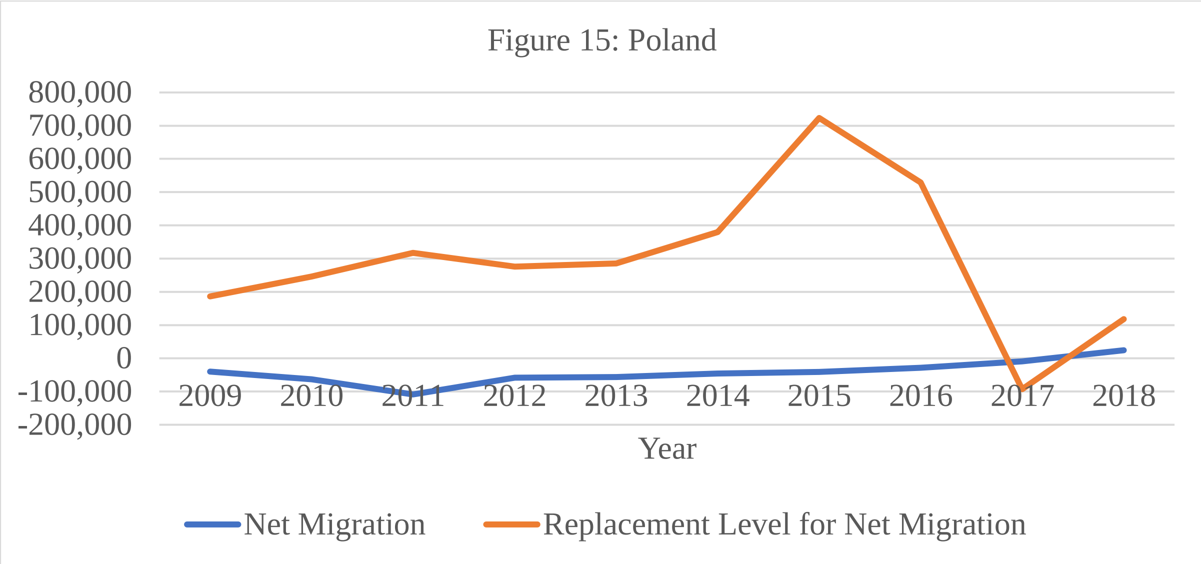
Source: Author’s calculations based on Eurostat (2021).

Figure 14: Net Migration and Replacement Level for Net Migration for Slovakia 2013-18



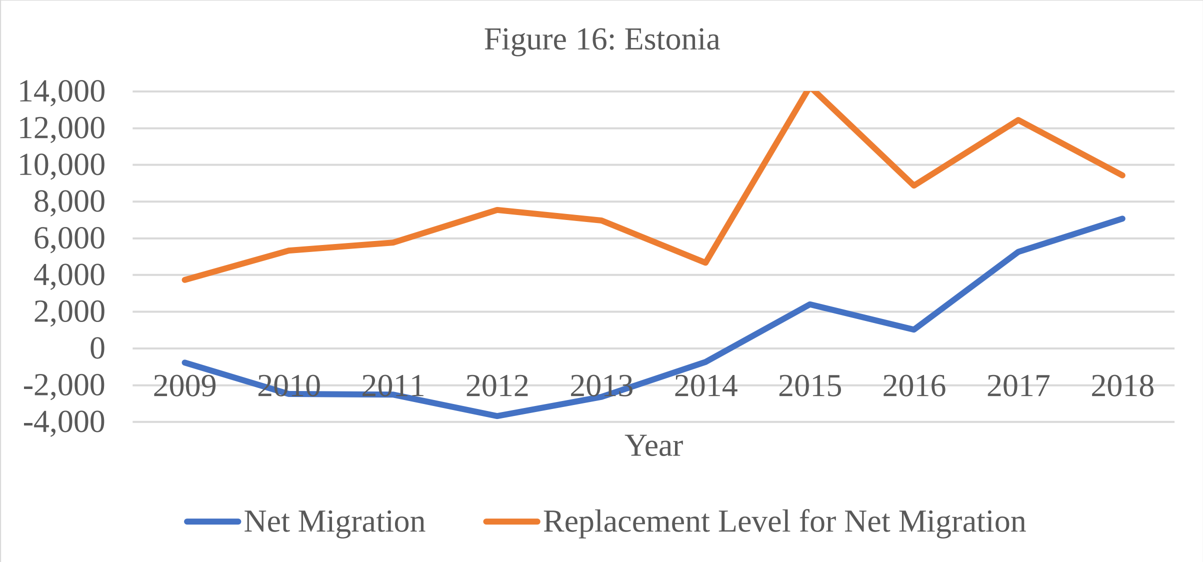
Source: Author’s calculations based on Eurostat (2021).

Figure 15: Net Migration and Replacement Level for Net Migration for Poland 2009-18



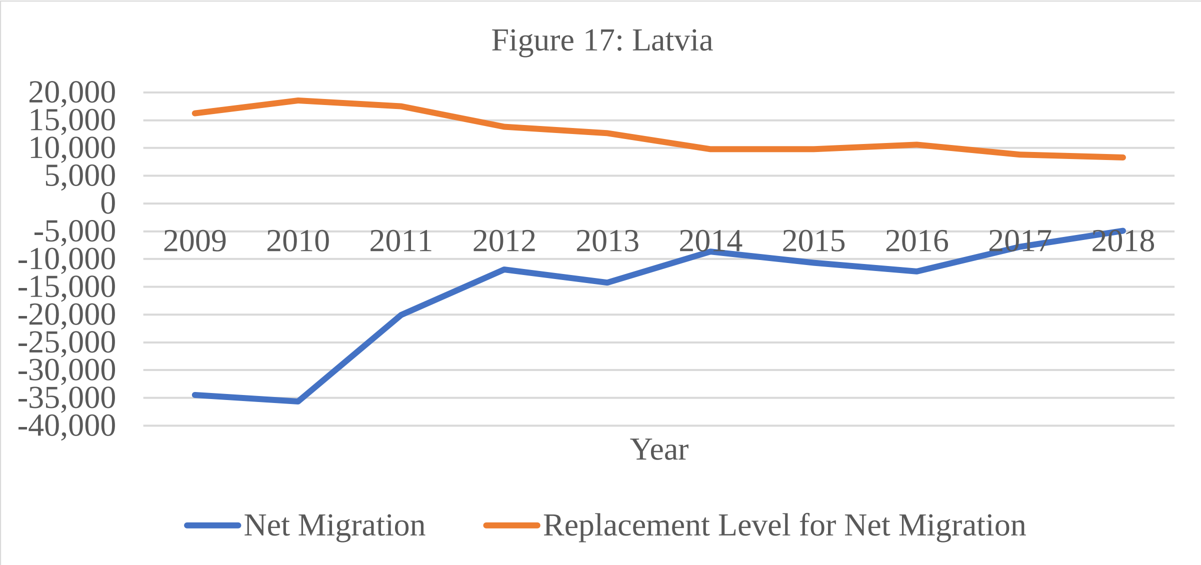
Source: Author’s calculations based on Eurostat (2021).

Figure 16: Net Migration and Replacement Level for Net Migration for Estonia 2009-18



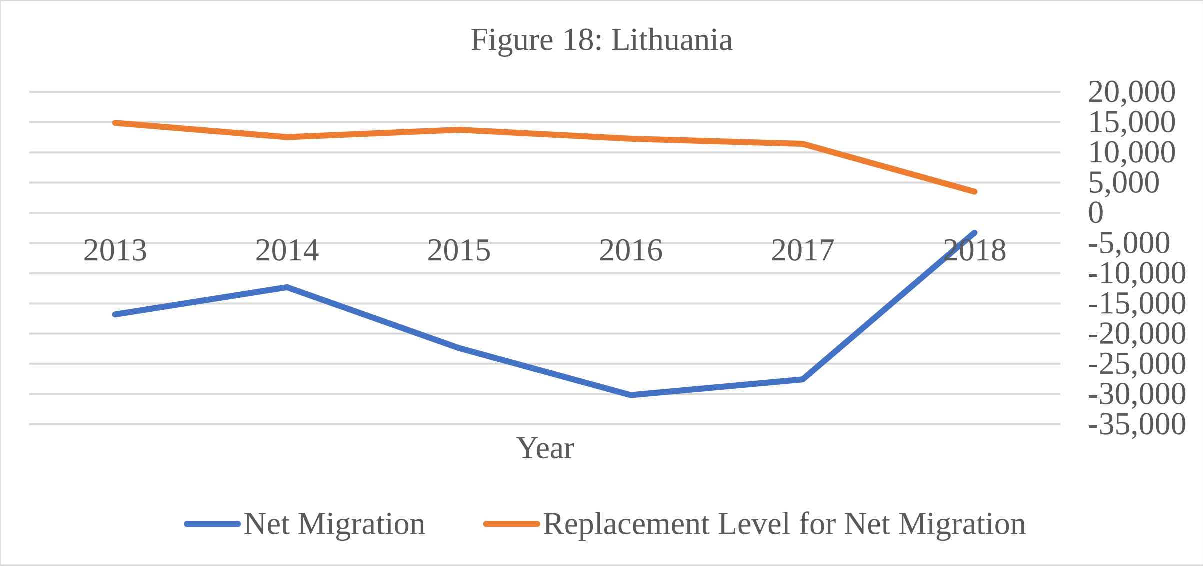
Source: Author’s calculations based on Eurostat (2021).

Figure 17: Net Migration and Replacement Level for Net Migration for Latvia 2009-18



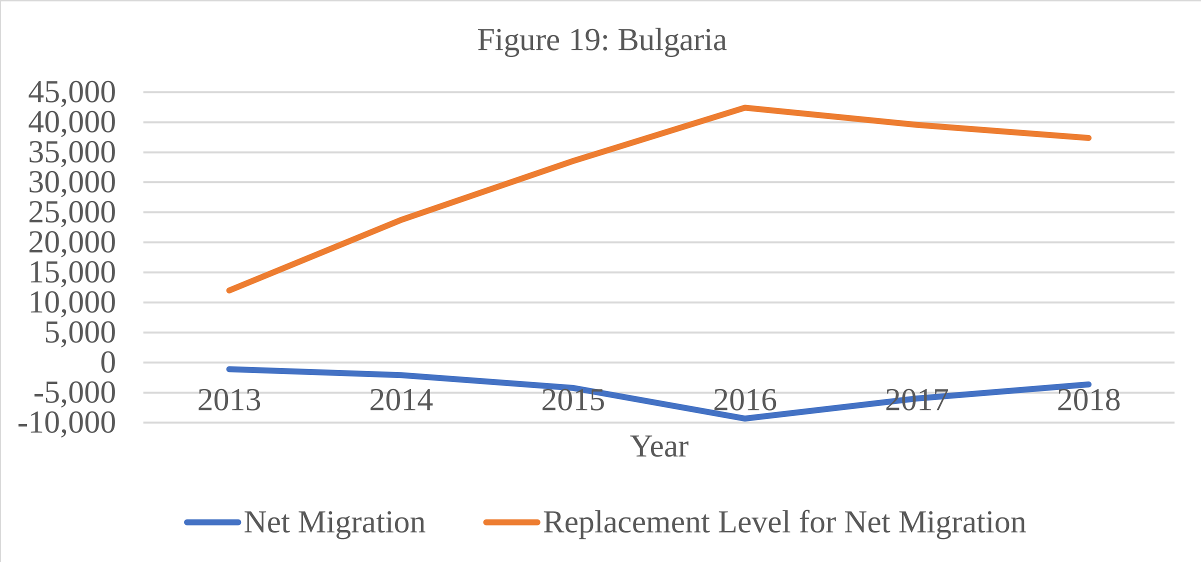
Source: Author's calculations based on Eurostat (2021).

Figure 18: Net Migration and Replacement Level for Net Migration for Lithuania 2013-18



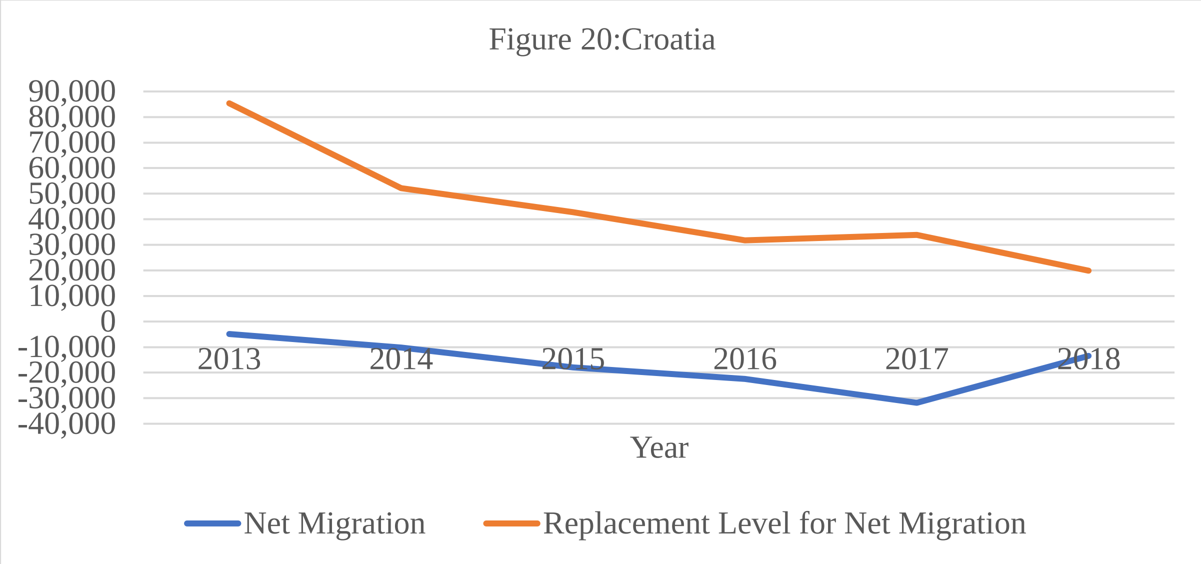
Source: Author's calculations based on Eurostat (2021).

Figure 19: Net Migration and Replacement Level for Net Migration for Bulgaria 2013-18



Source: Author’s calculations based on Eurostat (2021).

Figure 20: Net Migration and Replacement Level for Net Migration for Croatia 2013-18



Source: Author's calculations based on Eurostat (2021).

Table 1: Population Growth Rate, Rate of Natural Increase, Rate of Net Migration, Total Fertility Rate (TFR) and Life Expectancy at Birth: Selection European Countries 2009 and 2018

Country	Population Growth (%)		Natural Increase (%)		Net Migration (%)		TFR		Male Life Expectancy at Birth		Female Life Expectancy at Birth	
	2009	2018	2009	2018	2009	2018	2009	2018	2009	2018	2009	2018
Belgium	0.8	0.5	0.2	0.1	0.6	0.4	1.84	1.62	77.4	79.4	82.8	83.9
Bulgaria	-0.6	-0.7	-0.4	-0.7	-0.3	-0.1	1.65	1.55	70.2	71.5	77.4	78.6
Croatia	-0.2	-0.7	-0.2	-0.4	-0.0	-0.3	1.59	1.47	72.8	74.9	79.7	81.5
Czechia	0.4	0.4	0.1	0.0	0.2	0.4	1.52	1.71	74.1	76.2	80.5	82.0
Denmark	0.4	0.4	0.1	0.1	0.3	0.3	1.83	1.73	76.9	79.1	81.1	82,9
Estonia	-0.2	0.4	-0.0	-0.1	-0.2	0.5	1.71	1.68	70.0	74.0	80.3	82.7
Finland	0.5	0.1	0.2	-0.1	0.3	0.2	1.86	1.41	76.6	79.1	83.5	84.5
Germany	-0.2	0.3	-0.2	-0.2	-0.0	0.5	1.35	1.57	77.8	78.6	82.8	83.3
Hungary	-0.2	-0.1	-0.3	-0.4	0.2	0.3	1.33	1.54	70.0	72.7	78.3	79.6
Iceland	-0.6	2.4	1.0	0.6	-1.5	1.9	2.33	1.71	79.8	81.3	83.8	84.5
Italy	0.3	-0.2	-0.0	-0.3	0.4	0.1	1.45	1.29	79.1	81.2	84.2	85.6
Latvia	-2.0	-0.8	-0.4	-0.5	-1.6	-0.3	1.47	1.61	67.5	70.1	77.7	79.7
Lithuania	-1.3	-0.5	-0.3	-0.4	-1.0	-0.1	1.50	1.64	67.1	70.3	78.7	80.7
Luxembourg	1.7	2.0	0.4	0.3	1.3	1.6	1.59	1.39	78.1	80.1	83.3	84.6
Netherlands	0.5	0.6	0.3	0.1	0.2	0.5	1.76	1.59	78.4	80.3	82.5	83.4
Norway	1.2	0.6	0.4	0.3	0.8	0.3	1.98	1.57	78.4	81.1	83.2	84.5
Poland	0.8	-0.0	0.1	-0.1	0.0	0.1	1.41	1.46	71.5	73.7	80.1	81.7
Slovakia	0.2	0.1	0.2	0.1	-0.0	0.1	1.45	1.55	71.4	73.9	79.1	80.8
Sweden	0.9	1.1	0.2	0.2	0.7	0.9	1.93	1.76	79.4	80.9	83.5	84.3
Switzerland	1.1	0.7	0.2	0.2	0.9	0.5	1.49	1.52	79.9	81.9	84.6	85.7

Source: Eurostat (2021).
Notes: Blue indicates decrease between 2009 and 2018.
Orange indicates increase between 2009 and 2018.