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Nordic Centre for Spatial Development

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Nora Sanchez Gassen and Timothy Heleniak

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Nordregio
P.O. Box 1658
SE-111 86 Stockholm, Sweden
nordregio@nordregio.se
www.nordregio.se
www.norden.org

Analyses and text: Nora Sanchez Gassen
and Timothy Heleniak

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1. Migration and population dynamics

Around the turn of the century, the United Nations (UN) (2001) published a report entitled 'Replacement Migration: Is it a solution to declining and ageing populations?'. It described population decline and population ageing as two critical trends that could have large-scale social and economic implications for the European Union and other regions and countries around the world. Population decline is defined as the shrinking of population numbers caused by an excess in the number of deaths and emigration over the number of births and immigration. Population ageing refers to the increase in the number of older people relative to the rest of the population. It is caused by increasing longevity coupled with declines in fertility (Coleman 2002). Hence, population ageing and decline are the result of trends in fertility, mortality and migration. In its report, the UN investigated the role of international migration in preventing further ageing and population decline in Europe and elsewhere. The UN referred to the respective required migration levels as 'replacement migration'.

In the European Union (EU), in 2001 consisting of 15 member states¹⁾, the UN (2001) concluded that the population could be kept from declining in size if future migration levels remained stable at the levels experienced between 1990 and 1998. To maintain the size of the working-age population (aged 15 to 64), migration numbers would have to double. Population ageing could only be prevented with migration numbers 15 times higher than those in the 1990s. The large number of immigrants would be necessary because of the rapid ageing of European populations, and because the immigrants themselves would age and need to be successively replaced by younger migrants. This would lead to unprecedented population growth and increase in the proportion of immigrants in the EU. The UN (2001) concluded that immigration may be one strategy

to counteract population ageing, but could not be the only solution. The migration levels necessary to prevent population ageing in Europe entirely were considered too high to make this a realistic strategy.

Despite these cautious conclusions, the UN Replacement Migration Report triggered controversy among demographers and policymakers (Coleman 2002). While various hypothetical scenarios were proposed, they were often understood as policy recommendations (Saczuk 2013). Many commentators argued that the levels of replacement migration needed to offset population ageing were 'absurd'. The need for additional strategies to mitigate population ageing and its effects, such as the activation of the 'silent reserve' in the workforce, the promotion of childbearing and the reform of pension systems, has been widely recognized (Bijak, Kuspiszewska & Kupiszewski 2008). Many commentators also criticized the report for focusing too narrowly on demographic processes and excluding the wider social, economic and cultural implications of the projected migration trends. In addition, several authors have discussed the extent to which the projected increase in support ratios, decline in labour force and population numbers pose challenges for societies, as the UN assumes (Saczuk 2013).

While the report received considerable criticism, the questions of how and to what extent international migration may influence the population size and age structure of receiving countries remains important, not least in the context of the ongoing refugee crisis. The Nordic countries, particularly Sweden, have been among the largest recipients of refugees among the EU countries. Nonetheless, the demographic impact of international migration does not seem to be a prime concern in the migration policies of the Nordic governments. In Sweden, Norway, Iceland and Denmark, coalition contracts and strategic programmes of current governments²⁾ stress the humanitarian obligation

1) In 2001, the EU included the following 15 member states: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom of Great Britain and Northern Ireland.

2) The following documents were considered: Swedish government (2014), Government Offices of Sweden (2014), Danish government (2015), Norwegian government (2013), Icelandic government (2013).

to provide a refuge for people in need, the contribution of labour migrants to Nordic economies and the migrants' obligation to integrate into host societies. The demographic impact of migration, by contrast, is not explicitly discussed. Only Finland is an exception: there, the government acknowledges the ageing of the population and discusses the migrants' role in reducing the dependency ratio and alleviating labour shortages.³⁾

Population projections by European and national statistical offices provide some insights into the role of migration for population dynamics in the Nordic countries. They generally assume that all Nordic countries will receive immigrants over the next decades⁴⁾, and conclude that migration may be instrumental in preventing populations from decreasing until 2080 (Statistics Iceland 2015, Tønnessen, Leknes & Syse 2016, Statistics Sweden 2016, Statistics Finland 2015, Statistics Denmark 2016). The exceptions are Iceland, which is expected to maintain positive natural population growth in future decades⁵⁾, as well as Sweden and Norway, where the populations may continue to grow for several decades even in the absence of migration (Tønnessen, Leknes & Syse 2016, Statistics Sweden 2016). International migration is also expected to slow,

but not to prevent, population ageing in all Nordic countries (Eurostat (2014): main scenario and 'no migration' scenario).

This report summarizes the main findings on the impact of migration on population dynamics in the Nordic countries, as projected by the European Statistical Office, Eurostat (2014). We chose Eurostat's *Europop2013* projection set here, because it projects future populations in all countries using the same method, based on a coherent set of assumptions and projection parameters. The results are therefore easily comparable across the five countries. We supplement the *Europop2013* projection results with additional scenarios that show the impact of migration on additional population outcomes that may be of interest to policymakers.

The scenarios shown in this report should not be understood as predictions, and the migration assumptions should not be viewed as policy recommendations. Instead, the projections are hypothetical demographic scenarios that are intended to show how different levels of migration would influence population sizes and structures. These calculations serve as reference points against which migration levels to the Nordic countries may be compared in order to gauge the future consequences of current and developing trends.

3) Finnish government (2015); see also Ministry of the Interior, Finland (2013).

4) Some scenarios are calculated that assume low negative net migration numbers during the projection period, e.g. Statistics Iceland (2015)

5) Statistics Iceland (2015) calculates one scenario in which natural population growth turns negative. This scenario assumes a comparatively low fertility rate of 1.8 to 1.85 until 2065 and a comparatively strong increase in life expectancy. In this case, the population size would continue to increase until around 2050, and start decreasing thereafter.

2. Population projections for the Nordic countries: Expected developments

We start with selected projection results from the EuroPop2013 projection set (Eurostat 2014). Figure 1 shows how the total population size, the size of the groups aged between 15 and 64, which constitute the main labour force, and the dependency ratio are expected to develop between 2015 and 2080 in each of the five Nordic countries. The dependency ratio compares the size of age groups defined as economically dependent (those aged 0 to 14 and 65+ years) with age groups from which the workforce is typically recruited (groups aged 15 to 64 years). We present the results of three scenarios:

■ **Scenario 1:** In its so-called ‘main scenario’, Eurostat (2014) assumes that annual net migration numbers will be positive throughout the projection period in all Nordic countries. Net migration numbers indicate the surplus of immigrants over emigrants in each year. In total, Denmark is expected to receive a surplus of around +890,000 immigrants between 2015 and 2080. Finland is expected to receive +930,000 migrants and Iceland +24,000 migrants. In Norway and Sweden, net migration numbers are expected to be +2,300,000 and +2,700,000 over the same period of time.

■ **Scenario 2:** In a ‘reduced migration’ scenario, Eurostat (2014) assumes lower, but still positive, net migration numbers for all Nordic countries. In this scenario, Denmark is expected to receive a total migration surplus of around +710,000 people between 2015 and 2080. Finland will receive +740,000 people and Iceland +19,000 people. The largest numbers of migrants are expected for Norway (+1,800,000 people) and Sweden (+2,200,000 people).

■ **Scenario 3:** The EuroPop2013 population projection was published in March 2014, before the European refugee crisis brought large numbers of asylum seekers to Europe. The crisis raises the question of how popula-

tion dynamics in Europe would develop if large migration inflows became the norm in the coming decades. To estimate this, we added a third scenario. We calculated the average annual net migration inflow to the five countries for the time period 2010 to 2014 (Eurostat 2016a, 2016b), which was a period of comparatively high immigration for the Nordic region. We then assumed that the same number of people would move to the Nordic countries in each projection year. This would result in the following total net migration numbers between 2015 and 2080: +970,000 (Denmark), +1,100,000 (Finland), +46,000 (Iceland), +2,900,000 (Norway) and +3,800,000 (Sweden).

The three scenarios differ only with respect to their underlying migration assumptions. They are all based on the same fertility and mortality assumptions that Eurostat (2014) defined in its ‘main scenario’. In 2013, the Nordic countries had total fertility rates between 1.74 (Denmark) and 2.07 (Iceland). The total fertility rate (TFR) indicates the average number of children that a woman would bear during her lifetime if the fertility behaviour of a given year remained stable in the future. A TFR of around 2.1 children per woman is necessary for a couple to replace themselves (owing to higher child mortality, this rate may be higher in developing countries). If the TFR of a country remains below 2.1 for sustained periods of time, new cohorts will be smaller than the preceding ones, and populations will eventually decline. Immigration may partly or fully prevent population decline, as has occurred in several European countries during recent decades. Among the Nordic countries, only Iceland had a TFR close to replacement level in 2013, although Sweden (TFR: 1.93) came close. It is assumed that these rates will remain relatively stable and converge until 2080, when TFR values will lie between 1.87 (Denmark and Finland) and 1.99 (Iceland).

The five countries are also expected to converge in

terms of life expectancy. In 2013, life expectancy at birth ranged from 78 years (Finland) to 81 years (Iceland) for men and from 82 years (Denmark) to 84 years (Iceland) for women. Life expectancies are expected to increase until 2080 in all five countries, and reach levels of around 87 to 88 years for men and around 91 to 92 years for women. These assumptions are the basis for all scenarios shown in the figures and tables in this report. Therefore, the projected population sizes and dependency ratios shown in the following figures are purely the result of differences in migration assumptions, allowing us to estimate the effect of different migration levels on future population outcomes.

Three results stand out from Figure 1: First, populations will increase in all Nordic countries until 2080. The more migrants are assumed to come to the Nordic countries, the larger the population increase will be. Even in Scenario 2, which assumes the lowest net migration numbers, there is an increase in population sizes. The largest increase is expected in Norway, where the population could reach between 8 and 10 million people in 2080, starting from 5.2 million people in 2015.

Second, the working-age population (15 to 64 years) will remain stable (in Denmark and Finland) or increase (in Iceland, Norway and Sweden) until 2080. This makes the Nordic countries an exception in Europe, because declines in the labour force are expected in many other countries (European Commission 2015).

Projected increases in the working-age population are again particularly pronounced in Norway and Sweden, where the size of the 15 to 64 age groups may increase by more than one or two million people between 2015 and 2080. Again, the higher the assumed net migration flows to the countries, the larger these age groups will be.

Third, while at least some of the Nordic countries are likely to see their working-age population increase until 2080, the number of older people will increase even faster (see Statistics Sweden 2009). This leads to increases in dependency ratios, depicted in the last column of figures in Figure 1. In all Nordic countries, there will be more economically dependent people per person of working age in the future than today. The number of migrants that will move to the Nordic region does not appear to strongly influence this trend: Irrespective of which net migration level is assumed in the three scenarios, the ratios increase in a very similar manner.

Hence, the first conclusion from Figure 1 may be that migration flows to the Nordic countries will increase the size of their labour forces and populations in the future, but are less influential in slowing the ageing process. Is this really so? To estimate the effect of migration on population ageing further, it is useful to compare how the population trends would develop if all migration to and from the Nordic countries were to cease today. We turn to this question next.

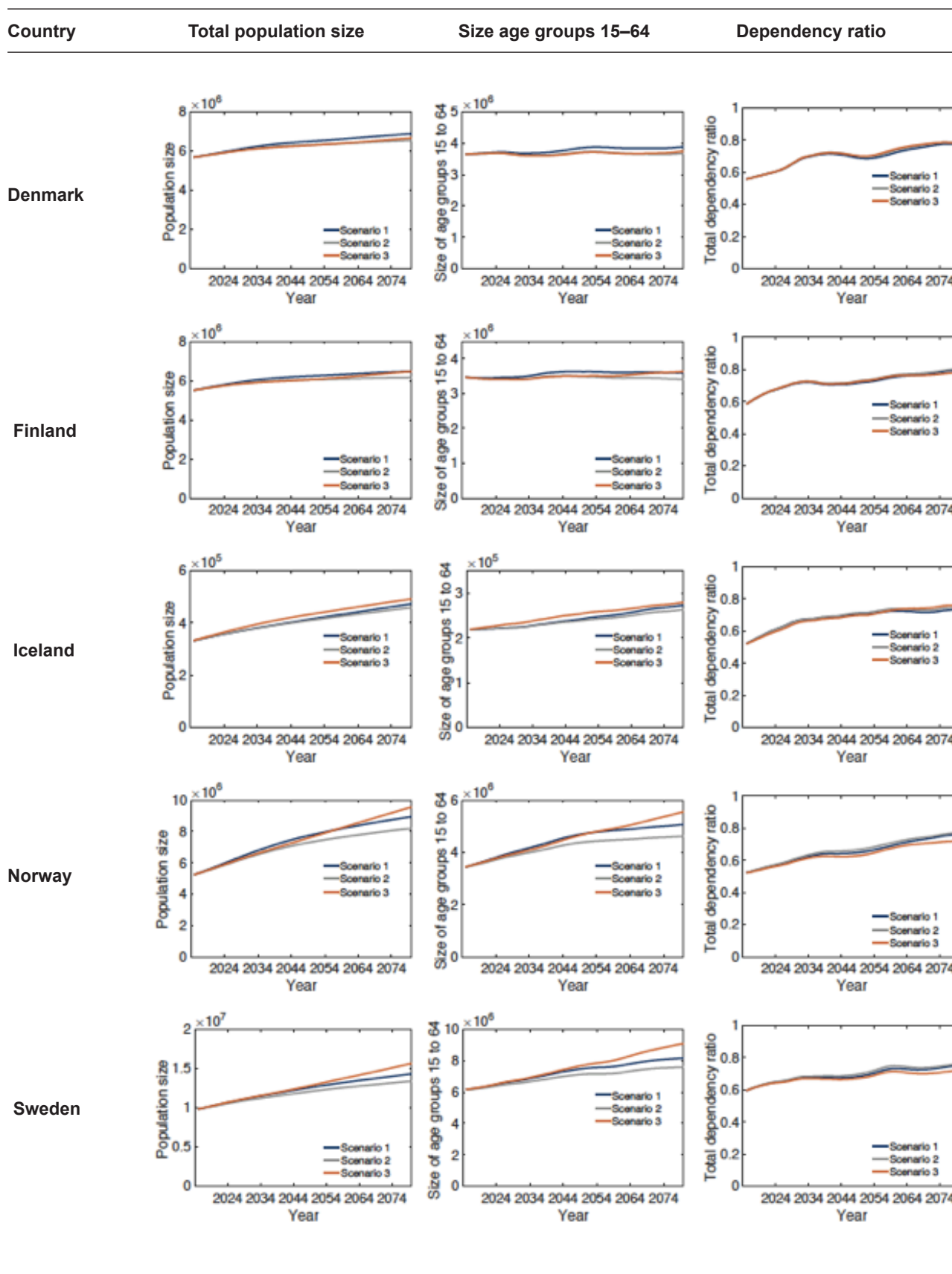


Figure 1: Projected development of total population size, size of age groups 15 to 64 and dependency ratio between 2015 and 2080 in the five Nordic countries. Three scenarios:
 1) Scenario 1 ■: Europop2013 'Main scenario',
 2) Scenario 2 ■: Europop2013 'Reduced migration scenario',

3) Scenario 3 ■: Scenario assuming annual migration levels that correspond to the average annual net migration numbers of the years 2010 to 2014 in each country.

Source: Eurostat (2014) and own calculations.

3. How would the Nordic populations develop in the absence of further migration?

Scenario 4 shows how population size, the size of 15 to 64 age groups and the dependency ratio in the Nordic countries would develop in the absence of future migration, i.e. if immigration numbers and emigration numbers were to fall to zero today and remain at this level until 2080. Thus, all population dynamics shown in Scenario 4 are purely the result of fertility trends, mortality trends and the ageing of the resident populations.

The projection results confirm the impact of migration on population sizes and the size of the 15 to 24 age groups in the Nordic countries. Without future migration, the populations of Denmark, Finland and Norway would decline until 2080. In Sweden, the population would remain almost at its current size until 2080 if migration were to cease. In Iceland, a fertility rate close to replacement level and a comparatively young age structure would keep the population growing until 2080, albeit at a slower pace than if additional migrants came to the country. Similar trends appear if the working-age population is considered (those aged 15–64). For this population, numbers would decline if migration ceased (see also Statistics Sweden 2009). Fewer people would be available for the labour market in the future. Again, the only exception is Iceland, where the working-age population would remain almost constant throughout the projection period. In the other countries, even the comparatively low migration numbers assumed in Scenario 2 would be sufficient to prevent a decline in this population group.

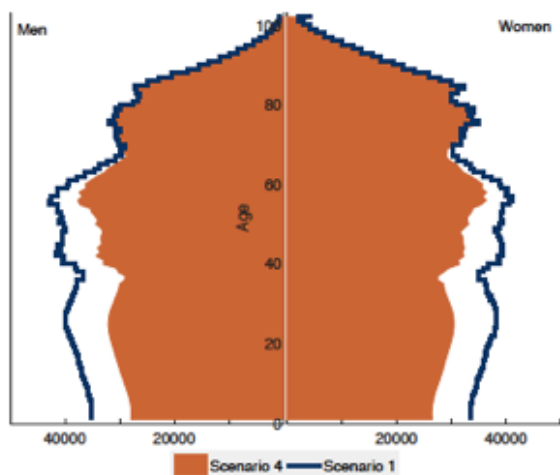
The last column in Figure 2 shows the impact of migration on dependency ratios. Projection results reveal that the ratio of economically dependent people to the pool of potential labour force participants would increase appreciably faster in all Nordic countries if no

further migrants arrived. The effect of migration is not as strong as on population sizes or working-age populations. Nonetheless, migration slows the ageing process in each country, even in Iceland, which currently has the youngest population structure of all five countries.

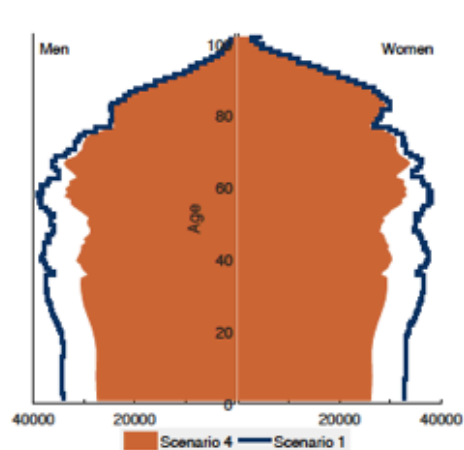
The effect of migration on population size and structure is clearly visible in Figure 3. This shows population pyramids with and without further migration for all Nordic countries in the year 2050. The y-axes show the different age groups; the orange shaded areas and dark blue lines in both directions of the x-axis show the size of each. Male populations are displayed on the left of the y-axes; female populations are on the right. The pyramids contrast the results of two projection scenarios: Pyramids in orange show how the population in each country would look in 2050 if all migration ceased today (Scenario 4 from Figure 2). The dark blue line indicates the population pyramid that would appear in 2050 if migration numbers develop in the future as assumed by Eurostat (2014) in Scenario 1.

A comparison of the two population structures in each country clearly shows the contribution of migration. Without any additional migration, all populations would be smaller in 2050 than they would be with continuing migration inflows. The differences in population numbers are particularly stark in the younger and middle aged groups. Migrants are often young adults, so they initially contribute to the size of these age groups. As time passes and the migrants age, they increase the size of middle and older age groups. If migrants have children, these add to the youngest age groups in the population. Through these mechanisms, immigrants contribute both directly and indirectly to the population size and age structure of their host population.

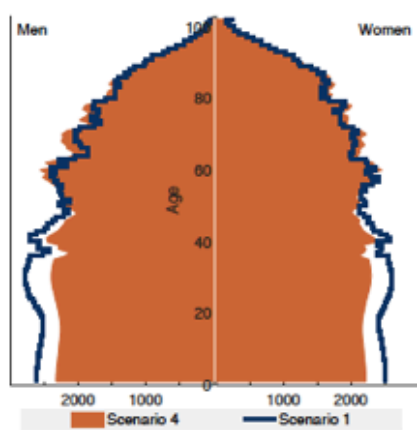
Denmark



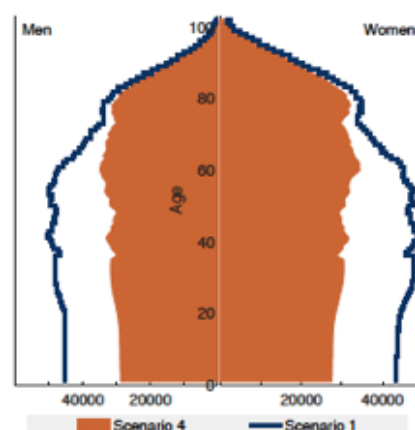
Finland



Iceland



Norway



Sweden

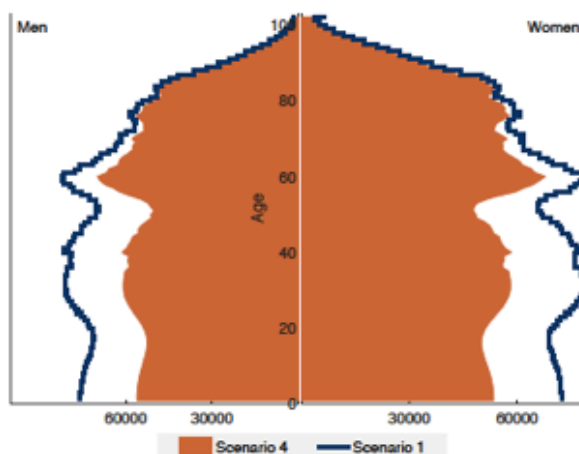


Figure 2: Population pyramids of the Nordic countries in 2050. A comparison of population structures that would appear with migration (Scenario 1 ■) and without future migration in the year 2050 (Scenario 4 ■).
Source: Eurostat (2014) and own calculations.

4. How many immigrants of working age would be needed to maintain the current age structures of the Nordic countries?

Population ageing, i.e. the growth in the proportion of older people in European societies, has caused considerable concern among policymakers and the research community. By 2000, a range of countries had already identified population ageing as a major concern for public pension systems, health care and long-term care provision (Zoubanov 2000). The European Commission (2010) defined population ageing as a key challenge that had to be addressed to maintain employment, productivity and social cohesion in Europe. Researchers have estimated the effect of population ageing in a wide range of areas, for instance on economic growth, educational expenditure, eldercare and the distribution of electoral power (European Commission 2014, Cangiano 2014, Sánchez Gassen 2015). The question of whether international migration may be promoted to counteract population ageing has received widespread attention in this context. The UN Replacement Migration Report (2001) concluded that migration flows alone cannot stop the ageing trend in the EU (then 15 member states), because the numbers required would be unrealistically high. However, the Nordic countries have younger populations than many of their southern European neighbours, so migration may be a more promising strategy there. Next, we repeat the UN calculations to ascertain how many immigrants per year would be needed to stop population ageing, and whether it could be a feasible policy option for the five countries considered here.

The first column of Figure 4 shows the number of migrants of working age (15 to 64 years) that would have to move to the Nordic countries each year to keep the dependency ratio at the level of 2015, i.e. to prevent any further ageing of the population. In the earlier projection years (2015 to 2050) the numbers needed for this goal increase slowly to a level of approximately 200,000 in Denmark, Finland, Norway and Sweden

and 25,000 in Iceland. These are already substantially higher net migration numbers than those expected by Eurostat (2014) in Scenarios 1 and 2, and even the higher migration numbers of Scenario 3 presented above. In the longer term, the migration numbers required to keep the dependency ratio stable increase drastically. In the year 2080 alone, the five Nordic countries would need to accommodate between 220,000 (Iceland) and 2,200,000 (Norway) migrants to keep the ratio at the 2015 level. This drastic increase in migration numbers is the result of the ageing of the host population, but is also because the migrants themselves age and would have to be replaced to sustain the dependency ratio in the long term. If we sum the migration numbers over the entire projection period, Denmark would have to accommodate almost 30 million migrants between 2015 and 2080, Finland 29 million, Norway almost 41 million and Sweden 38 million. In Iceland, the required net migration number would be somewhat lower, at 4.1 million. Owing to the very high influx of migrants, population sizes in the Nordic countries would surge during the projection period. As column 3 in Figure 4 shows, the population of Denmark would increase from 5.7 million in 2015 to 39.4 million in 2080. In Norway, the increase would be even more drastic: from 5.2 million to 52.6 million people. The number of people aged 15 to 24 would increase in parallel with the total population of all Nordic countries.

It is important to note that the dependency ratio is just one measure of changes in the age structure of a population. In recent years, its use has been increasingly criticized. Most importantly, the dependency ratio does not take into account that many elderly people remain active and in employment beyond their 65th birthday, so are not necessarily dependent. As life expectancy increases, older people may remain longer in employment in the future. In addition, not all peo-

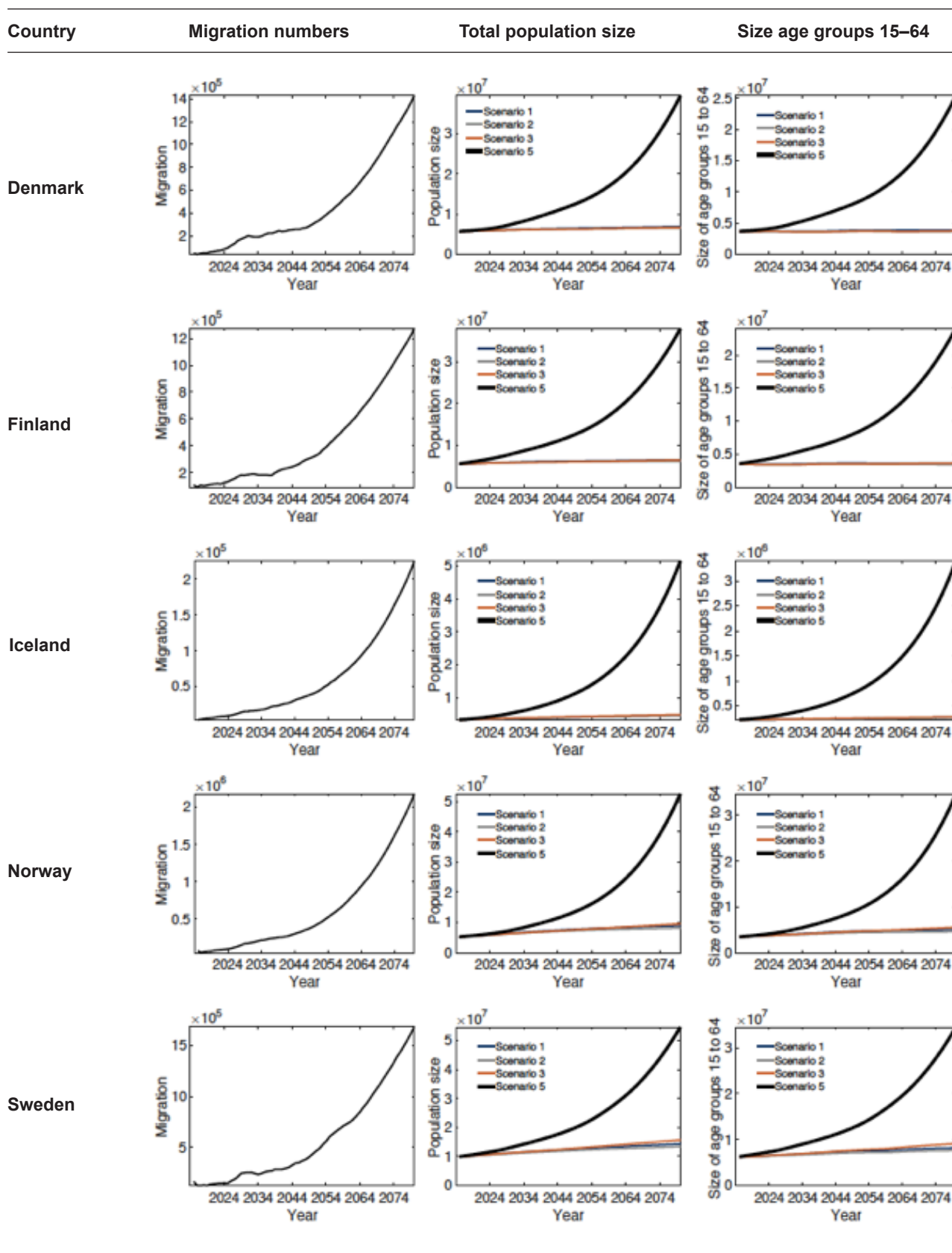


Figure 4. Net migration numbers required to maintain dependency ratio at level of 2015, development of total population size and size of age groups 15 to 64 years between 2015 and 2080 in the five Nordic countries. four scenarios: 1) Scenario 1 ■: Europop2013 'Main scenario', 2) Scenario 2 ■: Europop2013 'Reduced migration scenario',

3) Scenario 3 ■: Scenario assuming future migration levels for each year that correspond to the average migration numbers of the years 2010 to 2014 in each country. 4) Scenario 5 ■: Scenario assuming the number of migrants required to maintain the dependency ratio at level of 2015. Source: Eurostat (2014) and own calculations.

ple aged 15 to 64 are economically active, for instance due to education, unemployment, sickness or parental leave. Comparing the size of young and old groups defined by fixed age limits is therefore a very simplistic way to capture ageing processes and their impacts. In recent years, a range of other ageing indicators have been used as alternatives to the dependency ratio; for instance the support ratio, which compares not only the size, but also the consumption and labour income of all age groups (see, for instance, Caswell & Sánchez Gassen 2015). Sanderson and Scherbov (2010) propose the so-called 'prospective dependence ratio' to measure population ageing. This indicator does not assume that people become economically dependent as soon as they reach a specific age. Instead, it only designates people whose life expectancy is 15 years or less as 'old' and dependent. With this definition, the indicator takes increases in life expectancy into account, which may make it increasingly possible to participate in the labour market beyond the age of 65. Nonetheless, even this indicator may mask considerable variation in the health status and cognitive functioning of older people, which in turn may influence their ability to participate in working life as well as their need for care (Skirbekk, Loichinger & Weber 2012, see also Ryder 1975).

To some extent, both older and newer indicators of ageing thus simplify reality and reduce the variation in health status found among young and older age groups. Given this limitation, it remains instructive to compare how projection results change across different indicators of ageing. Here we replicate the projections in Figure 4 and measure how many immigrants would be needed to maintain the prospective dependency ratio at current levels in the Nordic countries. Table 1 shows the results. We compare the total number of migrants that would have to move to the Nordic countries between 2015 to 2080 to keep the dependency ratio and the prospective dependency ratio stable (left column of the table). The right column of the table shows popula-

tion numbers in each Nordic country in 2080, if the required number of migrants would in fact move there during the projection period.

The results show that the number of migrants needed to sustain the prospective dependency ratio are substantially lower than the number required to keep the dependency ratio stable. For instance, 10.1 million migrants would have to move to Denmark to keep the prospective dependency ratio stable rather than the 29.7 million that would be needed to maintain the dependency ratio. Hence, in discussions of the role of migration in preventing population ageing in the Nordic countries, it is important which indicator of ageing is considered. The difference in migration numbers would also lead to differences in the population size in the Nordic countries. If migration inflows were limited to the numbers necessary to maintain the prospective dependency ratio, population sizes in 2080 would be substantially lower than those in the scenario where the dependency ratio is maintained. Nonetheless, even the projected population numbers in the 'prospective dependency ratio' scenario are very large in comparison with current population sizes in the Nordic countries. Within a period of six decades, the populations of the Nordic countries would more than double (in some cases even quadruple or more) if policymakers used replacement migration to maintain the prospective dependency ratio.

Therefore, these results overall raise strong doubts about the concept of replacement migration as a strategy to prevent population ageing in the Nordic countries. The migration numbers needed to maintain current dependency ratios would be unprecedented, and even the migration numbers necessary to maintain the prospective dependency ratio would be higher than migration flows to the Nordic countries in recent years. They would lead to unprecedented population booms in all countries and create enormous, perhaps impossibly large, demands for housing, infrastructure,

	Net migration numbers required during period 2015-2080 to stabilize		Population size in 2080 that would result from stabilizing	
	Dependency ratio	Prospective dependency ratio	Dependency ratio	Prospective dependency ratio
Denmark	29.7 million	10.1 million	39.4 million	16.1 million
Finland	28.8 million	13.3 million	37.8 million	19.0 million
Iceland	4.1 million	1.2 million	5.1 million	1.7 million
Norway	40.8 million	14.4 million	52.6 million	21.3 million
Sweden	38.1 million	19.0 million	54.6 million	30.9 million

Table 1. Immigration numbers required to keep indicators of population ageing at level of 2015, and resulting population numbers in 2080.

Source: Own calculations.

integration measures, welfare support and strain on the environment. Within a few decades, the current host populations living in these countries would become minorities. For this reason alone, replacement migration to maintain age balances is likely to be socially unjustifiable. Finally, even if immigration on such a scale were approved by the resident populations, it is far from assured that sufficient migrants could be recruited from sending countries; high population growth rates, poor employment possibilities and resource scarcity are likely to sustain migration pressures in many developing areas of the world in the years to

come, notably in Northern Africa and the Middle East (Bommes, Fassmann & Sievers 2014). Nonetheless, it is less clear how many migrants would be willing to move to and integrate into the Nordic region, and whether they possess the education and skills necessary to integrate them into labour markets (Rauhut 2004). Given all these constraints, migration cannot be considered a feasible solution to prevent population ageing in the Nordic countries completely. Nonetheless, migration may be one among several strategies to slow changes in the age structure and replenish the ageing workforce.

5. Comparing the influences of fertility and migration on population ageing

The age structure of a population can be influenced by fertility and migration.⁶⁾ Given the large number of migrants that would be necessary to stop or even moderate population ageing, we may ask whether policymakers would be better advised to focus efforts on creating family-friendly work and societal environments to boost fertility.

The effect of increases in fertility and migration on the age structure of a population can be compared using elasticity analysis. Elasticity analysis measures the influence of small proportional changes in fertility or migration on population outcomes, if all other demographic parameters are held stable. For instance, we can assess whether a small proportional (e.g. one-percent) increase in fertility rates would have a larger effect on population ageing than the equivalent change in migration numbers. We can also compare the influence of the two demographic factors in the short, medium and long term. The method of calculating elasticities has been described in detail elsewhere; the equations to conduct the analyses as well as computer code to calculate the results have been published (Caswell and Sánchez Gassen 2015). Here, we use Scenario 1 calculated by Eurostat (2014) and examine how the dependency ratios would change in each projection year if age-specific fertility rates are increased between 2015 and each projection year by one percent, or if net migration numbers were raised by one percent.

Figure 5 shows that small increases in migration numbers reduce the dependency ratio throughout the projection period. If migration numbers in each projection year were one percent larger than Eurostat (2014) expects in Scenario 1, the dependency ratio would be as much as 0.1 percent lower in most future years. These

calculations confirm that increases in migration can slow the ageing of Nordic populations, but the overall effect is not very large. Small increases in fertility have a stronger impact: As the figures show, a one-percent increase in fertility rates would increase the dependency ratio by as much as 0.4 percent between 2015 and 2030. This is because the additional children that would be born as a result of fertility increases are not part of the working-age population during their first 15 years of life. Thus, rather than decreasing the dependency ratio, increases in fertility first lead to an increase in the number of dependent people. However, once the larger cohorts born between 2015 and 2030 reach working age, we see that increases in fertility start to reduce the dependency ratio. Around the year 2065, increases in fertility effective since 2015 start to have a larger impact than increases in migration. During the final projection years shown in Figure 5 (2065 to 2080), increases in fertility have a substantially stronger effect on the dependency ratio than similar increases in migration numbers in all five countries.

Overall, the results shown in Figure 5 illustrate that increases in fertility can have a powerful impact on slowing the dependency ratio, but the effects will only be felt after several decades. Changes in migration numbers reduce the dependence ratio immediately, but are less influential than changes in fertility. Therefore, policymakers who wish to moderate population ageing in their societies may be well advised to use both strategies: encourage immigration in the short term to fill gaps in the labour market or to sustain ageing populations, and provide conditions that help couples to reproduce.

When interpreting the results in Figure 5, one should bear in mind that the panels show the result of hypothetical scenarios. We consider the effect on dependency ratios in the Nordic countries if migration numbers or fertility rates were to increase by one percent while all other demographic behaviours developed

6) Mortality, the third demographic factor influencing population structure, cannot be influenced by policymakers other than by improving the population's health and longevity through broad access to good quality health care, prevention and rehabilitation measures. Therefore, we disregard it here.

as predicted by Eurostat (2014). We do not take into account the difficulty of making such demographic changes. For instance, the one-percent increases in migration numbers hypothesized here may be much easier to achieve through changes in migration, em-

ployment or asylum policies than a similar increase in fertility rates. Hence, the panels in Figure 5 show the effect of changes in demographic behaviour, but do not indicate their practicality; this is an additional factor to keep in mind when interpreting the results.

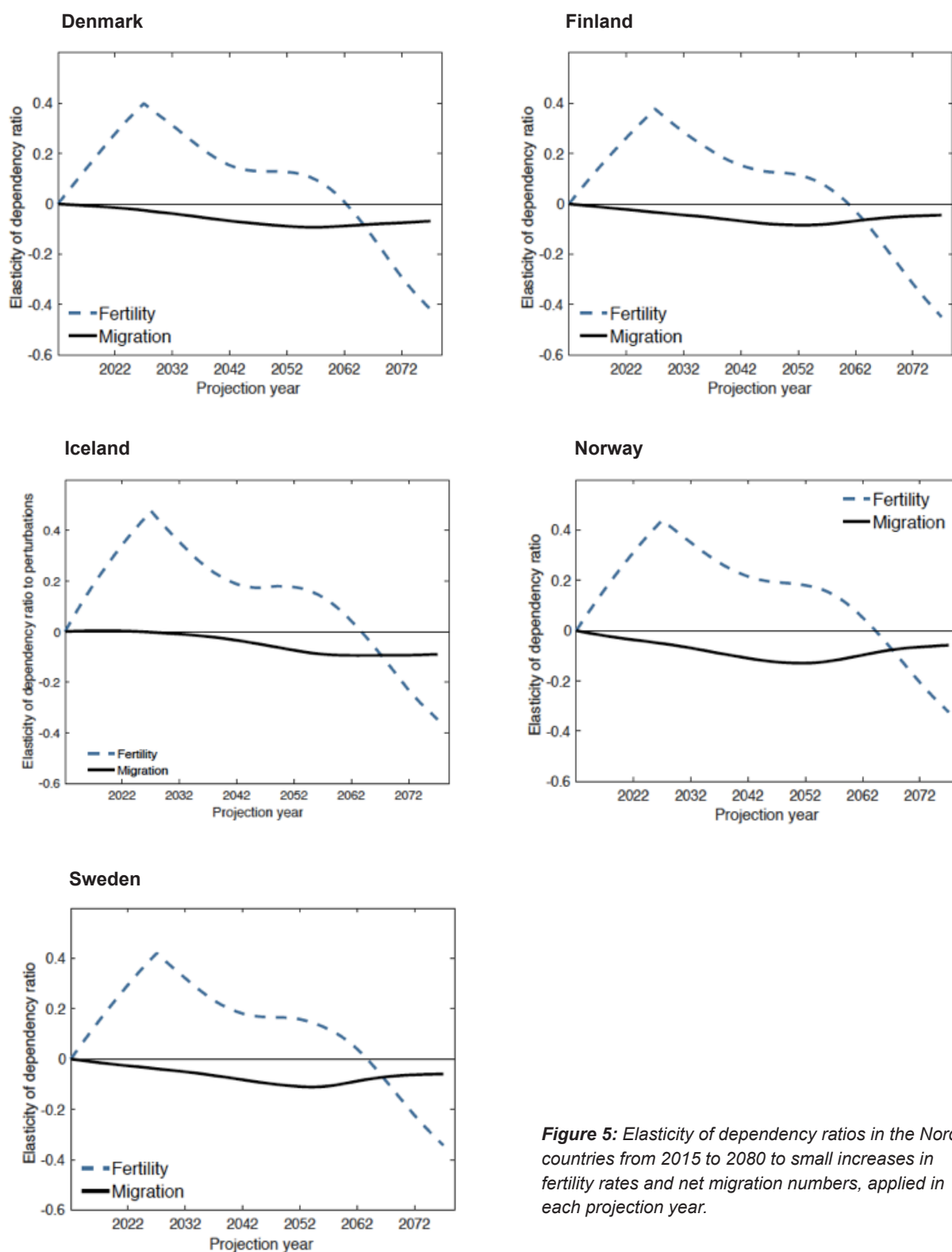


Figure 5: Elasticity of dependency ratios in the Nordic countries from 2015 to 2080 to small increases in fertility rates and net migration numbers, applied in each projection year.

6. Conclusion

The populations of the Nordic countries are likely to grow during future decades; in addition, they are expected to age. The calculations presented in this report show the contribution of migration to these developments. In Denmark, Finland and Norway, international migration is the driving force behind population growth. Without migration, these populations will decline. In Sweden and Iceland, population growth would be substantially lower if migration ceased. International migration also helps to slow population ageing in each country. Nonetheless, migration cannot halt the ageing process. The analyses in this report show that the number of migrants necessary to maintain current age structures would be unrealistically high, and would lead to unprecedented population booms, possibly creating impossible challenges for the housing market, labour market and welfare systems. The exact number of migrants required to maintain current age structures differs depending on which indicator of ageing is considered. However, in all cases the number required would far surpass even the high migration numbers of recent years. Therefore, replacement migration does not appear to be a valid strategy to prevent further population ageing in the Nordic region.

While migration cannot stop the ageing process completely, it is one possible measure to boost labour forces and to help lower dependency ratios in the short term. To fulfil these functions, it is crucial that immigrants are speedily integrated into societies, and particularly into the labour market. If newcomers remain outside paid employment for longer periods of time because of sickness, lack of qualifications or discrimination, this will increase the number of economically dependent people and the burden on public security systems. The figures and tables presented in this paper did not take these aspects into account. Instead, the paper focused purely on the demographic impact of migration. Nonetheless, it is important to place the demographic trends in context. After all, the educational profiles of migrants, their integration, labour demands and workforce participation are crucial in determining their contribution to the Nordic countries.

In the context of the recent refugee crisis, it is important to remember that asylum seekers are more likely

than other migrant groups to suffer from posttraumatic stress symptoms and depression, caused by their experiences of war, persecution, dangerous escapes from their home country and insecurity about their future in the new host countries (Lindencrona, Ekblad & Hauff 2008). These psychological symptoms have been associated with poor socioeconomic integration (Schick et al. 2016). Timely access to specialized mental care and adequate treatment may be crucial to support asylum seekers and to facilitate their integration into the Nordic countries.

Supporting asylum seekers and refugees with special health care needs also appears to be important in the light of recent fiscal estimates: Projections for several Nordic countries are for at least a temporary increase in government spending during the coming years, fuelled by rapid population growth and additional expenses from the refugee crisis (Konjunktur Institutet 2016, Holmøy & Strøm 2012, see also OECD 2013). To limit the strain on public finances, the speedy integration of refugees into the Nordic labour markets appears crucial. This may also help to maintain public support for redistributive policies; recent studies suggest that support may decline in populations that become ethnically more heterogeneous (see Jensen & Skaaning 2014, Mahler, Loontjer & Parang 2015).

Thus, the current refugee crisis offers both challenges and opportunities for Nordic welfare states. The integration of refugees into education systems, the work force, and society at large should be of primary importance in all countries, once their applications for asylum are approved. This would help refugees to quickly adjust to their new home countries, and it would benefit the labour forces and welfare states of the ageing Nordic societies. However, this report showed that even with the best integration measures, migration alone cannot address the challenges of ageing populations. The creation of family-friendly living conditions to boost fertility, increases in labour force participation rates of host populations, shifts in pension age and reform of social security systems are among the many other complementary strategies that could be adopted in response to the social and economic challenges of ageing societies.

Finally, it is important to note that the calculations in this report focused on trends at the national level. These may mask considerable regional variation in population growth and ageing within each country (Rauhut & Eðvarðsson 2009, Hansen, Rasmussen & Roto 2011, Roto 2012). Many remote and rural areas in the Nordic region are already experiencing population decline, labour shortages and rapid ageing, as young people move to urban centres to find employment or

participate in education programmes. Many large cities, by contrast, are battling sharply rising population numbers that put strain on the housing sector and infrastructure. Thus, within each country, the impact of migration may depend on where newcomers settle. Detailed analyses in such subnational contexts were beyond the scope of this report, but must be considered when planning future migration strategies in each country.

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Nordregio
P.O. Box 1658
SE-111 86 Stockholm, Sweden
nordregio@nordregio.se
www.nordregio.se
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