MUNICH RESEARCH INSTITUTE FOR THE
ECONOMICS OF AGING AND SHARE
ANALYSES (MEA-SHARE GGMBH)

DISCUSSION PAPER

ESTIMATING THE SIZE OF THE CARE GAP IN SELECTED EUROPEAN COUNTRIES: AN EMPLOYMENT BALANCE

AXEL BÖRSCH-SUPAN & JOHANNES RAUSCH

03-2025

Munich Research Institute for the Economics of Aging and SHARE Analyses (MEA-SHARE gGmbH)

Leopoldstrasse 139
80804 Munich, Germany
Phone +49 89 4111205-151

WWW.MEA-SHARE.EU

Estimating the Size of the Care Gap in Selected European Countries: An Employment Balance

Axel Börsch-Supan and Johannes Rausch

18.12.2024

Abstract:

This deliverable is a first step to estimate the care gap in Europe. Most European countries have to expect an absolute decline in their labor force, and all European countries will see a decline in the number of workers relative to the population size. This includes care workers, defined as individuals who provide formal care in households and institutions. At the same time, all countries have to deal with a rising demand for care since the share of very old individuals in the population will increase. This will result in a gap between the supply of, and the demand for, formal care workers. The study uses a "shift-share" methodology combined with a scenario approach to provide first estimates of this gap, abstracting from behavioral adaptations and conditional on strong assumptions regarding the provision of informal care. We look at eight EU member states: Denmark, France, Germany, the Netherlands, Italy, Poland, Spain and Sweden.

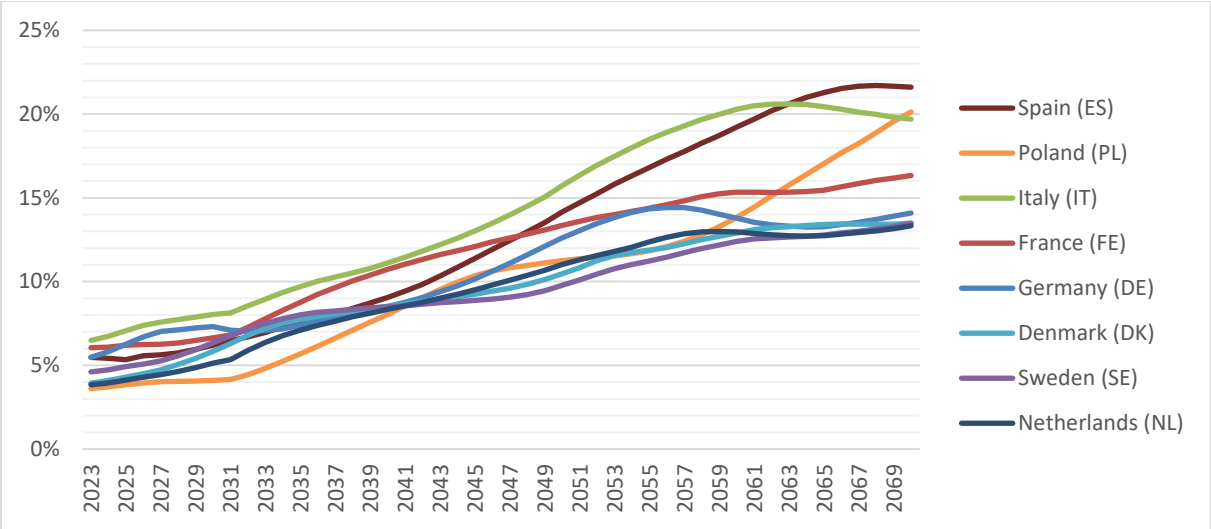
Our main result is that under current behavioral assumptions – especially current labor force participation, part-time rates and retirement age – this gap will grow much larger in all eight countries than it is already today. On the other hand, supply and demand could be balanced if so far untapped labor potential is brought into the labor market, mainly among women and early retirees. Untapped labor potential is defined as the difference between today's labor force participation rate and a hypothetical rate that is considerably higher but realistically achievable insofar as it has been already realized in Europe. We have chosen Sweden as such a benchmark. We show that this helps to close the care gap in all countries except Denmark, Sweden and the Netherlands, where labor force participation is already high and therefore the untapped potential small. France, on the other hand, has such a low labor force participation rate, that exploiting the untapped labor potential barely suffices to close the gap until 2060 but not in the far future.

1. Introduction

The European labor market is facing significant changes and challenges. In particular, the demographic change will have major consequences. The size of the elderly population will increase, while most countries must expect a decline in their working-age population. The resulting decline in labor supply will thereby exacerbate the already widespread shortage of (skilled) workers (European Labour Authority (ELA), 2024). In some sectors with shortages, the decline of adequate employees is likely to accelerate even faster than the demographic trend would imply, as younger workers are underrepresented here. Examples are the healthcare sector and many craft occupations (ELA 2024).

On the other hand, the demand for labor is likely to increase in some sectors, e.g., due to the greening of the EU economy or to population aging, the very topic of this study. The latter applies to the healthcare sector and there especially for the long-term care since the size of the very old population will grow rapidly and therefore the population in need for care. Figure 1 shows the "very old" dependency ratio, defined as the number of people age 85 and older divided by the population in working age (20-64) for a selection of EU countries. It at least triples between now and 2070, and it even quadruples in Italy, Spain and, remarkably, in Poland.

Figure 1: The "very old" dependency ratio by country (in %)

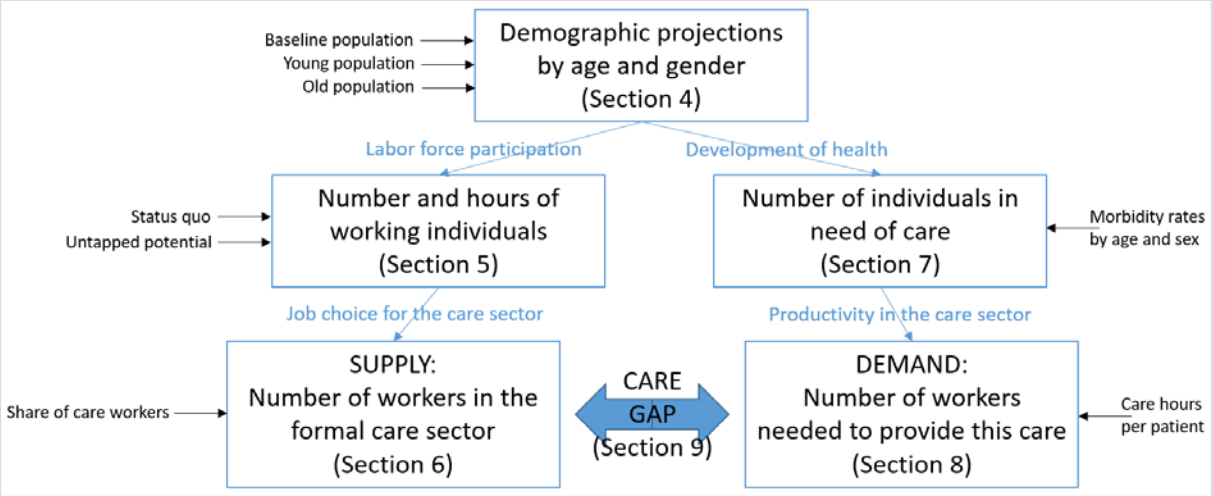


Source: own calculation

As a result, a gap will emerge between the supply of labor in the care sector and the demand for long-term care. The central aim of this study is to deliver a first and approximate estimate of the size of this "care gap". The paper uses a shift-share methodology combined with a scenario approach that abstracts from behavioral adaptations and uses some strong assumptions regarding the productivity in the care sector and the provision of informal care.

Figure 2 depicts the main building blocks of the study. It begins with a projection of the demographic developments from 2023 to 2060 for a selection of eight EU member states. These include Denmark, France, Germany, the Netherlands, Italy, Poland, Spain and Sweden. Main output of this building block is total population size, number of people in working age and number of very old individuals. We consider three scenarios: baseline, young population and old population, defined by assumptions about fertility, mortality and migration that are detailed in Section 4.

Figure 2: Building blocks of this study



Source: own picture

The next aim of this study is to determine the evolution of the future labor supply in the course of the demographic development and to discuss to what extent an eventual decline could be offset by so far untapped labor potential. Already existing shortages are thereby not considered directly. The untapped labor pool considered in this study includes women who are not part of the formal labor force, early retirees, female part-time workers, and unemployed.

The term “untapped” is somewhat misleading and needs to be understood in the context of this study as not participating in the formal wage-earning labor force. For instance, many non-working women and part-time workers are not (full-time) employed because they have other obligations, such as raising children or caring for relatives. Expanding employment in these groups will depend therefore on improving the reconciliation of work and domestic responsibilities, e.g. by hiring more personnel for childcare and in the formal long-term care sector. It is therefore important to account for the complementarity of formal and informal care, which we will discuss at several places in this study. We will distinguish between “formal care workers” who deliver formal care in institutions and individuals’ homes and “informal care providers” including family and friends.

In the case of the older population, the expansion of employment depends on the physical and mental health after an already long working life. Since the number of healthy years increases with life expectancy (although at a retarding pace), at least a partial increase in the employment participation of the older population should be possible without hitting health-related limits. This applies particularly to countries, which currently have a relatively early average retirement age. Reducing the proportion of unemployed people is a less controversial approach of counteracting the reduction in employment. However, this is not an automatic process either, as unemployment is not only due to a lack of labor demand, but also often to a lack of qualifications. In addition, occupations with a shortage of qualified labor supply are often avoided because they are considered less attractive or too strenuous (e.g. construction workers and healthcare professionals; see ELA 2024). Today's unemployment is therefore also the result of self-selection into professions that are regarded as more attractive. A reduction in unemployment rates can therefore only succeed if currently less favorable occupations become more attractive (e.g. by paying higher wages) and the general qualification of the population is improved. Modelling the behavioral reactions to higher wages in the care sector is beyond the scope of this study but will be a subject for future papers in this project.

Regarding labor supply, we consider two scenarios. The first scenario models the status quo and keeps age, gender and country-specific labor force participation rates constant. The second scenario ("untapped labor potential") assumes labor force participation rates that are considerably higher than the status quo but still realistically achievable insofar as they have been already realized in Europe. Of the considered countries, Sweden has the highest participation rates in Europe among women and individuals of age 50 and older. We have therefore chosen Sweden as target benchmark for these population groups. Regarding the unemployed, we are more modest and assume the EU-average as target rate. Details are provided in Section 5.

The next building block specifies the share of worker who choose jobs in the formal long-term care sector. This share reflects not only the current demographic situation but also the mix between formal and informal care and therefore varies greatly among the eight countries considered. In the status quo labor market scenario, we assume that this share will remain constant in each country. This assumption would be unrealistic in the untapped labor potential scenario since working more in the formal sector of the economy will crowd out informal care. Hence, for internal consistency, we assume that the share of formal care workers will reach the Swedish share in all countries. This is detailed in Section 6.

This study will not project future labor demand in general, even though it may be subject to major changes. For instance, workers may be replaceable in some areas through technological alternatives (e.g. due to artificial intelligence and advanced robotics) while other professions may disappear with the greening of the EU economy. Such potential changes in labor demand are not considered due to the high complexity and uncertainty. Rather, this study projects the demand for formal care workers only. This is done in two steps. First, we project the number of individuals that are severely limited based on the current age and gender-specific ratio of individuals with severe limitations. Details are provided in Section 7. In a second step, we use current data on hours of formal care associated with each individual who has severe limitations. Converted into full-time equivalents,[1] this yields the demand for workers in the formal care sector. This is detailed in Section 8. Demand and supply are then juxtaposed in Section 9.

Overall, the results of this study show that a decline in the labor force is projected for all countries except Sweden. The decline is particularly large in Poland, Italy and Spain. The demographic-related decline in labor supply meets an increased demand for long-term care (defined as individuals with severe limitations) in all countries. Closing this "care gap" by exploiting the so far untapped labor potential works in all considered countries except Sweden, Denmark and the Netherlands where labor supply is already high. We thereby assume that the untapped labor potential corresponds to the difference to Swedish participation rates for women and elders and the EU average unemployment. This implies considerable changes in some national participation rates. Examples are the Dutch and German high part-time rate, the low Italian female employment rate, or the generally low labor force participation in France.

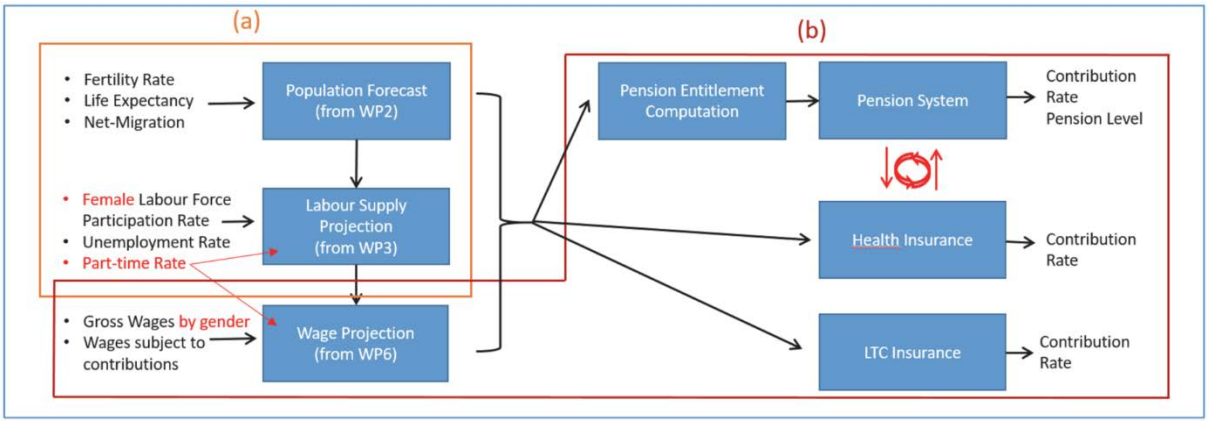
The paper is structured as follows. Section 2 presents the simulation model MEA-SOCSIM that is used for the projection of the national populations and labor supply. Section 3 introduces our data sources. Sections 4-8 describe the building blocks of our projection model as depicted in Figure 2. Section 9 concludes the study. It examines the extent to which the care gap can be closed by the untapped labor potential and discusses the many critical assumptions of our methodology.

[1] Full-time equivalents are computed by dividing the total weekly working time by an assumed weekly full-time working time of 40 hours.

2. MEA-SOCSIM

For the demographic and the labor force projections the simulation model MEA-SOCSIM (see Figure 3) is used. MEA-SOCSIM consists of several modules, some of which build on each other, while others are only loosely connected. The latter applies primarily to the modules for the prediction of the social security systems, which are not used in this study. In the following, the main methods and assumptions of MEA-SOCSIM for the projection of a population and its labor markets are briefly presented.

Figure 3: Structure of MEA-SOCSIM



Source: Own picture

The population forecast extrapolates the population of the base year on assumptions regarding the future development of life expectancy at the time of birth, future net migration and future female fertility. It considers thereby the population by age and gender. The assumptions base also on age- and gender-specific fertility rates, life tables and migration rates. However, those age structures are only variable to a limited degree. The future assumptions are mainly to be made regarding the annual over age aggregated rates.

Labor supply is determined by multiplying the population by labor force participation rates. MEA-SOCSIM distinguishes between gender and age. We do not consider regional differences in this study. The base year of our labor market simulations is 2023. As we will discuss later, we take the labor force participation rates from the Eurostat LFS database. For the future, the labor force participation rates can be varied to simulate the effects on the labor force or employment due to behavioral and institutional changes as well as changes in labor market conditions. The numbers of unemployed, (compulsorily insured) employed and self-employed are then determined using age-specific rates based on the labor force. Over the simulation period, these rates can be increased or reduced (independent of age). At last, the total labor supply in working hours depends on the number of employed, the rate of part-time employment and the average working hours in full or part-time. This total labor supply is computed in the following only for the dependent employees. Hence, it does not include the working hours of self-employed.

The retirement behavior and, in particular, its reactions to changes in institutional variables such as the statutory retirement age are important for the future development of the labor supply. MEA-SOCSIM determines the transition into retirement for the group of self-employed and not at the labor market participating individuals (e.g. housewives) in a different way than for the group of unemployed and dependently employed. For the first group, MEA-SOCSIM determines the pensioners under the assumption that they claim their pension at the statutory retirement age or age a minimum pension

can be drawn. For the self-employed, this can effectively lead to parallel pension payments while the self-employed activity continues. For the second group, retirement is based on the assumption that their labor market exit coincides with the time of the first receipt of a pension.[2] MEA-SOCSIM computes, therefore, their transition from work/unemployed into retirement on the basis of the decline in their labor participation rates at older ages. Irrespective of national laws, it considers, thereby, a retirement period between age 51 and age 80, i.e. the first person leaves the labor market and retire at age 51,[3] while it is assumed that the entire population is retired by the age 80 at the latest.[4] National regulations are assumed to be reflected in the decline of the participation rates after the age of 50.

3. Data Source

This study uses two external data sources: statistics provided by Eurostat and data from the Survey of Health, Ageing and Retirement in Europe (SHARE).

3.1. Eurostat Statistics

The main data sources used in this study are statistics provided by Eurostat. They are used in particular as basis for the simulations of the future population and labor force.

The Eurostat data includes detailed information on the population of each EU country by age, gender and year up to the simulations' base year 2023. Moreover, Eurostat provides a set of population forecast inclusively a detailed summary of the applied assumption. For the time being, we mainly replicate the newest version of those forecasts (EUROPOP2023). In addition to a set of baseline assumptions regarding the future development of fertility, mortality and migration, EUROPOP2023 possess alternative assumptions of those determinants for the formation of sensitivity scenarios. Those alternatives include a set of lower future values and additionally assumptions for a higher national net immigration. In order to get a set of three assumptions for each determinant we generate higher sensitivity assumption for the future mortality and fertility as well by using the distance between the EUROPOP2023 assumption for the lower sensitivity scenario and the baseline scenario in the opposite direction. The assumptions for the considered countries/forecast are presented and discussed in the next section.

The Eurostat data provides, moreover, the baseline information for the labor market predictions through its labor force survey (EU-LFS). This survey provides the participation rates of the population on the labor market (labor force) divided in employed, self-employed and unemployed. Moreover, the survey has data on workers in part-time as well as on the average working hours of the full and part-time employed population. Unlike the population data this information is, however, not provided by single age groups. The participation data are instead provided in five years age groups, the part-time

[2] This is an assumption which becomes more and more outdated as many governments try to motivate pensioners to continue to work by offering generous opportunities to combine work and pension income (even before the statutory retirement age). The share of working pensioners increases therefore. Currently only about 10% of the under 70-year-old combined labor and pension income (see OECD, 2017 or Goll, 2020). However, there are significant differences between countries. The assumption therefore more likely results in an underestimation than overestimation of the number of pensioners.

[3] Lower (retirement) ages represent disability pensions.

[4] MEA-SOCSIM does not consider national mandatory retirement rules in detail. Instead, it is assumed that they are reflected in the participation rates. Mandatory retirement is, thereby, not a part of the pension policy itself but results more often from the fact that labor contracts can legally end with the statutory retirement age. In Sweden, for example, employees have the right to work only until the age 69. Afterwards, they would have to find an agreement with their employer if they want to continue to work.

and working hour information in even rougher and partly overlapping age groups. The provision by age-groups is in so far problematic as we use the decline in the labor participation after age 50 for the computation of the retired population. We, therefore, convert the average participation rates given by age groups into rates by age using a spline-interpolation method. Due to the rougher age units in which the part-time rates and working hours are reported, we refrain from converting these data as this would lead to unstable results.

The Eurostat data includes moreover information on the health status of the older population which will be used in the Section 6-9 as proxy for the future development of the demand on care.

3.2. Survey of Health, Ageing and Retirement in Europe (SHARE)

For various auxiliary purposes, we use the data provided by the Survey of Health, Ageing and Retirement in Europe (SHARE). This multidisciplinary, cross-national panel dataset contains information on health, socioeconomic status, work history and social networks for individuals aged 50+ across European countries (Börsch-Supan et al. 2013). The first wave of SHARE was conducted in 2004 and the most recent wave in 2021/22.

4. Demographic projections

This study considers a selection of eight EU member states that takes geographical and economical aspects into account. The aim is to include the largest European economies as well as countries from Southern, Western, Northern and Eastern Europe. A further criterion is a selection that represents a broad coverage of different social security systems. In total, the following eight countries are considered:

- South Europe: Italy and Span,
- West Europe: France, Germany and the Netherlands,
- North Europe: Denmark and Sweden and
- East Europe: Poland.

With three countries, Western Europe is somewhat overrepresented, whereby the Netherlands are primarily included due to its special flat rate pension system.

For the population forecast, assumptions regarding the countries' future fertility rates, net migration rates and life expectancy are necessary. As this study aims to replicate the Eurostat population forecast EUROPOP2023, the same assumptions are used as far as possible. However, minor deviations are unavoidable, as the EUROPOP2023 assumptions change the population determinants with regard to the age structure more extensively than MEA-SOCSIM is able to do. This applies in particular to the net migration. Those deviations result only in slight differences. The EUROPOP2023 assumptions (by year and age) are provided on the Eurostat homepage (Eurostat, 2023) and are mainly based on historical trends. In general, the EUROPOP2023 assumptions are used as documented. The only major deviation is Sweden. EUROPOP2023 assumes a rather large net migration, which is in stark contrast to the actual situation: in 2024, Sweden has more emigrants than immigrants. Assuming that 2024 is a temporary extreme, we scaled the Swedish migration figures down by 30% which corresponds to the actual figures in 2022 and 2023.

This study generates three population forecasts for each country; one baseline scenario, one for a young population with higher mortality, net immigration and fertility rate and one for an older population with lower mortality, net immigration and fertility rates. In the following, the assumptions for the three determinants are presented and discussed. Table 1 gives an overview of the three scenarios.

Table 1: Scenarios for population forecast

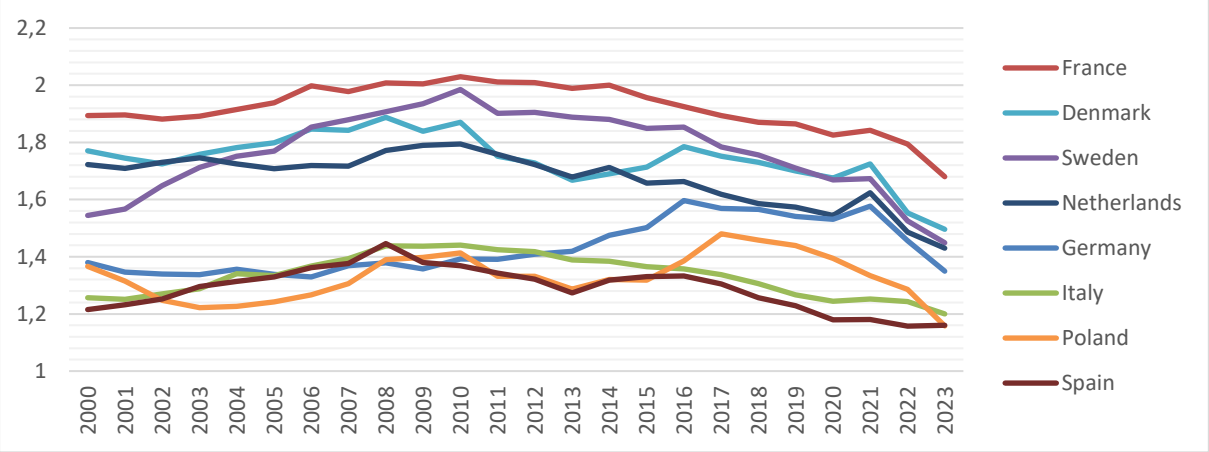
Scenario	Assumptions about Fertility	Migration	Life Expectancy
Young population	High	High	Lower Increase
Baseline population	Mediate	Mediate	Mediate Increase
Old population	Low	Low	High Increase

Source: own table

4.1. Fertility Rates

The future fertility rates depend mainly on the countries' historical birth rates, which are depicted for the last 24 years in Figure 4. It shows some stable differences between the countries in consideration. France for instance represents the country with the highest fertility rate. Temporarily they even exceeded the value of 2.0. Also, Denmark, the Netherlands and Sweden had in comparison to the other countries high fertility rates, although the Swedish one stated from a lower level in 2000 before it increased to nearly 2.0 in 2010. However, after 2010 the fertility rates of all four countries (including France) started to slight decrease. Moreover, a considerable drop occurred after 2021, most likely due to the corona pandemic and rising unstable worldwide political situation. On the other side, there are Italy, Spain, Poland and Germany, which had fertility rates below 1.4 in the past. However, Germany managed to increase its fertility rates considerable from 1.36 to 1.59 between 2009 and 2016. The German fertility rate remained then at the same level as observed for the Netherlands and dropped in the same manner in 2021. A temporary slight increase also occurred in Poland until 2017. However, the fertility rates faced an immediate downward trend afterwards. In Spain and Italy, fertility rates have remained relatively constant at around 1.3 over the last 20 years. At least, there was not an additional drop due to the corona pandemic. It remains to be seen to what extent the decline due to the corona pandemic will disappear again in the coming years or remain for the time being.

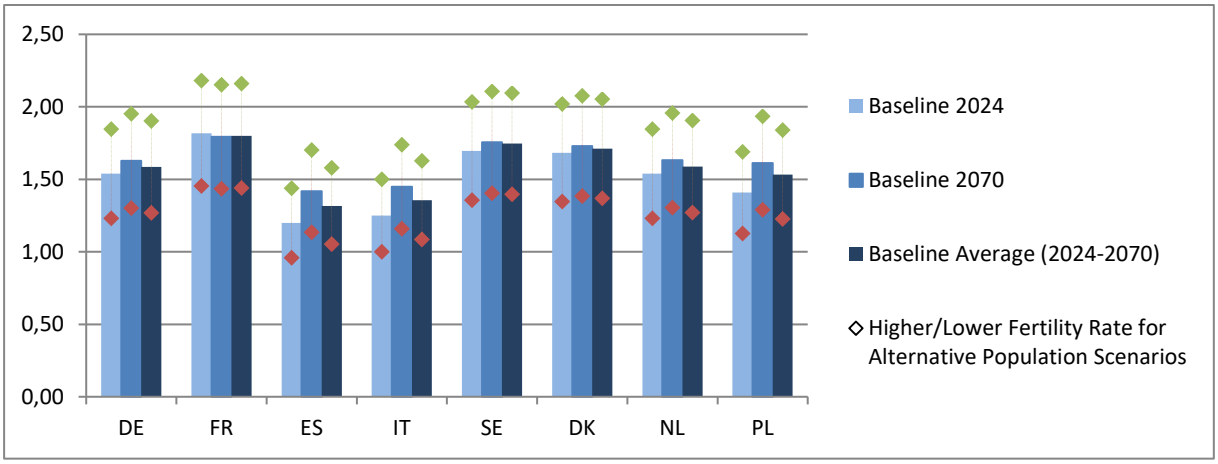
Figure 4: Fertility rates since 2000



Source: Eurostat until 2022 and National Statistics Offices (for 2023)

The Eurostat assumptions are based on data up to the year 2022. The latest drop in fertility rates are therefore not included. Accordingly, the baseline assumptions consider in 2024 fertility rates that are similar to those in 2021. The assumed fertility rates at the start year 2024, the end year of the forecast 2070 as well as their averages over the simulation timeline are depicted in Figure 5. The baseline assumptions are given by the bars while the red/green diamonds indicate the higher/lower fertility rates of the alternative scenarios. The alternative scenarios shift the fertility of each simulation year up/down by around 20%.

Figure 5: Assumption about future fertility rates



Source: Eurostat

Except for France, an increase in fertility is assumed for all other countries and scenarios. Given the recent decline in the fertility rates among countries with historical higher fertility rates, this increase may seem a bit optimistic. On the other hand, the assumed increases are rather small. More questionable is the assumption that the fertility rates should increase in Spain, Italy and Poland by a value of 0.2 between 2024 and 2070, given their relative stable rates in the past. On the other hand, Germany showed that the stable trend can be broken although it has reversed very recently.

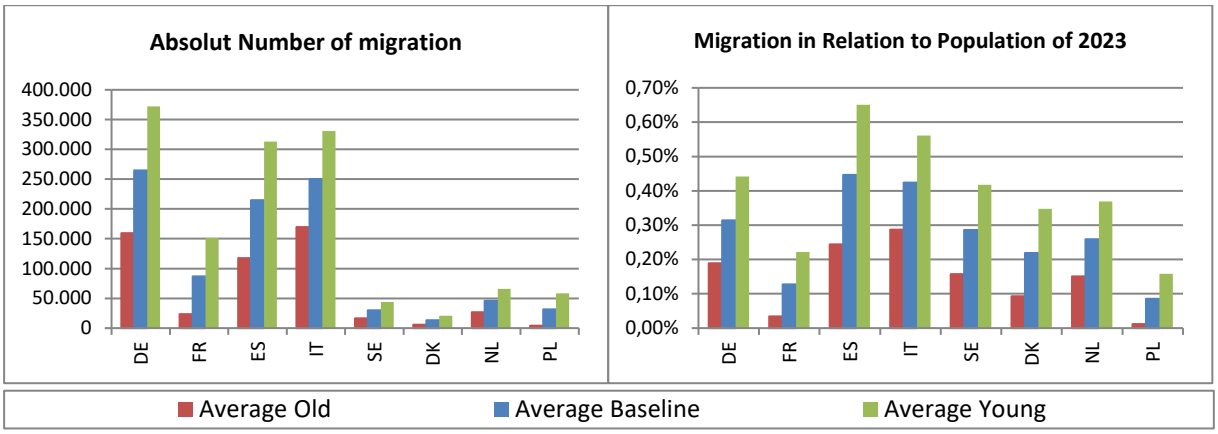
4.2. Migration

Migration predictions are very difficult since migration is more directly dependent on the political, economic and social situation than fertility and life expectancy. A more restrictive immigration policy could immediately reduce immigration, and this appears to going on right now. Sweden is a particularly stark example of a sequence of very high net immigration between 2005 and 2020 to an even slightly negative balance in 2024.

Figure 6 depicts the three EUROPOP2023 assumptions and our adaptation for Sweden described above regarding the annual number of net migration. More precisely, its left graph depicts the annual average number of net immigrants over the simulation period. Not shown is the changes in annual migration over time, which is substantial for several of the countries. For instance, in Poland more people are expected to leave at the start of the projection which then changes into a net immigration. For other countries (Germany and Spain in particular), a quite high immigration is expected at the beginning of the simulation due to the recent refugee flows (e.g. due to the Ukraine war) which is then assumed to return to its historical average quickly in the coming years. The Europop2023 takes into account, moreover, some additional factors in the determination of future migration. For example, a pull effect of 10% is considered as reaction to a shrinkage of the working population (for a detailed overview of the key assumptions see Eurostat, 2023).

The absolute number of migrants is, however, hardly comparable across countries since the number of migrants tends to depends on the size of a population and its economy. The left graph of Figure 6 shows, therefore, the average net migration rate as a percentage of the population in 2023. There are some notable differences between the patterns of absolute and relative net migration: the net migration rates of Spain and Italy amount to 0.4% and are therefore substantially higher than those of Germany and Sweden, which are around 0.3%. The rates for the Netherlands and Denmark are slightly lower at 0.25%. France, which is in fourth place in terms of absolute net immigration, is in seventh place with a migration rate of 0.13%. Poland has the lowest rate at 0.9%.

Figure 6: Assumptions net migration



Source: Eurostat

4.3. Life Expectancy

For the ageing of the population the development of mortality/life expectancy, is the most important factor. In the past life expectancy has risen steadily and so has the older population. There is little dispute that this trend is expected to continue in the coming decades. Questionable is its extent and speed. Moreover, it is to be seen how the decline in life expectancy during the corona-pandemic affects the long-term development of the life expectancy. On the one hand, a temporary decline is conceivable, which has no long-term impact. In this case, the corona period should be not considered in the assumptions regarding the future development of life expectancy. Alternatively, a lingering effect can be assumed. The EUROPOP2023 assumptions are mainly based on the former case and presume a quick return of mortality rates to the pre-pandemic level and no influence on the long-term trend. However, there are other official projections that consider the second possibility (e.g. the 15th coordinated population forecast of the German Federal Statistical Office). In general, it can be noted that the EUROPOP2023 presumes stronger increases in life expectancy than most national statistical offices (see Table 2).

Figure 7 shows the EUROPOP2023 assumptions on life expectancy at birth for 2024 and 2070, separately for women and men. The alternative assumptions regarding higher and lower future mortality are given by the green and red diamonds. There are some noteworthy distances between the countries' life expectancies. Especially, the Polish population has in comparison to the other populations a rather low expected life span. Accordingly, to the current periodic life tables newborn boys in Poland are expected to life 5 years less than newborn German boys which themselves are expected to life 2.5 years shorter than Italian or Spanish boys who have the highest life expectancy among the considered countries. Also, newborn Polish girls have a lower life expectancy than the girls in all other considered

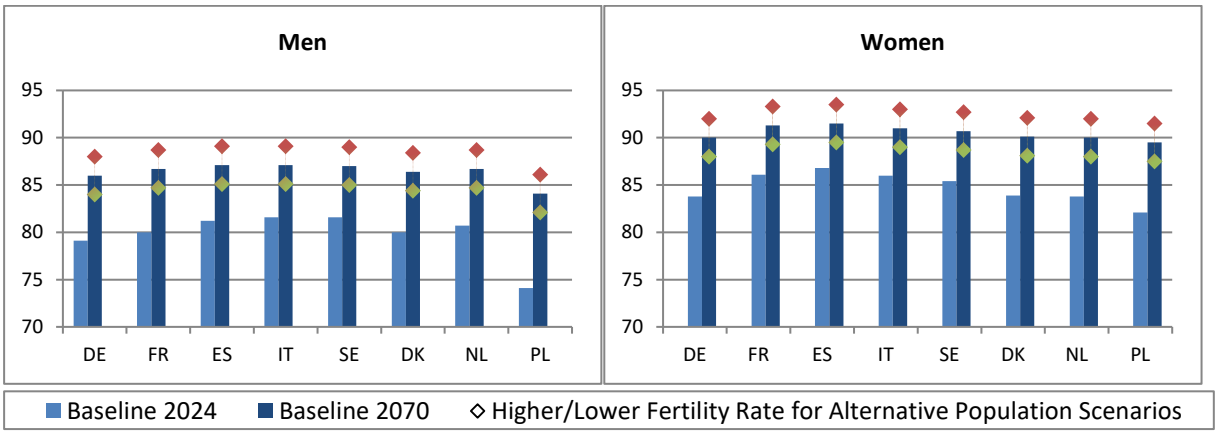
countries. However, the difference is less pronounced. The highest life expectancy can be observed in the southern European countries, followed by France and Sweden.

Table 2: Baseline assumptions on life expectancy in 2070 by EUROPOP2023 and national statistical offices

	EUROPOP2023		National Statistical Office	
	Men	Women	Men	Women
Germany	86.0	90.0	84.6	88.2
France	86.7	91.3	87.5	90.0
Spain	87.1	91.5	86.03 (in 2071)	90.05 (in 2071)
Italy	87.1	91.0	85.8	89.2
Sweden	87.0	90.7	87.44	89.74
Denmark	86.4	90.1	88.2	90.3
Netherlands	86.7	90.0		
Poland	82.3 (in 2060)	86.5 (in 2060)	78.63 (in 2060)	85.14 (in 2060)

Source: Eurostat and national statistical offices

Figure 7: Assumptions on future life expectancy



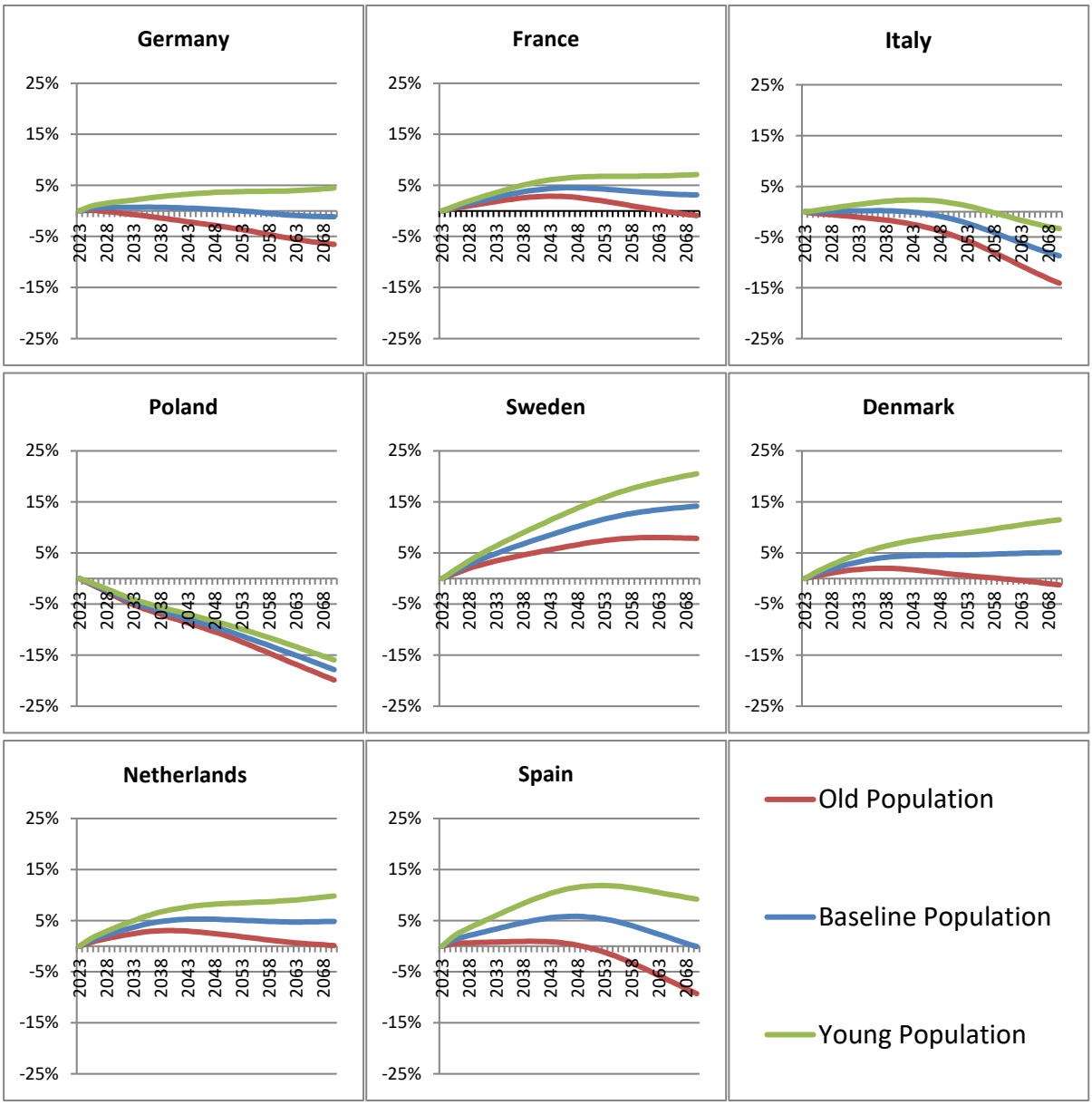
Source: Eurostat

For the future, Eurostat assumes a further increase in life expectancy. For men, the range of the increase is between 5.4 years (Sweden) and 10 years (Poland), with the increase in Poland being comparatively high. The second-highest increase is assumed for Germany with 6.9 years. This comparatively high growth rate results from the comparatively low life expectancy of the Polish male population nowadays. For women, the assumed increase of the life expectancy is lower with 4.7 years in Spain to 7.4 years in Poland. In general, it is expected that the life expectancy increases more in those countries which have currently lower life expectancies. This does not change the ranking of countries in terms of life expectancy. For the alternative scenarios, the increase in life expectancy is assumed to be 2 years lower or higher.

4.4. Change in Total Population Size

The development of the size of the populations is depicted in Figure 8. For reasons of comparability, we show the rate of change relative to the base year 2023.

Figure 8: Change in population size (in % relative to population size in 2023)



Source: own computation

Figure 8 shows that the populations of France, Denmark and the Netherlands follow relatively similar trends. Under the baseline scenario, their populations will increase by around 5% over the next 15 to 20 years. The Danish and Dutch population remains subsequently at the new level, while the French population subsequently decreases slightly. In 2070 it is, however, still 3% higher than at the beginning of the simulation period. In the alternative scenario of a future older population, the total population of the three countries also increases initially. In the long term, however, it shrinks again and in 2070 is even slightly below its size in 2023. If, on the other hand, fertility and immigration are assumed to be higher (future younger population), their populations increase in size more strongly, although this scenario assumes higher mortality rate and therefore smaller older population. Under the baseline scenario, the German population does not change much in size. At best there is a slight downward trend. Under the alternative scenarios, however, its population grows/shrinks relatively continuously by around 5% until 2070. The Italian population remains initially also relatively constant under the baseline assumptions but shrinks relatively quickly after 2040 by approx. 9% until 2070. Its population even

shrinks under the scenario of a future younger population after a temporally slight increase. The only other country where this is the case is Poland, which population shrinks sharply from the beginning under all three scenarios. By 2070, the Polish population is expected to be 17% smaller than in 2023 under the baseline scenario, making Poland an extreme case. The comparatively sharp decline in population size is most likely due to the comparatively low immigration. Another special case is Sweden, whose population grows strongly in all scenarios. According to the baseline assumptions, the Swedish population will be 14% higher by 2070; under the alternative scenarios by 8% and 21% respectively. Spain shows, at last, a relatively uneven development. In the baseline scenario, the population initially grows by 5% and then shrinks back to the size of the base year. Assuming an older future population, the size of the Spanish population does not initially change until it starts to decline in 2045 and is 9% lower in 2070 compared to the base year. By contrast, assuming a younger future population, the population grows by 9%.

Overall, there are strong differences between the countries but also similarities. It is also noticeable that the differences between the three scenarios vary considerably in some cases. For example, the discrepancy between the alternative scenarios and the baseline scenario in Sweden and Spain is around 6 to 9 percentage points, whereas in Poland it is only 2 percentage points.

4.5. Old-Age-Dependency Ratio

The population size does not provide any information about the composition of the population. In particular, it does not reveal the extent to which the population is ageing, which represents one of the central challenges for the European social systems. A variable, which provides information on this, is the old-age dependency ratio. This rate puts the older population in relation to the population in working-age. Its exact definition can thereby vary. In this study the rate is given by the relation of the over-65-year-olds to the 20 to 64-year-olds. Its development is depicted in Figure 9.

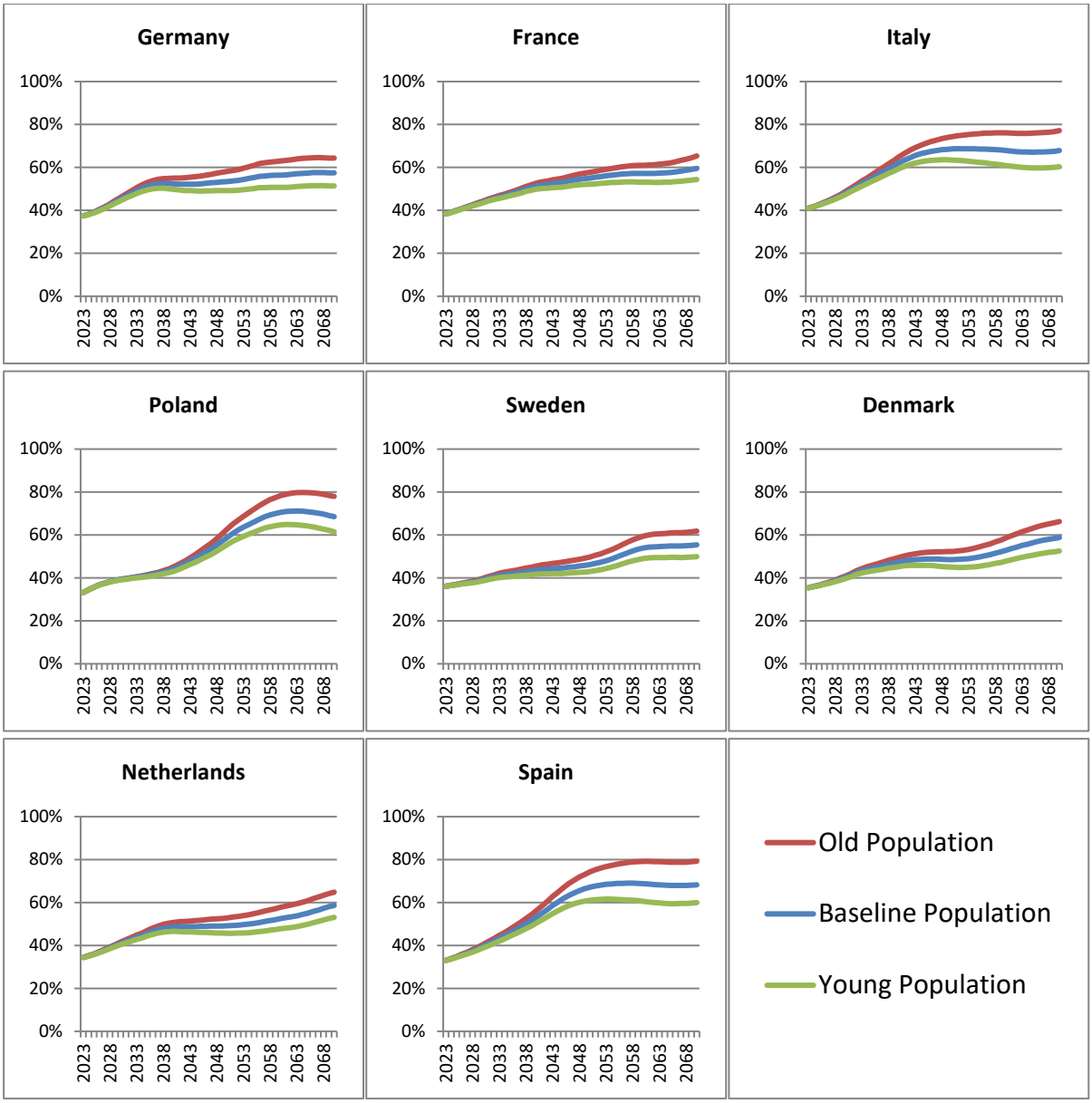
General, the old-age dependency ratio increases during the simulation timeline for each scenario and country. However, the extent of the increase varies, whereby two cases can be distinguished. The first case includes Germany, France, Sweden, Denmark and the Netherlands, whose old-age dependency ratios rise to 55-59% by 2070 under the baseline scenario. The absolute growth is thereby slightly higher in the Netherlands and Denmark with 23-24 percentage points than in Sweden, Germany and France with 19-21 percentage points. The second case includes Italy, Spain and Poland, whose old-age dependency ratios rise to nearly 70% by 2070 under the baseline scenario. Their old-age dependency ratios in 2070 are therefore 10 percentage points higher than those of the previous group. For Poland and Spain, the difference in the absolute growth is even larger given the fact that those two countries have the lowest old-age dependency ratios in 2023.

Regardless of this grouping, most countries also have their own characteristics in the timing of the increases. In Germany, for example, the main increase of the old-age dependency ratio takes place in the next 15-20 years. Subsequently, it rises only slowly. In France, on the other hand, the increase remains relatively constant over the entire simulation period. Denmark and the Netherlands show a similar pattern, consisting of a phase with a low growth rate between 2040 and 2055 and two phases with stronger growth rates before and after this one. In Italy and Spain, the old-age dependency ratio increases until around 2050 and remains relatively stable thereafter. In Poland, the main increase occurs after 2035 and lasts until around 2060, so the growth phase is around 10 years later than in Italy and Spain. In addition, the old-age dependency ratio in Poland appears to fall slowly after 2060. In

Sweden, the main increase occurs between 2050 and 2060, which is like in Poland later than in most other countries.

Under the alternative scenarios of an older or younger future population, the old-age dependency ratios increase more or less. In 2070, the discrepancy to the baseline scenario varies from 5 percentage points (France) to 11 percentage points (Spain). However, noteworthy differences appear not until around 2040. This is partly due to the fact that the different assumptions regarding fertility rates only have an impact on the old-age dependency ratio after 20 years, as the ratio does not take into account individuals younger than 20 which show the strong relevance of the fertility assumptions on the long-term development of the population structure.

Figure 9: Old-age dependency ratio by country (in %)

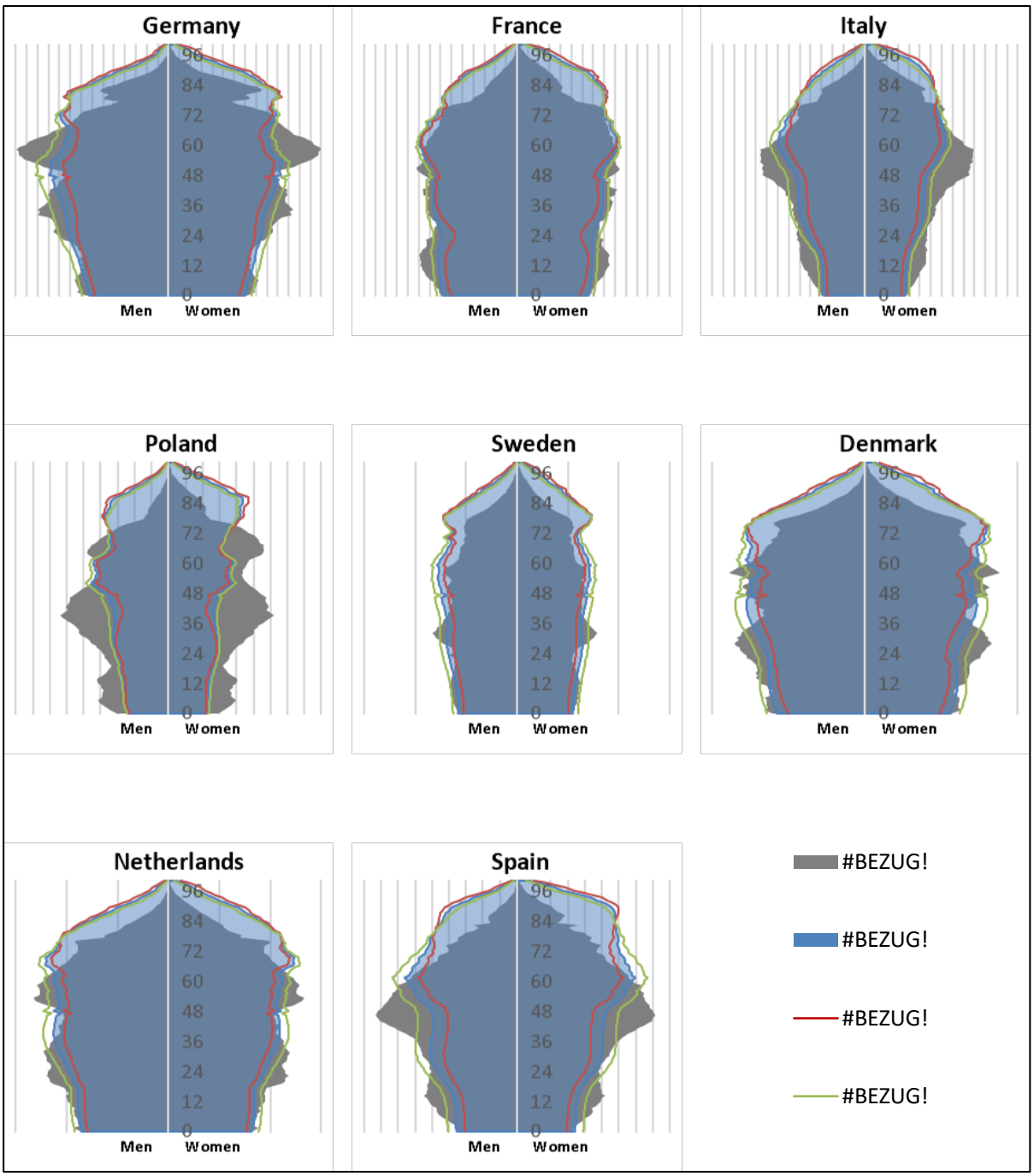


Source: own computation

4.6. Population Pyramids

Figure 10 compares the age distribution of the populations. It shows the population pyramids of the base year 2023 (gray area) and the final simulation year 2070, whereby the baseline scenario is depicted by the blue bars, the alternative scenario of a future younger population by the green line and of future older population by the red line. The scaling of the figure is not uniform between the countries. The vertical lines represent 5000 people in each case.

Figure 10: Population pyramids



Source: own computation and Eurostat
Note: vertical lines indicate 5000 people

The short and medium-term development of the population essentially depends on the current age structure, which is a result from the past fertility rates, mortality and migration but also from shocks

like wars or diseases. The composition of today's younger population is, moreover, relevant in the long run, as the 0- to 50-year-old of 2023 are the 47- to 98-year-old in 2070. It is therefore essential to take a look at the current population to understand the so far presented development of the more aggregated values. Thereby, it is decisive whether, when and to what extent a population has particularly pronounced (baby boomer cohorts) or underrepresented cohorts.

Out of all countries France has the most homogeneous population structure. Only slightly more pronounced cohorts can be observed for the middle and younger cohorts. What is striking, however, is the discrepancy between the size of the cohorts born before 1946 and those born after that year, which cannot be attributed solely to mortality in older age groups. The reason is actually a lower fertility rate prior to 1947. On average the fertility rate was 2.23 between 1920 and 1945 but 2.79 between 1945 and 1970. A general decrease in fertility occurred thereby in many European countries during the Second World War and was also followed by (a temporary) increase (e.g. Denmark and the Netherlands). However, in France the period with lower and higher fertility rates were longer and more pronounced. The increase in the old-age dependency ratio in France is therefore not only due to the increase in life expectancy, but also to the fact that these smaller now old cohorts will be replaced by larger cohorts in the coming years.

Another country with a quite homogeneous age structure is Sweden. Here, only small phases with more pronounced cohorts can be observed for the years around 1990 (around age 30). In fact, those cohorts are one reason for the faster increase of the old-age dependency ratio after 2050 as they reach the age of 65 at that time. Not as smooth as in France and Sweden but still quite homogeneous are the populations pyramids of the Netherlands and Denmark. They have somewhat larger cohorts born around 55 and 30 years ago. However, compared to other countries the differences to the other cohorts are still small. Nevertheless, those two slightly more pronounced age groups explain the two stronger growing phases observed in the development of their old-age dependency ratios.

Also, Spain and Italy have quite similar population pyramids, which is characterized by a particularly high proportion of the over 40-year-olds and comparable small cohorts born in the last 40 years. For instance, the largest cohorts (cohort 1965 in Italy and cohort 1977 in Spain) are ca. 50% larger than the cohorts born 30 years ago and 150% larger than the cohort born in 2023. The main reason for this is a strong decline in the fertility rates after 1975. The strong discrepancy between the older and younger cohorts lead to the striking increase in the old-age dependency ratio as the populations are not only aging due to the increase in life expectancy but also due to the declining middle-age population as a result of the low fertility rates of the last decades.

Germany and Poland have nowadays the most inhomogeneous age structure of all countries. In Germany, this is due to an underrepresentation of the cohorts born around 1945 compared to the years before and thereafter which led to a pronounced indentation in the population pyramid. Moreover, in Germany the cohorts born around 1960 are quite large, while the subsequent cohorts are noticeably smaller due to a rapid decline in birth rates. The cohorts born around 35 years ago were then again larger. One reason for this is that at this time the baby boomer reached the age of giving birth themselves. Another reason are strong immigration phases to Germany after the Second Would War, which stabilized todays middle age population despite similar low fertility rates as Spain and Italy had at the same time. Due to this the double aging effect is not as strong as in Italy and Spain, although its population will age faster in the next years due to the pronounced baby boomer generation.

In Poland, the ups and downs are even more pronounced. It starts with a similar underrepresentation of the cohorts born before 1947 as observed for France. However, the difference in the Polish fertility rates before and after 1947 were equally strong as in the Netherland or Denmark. The low very old population is, therefore, rather a result from the Polish population decimation due to the Holocaust and Porajmos during the German and Soviet occupation. Furthermore, the changed borders and the associated expulsion of Germans and Ukrainians as well as the resettlement of Poles may also have had an effect on the official number. The cohorts born after the Second World War is then larger, with the cohorts of those now aged 65 and especially those aged 30 to 50 making up the majority of the Polish population. In comparison to other countries (Italy, Spain and Germany), the particularly dominant baby boomer cohorts in Poland are therefore around 15-20 years younger, which explains the later increase of its old-age dependency ratio.

Until 2070 the population pyramids are changing in two aspects for all countries. Frist, the older age groups get larger due to the decreasing mortality and other country-specific reasons pointed out above. Second, the pyramids get more homogenous for the young- and middle-aged as the assumptions do not include sharp changes/shocks. In most countries the middle and younger age groups are smaller than in 2023. For France, Germany, the Netherlands, Sweden and Denmark this applies in particular to those ages that were taken by more pronounced (boomer) generations in 2023. For Spain and Italy, this applies, on the other side, for all ages below 60; for Poland even for all ages below 70. The decrease is, moreover, particular large in Poland.

The scenarios of a future younger and older population differ primarily in the size of the young and middle-aged population, while the number of very old people does not deviate significantly from the baseline scenario. The population of the young and middle-aged population is larger in the scenario of a younger future population due to the higher immigration and fertility, while it is smaller for the older population due to the higher mortality. Higher birth rates only have an influence on the size of the population under 47, while mortality and migration affect all age groups. Thus, higher immigration rates also increase the older population while higher mortality rates also result in more deaths among the middle-aged and young population. The higher mortality rates of the younger population scenario therefore outweigh the population-increasing effect of higher immigration in older age groups, but not in the middle age groups. For the older population scenario, the same pattern applies in the reversed direction.

5. Labor Supply

The next aim of this study is to determine the development of the labor supply in the course of the demographic change and to discuss to what extent any declines could be offset by so far “untapped” labor potential. Specifically, we are interested in the “untapped” employment potential of:

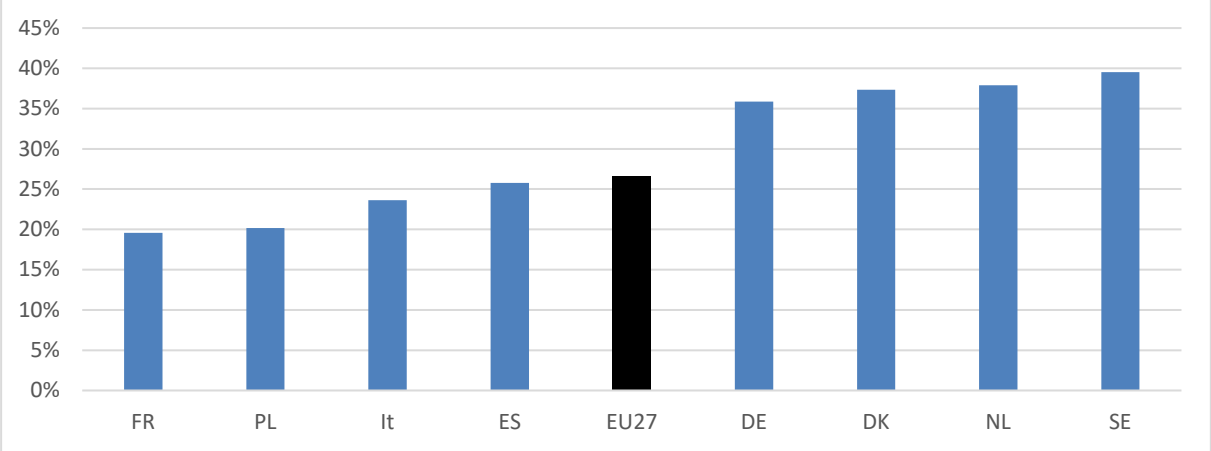
1. Older Workers,
2. Women,
3. Unemployed and
4. Female part-time employed.

The first three determinants address the number of employed people while the last one varies the number of hours worked.

5.1. Labor Participation of Old Worker

Figure 11 shows the labor market participation rates of the 60- to 70-year-old. France and Poland belong with rates of 20% to the countries with lower participation rates among the older population, while Italy (24%) and Spain (26%) have participation rate around the EU average. Germany, Denmark, the Netherlands and Sweden are, on the other hand, at the upper end of the scale with rates between 36% and 40%. The participation rates of the older population increased over the last decades in all countries under consideration. The increase itself can be partly associated to former pension reforms (see Börsch-Supan and Coile, 2020 and Börsch-Supan and Coile, 2025). In particular, the statutory retirement age is relevant for the labor market participation of the older population. For instance, out of the countries under consideration France and Poland have not only the lowest participation rates but also the lowest statutory retirement ages. However, the participation rate does not solely depend on the pension policy. Other factors are for example social norms encouraging an early retirement or the willingness and necessity to employ older people, hence the opportunity to continue to work.

Figure 11: Labor market participation rates of 60 to 70-year-old, in 2023 (in%)



Source: Eurostat

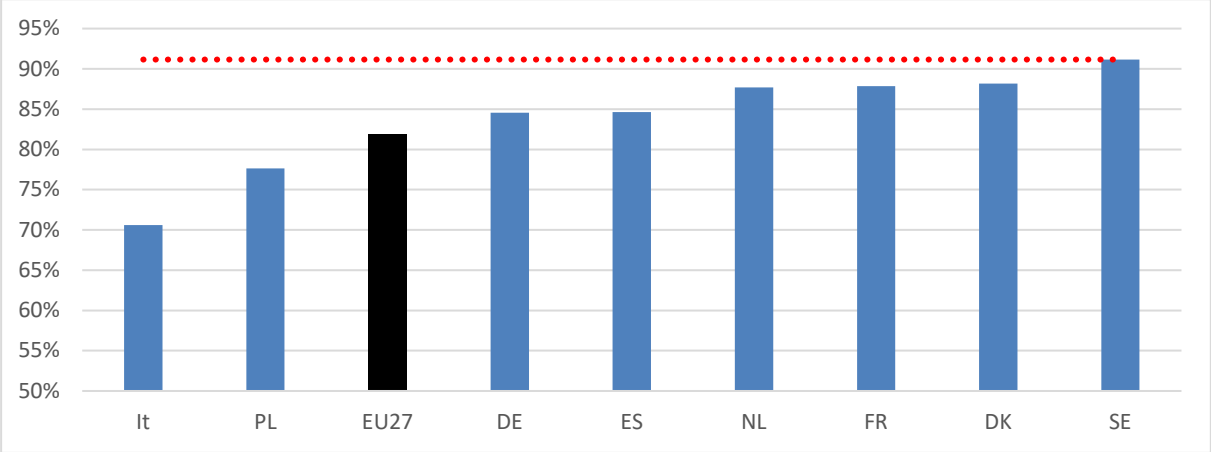
The future participation potential of the older population depends on several factors. One is the health of the older population, which should further improve in order to increase the acceptance to prolong the work phase. More precisely, not only the life expectancy should increase but also the years in good health. Another factor is the actual opportunity to prolong the labor contract or receive a job offer despite the higher age. Most important is, however, that the policy and especially the pension policy introduce incentives to prolong the work phase. The most straightforward method for this is to increase the statutory retirement age, which is the current policy in most of the countries under consideration.

5.2.Untapped Labor Potential of the Female Population

One way to see that there is untapped female labor potential is to compare it with the labor supply of men. Figure 12 shows the relation between female and male labor force participation rates. The countries considered are spread across the entire European scale. Sweden has the second largest female participation rate among all EU member states (only Finland has a higher one). It is less than 10% lower than the participation rate of the Swedish men. The Netherlands, France and Denmark also have rather high female participation rates, which are around 12% lower than the participation rates of men. Germany and Spain are in the middle of the EU countries. The female participation rates are ca 15% lower. In Poland and especially Italy the female participation rates are, on the other side, considerably lower.

The participation rate of Polish women makes up only 78% of the males' rate. In Italy, the ration is only 71%. Italy has actually one of the lowest female labor force participation rates in the EU and the lowest overall employment rate (see Carta et al. 2023).

Figure 12: Female labor force participation rate in relation to male labor force participation rate, in 2023 (in %)



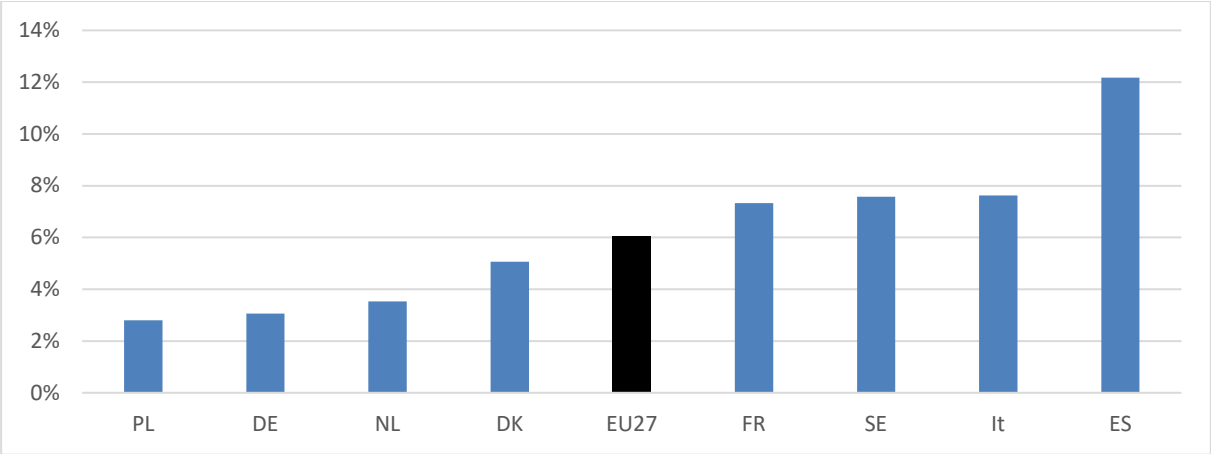
Source: Eurostat

An increase in female employment is not impossible. The proportion of women in employment has risen continuously in most European countries in the last decades. Over the whole EU, female employment rate has risen by 6.4 percentage points in the last 20 years and has experienced large increases before (see Carta et al. 2023). However, there are still many obstacles that prevent women from participating in the labor market such as deficits in the compatibility of child-rearing and work.

5.3. Untapped Labor Potential of Unemployed

While tapping into the labor potential of older people and women is associated with high hurdles, unemployed represents a theoretically already available source of labor. If labor supply decreases, e.g. due to demographic change, this should have a positive effect on the unemployment rate as the competition for open job offers decreases. However, this is only true to a limited extent, as unemployment has several causes, such as a lack of qualifications.

Figure 13: Unemployment rates, in 2023 (in %)



Source: Eurostat

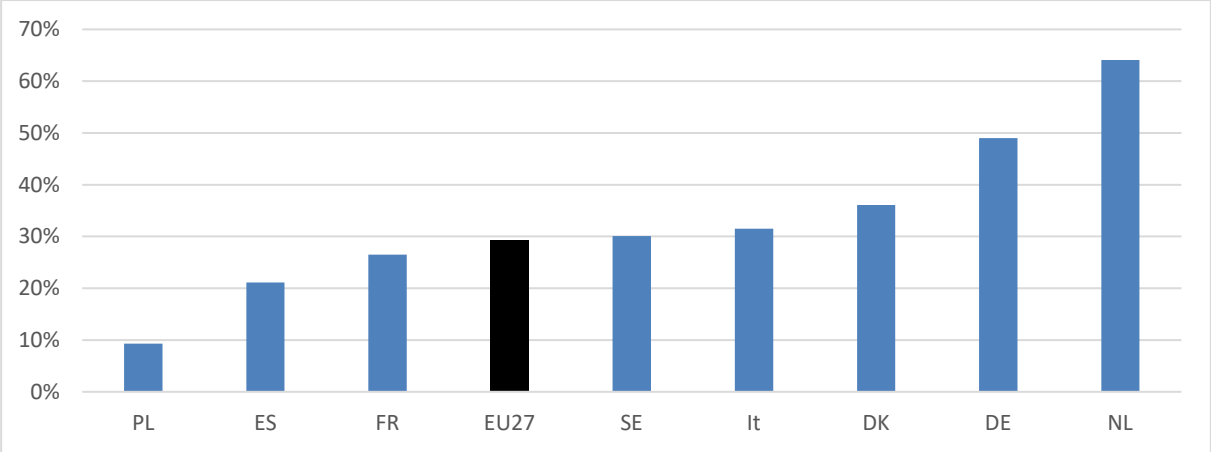
The potential labor supply of unemployed depends obviously on the amount of unemployed and therefore on the national unemployment rates which are shown in Figure 13. Half of the countries under consideration are among EU-countries with higher unemployment. Those are France, Sweden, Italy and Spain, whereby Spain has the highest unemployment rate of all EU countries with 12%. The rate is considerably lower in France, Sweden and Italy with around 7% to 8%. The other considered countries have unemployment rates below the EU average. They reach from 3% (Poland) to 5% (Denmark).

5.4. Untapped Labor Potential due to Part-Time Employment

Part-time is very common among women, see Figure 14. In most EU countries, part-time rates among women are more than double that of men (compare Appendix 1). The Netherlands have the highest part-time rates in the EU (64% of women in the labor force), Germany somewhat lower (49%). The Spanish, French and Italian part-time rates are around the EU average. Poland, in line with most other eastern European countries, has a much smaller part-time rate (9%). The reasons for working part-time can be manifold. Women work mostly part-time due to other family responsibilities, such as bringing up children or caring for incapacitated adults (see Eurostat, 2018). Other common reasons are health restrictions, the pursuit of an education but also not being able to find a full-time employment.

In the future, part time may become more common among older workers as several governments aim to increase the older populations' labor market participation through more generous partial retirement schemes.

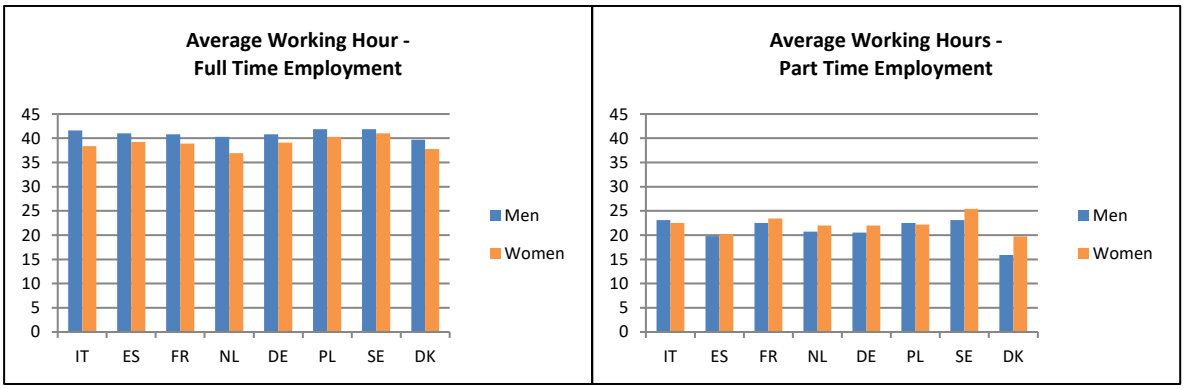
Figure 14: Part-time employed women as percentage of total employment, in 2023



Source: Eurostat

Working hours of part-time employed can vary considerably, as working hours can be reduced in varying degrees compared to a full-time employment. In this study only, the average difference in working hours as shown in Figure 15 is considered. In the considered countries full-time employed men work on average 41 hours and women 39 hours. The largest difference between the average working hours of full-time employment men and women can be observed for the Netherlands with 3.4 hours and the smallest difference in Poland with 1.6 hours. Part-timers are working on average half as long as full-time employed. Women work on average one hour more (22 hours) than men (21 hours). However, this is not the case in Italy and Poland, where part-time employed men also work more hours than women.

Figure 15: Average working hours by employment status and gender, in 2023



Source: Eurostat

There is current a rising movement to further reduce the working hours in some countries. On the other hand, there is already a shortage of labor in many sector (see ELA, 2024). Given the demographic change combined with the existing shortage, it is therefore questionable whether this movement will be successful or will continue in the long term. Nonetheless, some companies are currently testing the effect of a reduction in working time on the productivity. In other sectors, unions have already successfully fought for a further reduction in working hours. One prominent example is the new 35-hour week at Deutsche Bahn, in Germany.

5.5. Labor Market Scenarios

This study examines two sets of labor market scenarios. The first one keeps the current labor force participation rates constant also in the future. The second set aims to exploit the untapped labor supply by using the highest current national participation rates as benchmark. We call the first set "Status quo" and the second one "Untapped potential". The underlying assumptions are presented in Table 3.

In the untapped potential scenario, we use Sweden as benchmark for the potential labor force participation of older workers and women (see Figure 11 and Figure 12) since they are highest among the eight countries. The benchmark for bringing the unemployed back into the labor market is more modest and uses the EU average (see Figure 13).

Table 3: Labor market scenarios

	Status quo	Untapped potential
Old-Workers Participation Rate (50+)	Constant as in 2023	Relative decline of countries' participation rates after age 50 as in Sweden
Female Labor Participation	Constant as in 2023	Increase female labor force participation rate, so that Swedish relative difference between the participation rates of women and men applies (see Figure 12)
Part-Time Rates	Constant as in 2023	Use Swedish age-specific part-time for women if national part time rate a higher (see Figure 14)
Unemployment Rates	Constant as in 2023	Use EU average of age-specific unemployment rates for all countries

Source: own table

To determine the amount of "untapped" labor potential, the respective labor market rates are transferred in an appropriate way to the other countries. In terms of unemployment, this is done simply by using the EU27 age-specific rates directly if they are lower than the national rates. The Swedish labor force participation rates for older people and women, on the other hand, cannot simply be taken as they are for the other countries. The main reason for this is that the Swedish participation rates of the middle-aged and men also differ from those of the other countries and, for consistency, these differences should be taken into account when adjusting the employment rates of women and older workers. For women, this is achieved by applying the Swedish relative difference between the gender-specific labor force participation rates instead of the actual labor force participation rate of Swedish women. In addition, for women, the Swedish part-time employment rates are used if they are lower than the current part-time employment rates in the country concerned. With regard to the labor force participation of older people it is instead assumed that the labor force participation rates of men and women after the age of 50 decrease in the same relative manner as in Sweden.

Unless a scenario mentions explicitly an alternative development, the remaining labor market rates are kept constant. This applies for instance to the split of the labor force into employed and self-employed. The simulation also does not consider any changes to the average working hours of full- or part-time employed. All labor market scenarios are computed for the baseline, young and old population scenarios.

5.6. Demographic implications on labor supply: the Status Quo scenario

Population aging will have large impacts on labor supply in Europe. Figure 16 shows the percentage change in the number full-time equivalent workers (FTEs) relative to the base year 2023 for the three population forecasts in the Status Quo labor market scenario. For the baseline population scenario, a downward trend in the labor supply emerges in most countries. However, the size of the decline differs considerably between countries. In France, the number of FTEs initially remains relatively constant before it starts to decline after 2035. This decrease accumulates to 7% by 2070. A similar decrease appears in Denmark and the Netherlands. However, the decline takes place in two steps due to the retirement of the two baby boomer generations in Denmark and the Netherlands. The first decrease, which accumulates to around two percent points, starts in the next years and last until 2040, the remaining decline takes place after 2055. In Germany, the total decline of the labor force is with 12% nearly twice as high as in Denmark and the Netherlands. Half of this reduction takes place in the next 10 years due to the retirement of the pronounced baby boomer generation in Germany. The decline is even larger in Spain and Italy with 18% and 20% by 2070. The strong decline illustrates thereby the large difference between the cohorts born before and after 1975. The downwards trend is quite homogenous in both countries. The by far largest and fastest decrease happens in Poland, which labor force sinks for the baseline population forecast by 12% until 2040 and 33% until 2070. This also reflects the strong decline of the Polish population. On the contrary, Sweden is the only country whose labor supply increases for the baseline population scenario. The total increase until 2070 amount to 5% and is temporarily even 6% large.

The downward trends are even stronger for the old population scenario because the working-age population is declining more rapidly due to lower fertility and migration rate. This also leads to a decline in the number of FTEs in Sweden. Although their number will initially increase by 2% until 2045, it will then fall by 4% compared to 2023. For the other countries, an additional decline in the number of FTEs

arises, which range from 5 percentage points (Poland) to 12 percentage points (Spain) compared to the baseline population scenario.

On the other side, the higher fertility and immigration rates of the younger population scenario have a positive effect on the labor supply. Due to the symmetry in the assumptions, the increasing effect is, thereby, similarly strong to as the reducing effect of the old population scenario. Under the young population, Sweden is, moreover, not the only country anymore with an increase in the number of labor market participants. The number of FTEs also rises in Denmark by 2% until 2070 and at least temporarily in the Netherlands. Their number remain, moreover, relatively stable in France. In Germany, the labor force will remain more or less stable after 2035. Before then, it will fall by 4%, which is primarily a consequence of the low birth rates after 1960. The Spanish labor force does increase first but still decreases by 7 % on the long run.

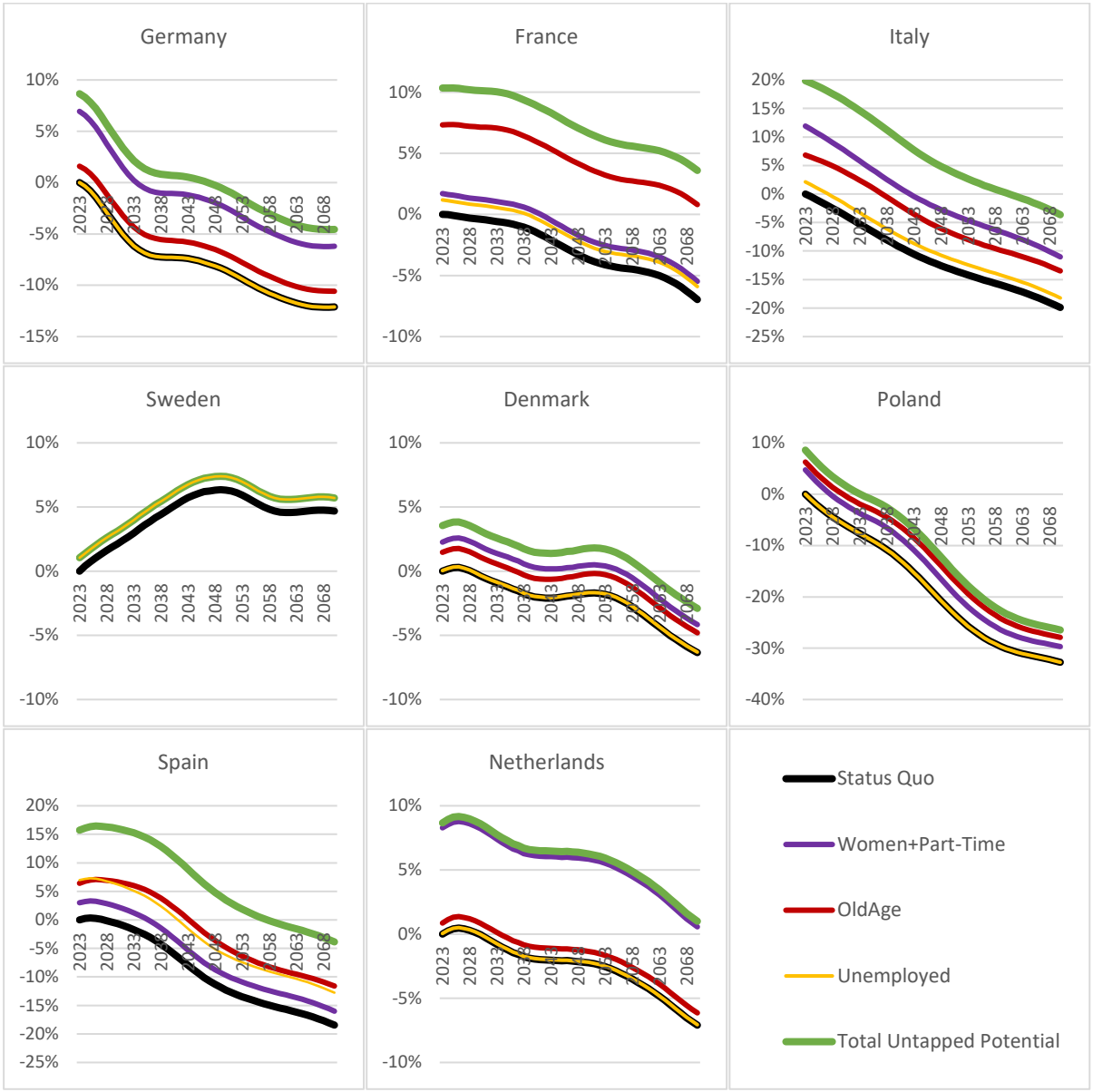
Figure 16: Change in number of labor force participants (FTE) by population scenario (Status Quo labor market scenario; in % relative to FTEs in 2023)

Source: own computation

5.7. Exploiting the untapped labor potential

The relative change in full-time equivalent workers for the Untapped Labor Potential scenario is depicted by the top green line in Figure 17. We also show separately the relative change if only one of the groups with untapped labor potential is put to work (older workers, women, and unemployed). For comparison, the black line refers to the Status Quo labor supply scenario. Its development is identical to the baseline case of Figure 16.

Figure 17: Change in number of labor force participants (FTE) in the Untapped Labor Potential scenario (baseline population, in % relative to FTEs in 2023)



Source: own computation

For all countries, the number of FTEs is higher than in the Status Quo scenario. In the Netherlands and France, the demographically induced decline can be offset or even turned into an increase. However, the policies, which create this increase, are very different across the eight countries. They are discussed in the sequel of this section.

5.7.1. Reduction of Unemployment

The unemployment scenario reduces the national unemployment rates to the EU average for those countries that are above this average (see Figure 13). The impact on the total working hours is consequently larger for those countries with currently higher unemployment rates. These include the Southern European countries Spain and Italy, as well as Sweden and France. On the other side, unemployment is below than the EU average in Poland, Germany, Denmark and the Netherlands. As a consequence, there is no effect of the Unemployment Scenario on the number of FTEs for those countries. The by far largest effect on the FTEs can be observed in Spain with additional 7% FTEs. In Italy the untapped workforce amount to 2% of today workforce in France and Sweden to 1%. Hence, high unemployment represents potential labor supply to offset the decline in labor supply at least in some countries. However, this is not always the case as unemployment is already low in some countries like Poland.

5.7.2. Older workers labor participation

In the Untapped Labor Potential scenario, we assume that all countries will reach the Swedish level of old-age labor force participation. Consequently, we see no changes for Sweden but large changes for those countries that have low old-age labor force participation, especially France, Italy, Spain and Poland, as opposed to Germany, Denmark and the Netherlands, where old-age labor force participation is already high (see Figure 11).

Overall, increasing the participation of the older population in the workforce can counteract a considerable part of the decline in the work force in those countries with currently low participation rates among the elderly. This applies in particular to France, where the decline in the FTE workforce can be offset completely by the untapped older worker. However, it remains to be seen to what extent this is possible in countries that are traditionally opposed against any change in the retirement age such as France.

5.7.3. Increase Female Participation Rate

Labor force participation rates and employment rates are in all European countries smaller for women than for men (see Figure 12 and Appendix 1). Part of this difference is due to women's traditional family responsibilities. On the other hand, national differences in the gap between the participation rates of men and women show that at least in some countries there is additional potential for women to participate in the labor market. Moreover, a higher participation of women in working life should not be prevented by family obligations. The removal of such obstacles – such as better childcare – should therefore be a political goal. Similar to old-age labor force participation, we assume in the Untapped Labor Potential scenario that all countries will reach at least the Swedish level of female labor force participation. This holds for both general labor force participation and part-time rate among women.

The extent of the positive effect depends on the current discrepancy between the participation rates of men and women. Consequently, the scenario has no impact on the Swedish total working hours as Sweden has one of the largest female participation rates among the EU member countries. The effects are particularly large in Germany, the Netherlands and Italy, less so in France, Denmark and Spain. The main effects in Germany and the Netherlands are due to their large share of part-time as compared to Sweden, while in Italy, the main effect is due to generally low female labor force participation. In the Netherlands, the total untapped labor potential is, moreover, mainly made up of the untapped labor potential of women.

5.7.4. Total effect of exploiting the untapped labor potential

The green line in Figure 17 shows, that exploiting the untapped labor potential cannot compensate for the declining population in working age in Poland. In Sweden, on the contrary, the labor force increase anyway accordingly to the population assumptions. In the remaining countries, current labor force participation is at least in one of the considered cases very low and exploiting this untapped potential can offset the decline of labor supply at least temporarily. In Germany this would be the case until 2045, in Italy, Spain and Denmark until 2060. In France, and the Netherlands exploiting the total untapped labor potential could offset the decline in the workforce even over the whole simulation timeline.

We conclude that total labor supply must not necessarily decrease in Europe despite the demographic trends. In fact, there is even a potential to increase the labor supply, if the elderly will be healthy enough to continue working in response to the increase in life expectancy, and if restrictions for women to participate in the labor market are eliminated.

Under the alternative population projections, the Untapped Labor Potential scenario has more or less the same proportional effect on labor supply (see Appendix 2 and Appendix 3). Under a future younger population, the decline in the FTE workforce is smaller or not present at all. Therefore, preventing a decline requires fewer or no behavior changes. In the case of a future older population, however, also in France and the Netherlands a prevention of the decline in the total working hours could be reached over the whole simulation period by exploiting the full untapped labor potential. In the other countries, the decline can be offset only for a shorter period and as already shown the workforce also would decline in Sweden.

6. The supply of care workers

To compute the future supply of formal care workers, we assume that the share of these workers in the labor force will remain constant, i.e., there is no labor migration from other sectors into the care sector. This is a strong assumption since one may argue on the one hand that aging populations will increase the wage for formal care workers and therefore attract more workers into this sector on the expense of other sectors of the economy. On the other hand, one may argue that the "Dutch disease" will prevail since the gap between higher productivity growth in the manufacturing sector and lower productivity growth in the service sector may increase and thus make working in the care sector even less attractive.

Eurofound (2020) provides estimates of the care work force as a share of the total workforce.[5] The ratios depend on detailed Eurostat data of 2019 and are reported in Table 4 for the countries under review.[6] We update those rates to 2023 values as follows. Since the accessible Eurostat data provide the number of workers by NACE Rev. 2 classification only up to the first two digits, we roughly update the data by assuming that the share of workers of the classification categories Q88.1 on all workers of category Q88 remains constant. The updated values are shown in the second row of Table 4. They vary from 1.0% to 7.2%. The countries can be divided in those with a low share of formal care workers

[5] The total workforce is defined as the sum of employed and self-employed. Unemployed are not included.
[6] Eurofound (2020) identifies the care workers by the NACE Rev. 2 classification categories Q87 and Q88.1.

(Poland, Italy and Spain), a moderate share (Germany, Denmark and France) and a large share (Netherlands and Sweden).

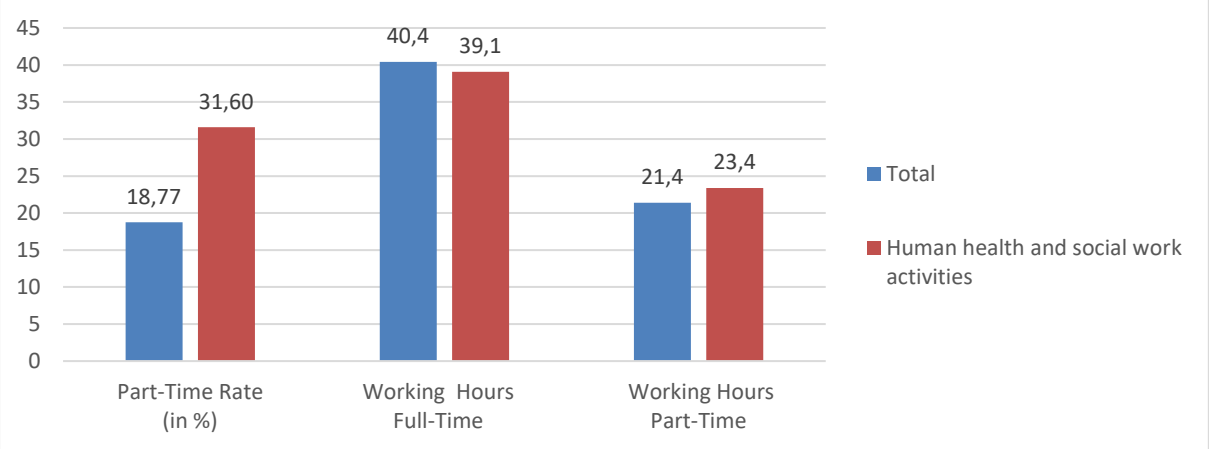
Table 4: Long-term care workers as share of the total (full-time equivalent) workforce, by Member State (in %)

	DE	DK	FR	IT	SW	PL	ES	NL
Eurofound (2020) (Per Person)	4.2%		4.4%	1.8%	7.1%	1.1%	2.2%	6.4%
2023 (Per Person)	4.0%	5.3%	4.4%	1.6%	6.1%	1.0%	2.4%	7.2%
2030 (In Full-Time-Equivalence)	3.7%	5.0%	4.2%	1.5%	5.8%	0.9%	2.3%	6.2%

Source: Eurofound (2020) and own calculation base on Eurofound (2020), Eurostat and Statisitcs Denmark
Note: Eurofound (2020) do not provided data on Denmark. The Danish rates are computed instead on data from Statistics Denmark. Thereby, the same categorization is used.

The third row in Table 4 reports the share of formal care workers based on full-time equivalents. As before, full-time equivalents are computed by the division of the total weekly working time and an assumed weekly full-time working time of 40 hours.[7] Since part-time employment is more common in the "human health and social work activities" sector, and in particular in the care sector (see Figure 18 and Eurofound, 2020), the share of formal care workers in full-time equivalents is smaller as its share by persons.[8]

Figure 18: EU27 average part-time rates and working hours for 2023



Source: Eurostat

Table 5 shows that all considered countries except Sweden will face a declining labor force of formal care workers. The decline is relatively small for Denmark (-3.4% from 2023 to 2060), the Netherlands (-4.0%) and France (-4.6%) but large for Poland (-30.1%). Germany (-11.2%), Spain (-15.5%) and Italy (-16.2%) are between.

[7] For the care sector, the part-time rates and average working hours of the "human health and social work activities" sector are used. However, the proportion of part-time in the care sector is actually even higher than in the total health sector (see Eurofound, 2020). The rates are therefore still slightly overestimated.
[8] This effect is amplified due to the lower average full-time working hours in the healthcare sector (see Figure 19). On the other hand, the slightly longer average working hours of part-time employed in the healthcare sector reduce the effect slightly (see Figure 19).

Table 5: Supply of formal care workers in the Status Quo labor scenario and baseline population scenario (in Tsd. FTE)

	2023	2040	2050	2060	2070	Decline by 2060 in %
DE	1,377	1,276	1,259	1,222	1,210	-11.2%
DK	127	125	125	123	119	-3.4%
ES	450	425	395	381	367	-15.5%
FR	1,123	1,107	1,082	1,071	1,045	-4.6%
IT	340	309	295	285	272	-16.2%
NL	480	470	469	460	446	-4.0%
PL	166	145	128	116	111	-30.1%
SE	289	303	307	302	302	4.6%

Source: own computation

7. Projecting the number of persons in need of care

We now turn to the demand side of formal care. As populations age, the proportion of people who are dependent on long-term care will also increase because the likelihood of a severe limitation increases with age. Eurostat provides information on the proportion of the population older than 50 with difficulties in personal care activities or household activities by sex and age, broken down into "Moderate", "Limited", "Severe" and "None". Those rates were collected the last time in 2019. The data are accessible for the age groups 55-64, 65-74 and over 74. As expected, the share of individuals with difficulties increases with age. In this study, we do refrain from making assumptions about an increase or decrease of these age-specific limitation rates. Rather, we project the future number of individuals with severe limitations by holding the current rates in the age groups constant. The change in the number of individuals with severe limitations is then used as a proxy for the change in the number of individuals in need of care.

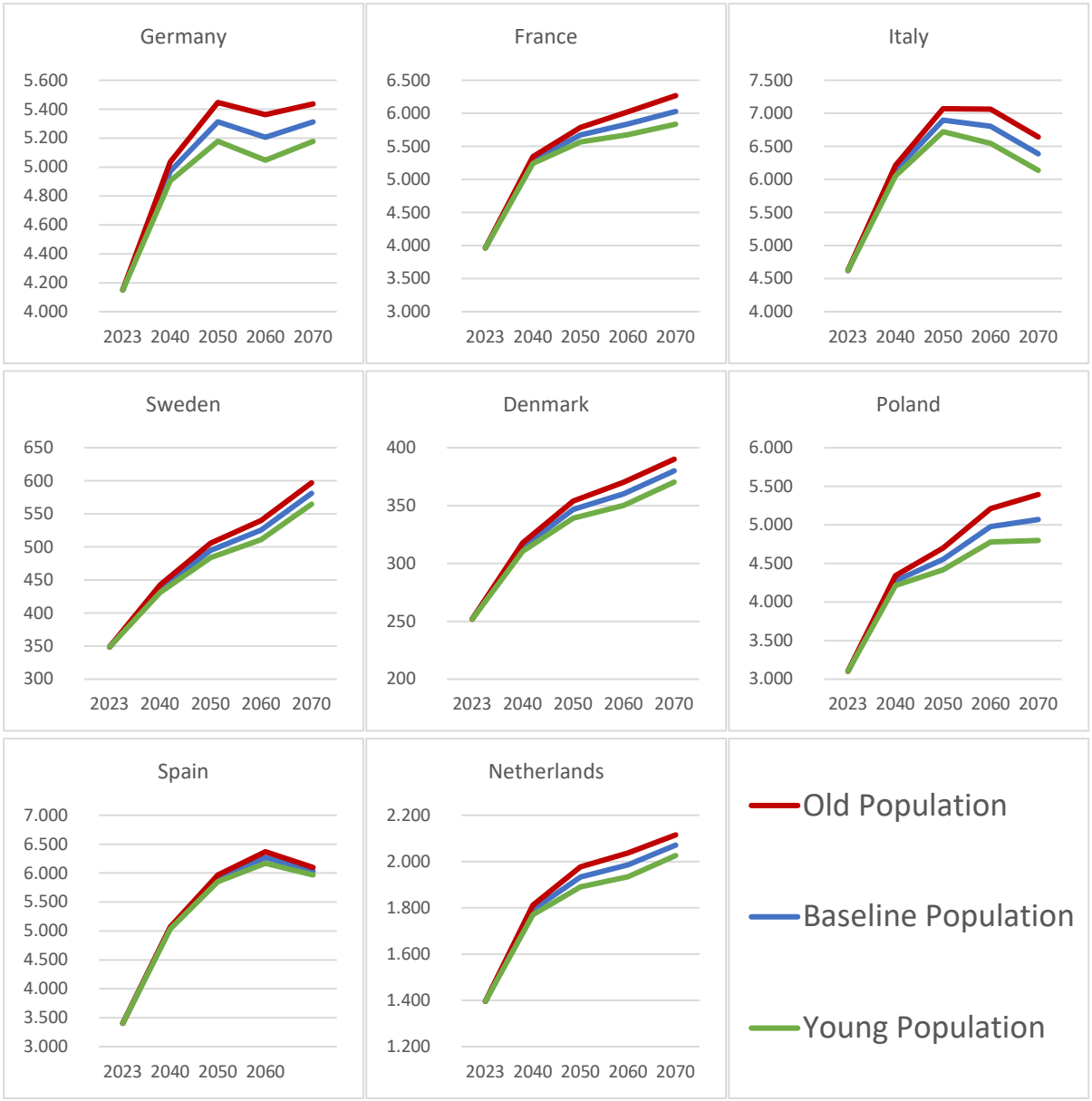
The projected increase in the number of individuals in need of care is reported in Table 6 for the baseline population forecast, expressed as relative change to 2023, and in Figure 19 for all three population scenarios, here expressed as absolute numbers. In Germany, the proportion of individuals with severe limitations will increase comparatively little, with only 28.0% by 2070. For instance, the next largest growth rate has Italy with 38.1% in 2070. The reason for this enormous difference is that, while the proportion of the population that is particularly old and therefore more likely to suffer from severe limitations increases with life expectancy, the middle age group of 55 to 65-year-olds is declining sharply in Germany. The decline is due to the fact that this age group is currently largely made up of the baby boomer generation (see Figure 10). As there is already a latent risk to have severe limitation at those ages, the decline of this age group offsets a part of the increase in the number of very old people with severe limitations.

Table 6: Increase in individuals with severe limitations (in % of 2023) by population scenario

	DE	FR	IT	SE	DK	PL	ES	NL
2040	19.8%	33.6%	32.6%	25.2%	24.7%	37.8%	48.4%	28.3%
2055	26.4%	44.6%	50.5%	50.7%	41.9%	53.4%	82.2%	40.1%
2070	28.0%	52.1%	38.1%	66.6%	50.9%	63.4%	77.2%	48.4%

Source: own computation

Figure 19: Increase in the number of individuals with severe limitations by population scenario (in Tsd.)



Source: own computation

This situation also exists in Italy, but is less pronounced, as today's particularly large age groups are younger than 60. As a result, the 55 to 65 age group is initially increasing and will decline less sharply in the long term. In Spain, the baby boomer generation is even younger. As a result, the 55 to 65 age group there will temporarily increase by 18% before falling back to its 2023 level in 2045 and then declining slightly. Together with the sharp rise in the very old population, this leads to the sharpest increase in people with severe limitations among the countries of consideration. In 2070 it amounts to 77.2%. The pronounced baby boomer generation in Germany, Italy and Spain is also leading to an unsteady increase of the number of people with severe limitations. In Germany, for example, their number increases by 28.6% until 2048, in Italy by 50.6% until 2054 and in Spain by 84.3% until 2059. The number of people with severe limitations then decreases again, partly as a result of the death of the baby boomer generation.

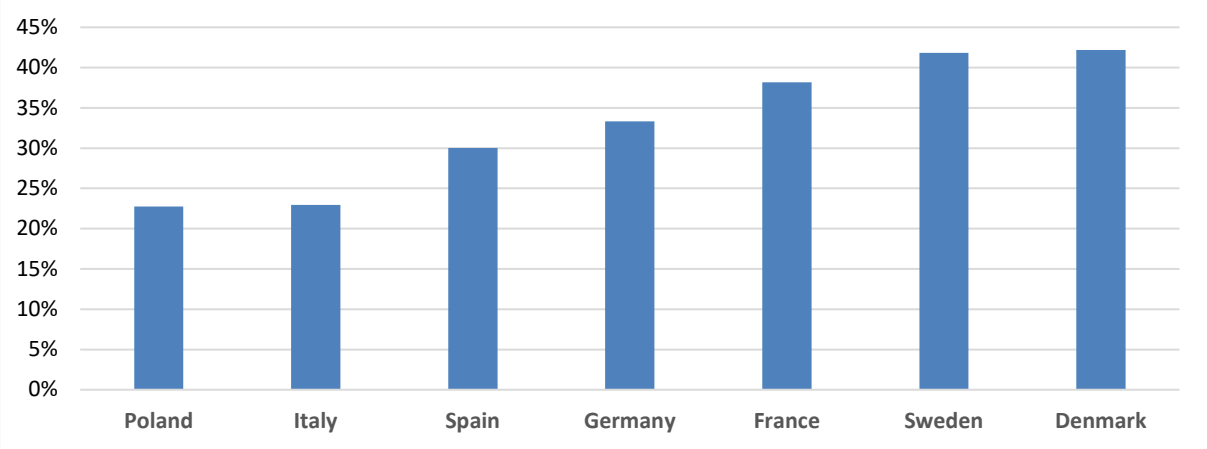
In the remaining countries, the number of individuals with severe limitations is increasing continuously, as the age groups above 55 remain essentially constant or increase with the life expectancy. This

is mainly due to the fact, that there are no as pronounced baby boomer generation in those countries. The number of individuals with severe limitation rise by 48.4% to 66.6% until 2070.

8. The demand for care workers

In the long term, society will therefore have to invest more resources in long-term care, including more individuals providing care. We assume that this increasing demand can only be met by increasing the number of formal care workers, not by an increase in informal care. This assumption is based on SHARE data, which show that we already have a lack of informal care (Figure 20). This is unlikely to get better in the Status Quo labor force data and even less so when exploiting the untapped labor potential will crowd out time for informal care. Hence, particularly in countries with a declining workforce, this will lead to an increasing share of care workers on the workforce. To make matters worse, this additional demand comes on top of already existing labor shortages in the long-term care sector (see ELA, 2023).

Figure 20: Unmet needs among people with limitations in activities of daily living (in %)



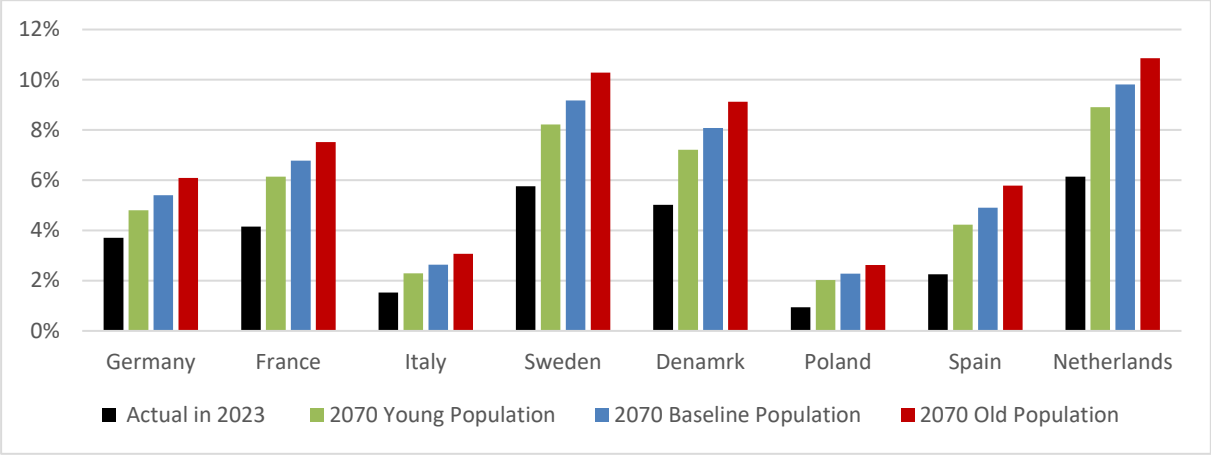
Source: SHARE Wave 6, own calculations

We roughly estimate the future demand for formal care workers by multiplying the number of individuals in need of care that was projected in the previous section by the current ratio of formal care workers per person in need of care. This reflects the current service level and assumes, in economic terms, that the productivity of formal care workers remains unchanged in the future. At this point, we do not claim that this service level is a satisfactory equilibrium. The SHARE data in Figure 20 actually indicate that this is not the case. For the future, we simply project this (unsatisfactory) situation into the future.

The resulting demand is expressed as share of the total future workforce (in full-time equivalents) to be comparable across the eight countries in spite of their different population sizes, see Figure 21. It refers to 2070 and three population projections (young, baseline and old). The share of formal care workers on the future work force increases in all countries. Under the baseline population scenario, the already large Swedish and Dutch share of formal care work forces would have to increase by 3.4 and 3.7 percentage points. Swedish formal care workers would then be 9.2% of the total FTE workforce in 2070 and the Dutch formal care workers 9.8% of the future workforce. Also in Denmark, the share would have to increase considerably by 3.1 percentage points. In Spain and France, the increase amounts to 2.6 percentage points. For the remaining countries, the care workers would have to make up between 1.1 to 1.7 additional percentage points of the future work force (in full-time equivalents)

Finally, Table 7 shows the absolute number of additional formal care workers necessary to meet the increased demand at the current service level.

Figure 21: Demand for formal long-term care workers as share of the total workforce in 2070 by country and population scenario (% in FTE)



Source: own calculation

Table 7: Number of additional formal care workers required to satisfy demand for long-term care (in Tsd. FTE)

	2040	2050	2060	2070
DE	272	386	350	385
DK	31	48	55	65
ES	218	331	379	348
FR	377	484	531	585
IT	111	167	160	130
NL	136	185	203	232
PL	63	77	100	105
SE	73	121	146	192

Source: own calculation

9. Employment Balance

Section 6 (Table 5) has shown that supply of formal care workers will decline due to the demographic development in the Status Quo labor market scenario. Section 8 (Table 7) has shown that the demand for workers in the care sector will increase at the same time. Figure 22 depicts the increasing gap between demand and supply in the Status Quo labor market scenario (blue and orange lines) for all countries. It is noteworthy that the gap is relatively small in Italy and Poland where informal care provides most of the long-term care.

The final aim of this paper is, therefore, to clarify to what extent the decline in the labor supply and additional labor demand in the care sector can be compensated by the so far "untapped" labor potential, where the "untapped" labor potential is defined as achieving Swedish old-age and female labor force participation and the European average of unemployment. This increase would particularly increase the formal care labor force in Poland and Italy where formal care is low and informal care high. At the same time, however, we cannot assume that, particularly in these countries, a huge increase in the formal labor force can be realized with the historically high level of informal care. As pointed out

in the introduction, we therefore additionally assume that the untapped labor potential scenario is accompanied by the Swedish share of formal care workers in the labor force of all eight countries. We assume that these changes are gradually implemented between 2023 and 2040. This is depicted in Figure 22 by the grey lines. In all countries except Sweden, Denmark and the Netherlands, exploiting the uncapped labor potential will provide a sufficient number of formal care workers to meet the increased demand for care, although barely so in France (and not after 2060; even earlier in the old population scenario, see Appendix 4). Sweden, Denmark and the Netherlands already have very high labor force participation rates. Hence, switching to the Untapped Labor Potential scenario does not change the labor supply as much as in the other countries.

Figure 22: Demand for and supply of formal care workers in the baseline population scenario (Tsd. FTE)

Source: own calculation

10. Conclusion and discussion

We have estimated the size of the "care gap", i.e., the difference between the demand for formal care workers, which increases proportionally to the number of individuals in old age, and the supply of formal care workers, which declines proportionally to the number of individuals in working-age. If labor force participation rates remain as they are today, this gap will increase in all considered countries. The key policy question of this study is therefore how to close this increasing care gap. We focus on the labor supply side and investigate whether there is sufficient yet untapped labor potential that increases not only the labor force in general but specifically in the formal care sector.

As a counterfactual scenario, we therefore modelled an increase of the labor force participation rates in those population groups that currently exhibit a relatively large untapped labor potential in the countries in this study which are women and early retirees. We show that this helps to close the care gap in all countries except Denmark, Sweden and the Netherlands, where labor force participation is already high und therefore the untapped potential small. France, on the other hand, has such a low labor force participation rate, that exploiting the untapped labor potential barely suffices to close the gap until 2060 but not in the far future.

Our analysis has several limitations. Our scenario-driven shift-share methodology abstracts from behavioral reactions and assumes constant proportionality factors over time, especially age-specific morbidity rates. Regarding behavioral reactions, increasing wages in the formal care sector may close the gap because this would attract more workers into this sector. Medical progress and a reversal of recent harming life-style trends may reduce the age-specific morbidity trends. Whether applying the Swedish share of formal care workers to the labor force in all other countries in order to offset the decline in informal care is compatible with our untapped potential scenario in the counterfactual analysis is open for discussion. This also implies assuming that the more than proportional increase in the number of formal care workers is feasible without crowing out labor supply in other sectors of the economy. Finally, we assume that individuals or their families are able to pay for formal care when this is substituting for informal care.

In our future work in this project, we will build economic models of labor supply in both the care and other sectors that depend on relative wage difference between the sectors. This will modify the supply side in this study. On the demand side, we will build economic models that include financing long-term care by saving or contributory long-term care insurance. This will modify the morbidity-driven demand for long-term care in this study.

Literature

Börsch-Supan, A.H., Brandt, M., Hunkler, C., Kneip, T., Korbmacher, J., Malter, F., Schaan, B., Stuck, S., and S. Zuber (2013): Data Resource Profile: the Survey of Health, Ageing and Re-tirement in Europe (SHARE), International Journal of Epidemiology, 42(4), 1-10.

Börsch-Supan, A. and C. Coile (2020): Social Security Programs and Retirement around the World: Re-forms and Retirement Incentives, University of Chicago Press, Chicago.

Börsch-Supan, A. and C. Coile (2025): Social Security Programs and Retirement around the World: The Effects of Reforms on Retirement Behavior, University of Chicago Press, Chicago, forthcoming.

Eurofound (2020): Long-term care workforce: Employment and working conditions, Publication Office of the European Union, Luxembourg.

European Labour Authority (ELA) (2024): EURES Report on labour shortages and surpluses 2023, Pub-lications Office of the European Union, Luxembourg.

Eurostat (2018): Why do people work part-time?, https://ec.europa.eu/eurostat/web/products-euro-stat-news/-/ddn-20190918-1.

Eurostat (2023): Population projections in the EU – methodology, (https://ec.europa.eu/eurostat/sta-tistics-explained/index.php?title=Population_projections_in_the_EU_-_methodology#Assump-tions_for_migration).

Francesca Carta, Marta De Philippis, Lucia Rizzica, Eliana Viviano (2023): Women, labour markets and economic growth, Banca d'Italia.

Nicolas Goll (2020): Working Pensioners in Europe - Demographics, health, economic situation and the role of pension systems, SHARE Working Paper Series.

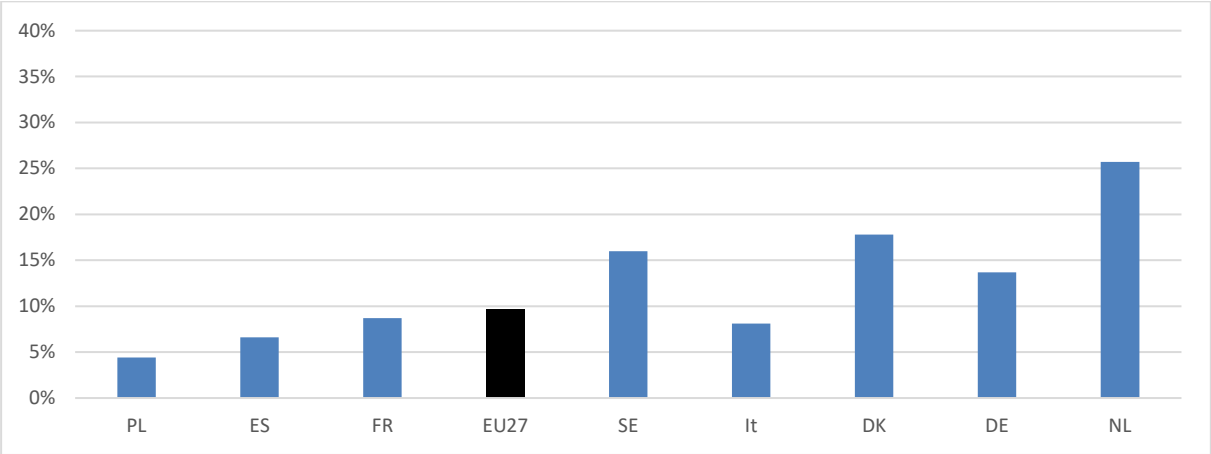
OECD (2017), Pensions at a Glance 2017: OECD and G20 Indicators, OECD Publishing, Paris. http://dx.doi.org/10.1787/pension_glance-2017-en.

Acknowledgements

The SHARE data collection has been funded by the European Commission, DG RTD through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982, DASISH: GA N°283646) and Horizon 2020 (SHARE-DEV3: GA N°676536, SHARE-COHESION: GA N°870628, SERISS: GA N°654221, SSHOC: GA N°823782, SHARE-COVID19: GA N°101015924) and by DG Employment, Social Affairs & Inclusion through VS 2015/0195, VS 2016/0135, VS 2018/0285, VS 2019/0332, VS 2020/0313, SHARE-EUCOV: GA N°101052589 and EUCOVII: GA N°101102412. Addi-tional funding from the German Federal Ministry of Education and Research (01UW1301, 01UW1801, 01UW2202), the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, BSR12-04, R01_AG052527-02, R01_AG056329-02, R01_AG063944, HHSN271201300071C, RAG052527A) and from various national funding sources is gratefully acknowledged

Appendix

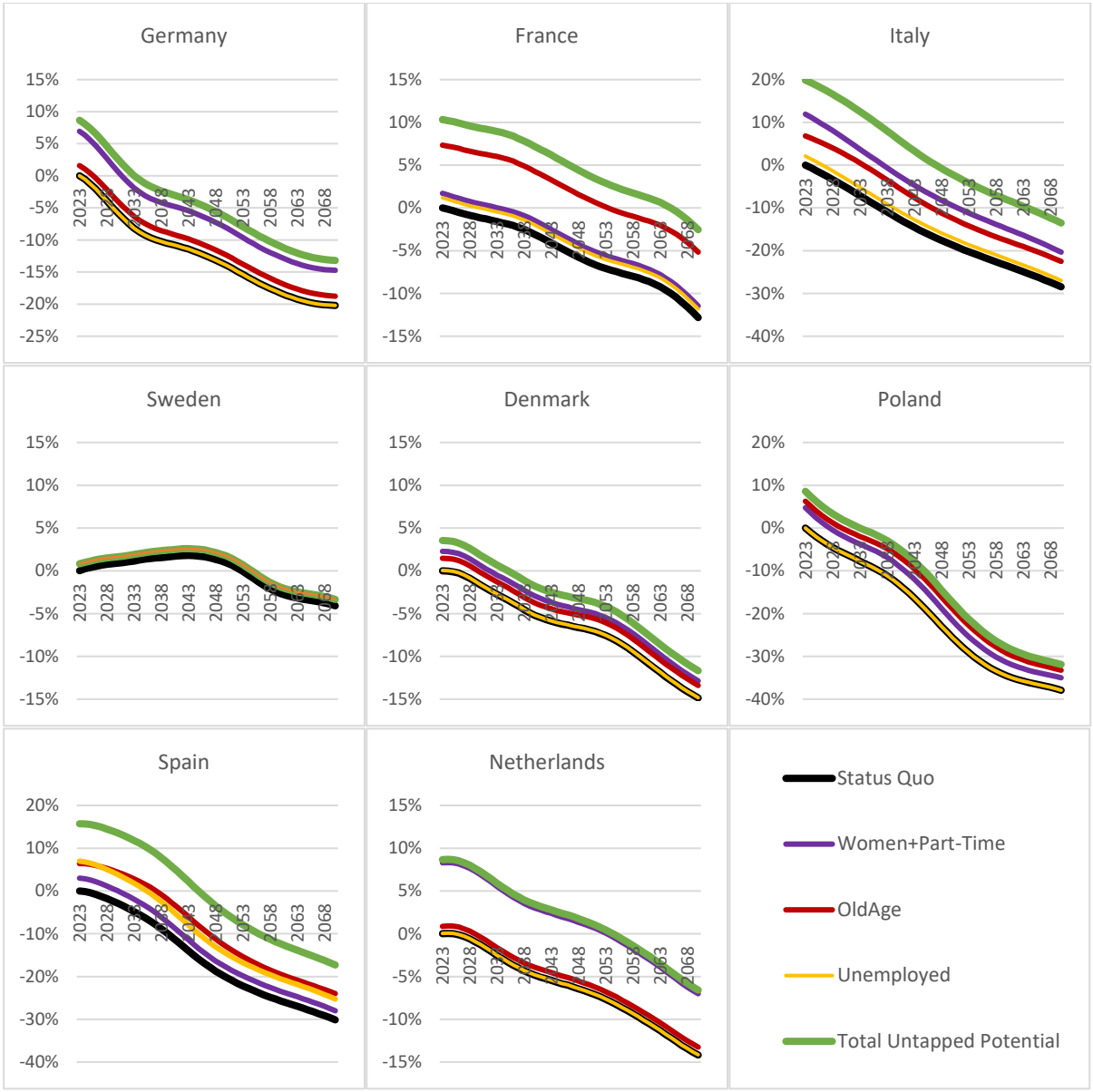
Appendix 1: Part-time employed men as percentage of total employment, in 2023



Source: Eurostat

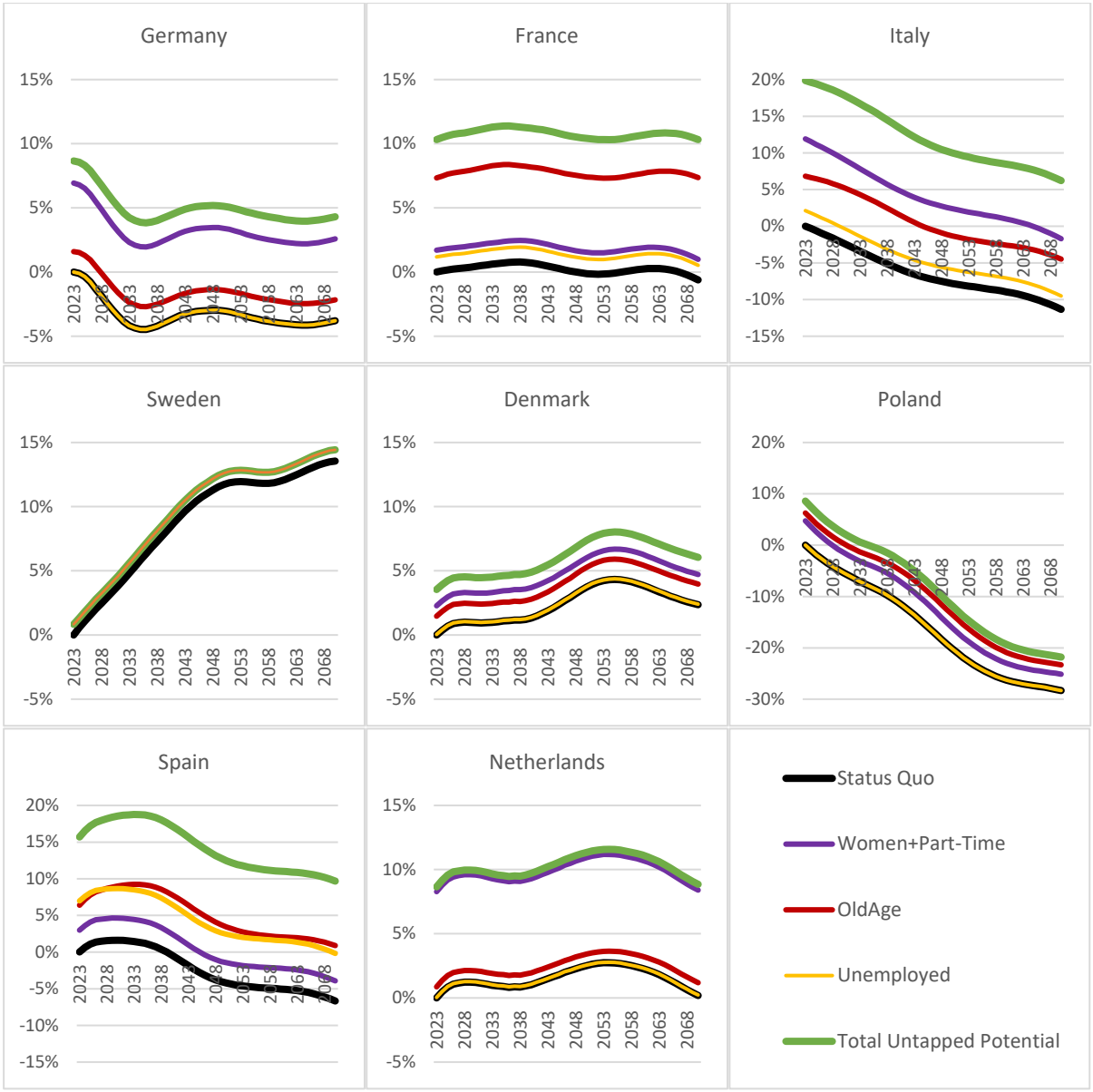
Note: same order as in Figure 14

Appendix 2: Change in number of labor force participants (FTE) in the Untapped Labor Potential scenario (old population, in % relative to FTEs in 2023)



Source: own computation

Appendix 3: Change in number of labor force participants (FTE) in the Untapped Labor Potential scenario (young population, in % relative to FTEs in 2023)



Source: own computation

Appendix 4: Demand for and supply of formal care workers in the old population scenario (Tsd. FTE)

Source: own computation

Appendix 5: Demand for and supply of formal care workers in the young population scenario (Tsd. FTE)

Source: own computation