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The Gender Pension Gap, past gender labour market inequalities and pension systems in the EU

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Abstract - The Gender Pension Gap (GPG) and its complement, the Gender Pension Coverage Gap (GPCG) are indicators of inequality between genders for the older population. The Gender Pension Gap (GPG) shows much variation across the Member States of the EU. This report analyses the links between the GPG, aspects of pension systems and gender inequalities on the labour market in past decades.

This report is a slightly revised version of an earlier report "Pension Systems and Gender Pension Gaps in the EU" (January 2024). It was prepared as part of a project in the context of the Belgian presidency of the Council of the European Union, which was funded by the Belgian Federal Public Service Social Security.

Jel Classification - H55, I30
Keywords - Gender Pension Gap, European Union, EU-SILC, gender employment gap

Table of contents

List of tables

List of graphs

Executive summary

The Gender Pension Gap (GPG) and its complement, the Gender Pension Coverage Gap (GPCG) are measured on the individual level, and extend coverage of inequality between genders to the older population. The Gender Pension Gap measures the difference in average gross pension between men and women, as a percentage of the average pension of men. The Gender Pension Coverage Gap is defined as the difference between the proportions of older men and women receiving any pension. Eurostat publishes these two indicators on gender gaps in pensions regularly, based on the EU-SILC database.

The GPG shows that in all countries of the EU, older women receive on average a lower pension than older men. In addition, the GPCG indicates that in several countries, older women are more likely than older men to receive no pension at all. The aim of this report is to ascertain, for the Member States of the European Union, the links between gender pension gaps, pension systems and gendered inequalities on the labour market in past decades.

Three indicators of past gender inequalities on the labour market have been selected:

- The gender employment gap: the difference in employment rates between men and women at active age (15-64).
- The gender part-time work gap: the difference between men and women in the part-time rate of employed persons.
- The gender pay gap: the (unadjusted) difference between the average hourly wage of men and women, as a percentage of the average hourly wage of men.

Time series for the employment gap and the part-time gap are published by the OECD. Estimates for the gender pay gap are published by Eurostat. There is considerable variation by indicator and by country in how far back in time the data extend, and in how detailed they are.

These time series show that in the older EU members in Northern[1], Western[2] and Southern[3] Europe, the employment gap has declined enormously during the last four or five decades, from values which were sometimes over 50 percentage points to less than 20 percentage points. By contrast, in the newer Member States in the Baltic, Central and Eastern Europe[4], the gender employment gap has decreased much less since the mid-1990s or 2000, even though it remains in 2021 at a low to moderate level compared to the EU as a whole. Female part-time work rates have been high for some decades in The Netherlands, Denmark and Sweden, and have increased more recently in many other countries in Western Europe and also in Italy. Although in recent decades men have started to work part-time more often in these countries, the gender part-time work gap follows the same pattern across countries as the female part-time rates. Both remain rather small in the new Member States. The gender pay gap has steadily declined between 2007 (the first year for which figures are available) and 2021 in most EU countries in

1 Denmark, Finland and Sweden.
2 Austria, Belgium, Germany, France, Ireland, Luxembourg and the Netherlands.
3 Cyprus, Greece, Italy, Malta Portugal and Spain,
4 Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania Slovakia and Slovenia.

Northern and Western Europe as well as in Cyprus and Spain, though not in France, Italy and Portugal. In the countries of Central and Eastern Europe, there is more fluctuation and the trends are less clear.

For the analysis of the relation between current gender pension gaps and the three indicators of past gender inequalities on the labour market in past decades, the Overall Gender Pension Gap (OGPG) in 2022 for the age group 66-75 years is used. The OGPG combines the Gender Pension gap and the Gender Pension Coverage Gap into a single indicator. The focus is on the people aged 66-75 in 2022 (the birth cohort 1946-55), because the labour market history has a bigger impact for this group than for those over 75, where widowhood is more common.

It is found that the OGPG in this age group in 2022 is very strongly related to the employment gap in 2000 (correlation of 0.79). The correlation is even stronger when the gender employment gap is limited to the same cohort, those born in the period 1946-55 (correlation of 0.87). The relation of the OGPG with the gender part-time gap is weaker and not linear. All countries where the gender part-time gap is wide also have large OGPGs. On the other hand, Member States who had a low gender part-time gap in 2000 show great variation in the OGPG. Surprisingly, there is hardly any correlation between the gender pay gap in 2007 and the OGPG in 2022 among those aged 66-75. A regression of the OGPG on the three indicators of gender gaps on the labour market confirms these findings.

To what extent do pension systems mitigate (or exacerbate) the impact of past gender labour market inequalities on the gender pension gaps? For this analysis, the OGPG for the whole population 66plus was considered. Aspects of pension systems are measured in a quantitative way by variables derived from the Theoretical Replacement Rates (TRRs), published by the European Commission and Social Protection Committee (2021).

Some EU Member States still have pension rules that explicitly distinguish between women and men, in particular concerning the statutory retirement age. Explicitly gendered pension rules appear mostly (but not always) to drive the OGPG upward in the countries concerned. However, removing those rules would not change by much the pattern of the OGPG across EU Member States.

Member States uprate existing pension benefits either to prices, to wages, to a mix of prices and wages or in an ad-hoc way. As women are overrepresented among the oldest old, their pensions might be more affected by indexation mechanisms than those of men. It is found, though, that the correlation between the OGPG and the change in the TRR 10 years after retirement (an indicator of the effect of indexation rules) is indeed negative but rather low. A simple model also suggests that the indexation mechanism can have a significant but limited effect on the OGPG.

Childcare is a frequent reason for needing to discontinue work for a number years, in particular for women. This can lead to the non-accrual of pension rights. Many countries have instituted pension credits (or other regulations) that can dampen the impact of a (limited) absence from work for this reason. The set of TRRs includes three scenarios involving career breaks due to childcare, and measures of childcare provisions in pensions systems were calculated as the difference between these TRRs and the corresponding base-case TRRs. It is found, though, that the correlations between these measures and the OGPG within the cohort aged 66-75 are negative, as expected, but also quite small.

Pension mechanisms that ensure redistribution might reduce the gender pension gaps, as women have on average lower earnings during their working life than men. Those mechanisms include pension credits, contribution and benefit ceilings, modifications of the link between contributions and benefits and non-contributory or minimum pensions, among others. Indicators of the total extent of redistribution in pension systems are the TRR malus for low earners and the TRR malus for short careers. The former represents the difference between the pension of a person with low earnings and that of the base case with average earnings and a 40-year career. The TRR malus for short careers shows the effect of having a career of only 20 years. Across EU Member States there is a strong correlation between the malus for low earnings and the OGPG, while the correlation of the latter with the malus for a short career is somewhat lower. A regression of the OGPG in which also the indicators of past gender labour market inequalities are included, confirms that the TRR malus for low earnings has a strong mitigating effect on gender pension gap.

It would be expected that survivor pensions reduce the OGPG, as women are much more likely than men to become widowed, and therefore form a large majority among the beneficiaries of survivor pensions. In fact, however, it was found that there is a moderately strong positive correlation: a number of mainly Southern European countries combine generous survivor pensions with large gender pension gaps. This finding may reflect the dominance (until recently) of the male breadwinner model in those countries, where married women seldom worked and therefore needed survivor pensions as income protection in old age when their husbands died. In further analysis, the employment history was controlled for by looking at the *change* in the OGPG when a cohort in retirement gets older and the proportion of widows increases. It was found that in countries with generous survivor pension the OGPG declines more than in countries with few or low survivor pensions.

1. Introduction

In 2013 Bettio et al. (2013) proposed the Gender Pension Gap (GPG) and its complement, the Gender Pension Coverage Gap (GPCG) as natural sequels to the Gender Pay Gap and other indicators of gender differences on the labour market. Like the latter, they are measured on the individual level, and extend coverage of inequality between genders to the older population. Currently, Eurostat publishes these two indicators on gender gaps in pensions on a regular basis. The Gender Pension Gap (GPG) measures the difference in average gross pension between men and women, as a percentage of the average pension of men.[5] The Gender Pension Coverage Gap (GPCG) is defined as the difference between the proportions of older (65plus) men and women receiving any pension.[6] All kinds of pensions are taken into account, including 2nd pillar pensions, regular private pensions and lump-sum payments in the 2nd pillar at the normal retirement date as well as care allowances and disability cash benefits paid after the standard retirement age. Both indicators are based on the EU-SILC database. More details are given in the first intermediate report of this project.[7]

The GPG shows that in all countries of the EU, older women receive on average a lower pension than older men. In addition, the GPCG indicates that in several countries, older women are more likely than older men to receive no pension at all. As pensions are the main source of income for older people (aged 65 and over), these differences are regarded as important aspects of the more general issue of gender inequality. Current gender pension gaps are the legacy of decades of gendered inequalities in careers and earnings, though the transmission of lifetime earnings inequalities into pensions is mitigated in different degrees by pension systems (Lis and Bonthuis, 2019)[8].

The aim of this report is to ascertain, for the Member States of the European Union, the links between gender pension gaps, pension systems and gendered inequalities on the labour market in past decades. An earlier report explored the extent and evolution of gender pension gaps in the countries of the EU. Also, these indicators were evaluated as to their quality, statistical robustness and appropriateness as indicators of gender inequality in old age. Some proposals for possible improvements were also made.

After a brief review of the literature, this intermediate report on phases 2 and 3 introduces three indicators of past gender inequalities on the labour market: the gender employment gap, the gender part-time gap and the gender pay gap. As far as the data permit, the evolutions of these indicators in past decades are traced for all EU Member States. In section 4, the relation of these past gender gaps with the current gender pension gaps is explored. Section 5 discusses the impact of five aspects of pension systems on the gender pension gaps: explicit gender differences in legislation, the indexation mechanism for existing pensions, provisions for career breaks related to childcare, the redistributive capacity of pension systems and survivor pensions. Section 6 concludes.

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5 table *ilc_pnp13*

6 https://ec.europa.eu/eurostat/data/database, table *ilc_pnp14*

7 In this report the phrase "gender pension gaps" will be used to refer to gender differences in pensions generally, while the abbreviations GPG and GPCG will refer to the specific measures.

8 This report contains references to several other studies of gender pension gaps.

2. A review of earlier studies

Several earlier studies have looked at the determinants of gender pension gaps. Though these often also touch on other aspects of the gender pension gaps, this brief review is limited to their contribution as regards the determinants.

Bettio et al. (2013) point out that lower pensions among women stem largely form their shorter careers, though the relationship between the career length and the pensions is not linear. Sector of employment and marital status also have an impact. Gender pension gaps were relatively low in the public sector and relatively high among the self-employed. Single women have higher pensions than married women with divorced women somewhere in the middle. Burkevica et al. (2015) found that gaps in lifetime earnings are among the main drivers behind the GGP. They stress that this is partly due to caring responsibilities, pregnancy and greater propensity to work part-time. The same factors are mentioned by Lodovici et al. (2016), who highlight that recent pension reforms may increase the gender gap in pensions, as changes in pension design often involve a shift towards multi-pillar pension systems with a closer link between lifetime contributions and benefits. These studies offer a number of useful points, but make no systematic effort to explain the variation in gender pension gaps across countries.

Two more recent studies do exactly that. The first is OECD (2018)[9]. Using the 2016 EU-SILC data, the authors consider the gender gap in the duration of working life, the gender part-time gap and the gender pay gap, all for the year 2016. They construct a measure of the gender gap in annual labour earnings, which reflects not just the pay gap, but also part-time employment, breaks in employment and all kinds of income from work. The correlation of this measure (when people with no earnings are included) with the gender pension gap for 2015 is 0.37. Furthermore, the OECD pension model is used to simulate the gender pension gap for all EU countries from earnings profiles by age and gender for each country. These age profiles are derived from EU-SILC data for a given year, viz. 2015. The correlation of the simulated gender pension gap with the actually observed one is 0.65. The implies that a large part of the current gender pension gap is not explained by current labour market differences between women and men and the current pension systems (in so far as the latter are covered in the OECD pension model). The differences between the observed and simulated gender pension gaps reflect both changing labour market patterns and pension systems. The pension model is also used to calculate a progressivity index of pension schemes, which measures the transmission of the cumulative lifetime inequalities into pensions. This shows that in some countries like Ireland and Malta inequalities are nearly eliminated by flat or almost flat benefits, while pension systems in Hungary, Latvia and Sweden are hardly redistributive and show almost constant replacement rates across a large range of earnings. (The possible correlation of the progressivity index with gender pension gaps is not explored, though.) Furthermore, it is possible to simulate the impact of childcare pension credits. It is found that these lower the GGP in a few countries, among which are Austria, Greece, France, Estonia and Bulgaria. Finally, it is noted that survivor benefits reduce the gender gap in pensions, as most beneficiaries of survivor allowances are women. However, there are large differences in the share of pensioners receiving survivor benefits, from close to zero in the Netherlands to near 60% in Spain.

[9] Much of the material in this study is also covered in Lis and Bonthuis (2019).

Veremchuk (2020) uses the EU-SILC data from the 2018 wave to perform a Oaxaca-Blinder decomposition of the gender pension gap, as well as of the gender pay gap. The first shows that the main factor contributing to gender inequality in pension income is the number of years in employment, while the higher proportion of people with higher education among currently retired men increases the gap. Furthermore, she finds no obvious relationship between the gap in hourly labour income and pension income. However, there is a positive correlation in countries with the longest history of a wage dependent second pillar. Also, across countries there is a positive relationship between the gender pension gap and the coverage of the second pension pillar. Finally, the cross-country relationship between the gender pension gap and gender attitudes (using results from the European Values Study) was considered. Omitting the former socialist states, it is found that in societies with higher support for gender equality, the pension gap is smaller.

The present study addresses the issue of the variation in gender pension gaps across EU countries using two new approaches. First, the potential is explored of aggregate OECD data on gender labour market gaps in former decades to explain the current gender pension gaps. Secondly, Theoretical Replacement Rates (TRRs) are used as quantitative indicators of aspects of pension systems.

3. Gender inequalities on the labour market in past decades

3.1. Indicators of gender inequalities on the labour market

Three indicators of gender inequalities on the labour market have been selected, for which published time-series are available and which are plausibly related to the gender pension gaps (GPGs).

- The gender employment gap: the difference in employment rates between men and women at active age (15-64).
- The gender part-time work gap: the difference between men and women in the part-time rate of employed persons.
- The gender pay gap: the (unadjusted) difference between the average hourly wage of men and women, as a percentage of the average hourly wage of men.

Time series for the employment gap and the part-time gap are published by the OECD[10] and are ultimately derived from Labour Force Survey. Estimates for the gender pay gap are published by Eurostat[11] and are based on the Structure of Earnings Survey (SES). There is considerable variation by indicator and by country in how far back in time the data extend, and in how detailed they are. Table 1 shows that for some countries the data on employment rates go back to the 1960s or 1970s (FI, FR, DE, IE, IT, NL, ES, SE) but for many other Member States, in particular those that joined the EU after 2000, the series only start in the 1990s or in 2000 (and for Croatia in 2002). The first year for data on part-time work is often much later than for the employment rate (in EE, FI, DE, IE, IT, NL, PT, ES, SE). Moreover, while the employment rates are generally broken down by five-year age brackets, this is not always the case for the earliest years. The age categories for the part-time work rates are 16-24, 25-54, 55-64 and 65+. Unfortunately, the Eurostat data on the gender pay gap go back to 2007 only.

Table 1 First year for which employment and part-time work data are available, by Member State

	Employment gap	Part-time work gap		Employment gap	Part-time work gap
Austria	1994	1995	Italy	1970	1983
Belgium	1983	1983	Latvia	2000	2000
Bulgaria	2000	2001	Lithuania	2000	1998
Croatia	2002	2002	Luxembourg	1983	1983
Cyprus	2000	2000	Malta	2000	2000
Czech Republic	1993	1993	Netherlands	1971	1983
Denmark	1983	1983	Poland	1992	1992
Estonia	1990	2000	Portugal	1974	1986
Finland	1963	1976	Romania	2000	2000
France	1975	1975	Slovak Republic	1994	1994
Germany	1970	1983	Slovenia	2000	2000
Greece	1983	1983	Spain	1972	1987
Hungary	1992	1995	Sweden	1963	1976
Ireland	1961	1983			

10 https://stats.oecd.org/; https://data-explorer.oecd.org/ .
11 Eurostat table SDG_05_20; https://ec.europa.eu/eurostat/databrowser/view/SDG_05_20/default/table?lang=en

3.2. Evolution of the gender employment gap

The results on the gender employment gap are distributed over five graphs in Figure 1, by region of the EU[12], in order to keep them uncluttered. Two observations stand out. First, in the older EU members in Northern, Western and Southern Europe, the employment gap has declined enormously during the last four or five decades, from values which were sometimes over 50 percentage points to less than 20 percentage points in all these countries in 2021. The decline was steeper in Scandinavia, where the gender employment gap reached a fairly low value already in the mid-1990s. In some countries of Southern Europe, the gap remains higher than in Western and Northern Europe. Second, and by contrast, in the newer Member States in the Baltic, Central and Eastern Europe, the gender employment gap has decreased much less since the mid-1990s or 2000, and in some countries (RO) it has even increased. Nevertheless, the gender employment gap in these countries is even in 2021 at a low to moderate level, and not higher than in the other regions of the EU. Below we will come back to the implications of these developments for the current and future gender pension gaps.

3.3. Evolution of the gender part-time work gap

Currently, part-time work rates among women are much higher in Western and Northern Europe than in the Baltic, Central and Eastern Europe (Figure 2, top graph). In the latter region, they are below 15% in all countries except Estonia, while in the other parts of Europe they are everywhere above that threshold except in Greece and Cyprus. As part-time work rates among men are much lower in all countries, the gender part-time gap follows the same pattern as the female part-time work rates. Countries that stand out in both respects are The Netherlands in particular, and also Germany and Austria.

The bottom graph of Figure 2 shows that the evolution of the gender part-time gap since 2002 varies considerably across countries. As part-time rates are and were low both for men and women in the Baltic, Central and Eastern Europe, there is little change in those countries. In most countries of Southern Europe, there was also not much evolution in the gender part-time gap, as part-time work rates remained the same or moved in tandem for women and men. In Italy, though, this gap increased substantially, as women are working part-time in 2022 much more often than in 2002. Substantial changes are observed in several countries in Northern and Western Europe. In Belgium, France and The Netherlands the gender part-time work gap has narrowed considerably and in Sweden is has been more than halved. In Sweden this is due to a falling part-time work rate among women, while in Belgium the part-time work rate among men has increased and in France and The Netherlands both developments occurred. In other Western European countries the gender part-time work gap remained nearly constant.

Data about part-time work rates for many EU countries go only back to the late nineties or the early 2000s. Consequently, Figure 2 shows the changes for only ten Member States. In 1983, the part-time work rate among women exceeded 25 percent only in The Netherlands, Denmark, Sweden and Germany. As very few men worked part-time in all countries at that time, the same Member States had the

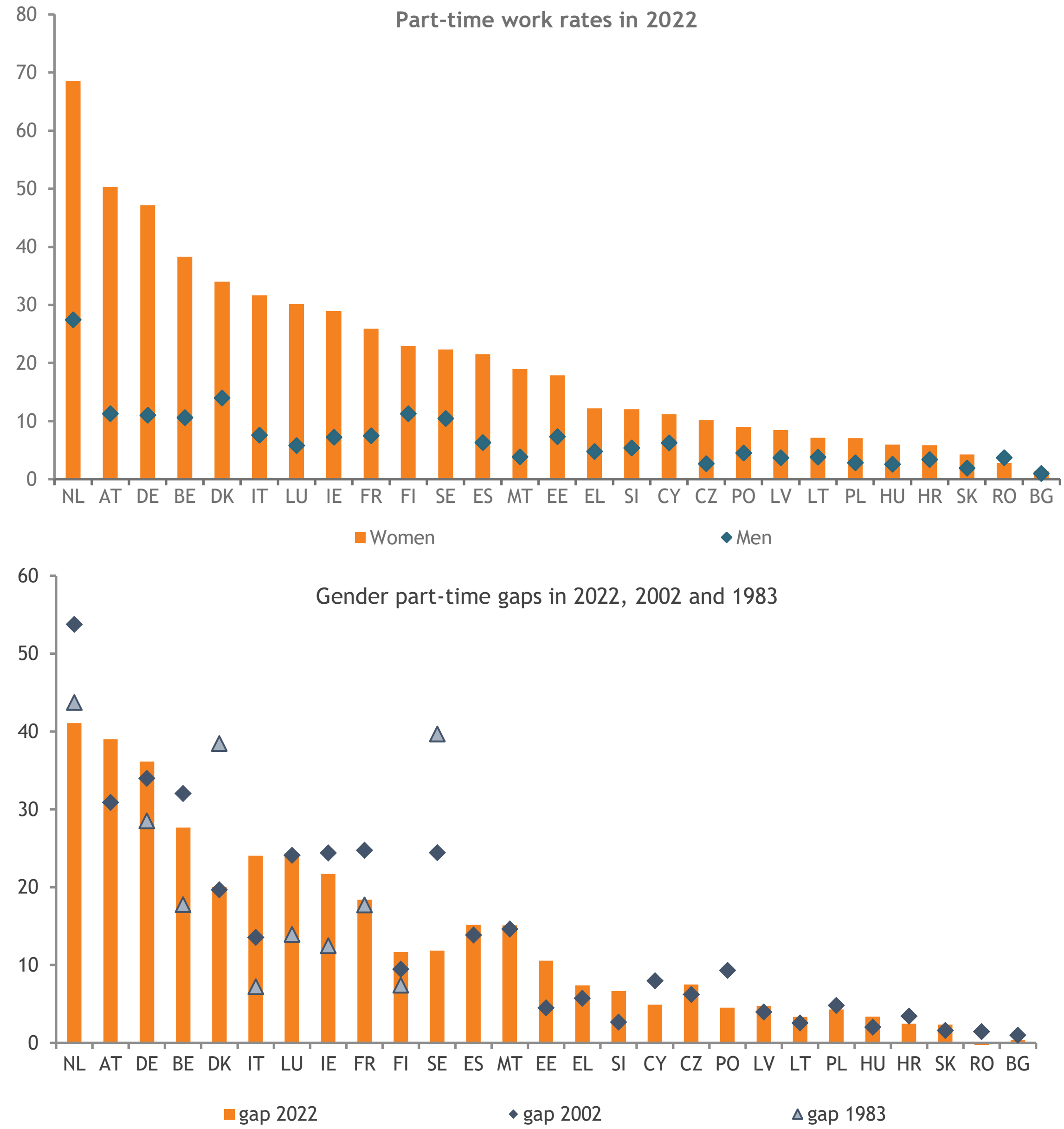
[12] The grouping of European countries into regions follows that of EuroVoc, which is used by the Publications Office of the European Union: https://op.europa.eu/en/web/eu-vocabularies/concept-scheme/-/resource?uri=http://eurovoc.europa.eu/100277. The exception is that the Baltic states are grouped together with the new Member States in Central and Eastern Europe (instead of Northern Europe), because ot their common recent history, and the similarities in current socio-economic conditions.

highest gender part-time work gaps. Comparing with 2022, it is striking that since 1983 the gender part-time gap has been nearly halved in Denmark and reduced to less than one-third in Sweden. This is both because part-time work rates have come down among women, while they increased for men. During the same period, the gender part-time work has increased in Germany, Belgium, Italy, Luxembourg and Ireland. In France and The Netherlands, this gap makes a yo-yo movement, going first up and then down again, so arriving in 2022 at about the same level as it was in 1983.

Figure 1 Evolution of the gender employment gap, by region of the EU, population 15-64
Percentage points

Notes: Horizontal and vertical scales vary by graph. To make sure the graphs remain clear, the countries in the Baltic, Central and Eastern Europe have been distributed over two graphs.
Source: OECD

Figure 2 Part-time work rates by gender in 2022 and gender part-time graps in 1983, 2002 and 2022
%



Note: population 15-64 in employment. Countries ordered in all graphs by part-time work rate among women in 2022.
Source: OECD

3.4. Evolution of the gender pay gap

Unfortunately, Eurostat publishes estimates of the gender pay gap only from 2007 on.[13] Figure 3 shows that between 2007 and 2021 there was a steady decline in the gender pay gap in most EU countries in Northern and Western Europe (though not in France), as well as in Cyprus and Spain. This was not the case in Italy (where the gender pay gap was low already in 2007) and Portugal. In the countries of the Baltic, Central and Eastern Europe, there is more fluctuation and the trends are less clear. The gender

[13] The OECD publishes estimates of the median gender pay gap (relative difference between median hourly wages of women and men), but these go back only to 2006. I tried to obtain estimates from various micro-data sources (European Community Household Panel, Luxembourg Income Study), but this was unsuccessful for various reasons.

pay gap appears to decrease only in Romania, Estonia, and the Czech and Slovak Republics. In 2021 the countries with the highest gender pay gaps (over 15 percent) can be found in all regions of the EU (except the South): Finland in the North, Austria, France and Germany in Western Europe, Estonia, Hungary and the Slovak Republic among the New Member States. The countries with a relatively low gender pay gap (5 percent or less) are also widely distributed: Belgium, Italy, Luxembourg, Poland, Romania and Slovenia.

Figure 3 Evolution of the gender pay gap, by region of the EU

%

Note: To make sure the graphs remain clear, the countries in the Baltic, Central and Eastern Europe have been distributed over two graphs.
Source: Eurostat

4. Past gender inequalities on the labour market and current gender pension gaps

4.1. Approach

In this section the relation will be explored between current gender pension gaps and the three indicators of gender inequalities on the labour market in past decades, that were presented in the previous section. For this purpose, the Overall Gender Pension Gap (OGPG) in 2022 for the age group 66-75 years is used, instead of the standard Gender Pension Gap. As explained in the first intermediate report, the OGPG is calculated in a way similar to the standard GPG, but while including older people without pensions (or zero pensions). The OGPG thus combines the Gender Pension gap and the Gender Pension Coverage Gap into a single indicator. As past labour market participation can have an effect both on the level of pension and on whether one has a pension at all, it makes sense to relate past gender inequalities to a single comprehensive indicator. We focus on the age group that is 66-75 in 2022 (alias the birth cohort 1945-54), because, as will be shown in the next section, the labour market history has a bigger impact for this group than for those over 75, where widowhood is more common. The bottom age threshold is set at 66 instead of 65, since in some countries the statutory retirement age is above 65, and in other countries, many people retire at 65 and so receive pensions only part of the year. The OGPG has been calculated from the EU-SILC microdata for 2021.[14]

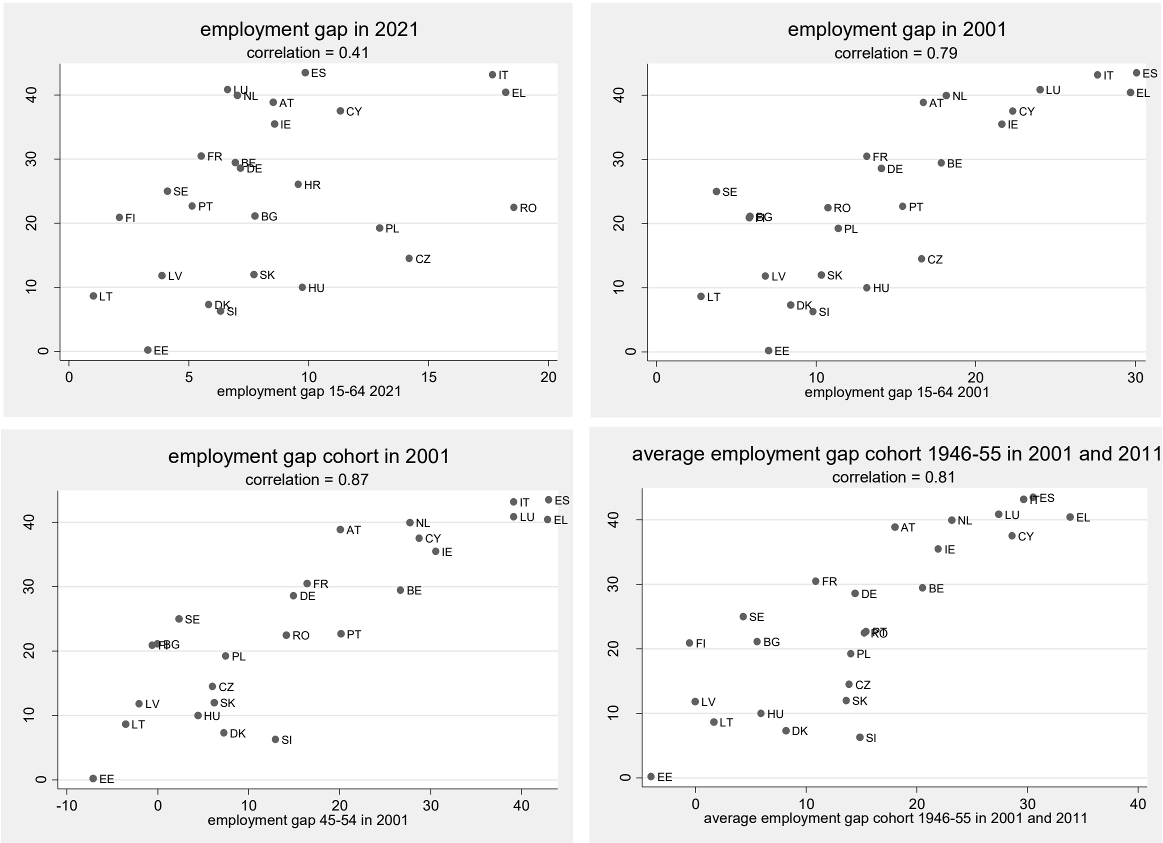
4.2. Impact of gender employment gap

We look first at the impact of the gender employment gap. The top-left graph in Figure 4 shows the correlation across EU countries between the current OGPG for the birth cohort 1945-54 and the current employment gap in the population at active age. As has been found in previous studies (e.g. Lis and Bonthuis, 2019), the current gender pension gaps correlate at best moderately with the employment gaps in the same year among the population at active age. When the current OGPG is related to the employment gap 20 years ago in 2000 (Figure 4, top right graph), the correlation turns out to be much stronger. All countries where the gender employment gaps was over 20 percent in 2000 have relatively high OGPGs in 2021. The opposite is less true: some countries where the gender employment gap was low, still have fairly high current OGPGs (Sweden, Finland). The correlation is even stronger (Figure 4, bottom left graph) when the gender employment gap is limited to the same cohort (those born in the period 1945-54, who were between 45 and 54 in 2000). In several countries in Southern Europe with a currently high OGPG, the gender employment gap in that particular cohort was higher than among the active population as a whole. Conversely, in Estonia and Latvia, where the OGPG is low, the gender employment gap in that particular cohort was lower than among the active population as a whole. One would expect that the correlation would be even higher if in addition to the gender employment gap within the cohort in 2000, the gender employment gap in 2010 (when the cohort was aged 55-64) is also taken into account. The bottom-right graph in Figure 4 shows that this is in fact not the case: though the

[14] An issue that does not seem to have received any attention in the literature is that current pensioners may include people who worked in another country during their active age, and who therefore may receive foreign pensions. Unfortunately, foreign pensions are not identified as such in EU-SILC and also not in ESSPROS as far as I have been able to see.

position of countries is rather similar, the correlation is somewhat lower. The gender employment gap in the age group 55-64 may deviate from that in younger age groups if there are differences by gender in early exit from work.

Figure 4 **Impact of the gender employment gap on the overall gender pension gap among the 66-75 in the EU in 2022**
%



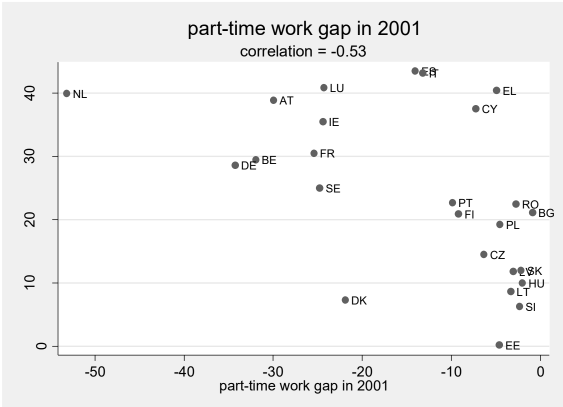
Note: Horizontal scale varies over graphs. No OGPG data for Malta, no employment gap data for 2001 for Croatia
Sources: OECD, EU-SILC

As a robustness check, the same analysis was performed for the cohort born a decade earlier between 1936 and 1945, looking at the relationship between the gender employment gap in 1991 when this cohort was aged 45-54 and the OGPG in 2011 when the cohort had aged to the age range 66-75. Unfortunately this is only possible for a limited subset of 14 countries, mostly older EU Member States and also Estonia. Here also a high correlation is found of 0.78. Note that compared to the cohort 1946-1955, the earlier cohort had both a higher OGPG in many countries while the employment gap when they were aged 45-54 was also higher. Exceptions are the Scandinavian Countries and also Estonia, where, as shown above, the gender employment gap declined earlier than in most countries in Continental and Southern Europe. A more comprehensive analysis of the patterns of the gender employment gap by age group and by cohort, and how these relate to gender pension gaps now and in the recent past, across the Member States of the EU, will be part of the final report.

4.3. Impact of the gender part-time work gap

The gender part-time work gap is the difference between part-time work rates of employed women and men in percentage points. Part-time employment is based on a common 30-usual-hour cut-off in the main job. As explained above, the OECD data on the gender part-time work gap go back only to 2000 for many countries, and moreover are broken down by only three age categories. For this reason, we cannot relate the OGPG in 2021 to the gender part-time work gap in 2000 of the same birth-cohort, but in Figure 5 show the correlation with the overall part-time work gap in 2000. Note that the gender part-time work gap is negative in all countries, as women work more often part-time than men (see section 3.3). The relation is negative, though not linear. Countries where the gender part-time gap is wide, all have also large OGPGs (The Netherlands in particular, but also Belgium, Germany and Austria). On the other hand, Member States who had a low gender part-time gap in 2000 (mainly because part-time rates were low for both sexes) show great variation in the OGPG, from very high to near-zero. Among the latter group of countries the gender employment gap is the main factor explaining differences in the OGPG, as shown in the previous subsection. In fact, the gender part-time work gap provides an explanation for why some countries (The Netherlands, Austria and Germany) have higher OGPGs than one would expect based on their gender employment gap. A notable outlier is Denmark which has a OGPG near zero, despite a moderate gender employment gap and a substantial gender part-time work gap.

Figure 5 The gender part-time work gap in 2000 and the overall gender pension gap among the 66-75 in the EU in 2022
Percent-point

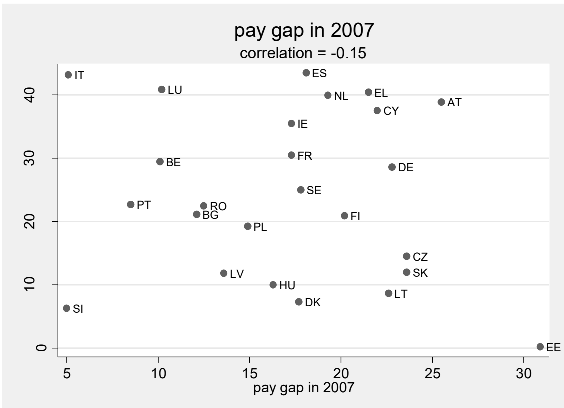


Note: part-time work gap in 2000 among people aged 15-64 in employment.
Sources: OECD, EU-SILC

4.4. Impact of the gender pay gap

The gender pay gap is available only from 2007 on, and only for the whole population, not by age group. Figure 6 shows the surprising finding that across the Member States of the EU, there is hardly any correlation between the gender pay gap in 2007 and the OGPG in 2021 among those aged 66-75. The pattern of the gender pay gap across countries may have changed over the past years, but unlikely to such an extent that the correlation between the gender pay gap in 2000 and the current OGPG would be much higher. If the subset of countries is limited to the "old" EU15 (so excluding the newer EU Member States in the East and South of the EU), the correlation remains near zero (note

Figure 6 The gender pay gap in 2007 and the overall gender pension gap among the 66-75 in the EU in 2021
Percent-point



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Sources: OECD, EU-SILC microdata

that in Figure 6 these countries, except Denmark, are spread out across the full width of the upper part of the graph).

Veremchuk (2020, pp. 17-22) finds the same lack of correlation between the gap in hourly labour income and the gender pension gap in 2018. She argues that this has to do with the date of the introduction of a wage-dependent second pillar. In countries where this date was before 1990, the correlation is positive. On the other hand, in the former socialist countries in the Baltic, Central and Eastern Europe, the movement from a purely PAYG pension system to a three-pillar one was implemented only at the end of the 1990s or the first years of the 2000s. Therefore, few of the current pensioners receive second- or third-pillar pensions. As the set of EU Member States in our study includes only five countries where a wage-dependent second pillar was introduced before 1990, this hypothesis is hard to check.[15] The final report will contain an exploration of the possible reasons for the lack of a strong and simple correlation between the gender pay gap and the gender pension gap.

4.5. Regression with all three variables

The regression reported in Table 2 confirms the findings reported above. When the OGPG of the birth cohort 1946-55 in 2022 is regressed on the three indicators of past gender inequalities on the labour market, the gender employment gap (within that particular cohort in 2001) turns out to be the dominant determinant. The gender part-time work gap has a small negative impact, and the gender pay gap hardly has any effect at all. The first two variables together explain more than three-quarters of the variation in the OGPG across countries. When inspecting the residuals (the difference between the predicted value based on the regression equation and the observed value for each country), Denmark shows up as a clear negative outlier. This means that the OGPG in Denmark is considerably lower than would be expected given its gender labour market gaps. [16]

Table 2 Regression of Overall Gender Pension Gap age group 66-75 in 2022 on three indicators of gender labour market inequality in the past

	Coefficient	Std. Error	Significance
Gender employment gap cohort in 2001	0.69	0.10	0.00
Gender part-time work gap in 2001	-0.21	0.10	0.06
Gender pay gap in 2007	0.15	0.21	0.48
Constante	7.68	4.40	0.10
n = 25; R^2 = 0.80			

15 Veremchuck (2018) also included Norway, Switserland the UK. Even so, she does not report a strong correlation between the gender pay gap and the gender pension gap in the subset of countries who introduced 2nd pillar pensions before 1990.

16 We come back to the case of Denmark in section 5.

5. Aspects of pension systems affecting the gender pension gaps

5.1. Introduction

In the previous section we explored the relation between past gender inequalities on the labour market and the current overall gender pension gap (OGPG) among those aged 66-75. It was found that the OGPG in that group is very strongly determined by the gender employment gap within that cohort when it was at active age. This would seem to imply that there is not much room left for differences between pension systems to explain variation in the OGPG across EU Member States. In this section some possibilities are explored by which aspects of pension systems can mitigate (or exacerbate) the pension gaps that are created by past gender inequalities on the labour market.

Aspects of pension systems are measured in a quantitative way variables derived from the Theoretical Replacement Rates (TRRs)[17]. These TRRs are published in the Pension Adequacy Report 2021 and refer to people retiring in 2019 (European Commission and Social Protection Committee, 2021a, pp. 66-67). They represent pension replacement rates for various hypothetical situations; the base case is a single man or woman who has worked for 40 years at the average wage in each year and has retired at the statutory retirement age. The calculations include pension schemes that are mandatory or widespread in the given country. While both net and gross TRRs are published, the gross ones are used here as the gender pension gaps are also in gross terms. The TRRs have the advantage that they summarize the impact of possibly many rules and regulations into a single measure. This is also the reason why the term aspects rather than policies is used in the title of this section. On the other hand, being based on model cases, they are not influenced by socio-economic differences between countries in the composition of the people in retirement. Thus, they allow a comparison of pension systems. The Pension Adequacy Report contains the warning that "The TRR levels depend on a number of factors and assumptions that can have varying effects in different countries; thus, they are not directly comparable across countries." (European Commission and Social Protection Committee, 2021a, p. 67) However, as is done in that report, in this study the base-case TRRs serve as a baseline for measuring the impact of various career and life events on the later pension, using the TRRs for alternative scenarios. Nevertheless, detailed comparisons between two or three countries are avoided. The interest is in the overall pattern across all Member States of the EU.

Note that the TRRs are only about the level of pension benefits, not about the conditions for being eligible for a pension. So, arguably, the TRRs could have a stronger association with the Gender Pension Gap (which includes only older people with a positive pension) than with the OGPG, which includes the Gender Pension Coverage Gap. The inclusion of the latter might distort or weaken the relationships

[17] "Theoretical replacement rates are standard simulations, also known as model person simulations, that measure how a hypothetical retiree's pension income in the first year after retirement would compare to their earnings immediately before retirement. They are defined as the level of pension income in the first year after retirement, as a percentage of individual earnings at the moment of take-up of the pension. They therefore mainly reflect the income-maintenance dimension of pension adequacy. […] The calculations include pension schemes that are mandatory or widespread in the given country. So while for some countries the analysis is limited to public mandatory schemes, in others it may also include e.g. occupational schemes." (European Commission and Social Protection Committee, 2021a, pp. 66-67)

somewhat. However, in order to preserve consistency with the previous sections, we retain the OGPG here as the indicator of gender pension gaps. Moreover, as was made clear in the first intermediate report, the OGPG is strongly dominated by the Gender Pension Gap. The final report will contain a sensitivity analysis based on the Gender Pension Gap.

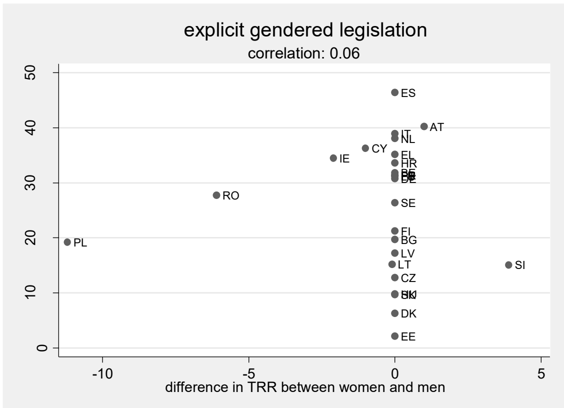
First, explicit gender differences in pension legislation in some countries are considered, followed by the indexation of existing pensions and the impact of measures of childcare provisions in pensions systems. The fourth aspect is the redistributive capacity of pension systems. Finally, the impact of survivor pensions is analyzed. While the previous section was about the OGPG among the 66-75, in this section the OGPG among all 66plus is the variable of interest.

5.2. Explicit gender differences in legislation

Some EU Member States still have pension rules that explicitly distinguish between women and men. This mostly concerns the statutory retirement age, which in 2019, was lower for women than for men in eight Member States: Bulgaria, the Czech Republic, Croatia, Lithuania, Austria, Poland, Romania and Slovenia. In six of these countries, the retirement age is set to converge unto that of men, but not in Poland and Romania (European Commission and Ageing Working Group, 2021, p. 56). The lower retirement age and other gender-specific pension rules can have an effect on the resulting pensions. The direction of this effect can be both to the advantage or disadvantage of women with respect to men. We measure this by the difference in the TRR of the base case between women and men.[18]

Figure 7 shows that in most countries the TRR for the base case is the same for women as it is for men: if they have the same career and retire at the same moment, they have the same pension replacement rate. The TRR is lower for women than for men in Poland, Romania, Ireland and Cyprus. On the other hand it is slightly higher in Austria and 4 percentage points higher in Slovenia. In Slovenia, in addition to a slightly lower statutory retirement age, women enjoy currently higher replacement rates than men and higher additional accrual rates for taking care of a child and for later retirement. These differences between genders will be phased out in the near future (European Commission and Social Protection Committee, 2021b, pp. 313-325). The much lower TRR for women compared to men in Poland is due to the fact that under the assumptions made, the lower statutory retirement age for women does not allow them to complete a 40 year

Figure 7 The effect of explicit gendered pension rules
Percentage points



Sources: Pension Adequacy Report 2021 vol 2, EU-SILC microdata

[18] In Belgium the family retirement pension (75% of reference earnings instead of 60% at the single rate) can be granted to one partner in a couple if the other partner renounces their right to a retirement pension. This is usually done if the sum of the pensions at the single rate is lower than the family pension of the partner with the highest earnings. While the family pension rules are formally gender-neutral, it is almost always the female partner who renounces her right, and therefore receives no pension of her own. This increases the Gender Pension Coverage Gap and also the OGPG (the effect on the Gender Pension Gap, from which people with no pensions are excluded, is ambiguous). A look at the MISSOC tables (https://www.missoc.org/missoc-database/comparative-tables/results/) suggests that Belgium is the only country with such family pension rules.

career. For an alternative case in which a career of 40 years until age 65 is assumed, there is no difference in the TRR between women and men. [19]

In particular countries like Poland and Romania, the explicitly gendered pension rules may well drive the OGPG upward, although their effect will be mediated by the actual labour market and retirement behaviour of women and men. It is also clear, though, that removing those rules would not change by much the pattern of the OGPG across EU Member States. The number of countries where these rules seem to have a substantial impact is simply too small. Also, the OGPG in Poland and Romania is not very high, but close to the median value across countries.

5.3. Indexation

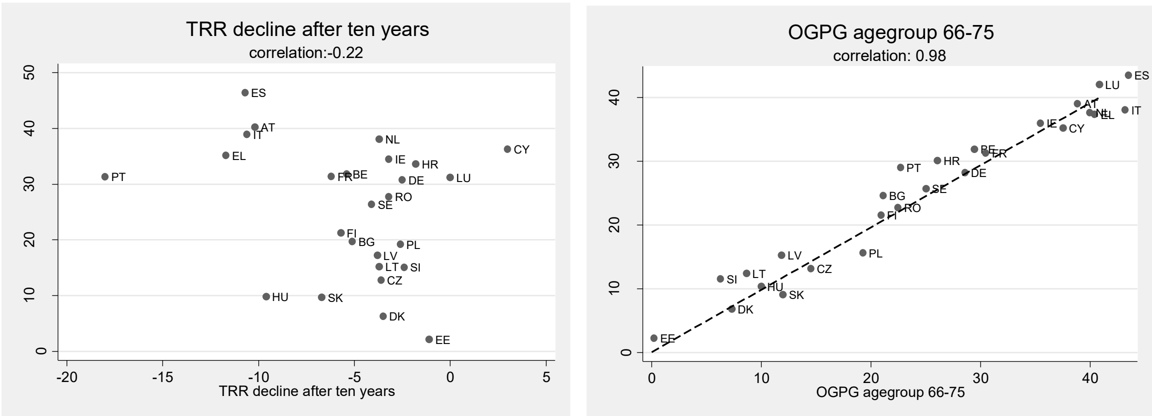
All EU Member States index pension benefits (i.e. adjust them) to a greater or lesser extent, to reflect changes in the cost of living or the overall standard of living. Overall, Member States' indexation rules for pension benefits can be broadly divided into four main groups (a) indexing to prices; (b) indexing to wages; (c) mixed indexation rules (linking to a weighted average of prices and wages); and (d) indexation of pension benefits based on ad hoc decisions. (European Commission and Social Protection Committee, 2021a, p. 50). Indexation to prices may mean that the pensions of the oldest old fall behind those of people who retired later. As in all EU countries women live longer than men, and therefore are overrepresented among the oldest old, their pensions would be more affected by indexation rules than those of men. Indexation to prices rather than wages might therefore increase the OGPG.

In order to measure indexation rules in a quantitative way, the TRR for the case '10 years after retirement' is compared with the base case. The former is only available for the people retiring in 2069, not for 2019 as are most of the other TRRs. The TRR for the case '10 years after retirement' is calculated considering the value of an individual's pension 10 years after retirement, i.e. in 2069, divided by the income of another average-earner worker retiring in 2069. Given the assumptions about these cases, the TRRs will be the same if indexation follows the average wage growth; otherwise the TRR 10 years after retirement will be lower. The implicit assumption in the current exercise is therefore that indexation rules in the recent past were similar to those expected for the future. Because in most countries, indexation rules are set in legislation, this is not an unreasonable assumption.

[19] A similar explanation may apply to Romania, although for that country the TRR is lower for women than for men even in the case with a 40-year career until age 65. I have not been able to find any mention of gendered pension rules for Ireland. Consultation of OECD or national experts may be needed to clear this up.

Figure 8 (left) shows that the correlation between the OGPG in 2021 and the change in the TRR after 10 years (TRR after 10 years minus TRR for the base case) is indeed negative as expected, but rather low. Countries where the TRR declines substantially after 10 years tend to have high OGPGs (except Hungary), but high OGPGs are also found for Luxembourg and Cyprus, where there is no decline in the

Figure 8 The effect of indexation on the overall gender pension gap
%, percentage points



Sources: Pension Adequacy Report 2021 vol 2, EU-SILC microdata

TRR. In the countries at the left side of this graph indexation is for prices only (Austria, Hungary, Italy) or ad-hoc (Greece, Spain). (European Commission and Social Protection Committee, 2021a, p. 51). The extreme position of Portugal may be due to the fact that its indexation rules also take into account the evolution of GDP and pension level in addition to prices; however, this large decline in the TRR for Portugal is unlikely to reflect the effect of indexation on current pensions.

A simple model was developed to understand better the relation between the OGPG and indexation mechanisms (see Annex 1), and this makes clear that the low correlation is not really surprising. This stylized but not unrealistic model when combined with real-world data indicates that a change from indexation to wages to indexation to prices would increase the OGPG by 4 to 7 percentage points, and that even in rather extreme scenarios (i.e. when the proportion of women among the oldest old is much higher than among younger pensioners) the impact is not likely to be higher than 10 percent points. These figures suggest that indexation can have a significant yet small effect on the OGPG, which is therefore unlikely to change drastically the pattern of OGPGs across EU Member States.

Another piece of evidence that the impact of indexation is unlikely to be large is the right graph in Figure 8. If there were no differences between cohorts, and indexation is such that the pensions of the oldest old are on average equal to those of the recently retired, the OGPG would be the same in all age groups and equal to the overall OGPG. If indexation does not completely follow wage growth, the pensions of the oldest pensioners fall behind their younger counterparts. If in addition women are overrepresented among the oldest pensioners, women are more affected by this than men, and so the OGPG among all pensioners would be higher than among the younger pensioners aged 66-75 considered separately. Figure 8 (right graph) shows that except in Portugal and Slovenia, the differences are smaller than 5%, however.

5.4. Childcare

Childcare is a frequent reason for needing to discontinue work for a number of years, in particular for women. This can lead to the non-accrual of pension rights. However, many countries have instituted pension credits or other regulations in response to this. Such credits can dampen the impact of a (limited) absence from work and, in some countries, can even raise the pension benefit to a level above that of an uninterrupted career (European Commission and Social Protection Committee, 2021a, pp. 83-86; see also Evandrou and Glaser, 2003; Frericks et al., 2008; Möhring, 2018; Lodovici et al., 2016; van den Bosch et al., 2023). Moreover, other features of pension systems, such as consideration only of the years with the highest earnings, can also imply that interrupting or reducing work due to childcare has a relatively small impact on the later pension (van den Bosch et al., 2023).

The set of TRR cases contains three scenarios about childcare (European Commission and Social Protection Committee, 2021a, p. 83).

- Career break for 3 years of childcare: childcare covering a period of 3 years of absence, and the worker applies for this period to be credited if possible. Two children are born 2 years apart. (Presumably, the base case is childless, though this is not completely clear.) Average earnings when working.
- Career break for 3 years of childcare and low earnings: the same as the first scenario, except earnings are 66% of average earnings when working.
- Break of 3 years, extended by part-time work for 10 years: childcare covering a period of 3 years of absence, as for the standard childcare case (two children are born 2 years apart), again credited if allowed. After the 3-year break follows a period of 10 years of part-time work at 66% of average earnings, before full-time work resumes. This case is only worked out for retirement in 2059.

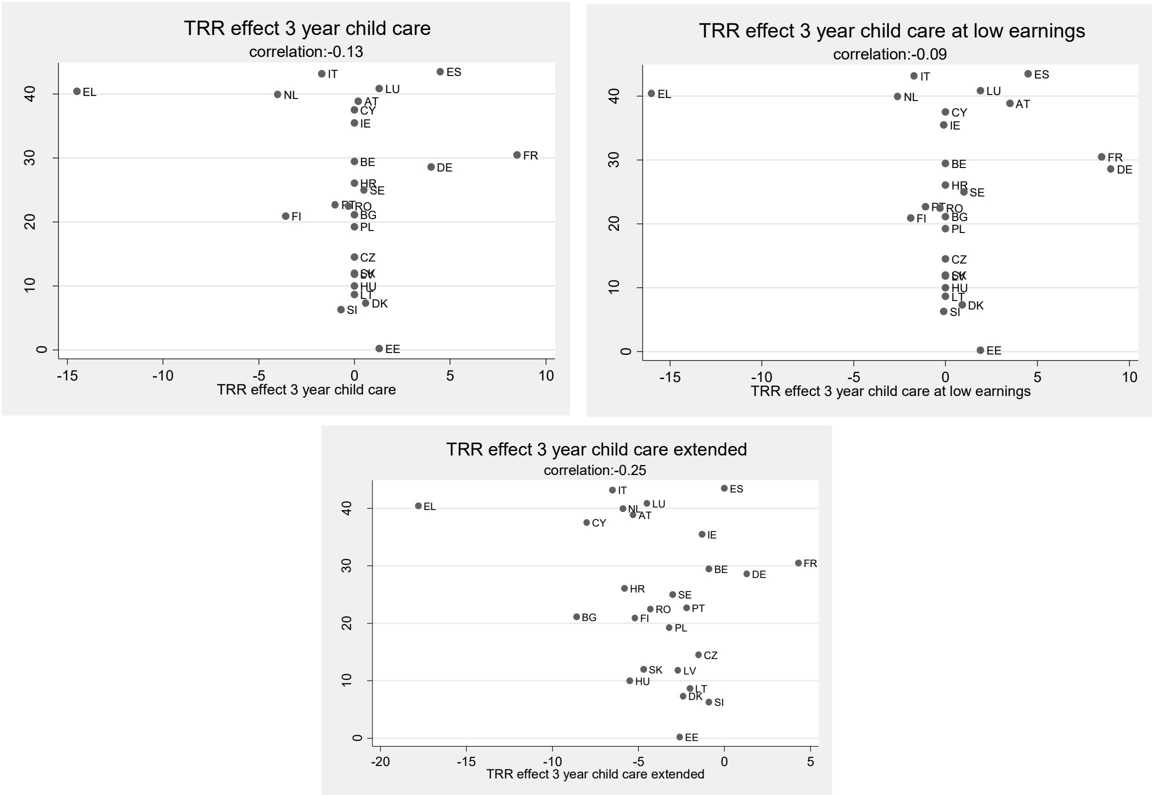
Figure 9 presents the correlations of the overall gender pension gap in 2022 of the cohort aged 66-75 with the differences between the child-care TRR cases and the relevant base case (standard base case for the first and third scenarios, the low-earnings case for the second scenario). The OGPG of the younger cohort (66-75) is used here, because it is to be expected that career-related provisions are more important for this group than for the older cohort where widowhood is more common. The correlations of the OGPG for all 66plus with the TRR measures are indeed lower.[20] The top left graph shows that in most countries, the impact on the later pension of a 3-year break for childcare is nihil or quite small. Most EU Member States have some regulation ensuring that time out of work for childcare is treated as a contributory period. In some countries, notably France and Germany, and to a lesser extent in Estonia, Luxembourg and Spain, as well as in Austria among low-earners, a pension bonus for those who have raised children actually increases the pension relative to the base case. This pension bonus is granted regardless of whether or not the worker takes a career break. In Greece, the loss in pension is disproportionally large relative to the period out of work, because the pension accrual rate per year increases strongly with the number of career years. The loss in pension is generally higher when the complete break of 3 years is followed by 10 years of part-time work at 66 percent of average earnings, as this longer period is not always covered by pension credits. Still, the loss is negligible in Belgium, Ireland

[20] These correlations are -0.09, -0.05 and -0.20 with the TRR effect of 3 year childcare, the TRR effect of 3 year childcare at low earnings and the TRR effect of 3 year childcare extended, respectively.

and Slovenia and more than compensated by the pension bonus related to raising children in France, Germany and Spain.

Figure 9 Childcare provisions in pension systems and the overall gender pension gap

%, percentage points



Sources: Pension Adequacy Report 2021 vol 2, EU-SILC microdata

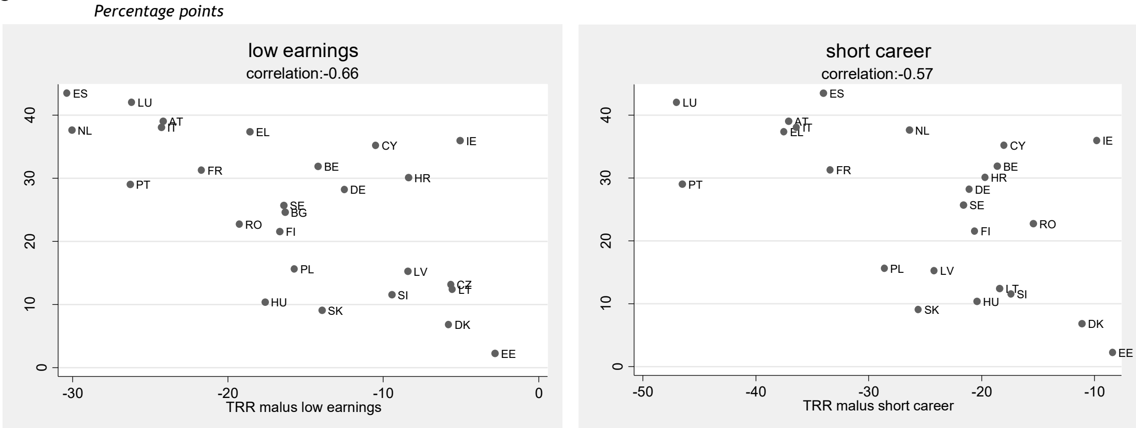
The correlations of the childcare provisions as measured by the TRRs with the OGPG of the cohort aged 66-75 are in the expected negative direction: when these provisions limit the impact of a career break on the later pension, the OGPG tends to be smaller. They are also near zero or rather weak, though. There can be various reasons for this weak effect. First, the pension bonuses for people with children that are independent of career breaks can generally be shared between both parents, except in France where only the mother is entitled to this. Thus, women may not receive these bonuses much more often than men, except to the extent that single parents are more likely to be female than male. By contrast, more women than men interrupt their career to care for their children, and so they are more likely to receive any pension credits granted in case of career breaks. Apparently, their effect on the later pension is too small to substantially reduce the OGPG. The pension credits may be granted for only a few years, or may be based on a minimum wage. Perhaps more importantly, the impact of motherhood on the career is not limited to the period of interruption of work, but is felt for many years after the mother returns to work (cf. van den Bosch et al., 2023, and references in that paper on the effect of motherhood on later wages). Childcare scenarios one and two do not incorporate this effect of career breaks (as the wage is assumed to be the same before and after the break), which is possibly an important reason for the limited impact of these scenarios on the TRRs.

The finding of low correlations does not necessarily mean that pension credits related to childcare have no mitigating impact on the gender pension gaps. Almost all EU Member states provide such credits or have pension regulations to the same effect. If these neutralize the impact of career breaks more or less to the same extent everywhere, these will not affect much the pattern of the OGPG across countries.

5.5. Redistribution

As women have on average lower earnings during their working life than men, mechanisms that ensure redistribution across socioeconomic groups might reduce the gender pension gaps. Those mechanisms include pension credits, contribution and benefit ceilings, modifications of the link between contributions and benefits and non-contributory or minimum pensions, among others (European Commission and Social Protection Committee, 2021a, p. 96). Indicators of the total extent of redistribution in pension systems are the TRR malus for low earners and the TRR malus for short careers. The TRR malus for low earners is calculated as two-thirds of the TRR for low earners minus the TRR for the base case with average earnings. The adjustment factor of 2/3 is used because the level of low earnings in the denominator of this TRR is set at 2/3 of average earnings. In this way the TRR malus measures, in percentage points, how much lower the pension of a low earner is compared to the pension of an average earner.[21] If the pension system is perfectly proportional to previous earnings, the TRR malus for low earners would be -33; conversely if a flat-rate benefit is the only pension, this TRR malus is zero. The TRR malus for short careers is defined as the TRR for careers of only 20 years (instead of 40) at average earnings minus the TRR for the base case.[22] If (under the TRR assumptions) pensions are exactly proportional to the length of the career, the TRR malus for short careers is -50; if the length of career has no influence on the pension it is 0.

Figure 10 The effect of redistribution
Percentage points



Sources: Pension Adequacy Report 2021 vol 2, EU-SILC microdata
Notes: TRRs for the short-career scenario are missing for Bulgaria and the Czech Republic.
When the OGPG for the 66-75 age group is used, results were very similar (the correalations were -0.74 and -0.38).

Figure 10 (left) shows that across EU Member States there is a strong negative correlation between the malus for low earnings and the OGPG. A big (small) malus for low earnings is associated with a high

21 For the gender pension gaps, such a comparison is more relevant than a comparison of replacement rates.

22 Because the TRRs are defined with respect to earnings in the year before retirement, no adjustment factor is needed for this measure. The model person is supposed to work for 10 years, then to interrupt work for 20 years, and to resume work for the last 10 years of the 40-year assumed period.

(low) OGPG. Countries where this malus is almost proportional to the difference in earnings, such as The Netherlands and Spain are among the countries where the OGPG is highest. Conversely, some countries like Estonia and Denmark have a low earnings malus close to zero and also very low OGPGs. The correlation is not perfect though, as the positions of Hungary and Ireland show. In the Hungarian pension system the malus for low earnings is close to the average value in the EU, yet the OGPG is relatively low in Hungary. The reason is probably that at least until recently the Gender Pay Gap was quite narrow in Hungary (see Figure 6), so retired women are not much more affected by this malus than men. In Ireland the first-tier pension system is quite redistributive with low maximum benefits in the contributory pension system and a means-tested non-contributory state pension (European Commission and Social Protection Committee, 2021a, p. 115; European Commission and Social Protection Committee, 2021b, pp. 91-96). The relatively high OGPG in Ireland is presumably due to private-sector occupational pensions, which are not included in the TRR calculations.[23]

The correlation of the OGPG with the malus for a short career is somewhat lower (Figure 10 right). The malus for a short career is near 50 percent in Luxembourg and Portugal, countries where the OGPG is in the high range. By contrast, this malus is quite small in Denmark and Estonia, where the OGPG is narrow. Ireland is again an outlier with a small malus for a short career and a rather wide OGPG.

The two TRR indicators for redistribution are strongly correlated across Member States: the correlation is 0.79. Outliers are the Netherlands, Romania and Spain, where the TRR malus for the short career is relatively small compared to the malus for low earnings. This may be due to a basic or minimum pension that is independent of the career (e.g. in The Netherlands), or to a career length requirement that is shorter than 40 years (e.g. in Spain) (European Commission and Social Protection Committee, 2021b). The high correlation suggests that the two TRR indicators measure an underlying concept of redistributive capacity within pension systems.[24][25]

The TRR set also includes a TRR for high earnings, i.e. the replacement rate for a person with a 40-year career, whose earnings rise from 100% of average earnings in his first working year to 200% just before retirement. The pension bonus for high earners that can be calculated from this[26] correlates strongly with the malus for low earners: -0.83. It also correlates with the OGPG (0.55), but this correlation falls to

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23 I have not been able to find figures on private-sector occupation pensions for current retirees in Ireland. As there are a large number of occupational pension funds in Ireland, these figures may well not be available at all.

24 It might be tempting to relate the distributional capacity measured by these indicators to the traditional distinction between Beveridgean and Bismarckian pension systems. While redistribution was not an explicit goal for both Beveridge and Bismarck, Beveridgean pension systems aim at poverty reduction in old age, so implying a degree of redistribution. For Bismarckian pension systems, the maintenance of the acquired standard of living (and relative status) is the main goal, so seemingly precluding much redistribution. Different authors assign different sets of countries to these two types (while some distinguish additional types). Ebbinghaus (2021) regards all Nordic countries as well as Ireland and The Netherlands as Beveridgean and Austria, Belgium, France, Germany and Luxembourg as Bismarckian. In Figure 9, the first group of countries are found all over the graphs, while countries from the second group are not found at the extreme right side of the graphs, but are otherwise also widely dispersed. As these pension systems have evolved over time, their original design has been much diluted by new elements.

25 The progressivity index presented in OECD (2018) seems to be another indicator of the redistributive capacity of pensions systems (see section 2). Curiously, across countries this progressivity index correlates only moderately (about 0.50) with the indicators based on the TRRs and not at all (0.09) with the OGPG. As the way this index is calculated is somewhat obscure, it is hard to make sense of these low correlations.

26 Analogously to the malus for low earners, this is calculated as 2*TRR(high_earnings, full career) – TRR(average earnings,_full_career).

near zero when the malus for low earners is controlled for. So the pension bonus for high earners has no additional explanatory power.

It is not straightforward to draw the implications for policy from these suggestive results. It would be interesting to clarify the role of the various redistributive mechanisms within pension systems that are mentioned above: pension credits, contribution and benefit ceilings, modifications of the link between contributions and benefits and non-contributory or minimum pensions. Unfortunately, this seems to be beyond the capabilities of the kind of cross-country study carried out here. Also, the effect of a particular mechanism may depend on its role within the pension system as a whole and on specific details. For example: a residence-based flat-rate pension or pension component might seem a big contribution towards ensuring gender equality (as well as equality in general) in pension systems. Such a pension exists in Denmark and Estonia, which indeed have very low gender pension gaps. But The Netherlands also has a (rather generous) residence-based flat-rate pension, yet the malus for low earnings is nearly proportional to the ratio of low earnings and average earnings, and the OGPG in The Netherlands is among the highest in the EU. It is well-known that occupational pensions (which are included in the TRR calculations) are very important in The Netherlands. Crucially, these occupational pensions are not paid simply on top of the basic pension (the AOW), but are integrated with it: "specific pension targets vary but generally aim to pay a defined benefit bringing the total pension (including a full AOW) up to 70% of average wages for 40 years of service." (European Commission and Social Protection Committee, 2021b, p. 249).[27]

Another problem of interpretation is that pension systems were not framed in a vacuum, but were designed within a specific social and economic situation. It is therefore useful to bring these indicators based on the TRRs into a regression of the OGPG where also the indicators of past gender labour market inequalities, which were presented above, are included (Table 3). In this regression only the malus for low earnings turns out to have a significant effect, while the malus for short careers, the decline of the TRR after ten years, and the malus for women were found not to have significant effects (p-value > 0.2), and were therefore taken out of the equation.[28] Among all 66+, the gender employment gap has the largest effect, while the gender part-time gap and the gender pay gap do not have significant effects. The TRR malus for low earnings has a strong effect. The size of -0.48 means that if this malus is -10 instead of -20 (the difference between Belgium and Italy) the OGPG declines by approximately 5 percentage points. The effects are even stronger for the OGPG among the younger age group 66-75. Interestingly, when including the TRR malus for low earnings in the equation for this group, the effect of the gender pay gap becomes larger in the equation for the age group 66-75 (compare with Table 3) though it is still not significant. The malus for low earnings acts apparently as a suppressor variable for the gender pay gap.

The TRR malus for low earnings clears up the peculiar position of Denmark. The very low OGPG of Denmark is not well explained by its gender employment gap, gender part-time work gap and gender pay gap which are not exceptionally narrow. The very limited TRR malus for low earnings in Denmark,

[27] This means in effect that occupational pensions are means-tested against the basic pension.

[28] See Annex 2 for the results of a regression with all variables. The effects of the TRR-derived variables are mostly not significant, and sometimes differ strongly between the equation for all 66plus and that for the age group 66-75. This is due to the strong multicollinearity between several of the TRR-derived variables.

and more generally its highly redistributive pension system provides the explanation needed for the low OGPG in Denmark. Not only is the Danish public pension, which presently still accounts for almost two-thirds of all pension income, a universal and non-contributory scheme, it includes an important supplement that is tested against all earned, capital and pension income (European Commission and Social Protection Committee, 2021b, pp. 49-50).[29]

Table 3 Regression of Overall Gender Pension Gap in 2021 on three indicators of gender labour market inequality in the past and the malus in pensions for low earnings, for all 66+ and for the age group 66-75

A. All 66+	Coefficient	Std. Error	Significance
Gender employment gap all in 2000	0.80	0.19	0.00
Gender part-time work gap in 2000	-0.27	0.11	0.02
Gender pay gap in 2007	-0.11	0.22	0.62
Malus for low earnings	-0.48	0.21	0.03
Constante	3.57	5.59	0.53
n = 24; R^2 = 0.77			
B. 66-75	Coefficient	Std. Error	Significance
Gender employment gap cohort in 2000	0.59	0.10	0.00
Gender part-time work gap in 2000	-0.16	0.10	0.12
Gender pay gap in 2007	0.27	0.20	0.19
Malus for low earnings	-0.43	0.19	0.03
Constante	1.19	4.87	0.81
n = 24; R^2 = 0.84			

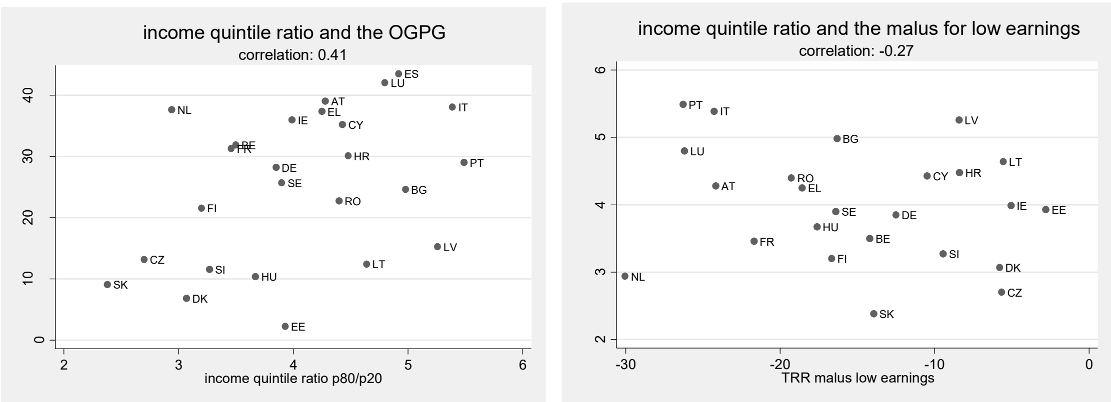
It is important to keep in mind that all variables discussed above (both the OGPG and the measures derived from the TRRs) refer to *individual* pension income. For this reason their link with the most common measures of income inequality, which are based on *household* income, is not strong, as Figure 11 shows. Inequality of disposable household income is measured by the income quintile share (S80/S20). The right graph shows that the correlation across countries with the OGPG is only moderate: many countries (including Belgium, the Netherlands, France and Sweden) combine relatively low inequality of disposable income among the older population with a relatively high OGPG. The correlation of the TRR malus for low earnings with the income quintile ratio has the expected negative sign (countries with a bigger low earnings malus tend to have more income inequality) but is quite weak. An important reason for these limited correlations (apart from the difference between individual and household income) is the fact that both the OGPG and the TRRs (as they are used here) refer to gross, not net pensions. These moderate to low correlations imply that any developments or measures that narrow the gender pension gaps or increase the redistributional capacity of the pension system on an individual basis do not necessarily reduce income inequality of disposable income. The reverse is also true:

[29] One may wonder what is the difference with the Dutch system, where as mentioned above, second-pillar pensions are in effect means-tested against the flat-rate AOW benefit. (If there are only two pension components involved, it does not matter for the total outcome which income component is means-tested against the other.) The difference seems to be that the Dutch TRRs are much larger (93.2 for the base case) than the Danish ones (63.6 for the base case). Because Dutch second-pillar pensions are quite high, they rise for a large number of beneficiaries above the level of the AOW. So most pensions are proportional to the previous wages. By contrast, Danish second-pillar pensions are smaller, and most Danish beneficiaries end up close to the maximum level of the universal scheme. To put this in a graphic way, the Dutch pension distribution is like a mountain that rises high above the water level. In Denmark, much of this mountain is submerged beneath the sea. This is another illustration of the fact that the effect of certain aspects of the pension system may depend on other parameters in the system.

reducing income inequality among the 65plus does not necessarily result in smaller gender pension gaps. The effects on these two indicators have to be assessed separately.

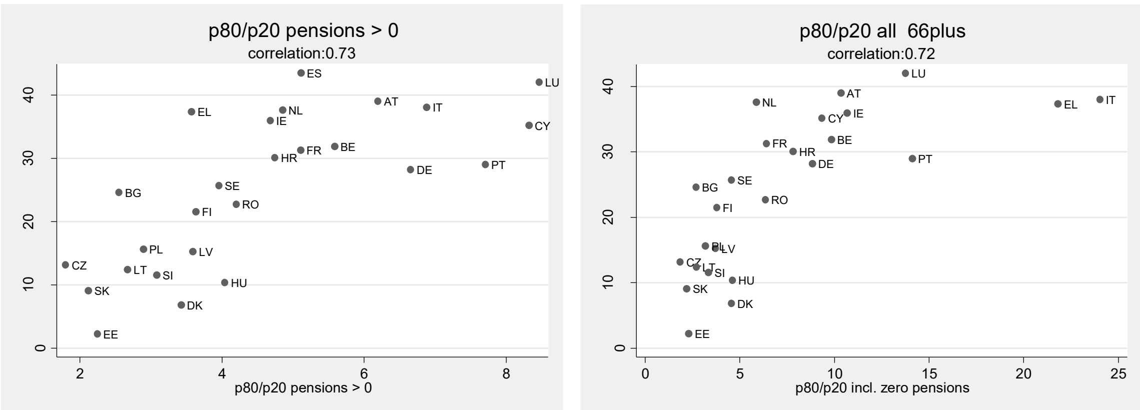
The correlation across EU Member states of the OGPG with the inequality of individual gross pension income is much stronger, as Figure 12 shows. These inequality measures are calculated from the micro-data in two versions: only for those with positive pensions, and for all 66plus including those without pensions. The latter displays much more variation than the former. Greece, Italy and Spain, where there are a large number of older people (mainly women) without pensions (see Figure 2 in the first intermediate report), have very high quintile ratios for pensions when including zero pensions.[30] Nevertheless, the two graphs show the same pattern. A number of EU Member states in Continental and Southern Europe (and also Ireland) combine high OGPGs with relatively high inequality of individual gross pensions. By contrast, countries in Eastern and Northern Europe tend to have lower OGPGs and less inequality of individual gross pensions. Within each of those groups, though, the relation is not strong.

Figure 11 Inequality of disposable income among the 65+ (S80/S20) in 2022 and the OGPG and TRR malus for low earnings
Ratio, percentage points



Sources: Pension Adequacy Report 2021 vol 2, EU-SILC microdata, Eurostat table ilc_di11

Figure 12 Inequality of individual gross pension income among the 66+ (S80/S20) in 2022 and the OGPG
Ratio, percentage points



Note: outlier ES left out of right graph, p80/p20 inclusing zero pensions is 64.1.
Sources: EU-SILC microdata

[30] Note that the P80/P20 is in fact rather sensitive to zero pensions. As the proportion of zero pensions in the bottom quintile approaches 1, the P80/P20 goes to infinity.

5.6. Survivor pensions

5.6.1. Introduction

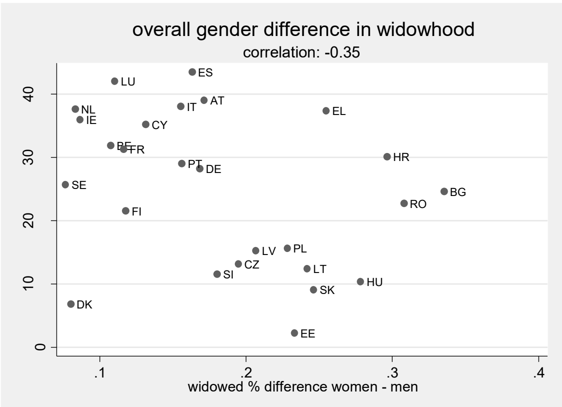
In most EU countries, older people without a retirement pension of their own (or a low one) can receive a survivor pension when their spouse has died. At the same time, women are much more likely to be widowed then men, as they live longer and tend to be younger than their husbands (OECD, 2018, pp. 39-43). Therefore, one would expect a negative correlation between the gender pension gap and the incidence of widowhood, or rather the difference of this incidence between women and men. For the same reason, more generous survivor pensions should lead to lower gender pension gaps.

As will become clear, things are not so simple. To anticipate the results in subsection 5.6.2 below: when the whole population 66plus is considered, across the EU more generous survivor pensions are associated with a higher, not a lower OGPG. Therefore, in subsection 5.6.3 we look at the difference in the OGPG between the oldest age group 76plus and the younger pensioners 66-74. As there are more widows in the oldest age group, one would expect that generous survivor pensions would be associated with a larger negative difference: the OGPG should fall when a cohort in retirement moves from the younger age group to the older one.

5.6.2. Correlation between the OGPG, the incidence of widowhood and survivor pensions within the population 66plus

The first expectation expressed above is not confirmed by Figure 13: the correlation between the OGPG and the difference in widowhood between women and men is indeed negative but rather moderate. The graph, incidentally, reveals that the difference in widowhood between women and men is much larger in many countries in Eastern Europe, and also in Greece, compared to other parts of Europe.

Figure 13 The overall gender pension gap in 2022 and the difference in widowhood between women and men
Percent-point



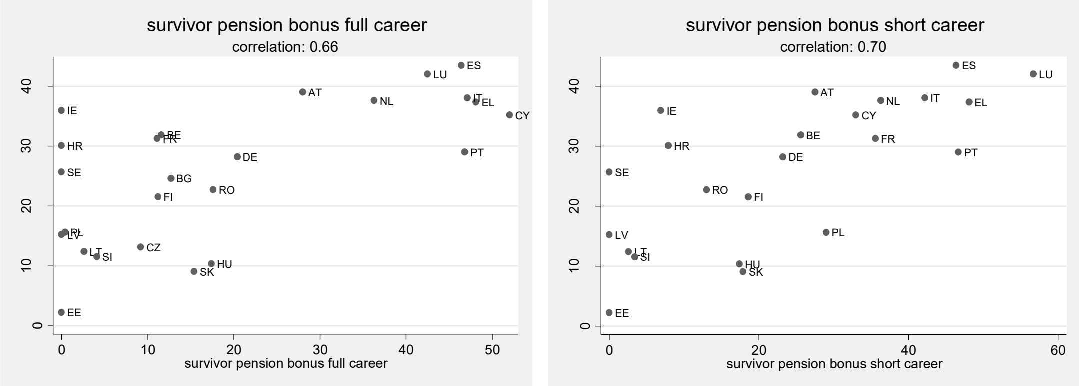
Source: EU-SILC microdata

As an indicator of the generosity of public survivor pensions, the 'survivor pension bonus' is derived from TRRs for two cases involving survivor pensions. The first case describes the wife in a couple where both members worked an uninterrupted 40-year career at average earning and together reached retirement age, but then the man dies at retirement. The calculated replacement ratio is the woman's pension (which can include part of her husband's pension as a survivor pension) over her last wage prior to retirement. The second case is similar, except that the wife (not the husband) had a short career of only 20 years (Pension Adequacy Report 2021a, pp. 90-91). The replacement rates in these cases are compared to those for the base case and the short-career case, respectively, in which the man did not die. The difference between the survivor – full career case and the base case was calculated and also that between the survivor – short career case and the short career case. These differences are called the survivor pension bonuses. Note that these do not only depend on the level of the survivor pensions, but also on the extent to which they are means-tested against other incomes, notably the own retirement pension. Note also that these survivor pension bonuses are indicators of the generosity of mandatory survivor pensions relative to mandatory retirement pensions, as a characteristic of the mandatory pension system. It would be possible to calculate the average survivor benefit relative to the average retirement benefit from the aggregate ESSPROSS data. However, for the purpose of the present analysis it is more relevant to use an indicator that is closer to the system and independent of actual benefit patterns. Furthermore, it has to be kept in mind that some countries have voluntary survivor pensions instead of or on top of public survivor benefits (OECD, 2018, chapter 7).

Figure 14 reveals that the survivor pension bonus (full career and short career versions) is correlated across EU countries fairly strongly with the OGPG, but rather surprisingly the correlation is positive: countries with relatively generous survivor pensions tend to have a higher OGPG than those with little or nothing in the way of survivor pensions. How can we understand this unexpected result? Note that in the left graph (about the survivor pension bonus for the full career case), the positive correlation is to a large extent due to a cluster of several Southern European countries and Luxembourg in the north-east corner. These countries have rather generous survivor pensions with apparently no or little means-testing against the own retirement pension. The theoretical replacement rate for the surviving wife in the full career case is in fact over 100% in all these countries. As has become clear above in section 3.2, the Southern countries and Luxembourg were characterized by relatively low female employment rates in past decades, and this is the main reason why the gender pension gaps in these countries are higher than the EU-average. Although these countries are relatively high spenders on survivor benefits (OECD, 2018, p. 41), generous survivor pensions apparently cannot compensate for the impact of the past gender employment gaps on current retirement pensions. The high survivor pension bonus in these countries can be interpreted as part of the male breadwinner system, in which non-working wives needed survivor pensions as income protection in case of the death of their spouse.

On the other hand, a number of Member States in the Baltic, Central and Eastern Europe, as well as Sweden and Ireland are close to the Y-axis in the left graph of Figure 15, indicating that in the full-career case no or only a very small survivor pension is granted. Some of these countries (Ireland, Croatia) occupy a position more to the right in the graph on the short career case. This suggests that in the latter countries, the survivor pension is strongly means-tested against the own retirement pension of the wife, while in others (Estornia, Latvia, Sweden) there is simply no public survivor pension (though some of these countries do have voluntary survivor pensions, see OECD, 2018, chapter 7). In several countries in this group women had longer careers of their own, so widows are supposed to rely on their own retirement pension.

Figure 14 The overall gender pension gap in 2022 and the 'survivor pension bonus'* in 2019
Percentage points



Note: * See text.
No data on the survivor bonus for Denmark and The Netherlands
Sources: Pension Adequacy Report 2021 vol 2, EU-SILC microdata

One has to be careful when interpreting these cross-country correlations. Obviously, survivor pensions help a large number of women to escape poverty and to maintain the standard of living they had before their husband died. For men, survivor pensions are less important, both because they are less often widowed and because they have higher retirement pensions. The simulations performed by Dekkers et al. (2022) show clearly that in Belgium, Luxembourg and Portugal (though not in Slovenia) at the present time the gender pension gap would be much higher than it is in fact, if survivor pensions would be suppressed.[31] Unfortunately, it is not possible to analyze the effect of survivor pensions using the EU-SILC data, because for the 65plus these benefits are not always distinguished from retirement pensions.

5.6.3. Survivor pensions, the incidence of widowhood and the difference in the OGPG between the age groups 76plus and 66-75

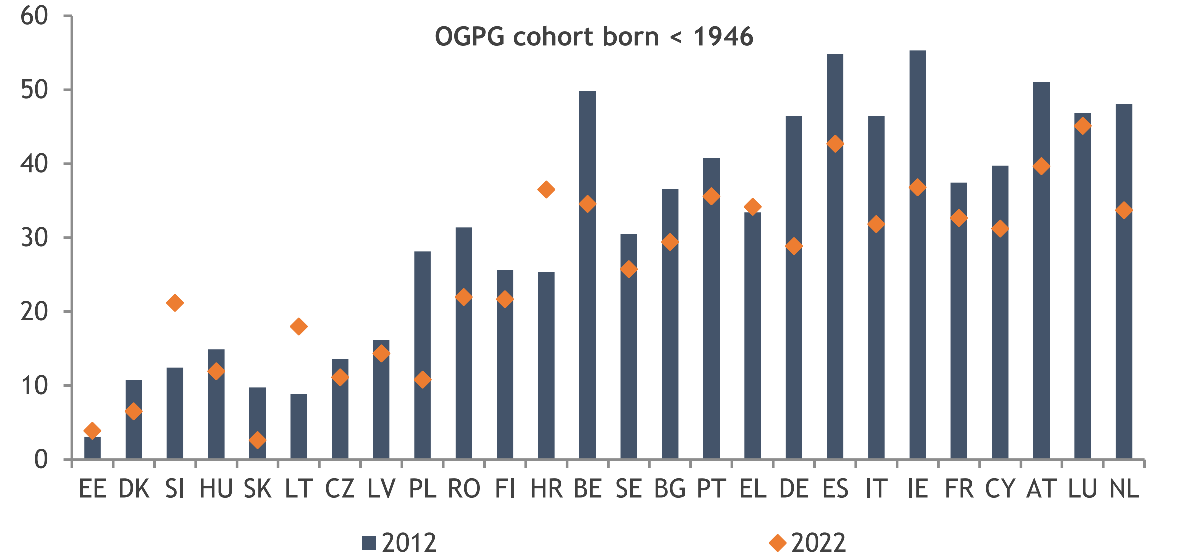
The correlations for all older people 66-plus presented above are not the whole story, though. Even if the variation in OGPGs across countries is dominated by the past gender employment gaps, one might expect an effect of the incidence of widowhood and of survivor pensions on the difference in the OGPG between the oldest old (76plus) and the younger pensioners (66-75). As there are more widows in the oldest age group than among the group 66-75, one would expect that the OGPG would be lower in the former than in the latter group. Across countries, this effect should be stronger where the proportion of widows increases more strongly, relative to the proportion of widowers, as a cohort of pensioners grows older. For similar reasons, generous survivor pensions would be associated with a larger negative difference.

Of course, different cohorts (people born at about the same time, e.g. between 1945 and 1954) have different labour market histories, which might affect a comparison between age groups in a particular year (as those age groups represent different cohorts). For this reason, we consider the difference in the OGPG for a *single* cohort between the period when they were aged 66 to 75 and the period when they were 76plus. Figure 16 shows the OGPG of people born between 1936 and 1945 for two different years:

[31] The MIGAPE project on which this article is based was limited to these countries + Liechtenstein.

in 2012 when they were between 66 and 75 years old, and in 2022 when they were 76 or older.[32] In most countries the OGPG declines over time, in particular in countries where it was high in 2012. As the results are about the same cohort (approximately), which is already pensioned in 2012 as well as in 2022, their labour market history remains constant between 2012 and 2022. So the decline of the OGPG must be a consequence of changes in the composition of the cohort (e.g. widowhood), or of aspects of the pension system, e.g. survivor pensions or minimum pensions.[33]

Figure 15 OGPG for birth cohort born before 1946 in 2012 and 2022
Percentage points



Note: countries ordered by overall gender pension gap in 2022
Source: EU-SILC microdata

Below in this subsection the relationship is explored between, on the one hand, the change in the OGPG within one particular cohort across years and, on the other hand, the extent of widowhood and the survivor bonuses as indicators of the generosity of survivor pensions. For this analysis we use the average of the change in the OGPG across several years, as the OGPG is subject to fluctuations from one year to the next.[34] In some countries the changes were rather unstable across years and for this reason data for Greece, Latvia, Lithuania and Luxembourg are not used. The average change in the difference between women and men of the incidence of widowhood, as a cohort grows older from the age group 66-75 to 76plus was calculated in a similar way.

[32] Unfortunately, it is not possible to identify this cohort exactly in 2022, because in the EU-SILC microdata age is censored at 80: ages above that threshold are recoded to 80. So the results for 2022 include also those for people over 85. The Eurostat database (table DEMO_PJANGROUP) shows that the latter make up about 30 percent of all people 76+ in the EU.

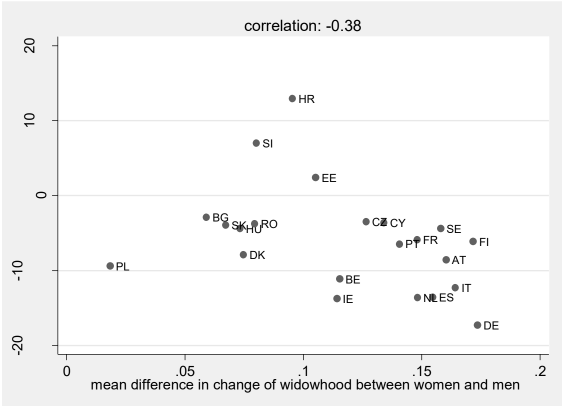
[33] The method of indexation cannot explain this difference, as it affects all pensions equally, unless indexation is differentiated by kind or level of the pension (as is the case in some countries).

[34] More exactly, for each pair of years (2017 - 2007; 2018 - 2008 and so on… 2022 - 2012), the OGPG was calculated for the age group 66-75 in the earlier year (2007, 2008 …) and for those of 76 or over in the later year (2017, 2018 …), the difference between these two OGPGS was taken, and the average value of these differences was calculated. So each difference is calculated within the same cohort, but across the pairs of years the cohorts shift by one year.

a. Correlation between the change in the OGPG and in the incidence of widowhood

Above we saw that the correlation between the OGPG and the difference in widowhood between women and men is negative but only moderate. In Figure 16 the change in the OGPG is related to the *change* in the gender-difference in widowhood.[35] If people would be more likely to become widowed as they grow older, but the proportions for women and men would move in parallel, there would be no reason to expect an effect on the change in the OGPG. In fact, the proportion increases more among women than among men in most countries. Figures 16 shows that the correlation between the change in the OGPG and the change in the gender-difference in the proportions of widow(er)s is moderately negative at -0.38. The correlation would be stronger at -0.52 without the outlier Poland. So in countries where women are much more likely than men to become widowed when they get 76 or older, the drop in the OGPG is larger than when the change in the risk of widowhood is more equal for the two genders. The first group of countries includes several in Southern Europe, while the latter is composed mainly of Member States in Eastern Europe.

Figure 16 Average change in the overall gender pension gap between the age groups 66-75 and 76+*and the average difference between age groups in the difference in the proportion in widowhood between women and men*
Percent-point



Notes: * See text for explanation of these variables
Source: EU-SILC microdata

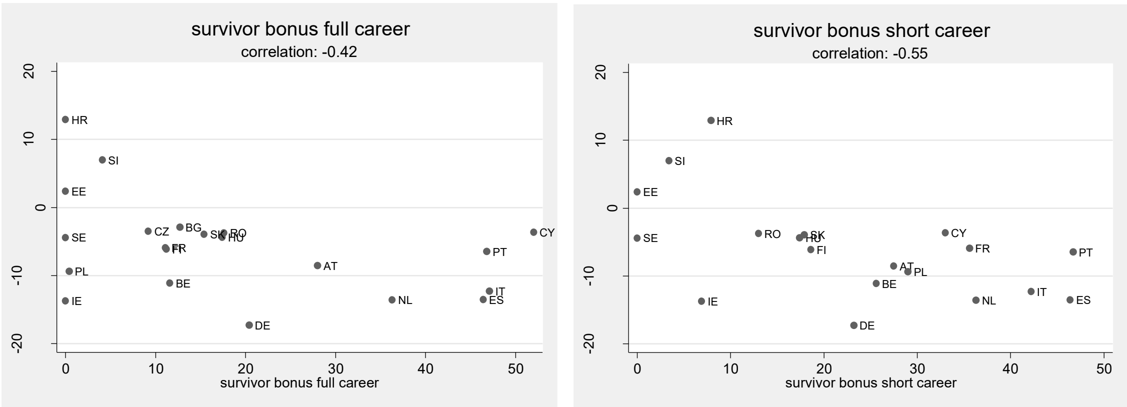
b. Correlation between change in the OGPG and the generosity of survivor pensions

A change of sign is also found when the survivor pension bonus (in the two variants) is related to the change in the OGPG, instead of the OGPG in 2022 for all 66plus. Figure 17 reveals that there is a moderate negative correlation between the survivor pension bonus and the change in the OGPG. In countries where survivor pensions are more generous relative to retirement pensions, the OGPG drops more when a cohort gets older and more widowed than in countries where survivor pensions do not exist or are very limited. Note that the survivor pension bonus is derived from the Theoretical Replacement Rates, and so are not influenced by the proportions of widows and widowers in the Member States. We perceive again a cluster of several Southern European countries, but now in the south-east corner of both graphs, indicating that generous survivor pensions are associated with a relatively large drop in the OGPG. Conversely, some Baltic, Central and Eastern European countries are at the extreme left of the graphs, having no or little in the way of survivor pension and a smaller drop or even an increase in the OGPG. The correlation is stronger for the survivor pension bonus based on the short-career case than for the full-career variant. This makes sense, as women are relatively more likely to benefit from a survivor pension bonus for a short career than for a full career. Short careers are after all much more common among women than among men. To put this in other words, few widowers will benefit from

[35] Formally, this is a difference-of-differences measure:
[PW(76plus, women) - PW(76plus, men)] – [PW(66-75, women) - PW(66-75, men)],
where PW denotes the percentage of widows/widowers.

a short-career survivor pension bonus as most of them will have long careers. The gender difference in this regard will be smaller or even reversed for the full-career survivor pension bonus.

Figure 17 Average change in the overall gender pension gap between the age groups 66-75 and 76+* and the 'survivor pension bonus'* in 2019
Percentage points



Note: * See text for explanations of these variables.
No data on the survivor bonus for Denmark and The Netherlands. Change in the OGPG not calculated for Latvia, Lithuania and Luxembourg.
Sources: Pension Adequacy Report 2021 vol 2, EU-SILC microdata

A regression analysis (see Annex 2) with the change in the OGPG as the dependent variable confirms the above findings: the effect of the difference-in-difference of widowhood variable is negative, but not statistically significant when the survivor pension bonus is controlled for. The effect of the full-career survivor pension bonus is also not significant when the short-career survivor pension bonus is included in the equation. The effect of the latter is -0.23, which means that if the short-career survivor bonus is 10 percentage points higher, the OGPG will be -2.3 percent points lower.

5.6.4. Summary: survivor pensions and the OGPG

It may be useful to summarize in substantive terms the results of this subsection about the impact of survivor pensions on the OGPG. Women are much more likely than men to become widowed, and therefore form a large majority among the beneficiaries of survivor pensions. At the same time, some EU Member States have generous survivor pensions (and are high spenders on these pensions), while others have no or very little in the way of survivor benefits. One would expect therefore that survivor pensions reduce the OGPG, and furthermore that across countries there is negative correlation between the generosity of survivor pensions and the size of the OGPG. In fact, however, it was found that there is a moderately strong positive correlation. A number of mainly Southern European countries combine generous survivor pensions with a large OGPG. One interpretation of this finding is that it reflects the dominance (until recently at least) of the male breadwinner model, where married women seldom worked, and therefore needed survivor pensions as income protection in old age when their husbands died. The impact of the wide gender employment gaps in previous decades on the OGPG was apparently much bigger than that of survivor pensions.

One way to control for the employment history is to look at the change in the OGPG when a particular cohort grows older and moves from the age group 66-75 to the 76plus. Widowhood becomes more common as people get older – more among women than among men – and so does the receipt of survivor pensions. At the same time the employment history does not change any more. So one would expect the OGPG to fall as a cohort grows older, and also that this decline is larger when survivor pensions are more generous. This expectation is confirmed by the cross-country analysis.

We can conclude that the positive correlation between the generosity of survivor pensions and the OGPG is spurious, caused by the fact that both are associated with the size of the gender employment gap and other gender labour market inequalities in the past. When the labour market history is kept constant (by looking at the change in OGPG when a cohort in retirement gets older), the results are in agreement with those of studies using micro-data (and with common sense): survivor pensions reduce the gender pension gap.

6. Conclusion

This study found that the Overall Gender Pension Gap (OGPG, a combination of the Gender Pension Gap and the Gender Pension Coverage Gap, calculated from the EU-SILC microdata) is to a large extent determined by the gender employment gap during the period when current pensioners were in their active ages. The gender part-time work gap plays a smaller role, while across EU Member States the gender pay gap is not associated with the current OGPG.

The impact of aspects of pension systems on the OGPG was studied using indicators derived from the Theoretical Replacement Rates (TRRs, published in European Commission and Social Protection Committee, 2021b). Some EU Member States have pension rules that explicitly distinguish between women and men, and these may drive the OGPG upward in some (but not all) of these countries. Indexation of existing pensions to wages rather than prices appears to have a significant but small downward effect on the OGPG. The correlations of pension credits related to childcare (or similar pension regulations) with the OGPG of the cohort aged 66-75 are small. The redistributive capacity of pensions systems was found to have a substantial mitigating effect on the OGPG. Generous survivor pensions also appear to reduce the OGPG.

What are the implications of these findings for the future gender pension gaps? In Western and Southern Europe the gender employment gap has continued to decline substantially in the two most recent decades. This will have a downward effect on the gender pension gaps among future pensioners in those countries. (In Northern Europe the gender employment gap has been fairly small from the early 1990's on.) By contrast, in the newer EU Member States in the Baltic, Central and Eastern Europe, the gender employment gap has decreased much less or has been stable. In those countries (where the current OGPG is generally below the EU average) the gender pension gaps may follow a more stable future trend. The gender part-time work gap has narrowed in some countries where it was highest before 2000, potentially bringing the future gender pension gaps down, but in other countries it has increased or remained stable.

Some countries have strengthened or intend to strengthen the link between previous earnings and the pension, by introducing or expanding occupational pensions and/or moving to a (notionally) defined contribution pension scheme. This will likely reduce the redistributive capacity of pension systems and therefore might widen gender pension gaps (see also Veremchuk, 2020, who reaches a similar conclusion).

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Annexes

Annex 1: A simple model of the effect of indexation on the Gender Pension Gap

For this simple model only two age groups are distinguished, 'the younger old' and the 'oldest'. Furthermore, it is assumed that when women and men move from the younger old to the oldest, their pensions are affected only by the method of indexation, which is the same for everyone. Furthermore, the gender pension gap among the younger old does not change over time (the pensions of women and men may rise, but in tandem). Together, these assumptions imply that the gender pension gap is always the same in both age groups considered separately. Given these simplifying assumptions, the Gender Pension Gap can be written as follows:

$$GPG = 1 - \{[pfy * Bfy + (1 - pfy) * x * Bfy] / [pmy * Bmy + (1 - pmy) * x * Bmy]\} \quad (1)$$

where *pfy* is the proportion of women who are in the younger old age group and *Bfy* is the average pension among women in the younger old age group. *pmy* and *Bmy* denote the same quantities for men. x is a factor which indicates how much the average pension of the oldest old differs from that of the younger old. It thus reflects both the method of indexation as well as by how much the pensions of the younger old increase over time (e.g. because younger cohorts had higher wages during their active ages).

Equation (1) can be simplified to:

$$GPG = 1 - [Bfy / Bmy] * [(pfy + x - pfy * x) / [(pmy + x - pmy * x)] \quad (2)$$

which reduces to 1 - [Bfy / Bmy] if $x = 1$.

Let us now work out the difference between the GPG when x takes any value (GPG(x) and when x = 1 (GPG(1)). The latter scenario obtains when indexation is by wages. Rearranging terms we obtain:

$$GPG(x) - GPG(1) = [1 - GPG(1)] * [(1 - pfy) * (1 - x)] / [x + pmy * (1 - x)] \quad (3)$$

What does equation (3) imply? If we take the age group 65-74 as the younger old, then *pfy* is 0.50 in the EU as a whole, varying between a maximum of 0.60 (in Slovakia) and a minimum of 0.46 (in Italy). For men the corresponding proportions for *pmy* are 0.57, 0.69 and 0.53. Furthermore, suppose pensions of new retirees rise at the same rate as wages, that wages increases by 1.25% per year in real terms, and that pensions are indexed only to prices. A real wage growth of 1.25% is assumed by the OECD when calculating the TRRs (OECD, 2021a). In this reference case, x would be equal to 0.87[36] after 10 years.

Taking the average values quoted above, the last term in square brackets in (3) would be equal to 0.94. In realistic situations, this term will be always between 0.9 and 1, and therefore has only a limited effect on the outcome. The term [(1 – pfy) * (1 – x)] contributes most: again taking the average and reference values for *pfy* and x, it would be equal to 0.07. This outcome has to be adjusted by the term [1 - GPG(1)].

36 $1 - (1.0125^{10} - 1)$

In this model, GPG(1) is equal to the GPG among the youngest old, 65-74, which as we have seen above, varies between 0% and 45%. So the overall impact would vary between 0.07 and 0.04 (or 7% and 4% in percentage-point terms). When taking the rather optimistic value of 2% for real wage growth, and the highest, resp. lowest values for *pfy* and *pmy*, the impact would be about 0.09 (9 percentage points).

Of course, *x* would be lower if a longer period than 10 years would be considered. But in that scenario, *pfy* (the proportion of women in the younger age group) would be higher, so (1 - *pfy*) would be lower, and so the outcome of equation (3) would not change much.

Equation (3) implies that the impact of (non-)indexation is larger when the GPG is smaller to begin with. This perhaps surprising implication (which can be easily confirmed by working out some numerical examples) is due to the fact that the impact of (non-)indexation is larger in absolute terms if the average pension of women is closer to that of men among the younger old.

Annex 2: Full results of the regressions

A1: Regressions with labour market gaps and all TRR-derived variables

Table A1 Regression of Overall Gender Pension Gap in 2021 on three indicators of gender labour market inequality in the past and TRR derived variables, for all 66+ and for the age group 66-75

A. All 66+	Coefficient	Std. Error	Significance
Gender employment gap all in 2000	0.90	0.23	0.00
Gender part-time work gap in 2000	-0.30	0.14	0.05
Gender pay gap in 2007	-0.01	0.25	0.98
TRR malus for low earnings	-0.25	0.35	0.49
TRR malus for short career	-0.22	0.24	0.37
TRR difference between women and men	-0.05	0.55	0.93
TRR fall after 10 years	0.29	0.42	0.50
TRR childcare extended	0.02	0.42	0.96
Constant	-0.39	6.45	0.95
n = 22; R^2 = 0.82			

B. 66-75	Coefficient	Std. Error	Significance
Gender employment gap cohort in 2000	0.62	0.12	0.00
Gender part-time work gap in 2000	-0.22	0.12	0.10
Gender pay gap in 2007	0.31	0.23	0.19
TRR malus for low earnings	-0.31	0.30	0.33
TRR malus for short career	-0.13	0.21	0.54
TRR difference between women and men	-0.49	0.48	0.32
TRR fall after 10 years	0.23	0.36	0.54
TRR childcare extended	-0.13	0.37	0.73
Constant	-1.92	5.50	0.73
n = 22; R^2 = 0.88			

A2: Regression of average change in OGPG within cohort

Table A2 Regression of average change in Overall Gender Pension Gap (2017-2022 vs. 2007-2012) within the same cohort

With TRR survivor bonus full career	Coefficient	Std. Error	Significance
TRR survivor_bonus full career	0.13	0.15	0.42
TRR survivor bonus short career	-0.35	0.18	0.07
gender difference in change of windowhood	-53.04	39.60	0.20
constant	5.78	4.92	0.26
n = 18; R^2 = 0.39			

Without TRR survivor bonus full career	Coefficient	Std. Error	Significance
TRR survivor bonus short career	-0.23	0.11	0.04
gender difference in change of windowhood	-42.28	36.99	0.27
constant	4.31	4.54	0.36
n = 18; R^2 = 0.36			

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