

DISCUSSION PAPER SERIES

IZA DP No. 11341

**The Impact of Life-Course Developments  
on Pensions in the NDC Systems in  
Poland, Italy and Sweden and Point  
System in Germany**

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**Agnieszka Chłoń-Domińczak**

*Warsaw School of Economics*

**Marek Góra**

*Warsaw School of Economics and IZA*

**Irena E. Kotowska**

*Warsaw School of Economics*

**Iga Magda**

*Warsaw School of Economics*

**Anna Ruzik-Sierdzińska**

*Warsaw School of Economics*

**Paweł Strzelecki**

*Warsaw School of Economics*

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## ABSTRACT

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# The Impact of Life-Course Developments on Pensions in the NDC Systems in Poland, Italy and Sweden and Point System in Germany\*

Old-age pensions in the NDC systems reflect the accumulated lifetime labour income. Interrupted careers and differences in the employment rates, particularly between men and women will have a significant impact on pension incomes in NDC countries. In the paper, we compare the labour market developments in four countries: Germany, Italy, Poland, and Sweden. There are pronounced differences in the labour market participation in the four countries: high levels of employment in Germany and Sweden are in contrast with low levels of employment in Italy and Poland. In the latter two countries, there is also a large gender gap in the labour market participation and employment pathways. Lower employment rates and gender pay gaps, as well as country-specific employment paths are important causes of differences in expected pension levels, but there are also differences due to the design of pension system and demographic developments. Prolonging working lives and reducing gender gaps in employment and pay, particularly for those at risk of interrupted careers, is key to ensure decent old-age pensions in the future. We argue that the pension systems' design modifications that weaken the link between contribution and benefits would not solve the challenge of providing adequate old-age pensions to people with interrupted careers. On the contrary, it would make the pension systems less sustainable, while the problem would be more challenging in the future.

**JEL Classification:** D15, H55, J16, J26, J31

**Keywords:** NDC, old-age pensions, lifetime labour income, gender pay gap, interrupted carriers, sequence analysis, employment path

**Corresponding author:**

Marek Góra  
Warsaw School of Economics (SGH)  
Aleja Niepodległości 162  
02-554 Warszawa  
Poland  
E-mail: Marek.Gora@sgh.waw.pl

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\* Prepared for the III NDC pensions conference in Rome on 5-6 October 2017. The paper profited from valuable comments and suggestions received from experts during the conference.

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## Introduction

The pension system and the labour market are two sides of the same coin. In pre-paid pension systems contributions paid by workers matter for their future pensions.<sup>1</sup> In the case of NDC and FDC systems, the link between contributions and benefits is very close. In other types of pension systems, such as NDB and FDB schemes the link to contributions is partial and depends on the benefit formula design. Consequently, the insured hardly understand the link and commonly perceive contributions as quasi-taxes. In tax-financed, typically flat-rate pensions, such as for example social pensions there is no link between contributions and pension benefits at the individual level. A lack of a direct individual link between contributions and pensions can lead to efficiency losses, weaker incentives to prolong working life and increases exposure of the pension systems to stronger political pressures. If the link is individualised, the life-course developments have a direct impact on the future pension levels.

Pension wealth losses due to interrupted or broken careers lead to lower expected benefits. For example, according to OECD (2015) estimates, women from OECD countries who earn the average wage and interrupt their career for five years to care for two young children would lose, on average, 4% of their pension income. Germany stands out with the steepest decline in pension entitlements, at 11%, while in Italy it amounts to 10%. The relative loss in pension entitlements in Germany is similar at different earnings levels and even larger for a ten-year career interruption, with pension entitlements falling by more than 20% (OECD, 2015). Therefore, evaluation impacts of employment careers on pension income can help to design flexible interventions on the labour market aimed at reduction of risks to leave a job for a long period. This policy measures are of high relevance in the pension systems that have a close link between contributions and benefits, such as NDC schemes.

The aim of the paper is to investigate how different employment patterns over the life course impact on the expected pension levels. For that purpose, we look at three countries that have implemented NDC systems i.e. Italy, Poland and Sweden as well as at Germany that has a point system also providing a link between lifetime wages and pension levels.

The four countries are different with respect to their pension system designs<sup>2</sup>, but more importantly they differ in terms of their labour market characteristics, including employment

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<sup>1</sup> Pre-paid means contribution financed as opposed to tax-financed (see: Góra and Palmer 2017).

<sup>2</sup> See for example (Chłoń-Domińczak, Franco, and Palmer 2012) for the comparison of NDC pension systems design in Sweden, Italy, Poland and Latvia.

rates and wage levels in general and specified for selected group of workers, particularly for men and women. However, so far a majority of the comparative studies focused on the expected outcomes of pension systems, which have been simulated by use of similar assumptions on the working careers (i.e. Pensions at a Glance reports (OECD 2015), or Pension Adequacy Reports (European Commission 2015)).

We see differences in the working histories among countries. The average contributory period expected in 2060 ranges from 41.5 years in Sweden, through 37.6 years in Poland to 37.3 years in Italy, according to the 2015 AWG report.<sup>3</sup> Men usually work longer than women do. They also have higher wages.

Therefore, in this paper we aim to analyse how different developments of working lives of men and women in the four countries impact their pension income. In particular, we aim to answer two sets of questions. The first set focuses on labour market characteristics and covers the following questions:

- How do employment rates, wages and labour incomes differ for men and women of different age?
- What are the differences and similarities in the working histories of workers in the four countries?
- What are the patterns of full and interrupted careers for men and women in the four countries?
- What is the assessment of job quality by country and sex?

The second set refers to the pension system outcomes:

- How do different patterns of working histories affect the expected levels of pensions under NDC and point systems?
- Can people with similar life-course developments expect similar outcomes in terms of pensions in different countries?
- How do pension levels differ between countries due to the pension system design, life expectancy or labour market characteristics?
- What kind of employment histories lead to the poverty risk at the old age? What is the risk to experience such employment histories in the countries considered?

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<sup>3</sup> Until 2060 working careers may need to be much longer. We use projections based on the current values to have a point of reference.

The paper has two main sections. In the first one, we provide current evidence of the labour market developments, with a particular focus on the differences between men and women by age. We look at the gender gap in pay and employment and their changes after 2000, making use of the data from the Labour Force Survey and European Structure of Earnings Survey. We also compare the stylised lifetime labour income of men and women assessed by use of the National Transfer Accounts methodology (Istemic and Sambt 2016). Then, we identify the distinct groups of workers depending on their employment histories collected in the SHARE survey to identify groups of workers with “interrupted” and “full” careers. Finally, we also look at the job satisfaction of men and women, which can also influence on the timing of retirement decisions.

In the second section, we apply the developed stylised labour market profiles to present simulations of the hypothetical/theoretical pensions in the four countries, which allows to assess the level of pensions taking into account country- and sex-specific profiles of employment over the life course. We also apply country-specific employment profiles to calculate hypothetical pensions in the Swedish pension system. As a result, the impact of the labour market and the impact of pension system on the hypothetical pensions are to be separated.

In the conclusions, we discuss on the role of integrated policies which focus on supporting high employment and its high-quality over the life course in shaping on the future pension adequacy in the NDC framework.

## 1. Labour market differences: what can we learn from the recent developments?

Men and women have different employment paths in virtually all countries. However, the range of these differences varies between countries. Many factors contribute to this: differences in labour market participation, choices of non-standard employment, including part-time or self-employment. Women more frequently choose these forms, in order to reconcile their work and family lives, that can be more difficult in some countries than in others. However, it has implications for pension levels once they retire. Wages of men and women also differ. In this section, we discuss the evidence related to the gender gap on the labour market and its accumulated impact on the lifetime labour income. Therefore, our focus is on both employment and wage gaps, as well as their impact on the difference in lifetime earnings by men and women. We also identify the typical profiles of full and interrupted labour market careers of

men and women in the four countries that reflect the differences observed at the macro level, using lifetime histories of individuals gathered in the SHARE-LIFE survey.

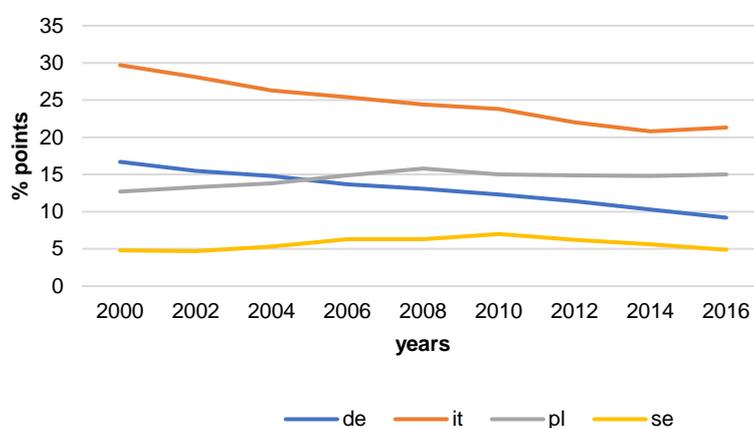
One of the important measures to improve the pension outcomes of men and women is to prolong their working lives. Given this policy priority, we also analyse the job quality, employment rates and transitions to retirement by men and women at later stages of the life course.

### 1.1. Labour market participation

The labour market participation that is crucial for future old-age pension entitlement in the DC systems differs significantly among four countries. The highest increases in the labour force participation for both men and women in last decades were in Sweden. It has been steadily increasing since 2000, reaching 89% for men and 84% for women in the 20-64 age group in 2016. The German labour market is characterised by the similar high and stable LFPR for men (86,5%) and much lower for women (77% in 2016). Yet, female labour market participation also increased. Between 2000 and 2016 it rose by 11 p.p.

In Italy and Poland, we observe slowly increasing LFPR of 20-64 year old men reaching around 80% in 2016 in both countries. The labour market participation is lower for women (59% in Italy and 66% in Poland). As a result, the gap between labour force participation of men and women is highest in the latter two countries, particularly in Italy (Figure 1). We also see that the difference in the labour market participation of men and women declines in Italy since 2000, which may indicate gradually changing patterns of the economic activity. The German labour market reveals the similar development. In Poland, the gender gap in employment remains stable.

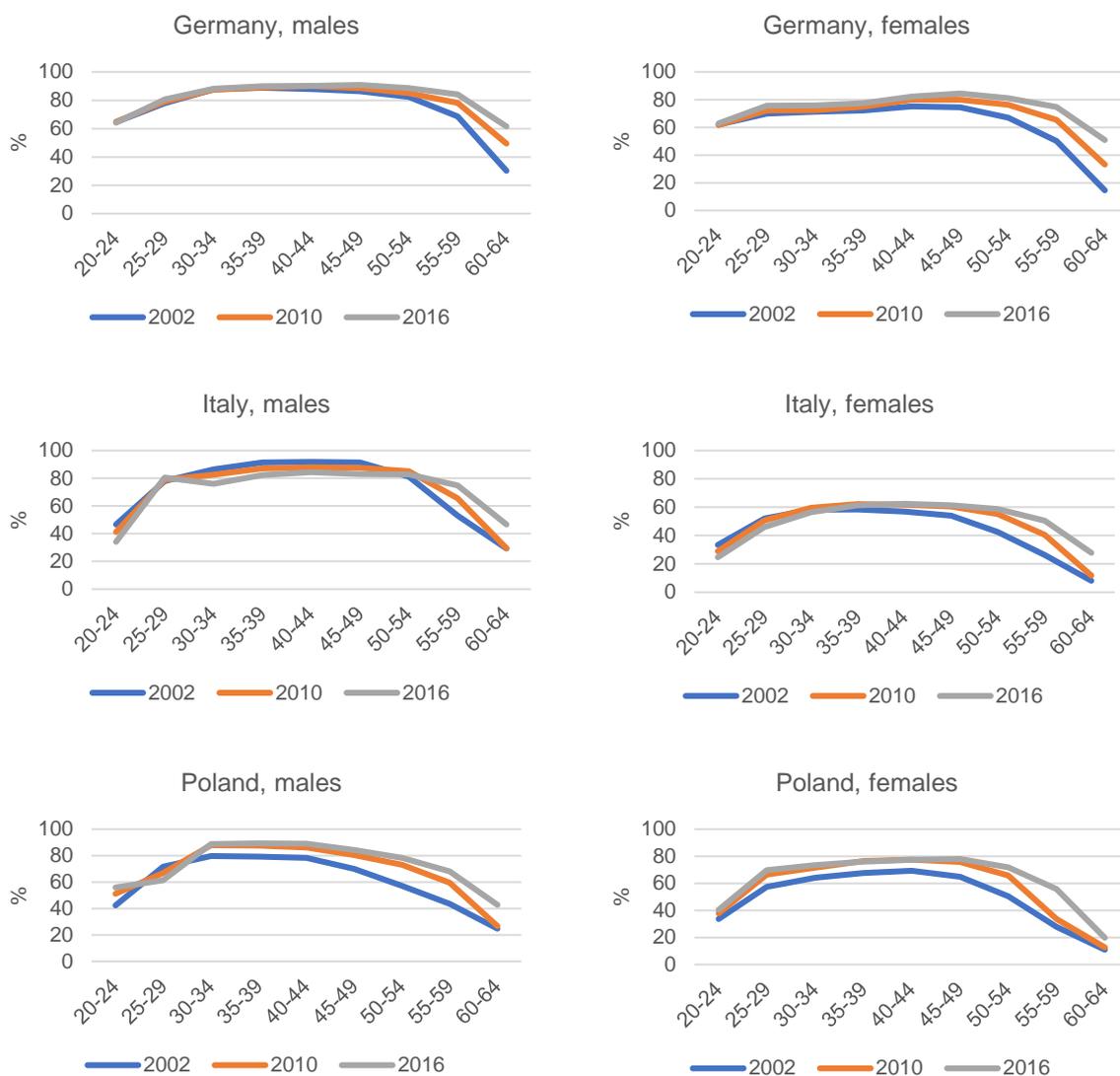
Figure 1: The gap between males and females labour force participation rate (20-64) in years 2002-2016.

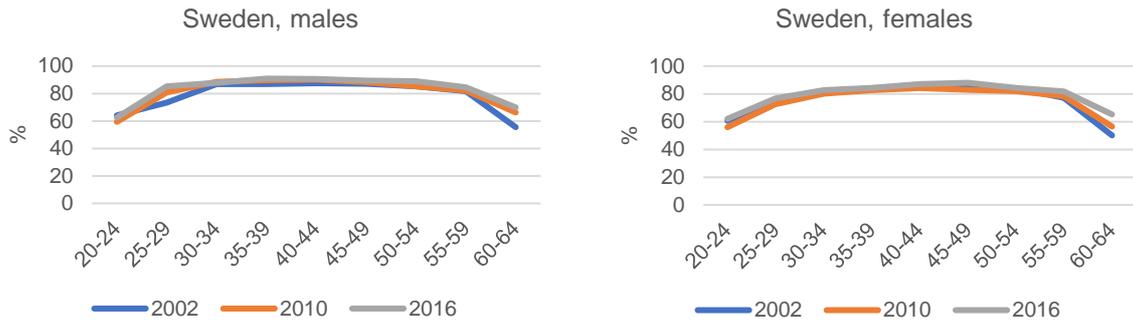


Source: Eurostat database and Authors' assessment

Changes in the age-specific employment rates between 2002 and 2016 show a more or less successful implementation of policies aiming at increasing employment in all age groups, only slightly disturbed by the last economic crisis. Older workers survived that crisis better than previous recessions and, in some aspects, they were in a better situation in 2016 compared to years before 2007. The employment rate in age groups 50 and over increased between 2002, 2010 and 2016 in all countries studied (Figure 2).

Figure 2: Employment rates by age in the years 2002, 2010, 2016



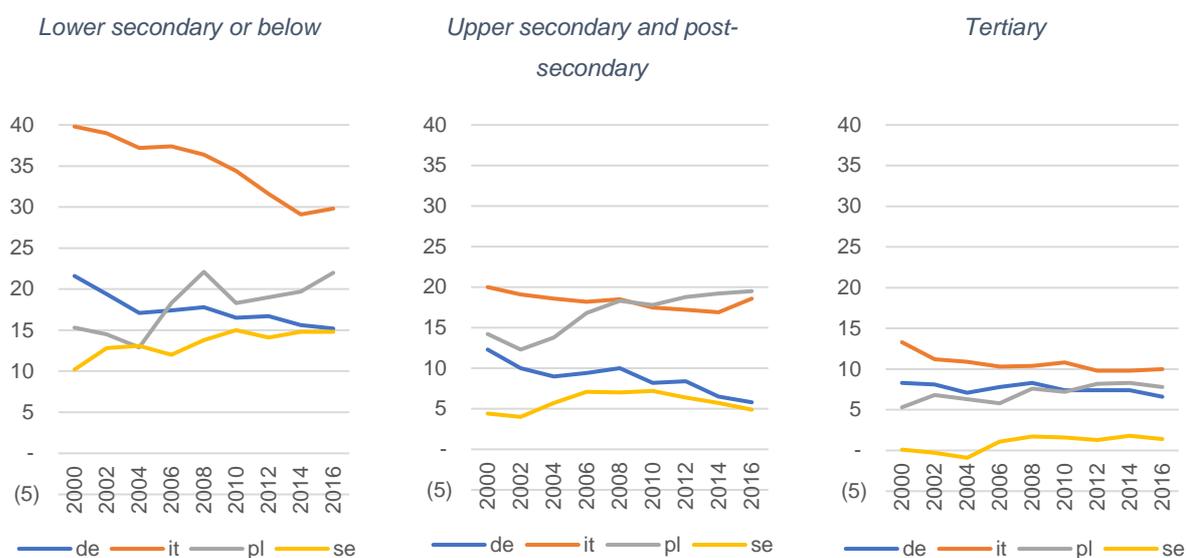


Source: Eurostat LFS database

Italian labour market has nearly come back to the pre-crisis employment level, which is still relatively low, especially for women. However, it struggles with a high share of non-standard contracts, such as ‘employer coordinated freelance work’ (*Contratto di Collaborazione Coordinata e Continuativa, co.co.co*) or ‘project work’ (*Contratto di Collaborazione a progetto, co.co.pro*) or self-employment, which can also lead to lower levels of access to social protection (Spasova et al. 2017). Swedish employment rates for both sexes stabilised at the high level. Employment rates in Germany are at the high level as well. In Poland, despite an increase in employment of people over 50, female employment rate is the lowest among all countries. With exception of Italy, where women work on average less than men at any age – employment rates between sexes differ mainly at older age groups.

The level of education is another factor that influences employment as well as the gender gap in employment. The highest difference between male and female employment is among those with the lowest level of formal education. It is particularly high, but declining in Italy. In Poland, we observe the rising employment gap between men and women with below tertiary education. In Germany, the gender gap in employment by educational attainment declines. In Sweden, there are virtually no differences in employment rates of men and women with tertiary education. With the rising share of highly educated women in the population, the total gender gap in employment is expected to decline in all countries (Figure 3).

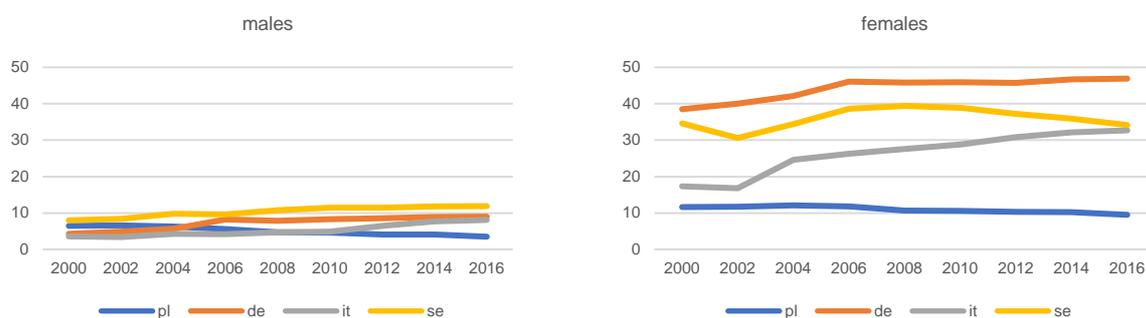
Figure 3: Differences between male and female employment rates by education in the years 2002-2016 (in % points)



Source: Eurostat LFS database

High employment rates of women in Germany and Sweden are partly due to higher part-time work shares. Part-time employment in Italy has been rising for over a decade. Marginal part-time work (below 20 hours a week) is relatively high in Germany (15% in 2014), partly due to popular 'Minijob' regulations. It is around 8% in Sweden and Italy, and low and stable in Poland (3%). The incidence of part-time employment is four times higher for females than for males in Germany and three times as high in Sweden. This means that the interrupted career profiles in these two countries are rather through part-time employment and not a withdrawal from the labour market, which is discussed further in the paper. An increasing share of part-timers accompanies the increasing female employment rate in Italy. Moreover, because of the economic downturn, involuntary part-time work has increased significantly in Italy to 63%, already from the high level in the past. To compare, 31% of part-timers involuntarily work less than full-time in Poland, 13% in Germany and 23% in Sweden (European Parliament, 2016).

Figure 4: Part-time employment as a share of the total employment (20-64) in the years 2000-2016



Source: Eurostat LFS database

A higher incidence of interrupted careers among women, leading to lower employment rates and a higher share of part-time employment of women result mainly from a necessity to reconcile work and family obligations, especially those related to children (Hofäcker and König 2013), Matysiak and Węziak-Białowolska 2016, Rostgaard 2014). As women are used to care for children, maternity duties reduce temporarily their labour force participation. Consequently, employment rates of women with small children are much lower in Germany, Poland and Italy in comparison to childless women of the same age (opposite than for men), as shown in Table 1. The largest gap is noticed in Germany and Poland. Interestingly, in 2016 employment rates of Swedish women with children were higher compared to childless women and in general were the highest of all countries, showing an effect of the developed and affordable institutional care for small children in this country. In Italy, even childless women demonstrate lower participation rates than observed in the other countries.

Table 1. Employment rates of persons aged 20-49 with at least one child younger than 6 by the number of children

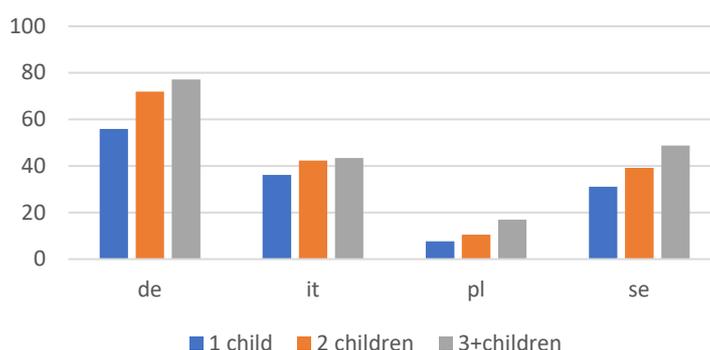
		2005	2010	2016	2005	2010	2016
		Men			Women		
<b>Germany</b>	No children	79.0	83.4	83.6	79.7	83.9	84.4
	1 child	87.7	91.8	92.6	<b>51.6</b>	<b>62.2</b>	<b>69.3</b>
	2 children	89.8	92.1	92.8	<b>47.4</b>	<b>53.2</b>	<b>63.1</b>
	3+ children	81.9	84.9	83.8	<b>32.8</b>	<b>38.8</b>	<b>43.6</b>
<b>Italy</b>	No children	81.0	76.5	70.7	66.9	65.2	62.0
	1 child	93.8	90.8	87.7	58.4	58.4	59.1
	2 children	93.3	90.8	88.1	49.5	51.5	51.9
	3+ children	90.5	84.8	80.8	35.7	34.5	39.1
<b>Poland</b>	No children	67.4	75.4	79.2	67.2	74.5	78.8

	1 child	87.0	90.3	93.5	56.8	64.1	69.1
	2 children	85.4	91.1	94.5	52.8	60.3	66.0
	3+ children	77.0	86.7	88.7	45.7	54.3	49.2
<b>Sweden</b>	<i>No children</i>		78.6	77.6		74.4	74.5
	1 child		90.0	95.1		<b>69.3</b>	<b>85.1</b>
	2 children		95.0	94.2		<b>80.4</b>	<b>80.8</b>
	3+ children		87.4	92.1		<b>74.9</b>	<b>79.5</b>

Source: Eurostat LFS database

The presence of children contributes not only to the lower labour force participation of mothers but also to the reduction in the number of hours worked. The strongest reduction of working time among mothers with young children can be observed in Germany, then in Sweden. In Poland, it does not exceed 20%, even in families with three children.

Figure 5: Part-time employment, females aged 20-49 with at least one child younger than 6 by the number of children, 2016



Source: Eurostat LFS database

Summing up, the gender gap in employment exists in all four countries – the highest in Poland and Italy and lower in Germany and Sweden. Educational attainment and children affect not only the employment rates, but also lead to widening the gender gap. There is a positive trend of increasing employment rates in all countries. It is combined with reduced gender gaps in Germany and Italy. In Sweden, the gap in employment between men and women is low, it is non-existent in the case of people with tertiary attainment. Employment rates of women aged 55 and over drop quickly in Poland and Italy, while they remain stable until around 60% in Germany and Sweden.<sup>4</sup>

<sup>4</sup> To some extent that can be an effect of a lower retirement age for women in Poland and Italy, who are in worse competitive position in relation to men.

This positive development is to a certain extent off-set by a large share of women working part-time, particularly in Germany and Sweden. We also observe a major increase in the share of female part-time employment in Italy. Only in Poland workers work most often full time.

## 1.2. Gender pay gap

Differences in wages earned by men and women are another important determinant of gender pension gaps, in particular in pension systems based on defined contributions (Chłoń-Domińczak, 2017). Therefore, we analyse gender pay gaps in four selected countries to determine their level and their cross-country differences. We also investigate gender pay gaps for different age groups. Finally, we study the development of gender pay gaps over time to evaluate the potential impact of those changes on the future gender pension gaps.<sup>5</sup>

Below we refer to *raw gender pay gaps*, which reflect the difference in average wages earned by men and women. We also consider *adjusted gender pay gaps*, which show the extent of “unexplained” pay differences between men and women – after adjusting<sup>6</sup> for differences in the composition in terms of factors determining wages, such as education and age. Adjusted pay gaps are a better indicator of gender wage inequality, yet from the perspective of the pension system and of the gender pension gaps these are the raw gender pay gaps that reflect the labour market characteristics that contribute to the future pension inequality. Thus, we base most of our analyses on the raw differences in wages earned by men and women.

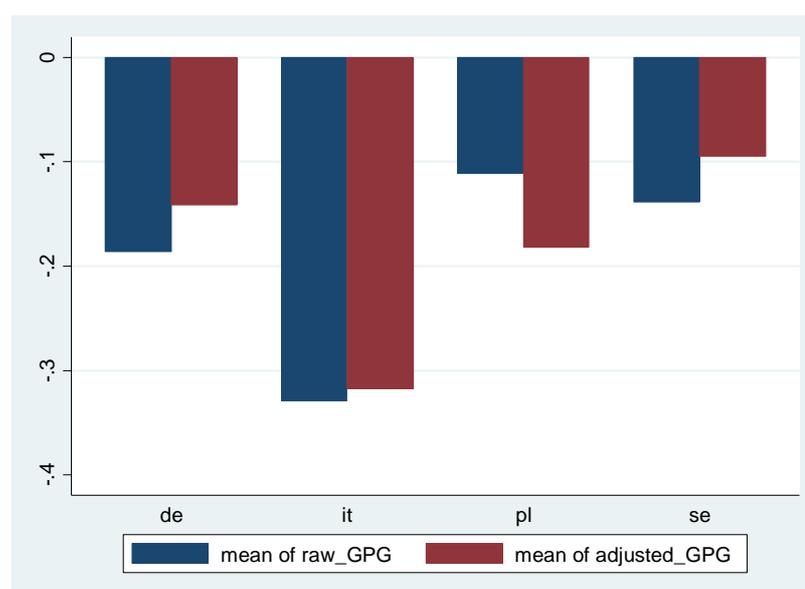
There are considerable differences in average hourly wages of men and women in all four countries studied (Figure 6). In 2014 in Poland, the average hourly wage of women was 11% lower than the average hourly wage of men; in Germany this gap exceeded 18%, and it reached almost 33% in Italy. Most of these wage gaps are not explained by differences in age or educational attainment of male and female workers, as the adjusted gender pay gaps are only slightly lower than the raw ones – and they actually exceed the raw pay gap in Poland, reflecting better educational attainments of women.

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<sup>5</sup> The analyses have been carried out within the framework of a “Gender pay gaps – a cohort analysis” project, supported by the Polish National Science Foundation (grant number 2013/10 / E / HS4 / 00445). The analyses are based on the European Structure of Earnings Survey (2002, 2006, 2010 and 2014 waves) provided by the Eurostat. All errors are ours.

<sup>6</sup> We used the non-parametric  $\tilde{N}$ opo decomposition technique to calculate the adjusted gender wage differences ( $\tilde{N}$ opo 2008). The selection of age, educational attainment and occupation as covariates for matching follows the methodological considerations by Goraus and Tyrowicz (2017).

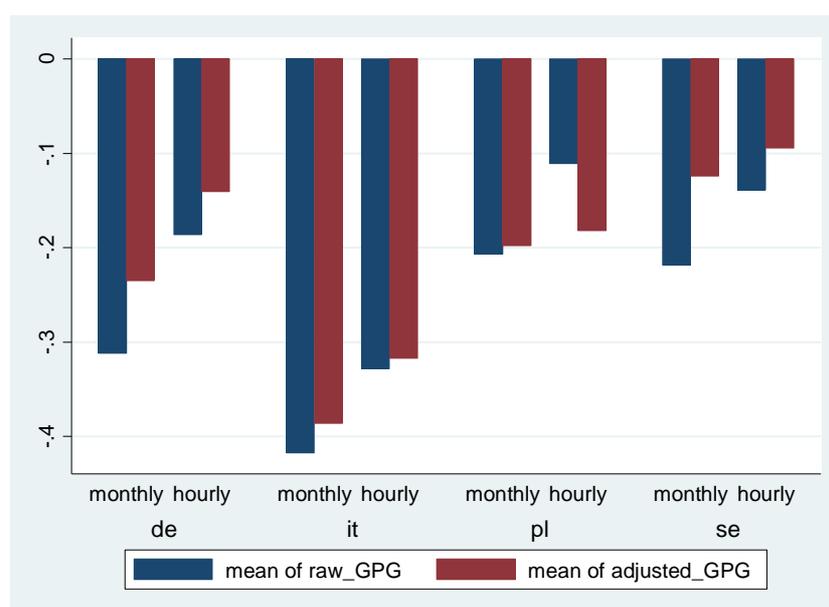
Figure 6: Raw and adjusted gender pay gaps (in %), 2014.



Source: Authors' analysis of the European Structure of Earnings Survey 2014

Differences in hourly wages of men and women fail to show the entire impact of gender pay gaps on gender pension gaps, as they conceal the fact that women work shorter hours in part-time employment (as discussed in section 1.1). This contributes to accumulating less of pension wealth. To account for these, we present raw gender pay gaps in terms of hourly and monthly earnings (Figure 7). Gender differences in average monthly earnings are higher than gender differences in hourly earnings in each one of the four countries. Thus, the overall gender pay gap in earnings – which are the base for pension contributions – amounts to around 20% in Poland and Sweden, but exceeds 30% in Germany and 40% in Italy. The difference between hourly and monthly pay gaps is particularly striking for Germany, where a large share of women works part time (Matysiak and Steinmetz 2008). While it makes combining work and family life easier, at the same time it translates into a significant pension disadvantage.

Figure 7: Hourly vs monthly gender pay gaps, 2014.

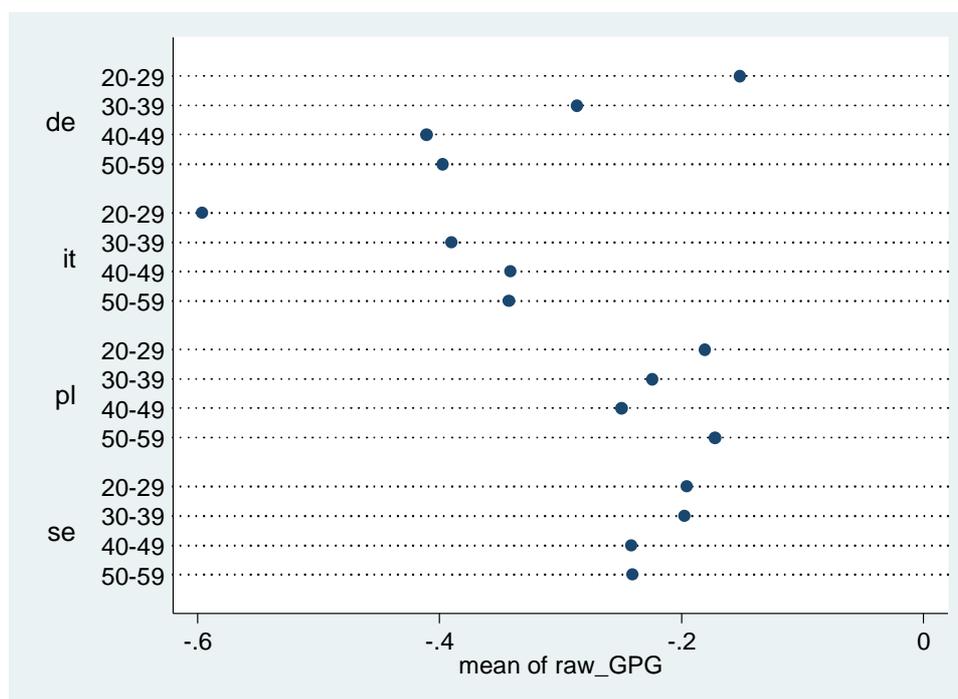


Source: Authors' analysis of the European Structure of Earnings Survey 2014

The size of the gender pay gaps varies by age, though the patterns are strongly country specific. The differences are the highest in Germany, where young women (20-29) earn wages which are approximately 15% lower than men's wages (Figure 8), this gap is almost double that for those aged 30-39, and exceeds 40% for men and women aged 40-49 (slightly decreasing afterwards). Also in Poland and Sweden gender pay gaps increase with age and show a similar pattern, but the differences are much lower. In Italy, young men and women display substantial differences in average wages. These gaps increased substantially in 2014. We suspect this relates to the decline in the employment gap among the low skilled men and women – the increased share of low paid women translated to a higher pay gap. For the older Italian workers, the differences are similar across the age groups.

What could explain the differences in gender pay gaps by age? It seems that the institutional setting is likely to play a major role (Baran et al. 2014). For instance, the fact that the gender pay gaps decrease for the oldest age group (49-59) in Poland (and Germany to lesser extent) is likely explained by self-selection of (better-earning) women, reflecting large flows of women to inactivity in that age group, explained by the availability of early retirement schemes. The fact that older women are much more disadvantaged in terms of pay than youngest women – in virtually all countries studied – points to the importance of the cumulated job experience which is lower for women, and different job careers of men, rarely interrupted for family reasons. The strong age disadvantage observed in Germany likely reflects its family policy setting, which included several incentives for women to withdraw from the labour market and lower their attachment, with low support for equal partnership policies (OECD 2017).

Figure 8: Age patterns of gender pay gap differences, 2014, monthly earnings.



Source: Authors' analysis of the European Structure of Earnings Survey 2014

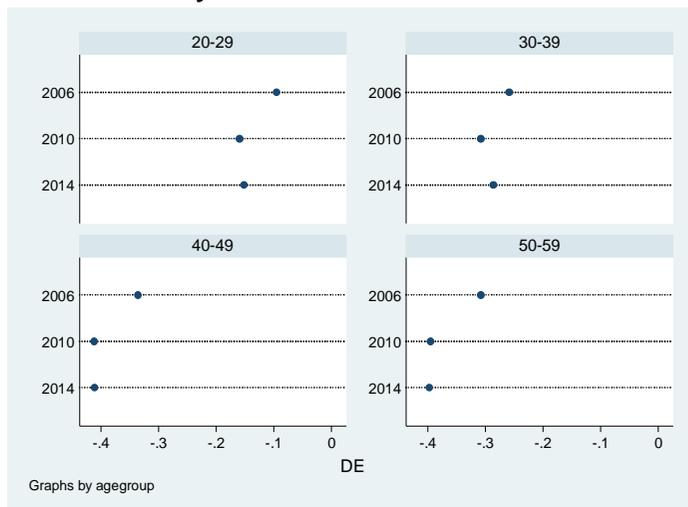
Finally, we also investigate the dynamics of gender pay gaps over time, from a cohort perspective. In other words, we ask the question whether e.g. young women are nowadays less disadvantaged in terms of pay, compared to young women in early 2000s (which we would expect, given the implementation and promotion of anti-discriminatory legislation and equal pay policies in most European countries). To this end, we look at raw gender pay gaps in average wages by age groups in three points in time: 2002, 2006, 2010 and 2014<sup>7</sup>, in all four countries.

We fail to find the expected drop in gender pay gaps over time for subsequent cohorts in all countries but Sweden (Figure 9a-d). In Germany, Poland and Italy the gender pay gaps in 2014 for the respective age groups are higher than in 2002/2006. In Germany, the pay gaps have increased in particular between 2006 and 2010. In Poland, the pay gaps decreased during this time framework, but increased afterwards (by 2014). Italy experienced no change in pay gaps between 2002 and 2010, and a high increase afterwards. Finally, Sweden observed a substantial increase in pay gaps in 2006 – and a strong fall afterwards. Overall, while the patterns of increasing or decreasing pay gaps vary between countries, it is visible for all of them that no long-term trend of more equal wages can be observed.

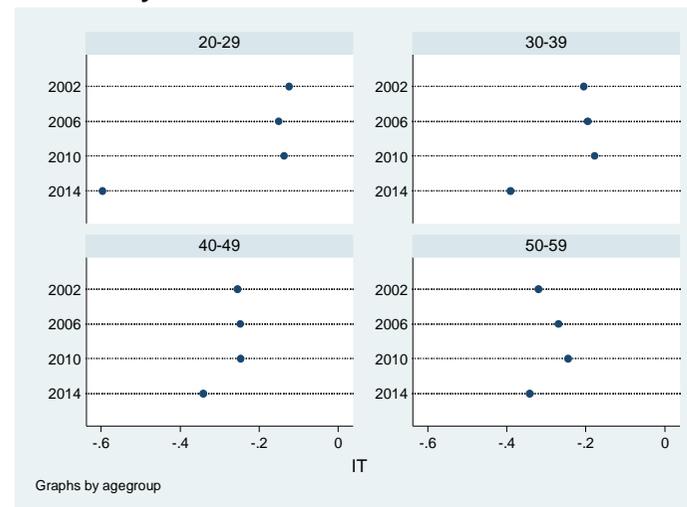
<sup>7</sup> The choice of these reference points is due to the data availability. In particular, 2002 data is unavailable for Germany.

Figure 9: Gender pay gaps by cohorts, 2002 - 2014.

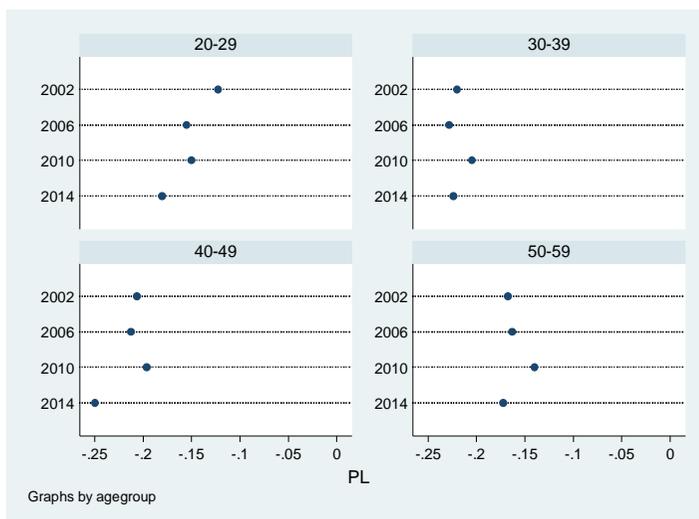
**a. Germany**



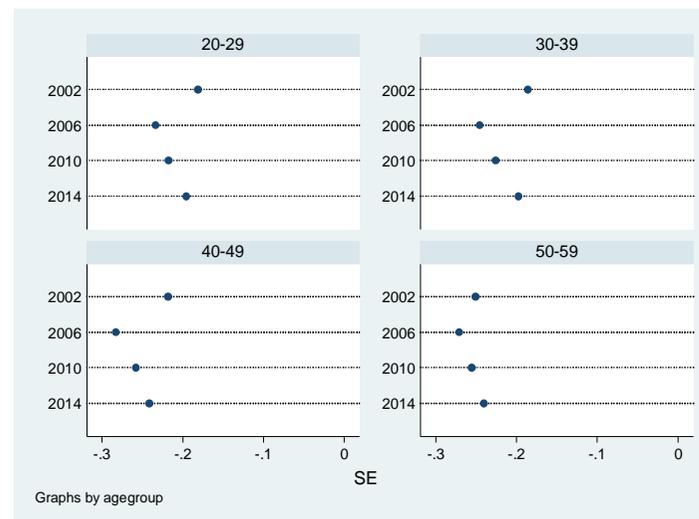
**b. Italy**



**c. Poland**



**d. Sweden**

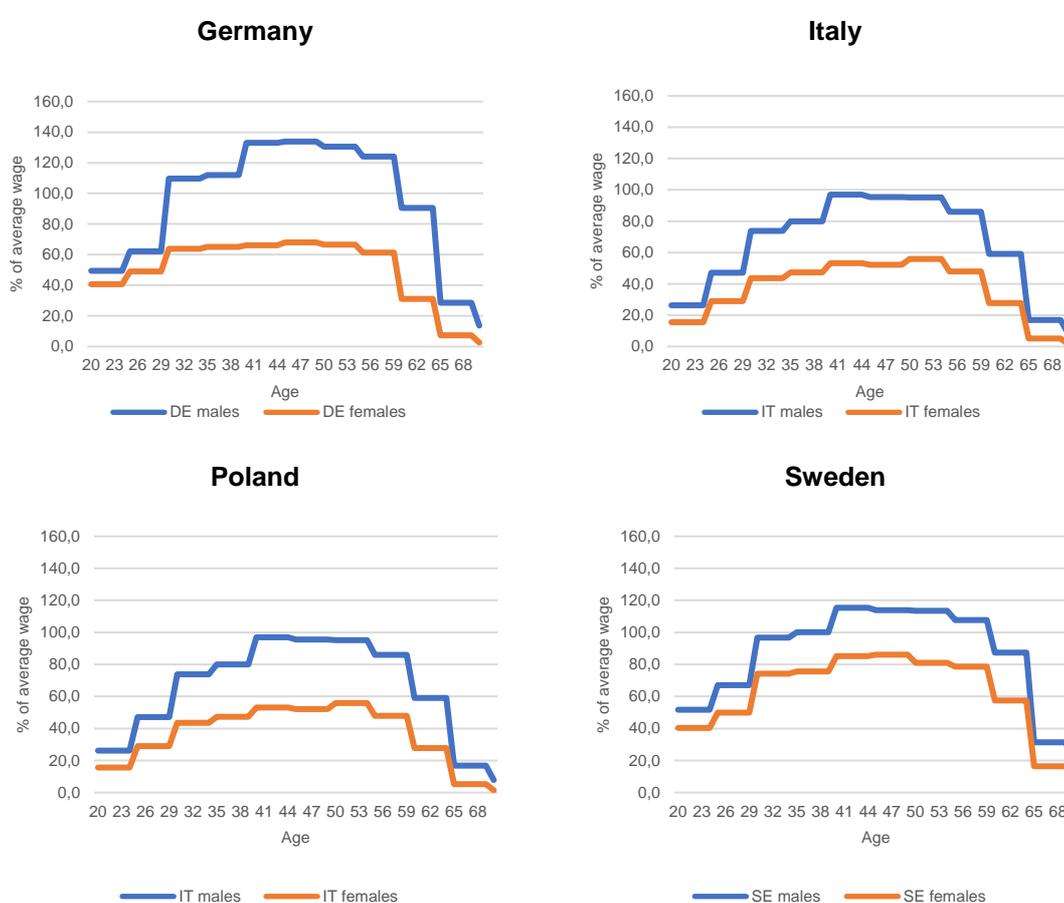


Source: Authors' analysis of the European Structure of Earnings Survey 2002, 2006, 2010, 2014

### 1.3. Employment and wages combined: the gender gap on the labour market

Combination of average wages and employment rates by age and sex indicates the overall labour market gap. Stylised are profiles of labour income of men and women are depicted in Figure 10. Combining the two dimensions shows that the gender gap increases. Germany tends to have the highest labour market gap, the difference between men and women is lowest in Sweden.

Figure 10. Stylised age profiles of labour income estimated using LFS and ESES data, 2014



Note: the age profiles are calculated multiplying the average wage in 10-year age group and employment rates in 4-year age groups, as presented in sections 1.1. and 1.2.

Source: Authors' assessment

The gender gaps at different ages lead to a higher cumulative gender gap in the life course. If we sum the stylised lifetime income for men and women, the accumulated life course gender labour income gap (LCGLIG) is substantial. We propose to measure the LCGLIG using the following equation:

$$LCGLIG = 1 - \frac{\sum_{i=20}^{65} w_i^f * e_i^f}{\sum_{i=20}^{65} w_i^m * e_i^m}, \text{ where:}$$

$w_i^m$  – average wage of men at age  $i$  measured in relation to country average wage,

$e_i^m$  – employment rate of men at age  $i$ ,

$w_i^f$  – average wage of women at age  $i$  measured in relation to country average wage,

$e_i^f$  – employment rate of women at age  $i$ .

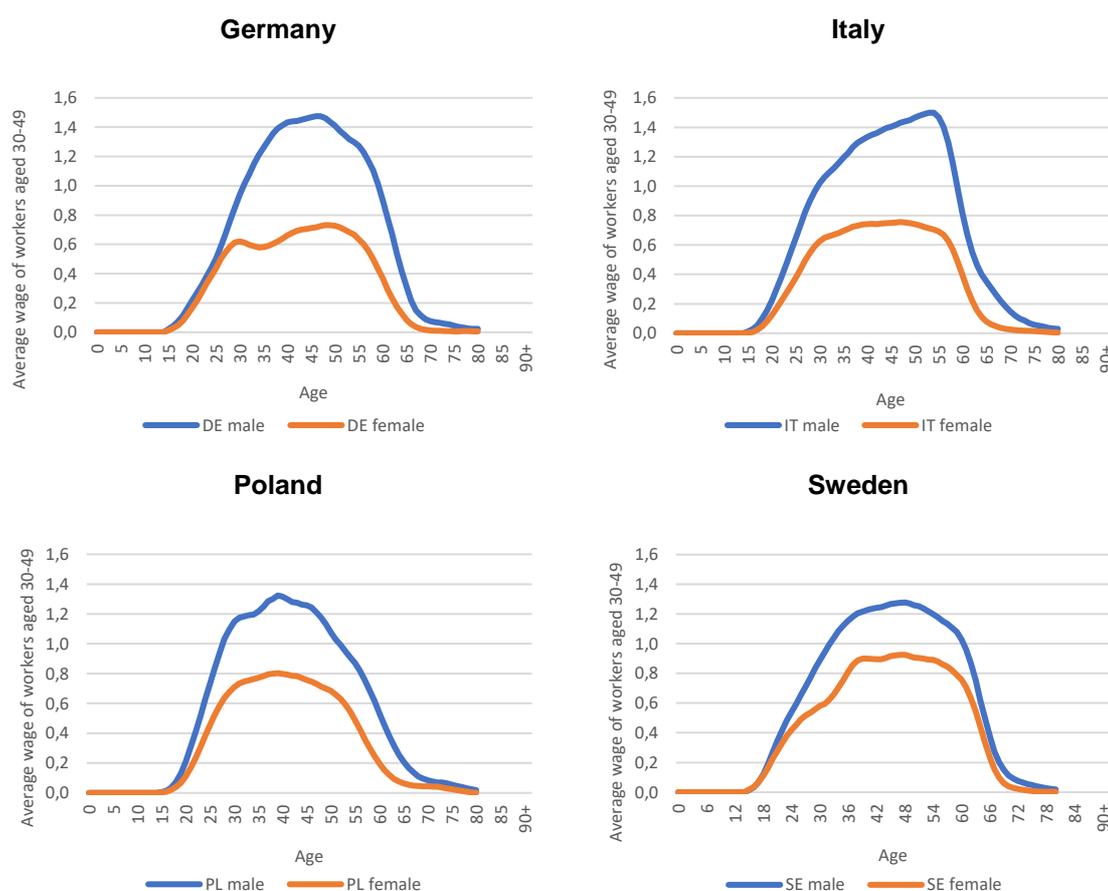
Based on the Eurostat data, the estimated value of LCGLIG in Germany is the highest at 46.8%, which is a combination of lower women's employment rates, combined with higher one among men. In Italy the value is 44.3%, in Poland 35.4% and in Sweden 27.3%. This shows, that even relatively low differences at given ages can lead to a lifetime income of women lower by one third, which translates directly to the similar difference in the level of NDC pensions.

#### 1.4. Gender specific age profiles of labour income

Another approach to measure the impact of differences in employment rates, wages and work intensity between men and women on the overall gender gap in the per-capita labour income is through the estimates using the National Transfer Account (NTA) methodology (Lee and Mason 2011; Mason et al. 2009). Cross-sectional per-capita labour income profiles using the EU-SILC data for 2010 were estimated by (Istemic and Sambt 2016).

As shown in Figure 11, in all countries the level of labour income of women is below the one of men, which is consistent with stylised profiles presented in section 1.3. The gender differences are visible already for women below 30, which can be a result the career breaks due to childbearing periods, which is particularly visible in Sweden and Germany. Women's incomes at their prime age are also below men's. The largest differences are between men and women in their prime age. Only in Sweden, we can see that at later stages of the life course, the labour income of men and women converge.

Figure 11. Age profiles of labour income in the four countries (NTA estimates), 2010



Source: (Istemic and Sambt 2016)

The NTA estimates confirm that combination of three factors: gender pay gap, gender differences in employment rates and lower work intensity due to the higher share of women working part-time lead to significant gap in per-capita incomes that will undoubtedly translate into a gender pension gap. The estimates of the LCGLIG on the gender-specific NTA labour income profiles indicate higher differences between men and women, compared to the profiles derived on the LFS and European Structure of Earnings data. In Germany, the LCGLIG reaches 49.2.8%, in Italy 48.3%, in Poland 42.1% and in Sweden 30.5%.

### 1.5. Employment paths: are there distinct employment patterns in the countries?

In addition to the analysis of the differences between men and women regarding average income and employment profiles, one should take into account also the potential risks resulting from the differences in work experience within those groups. The average differences in the labour market participation of men and women result from a combination of different individual life course developments, that lead to interrupted employment careers. Unstable and interrupted work careers are not only assigned to women. There are many explanations

of the diversity of different patterns of work careers. One explanation is the family situation. As we discuss earlier, in families with children employment rates are lower, particularly for women. As a result, people have little or no work experience due to more childcare oriented behaviour (Hakim 2003; Vitali et al. 2007). There are also persons who decide to reconcile work and family lives with more frequent career breaks or working part-time. These choices have an impact on individual pension levels (Kotowska, Stachura, and Strzelecki 2008, Vitali et al. 2007). Other people prefer high work intensity, particularly those with higher education. Another reason for the divergence in patterns of the stability of work experiences can be connected with health, life styles accepted in the society etc. The significant share of the unstable work careers can be also an indicator of the dual labour market with relatively better opportunities for persons without interrupted careers and difficulties in finding stable jobs by those whose career was interrupted and they lost access to “better” jobs (Reich, Gordon, and Edwards 1973; Elger 2015).

Identification of different types of labour market careers requires data on life course histories. We use the data collected in the SHARE-LIFE survey to analyse the employment pathways of people aged 60 and over, who are advanced in their labour market biography. The SHARE-SHARELIFE is the third wave of data collection for SHARE, which focuses on people's life histories. It covered all four countries discussed in the paper. The SHARELIFE questionnaire contains all important areas of respondents' lives, in particular the work history. These histories are typical to people from retired generations and most likely the younger generations can expect different patterns. Nevertheless, the country differences illustrate the divergent labour market developments, which are still likely to affect different pension outcomes for people by country.

In this section, we use SHARELIFE (Orso et al. 2017) data and the sequence analysis (Brzinsky-Fay, Kohler, and Luniak 2006) in order to identify typical labour market participation patterns observed in the countries considered. Three possible states are distinguished: full employment, inactivity/unemployment and part-time employment. In the comparison of sequences, we treat part-time as between the two first states.

After calculation of distances between the work trajectories at the micro level, we used cluster analysis with the Ward metric to identify two most different clusters. It appeared that in majority of cases, the difference was rather clear. For each country and sex two distinct clusters are identified. The first one is constituted by people with interrupted careers characterised with periods of inactivity or part-time work. The second one includes people with usually uninterrupted full-time work careers. The first cluster appears more frequently among women but it is also observed to some extent among men (Figure 12).

The meaning of “interrupted” work pattern also differs between countries and between sexes. For example, average interrupted men's career in Germany was only a bit less stable than

average full career of women. The “interrupted” career of women in Italy where labour force participation of women is very low is different from the one in Sweden, where women have high employment rates. In Poland, women initially withdraw from employment at the childbearing and childrearing periods, but some of them returns to the labour market at later stages of their life course. At the same time, the part-time employment seems to be very frequent among women with “interrupted” pattern of work careers in Germany and Sweden while in Italy it is rather rare. Instead, we see a very early transition to inactivity in Italy. These outcomes are consistent with our earlier findings on the employment characteristics of men and women in the four countries.

Almost all men in Sweden have full careers. Interrupted careers for men in Sweden are characterised by very low labour market participation, but such patterns apply to less than 5% of men. In the remaining countries, men with interrupted careers withdraw from employment early, which may indicate loss of their employability due to various factors, including health or disability.

The differences in the employment rates combined with differences in wage levels calculated for age groups 20-29, 30-49 and 50 and over for people with full-time and part-time employment translate into the differences in the life-course labour income gap. We compared the estimated life-course labour income in the four groups for all countries, taking the level of labour income of men with full careers as the basis. For men, the patterns of career interruptions in Sweden and Poland give the highest difference to life-course labour income. Women with full careers in Sweden have their estimated life-course labour income by 17% lower compared to men, which is the lowest out of four countries. In Poland, the difference is the highest and exceeds 37%.

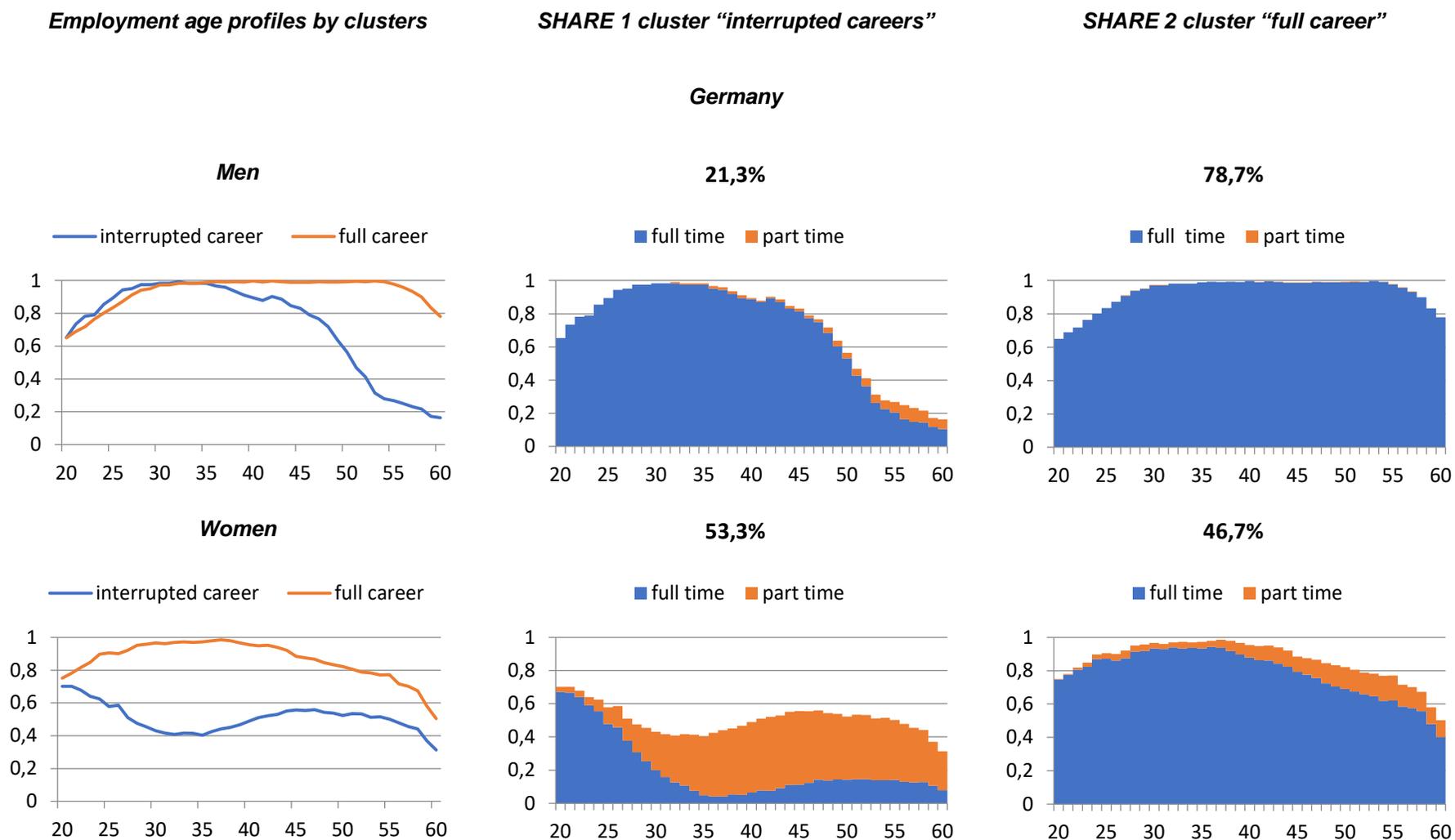
Career interruptions give a large penalty in the life-course labour income, ranging from more than 50% in Sweden to almost 95% in Italy. These differences have an important influence on individual pension rights in the NDC or point systems, as we discuss later in the paper.

*Table 2. Difference in the level of life-course labour income compared to men with full careers*

	Men	Women	
	Interrupted	Interrupted	Full
Germany	35.56	74.16	31.90
Italy	34.14	93.98	36.04
Poland	43.45	83.77	37.24
Sweden	58.56	53.83	17.23

Source: Authors' estimates

Figure 12. Employment age profiles for interrupted careers and full careers by sex in the analysed countries



**Employment age profiles by clusters**

**SHARE 1 cluster "interrupted careers"**

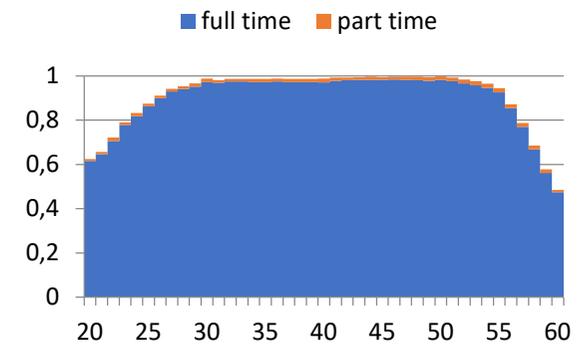
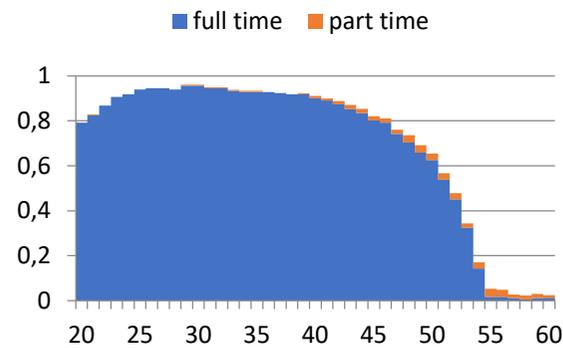
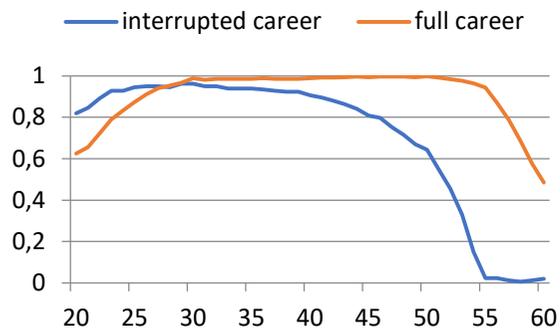
**SHARE 2 cluster "full career"**

**Italy**

**Men**

**27,1%**

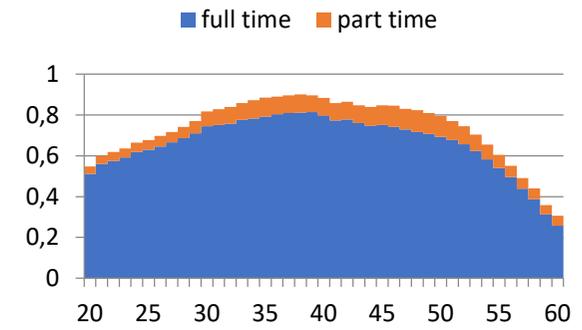
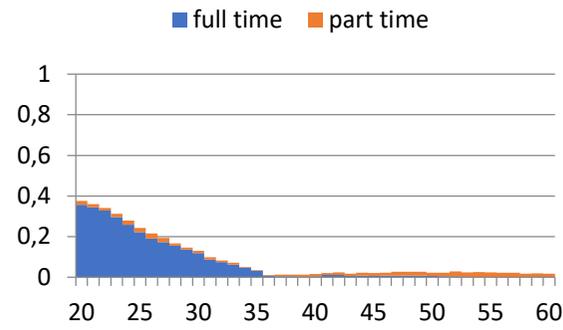
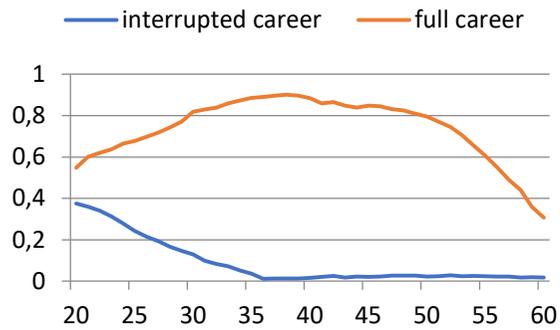
**72,9%**



**Women**

**48,9%**

**51,1%**



**Employment age profiles by clusters**

**SHARE 1 cluster "interrupted careers"**

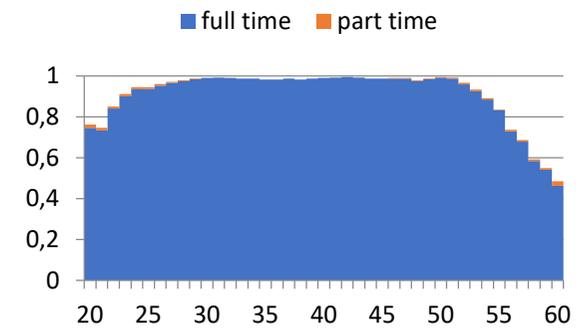
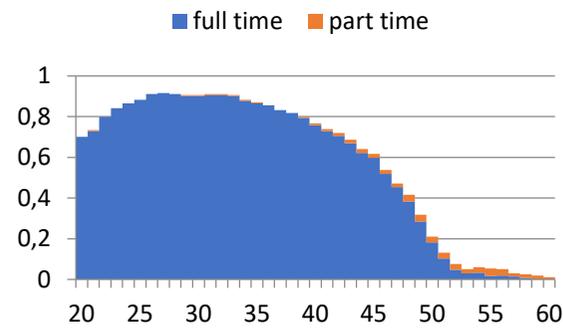
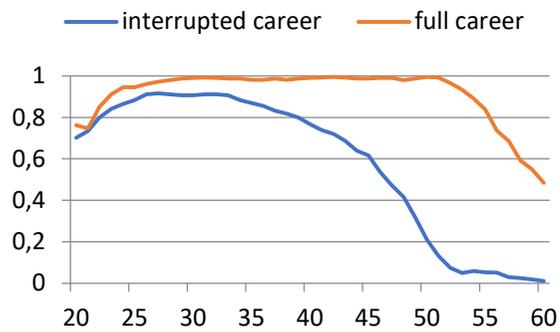
**SHARE 2 cluster "full career"**

**Poland**

**Men**

**35,68%**

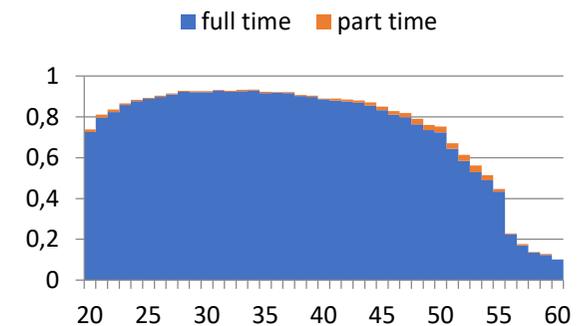
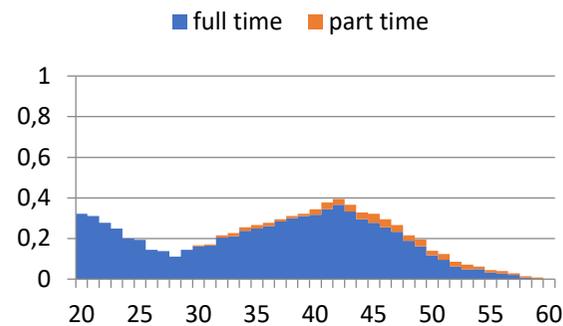
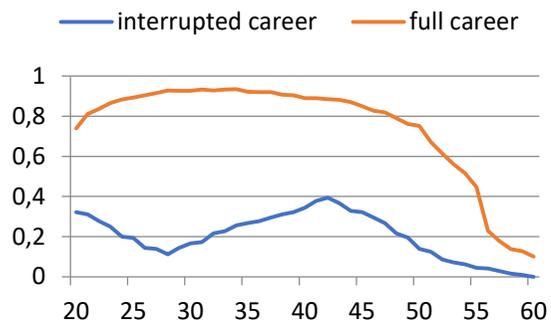
**64,32%**



**Women**

**24,38%**

**75,62%**



**Employment age profiles by clusters**

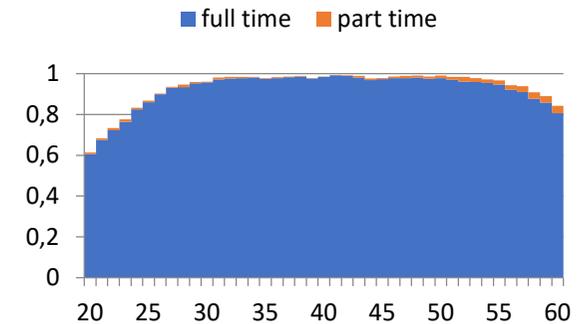
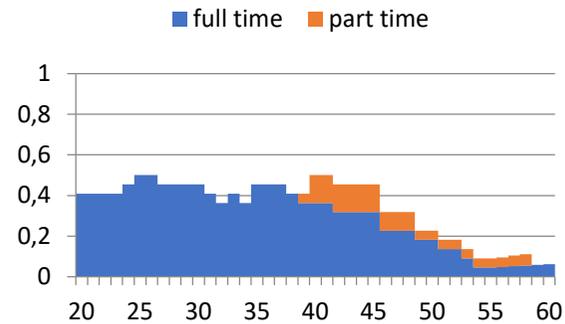
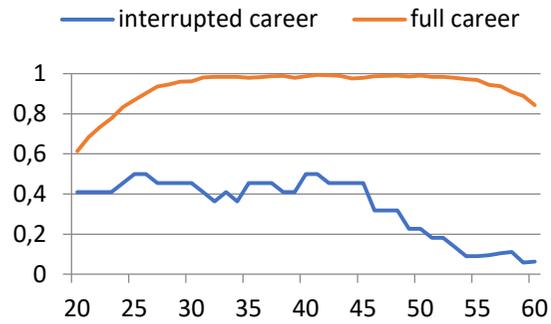
**SHARE 1 cluster “interrupted careers”  
Sweden**

**SHARE 2 cluster “full career”**

**Men**

**4,12%**

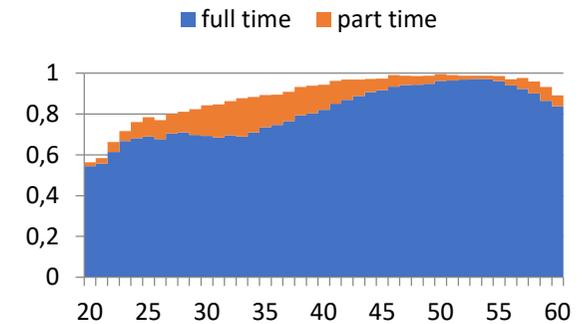
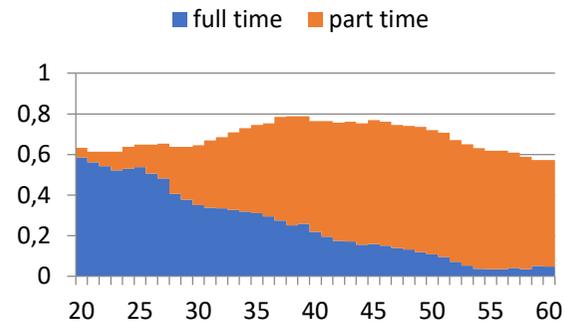
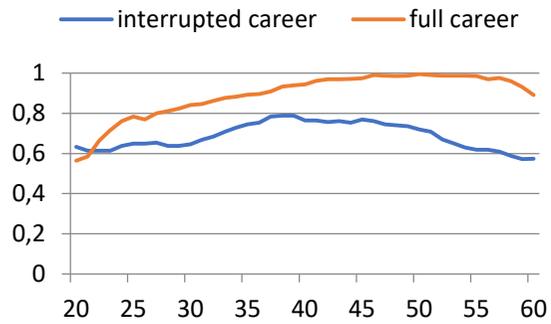
**95,88%**



**Women**

**37,0%**

**63,0%**



Source: Authors' estimates based on SHARE Wave 2 data

## 1.6. Job satisfaction of workers 50+: differences between men and women

Different labour market experiences between and within countries lead to different levels of job satisfaction. Chłoń-Domińczak, Holzer-Żelażewska, and Maliszewska (2017) identified four groups of workers, based on the assessment of various aspects of job satisfaction<sup>8</sup>, using the recent wave of SHARE (Wave 6 of 2015). The four groups are:

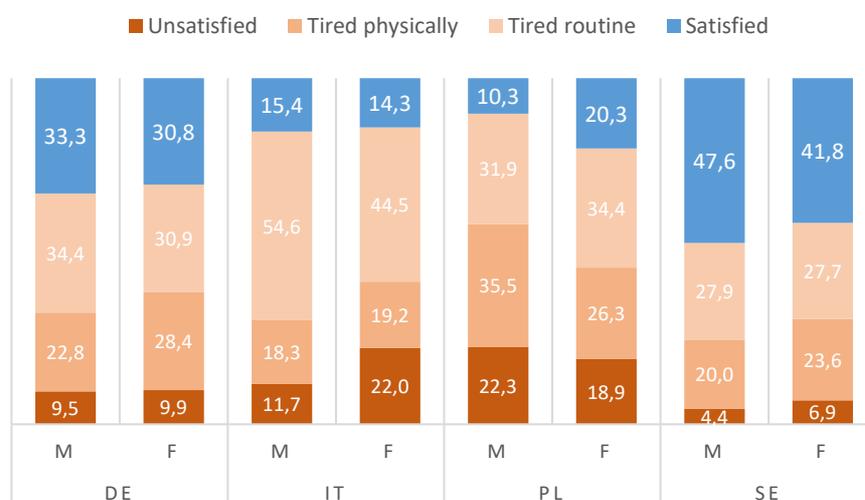
1. **Unsatisfied workers**, who generally experience many push factors out of the labour market: job demanding physical strength, time pressure, job insecurity, low promotion prospects, while at the same time they feel less supported and recognised, they have lower possibilities to develop their skills and they also feel that their salaries are not adequate to the job content.
2. **Workers tired physically**, they indicate high intensity of physical work, combined with worries that their health status will not allow them to work until they retire.
3. **Workers tired with routine work**, who in general assess their jobs well, however they indicate little flexibility of the job performance and lower level of factors that relate to the job support and recognition (compared to the last group).
4. **Satisfied workers**, who indicate that they are satisfied and encouraged by their employers.

The composition of groups varies in the four countries, as shown in Figure 13. The share of satisfied is lower in Italy and Poland, while highest in Sweden. Similarly, the “unsatisfied” group represents the higher share of workers in the former two countries. In Poland, we also see the highest share of employees who are tired physically, while in Italy and Germany the cluster of those who report to be tired with routine and less flexible work conditions is the largest. Between countries, differences are more visible than those between men and women are. In Germany and Sweden, the group of satisfied men is slightly larger than the group of satisfied women. In Poland, on the contrary, the share of women who feel satisfied with their job is almost double the share of men. Women also less frequently work in jobs that leads to physical tiredness. In Poland, the share of dissatisfied women is almost double that of men.

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<sup>8</sup> They applied factor analysis, followed by cluster analysis using 13 items related to job satisfaction for the full sample of 17 countries participating in the wave 6 of the SHARE survey.

Figure 13. Groups of workers above age 50 according to their job satisfaction by sex in selected countries



Source: Authors' analysis of SHARE data: wave 6; following the analytical approach of (Chłoń-Domińczak et al. 2017).

The higher level of job satisfaction is positively associated with higher employment rate among older workers (Chłoń-Domińczak et al. 2017). This means that workers in Poland and Italy are general inclined to retire earlier than workers in Germany and Sweden, what we discuss in the next section. Such behaviour in Poland will be further supported by recently reinstated lower retirement age<sup>9</sup>. The actual differences between countries and sexes may be even higher, as the survey measures only on the perception of people, who are working. Some people discouraged with a low quality of job could have already retired.

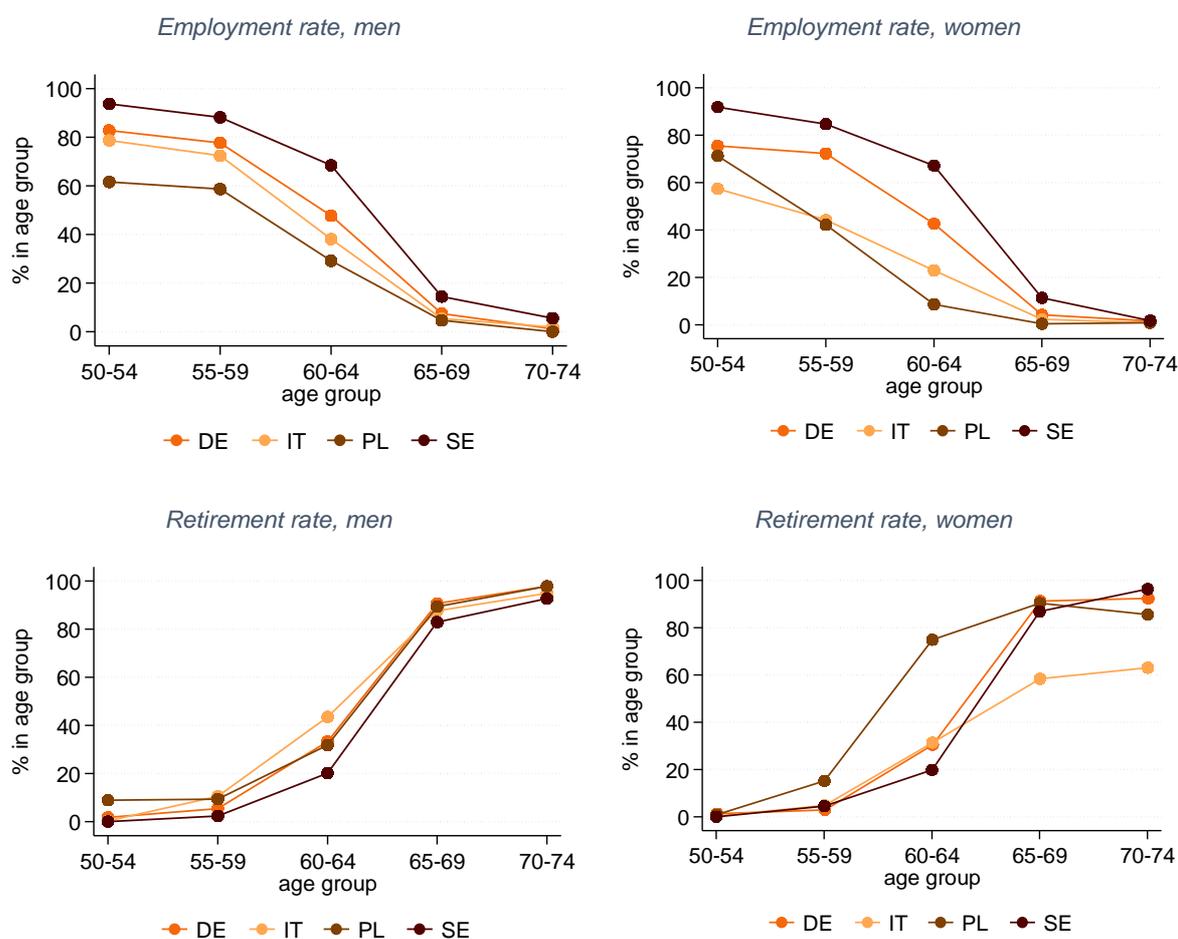
### 1.7. Extending working lives and prolonging retirement

In this section, we use the SHARE Wave 6 data to illustrate the differences between the four countries with respect to both employment rate of older workers as well as retirement rates (measured as a share of old-age pensioners in age groups). The estimates are shown in Figure 14.

The SHARE data confirms the LFS-based data. The highest employment rates of men are noted in Sweden and the lowest ones in Poland. For women a steep decline of employment rates refers to 55-59 and 60-64 age groups.

<sup>9</sup> For details see (Buchholtz, Chłoń-Domińczak, and Góra 2017).

Figure 14. Employment and retirement rates of men and women in the four countries, SHARE Wave 6.



Source: Authors' analysis of SHARE data: wave 6;

As regards retirement rates, the transition to retirement for men has similar pattern between the four countries. The largest differences are seen in the age group 60-64, i.e. close to the legal retirement ages. In this age group, Sweden shows the lowest share of old-age pensioners, while Italy the largest one. This indicates the early transition to retirement in Italy. The women's pattern of retirement is more diversified across countries. In Sweden, the age profile of the women's retirement rate is similar to men. Poland is distinct from the other three countries, as the majority of women aged 60-64 is already retired. In Italy, only 60% of women older than 65 receive old-age pensions. This confirms our observations on their labour market participation. Women, who withdraw earlier from the labour market or did not participate in employment at all, do not have entitlements to their old-age pensions and they have to rely on their husbands' incomes, survivor benefit or other sources of income. This confirms the significant differences between countries also in the outcomes of their pension systems, as they are functioning today.

## 2. Employment histories and pension levels

In this section, we present simulations of pension levels for men and women in the four countries. As indicated already, contrary to the approach used in the comparative simulations, we assume different employment paths by country and sex. While the assessment of theoretical replacement rates by the OECD (OECD 2015) and the European Commission presented in Pension Adequacy Reports (European Commission 2015) focuses on comparing the expected pension benefits under different pension systems for people with standard profiles of employment careers, the assumptions usually applied refer to the full (or almost full) employment length and different (but standardised) earnings levels.

Our goal is to assess the expected outcomes of the pension systems taking into account the country-specific labour market situation as regards gender-related biographies, employment and wages. As shown in the previous section, the labour market differences between countries and between men and women within countries are significant. The adequacy of future pensions will depend significantly on the employment histories that are distinct between countries.

### 2.1. Pension simulations: assumptions and approach

In order to compare the expected levels of future pensions, we prepared the microsimulation model that we use to calculate the level of old-age pensions in the four countries. In the model, we calculate the *theoretical future pensions* in relation to the country average wage in the year of retirement. The theoretical future pensions are calculated for individuals that start their employment at age 20 in 2017 and continue their labour market careers according to profiles specified in the relevant scenario.

There are four different scenarios of employment paths (each for men and women) that we apply in the simulations:

- 1) Average **Eurostat** scenario: probabilities of employment are set according to the average employment rates by country, sex and age (in 5-year age groups), levels of wages (compared to the average) are set using the average wages by country, sex and age (in 10-year age groups), as presented in sections 1.1 and 1.2;
- 2) **NTA** scenario: labour income that is the basis for contribution calculation is based on the NTA age profiles of labour income by country and sex, as presented in section 1.3;

- 3) SHARE scenario of **interrupted career**: probabilities of employment are set according to the first cluster identified in the sequence/cluster analysis, as presented in section 1.3, levels of wages are similar as in the Eurostat scenario;
- 4) SHARE scenario of **full career**: probabilities of employment are set according to the second cluster identified in the sequence/cluster analysis, as presented in section 1.3, levels of wages are similar as in the Eurostat scenario;

Other assumptions in the simulations are based on the Ageing Working Group assumptions (European Commission DG ECFIN 2015), as listed in Table 3. Life expectancy used for pension calculation is based on the Eurostat population projections (EUROPOP 2013).

*Table 3. Country- specific assumptions used in the pension simulations*

	Germany	Italy	Poland	Sweden
<b>Wage, employment and economic growth:</b>				
Average wage growth rate (in %)	1.5	1.2	2.2	1.5
Employment growth rate (in %)	-0.5	0.1	-0.6	0.5
Wage bill growth rate (in %)	1.0	1.0	1.0	1.0
GDP growth rate (in %)	1.0	1.3	1.6	2.0
<b>Contributions</b>				
contribution NDC (% of wage)	na	33.00	12.22	14.88
contribution NDC 2 (% of wage)	na	na	4.38	na
contribution FDC (% of wage)	na	na	2.92	2.33
<b>Indexation and rates of return</b>				
indexation of the NDC account (in %)	na	1.3	1.0	1.5
Indexation of NDC 2 account (in %)	na	na	1.6	na
Rate of return on FDC account (in %)	na	na	2.0	2.0
<b>Annuity calculation</b>				
Discount rate for annuity calculation (in %)	na	1.5	0.0	1.60
Adjustment of point value due to life expectancy	14%	na	na	na

*Source: own assessment based on AWG and OECD assumptions*

## 2.2. Theoretical future pensions

We calculate theoretical future pensions according to the four scenarios, separately for men and women. The amount of contributions paid at a given age depends on the age- and sex-specific employment probability and labour income, according to the applied scenario. We assume that both men and women retire at age 67 (target retirement age in Germany, Italy

and Sweden). For Poland, we also present results for lower ages: 65 for men and 60 for women, that is again the legal retirement age (since October 2017).

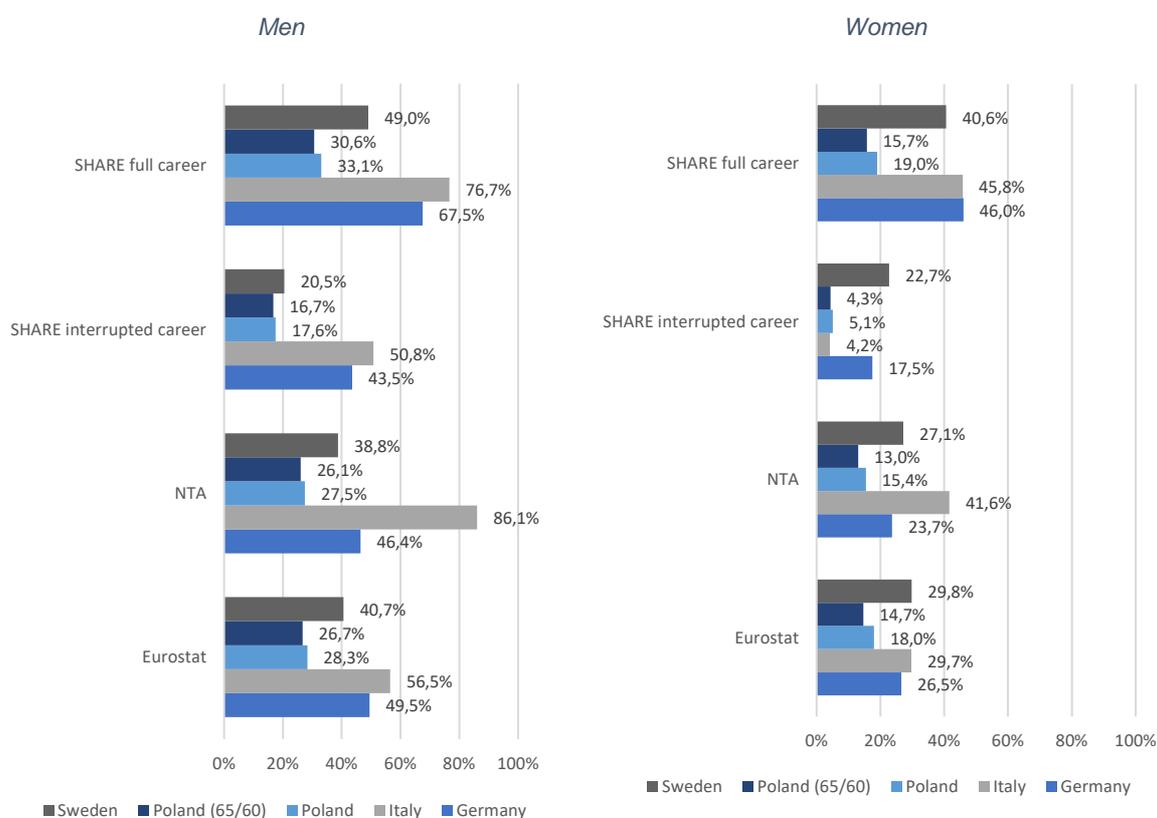
Figure 15 shows the summary of the simulation results. In general, men can expect higher pensions compared to women in all countries. The difference is largest in Italy and Germany (26.8 p.p and 22.9 p.p. respectively in the Eurostat scenario). In the remaining two countries, the difference is slightly exceeding 10 p.p. upon the retirement age of 67. Under the lower retirement age in Poland, the difference increases to 12.0 p.p. This is an outcome of accumulated differences in both labour market participation and average wages by sex.

There are also differences between countries. The Eurostat and NTA scenario results are in general similar. In the Eurostat scenario with average employment rates and average wages by age, the highest level of theoretical future pensions for men is in the case of Italy, exceeding 56% of average wage, followed by Germany, Sweden and Poland. For women in the same scenario theoretical future pensions in Sweden and Italy are close to 30%, in Germany they are slightly lower. In Poland, assuming retirement age of 67, women's theoretical future pensions remain below 20% and for lower retirement age (60 years) it falls below 15%.

Last but not least, the theoretical future pensions based on the two profiles of "interrupted" and "full" careers indicate the gaps in the expected pensions generated by the accumulated impact of career breaks. For men, the largest difference is seen in Sweden (28.6 p.p), however it should be noted that the majority of men in Sweden (almost 96%) are in the group with the full career. In Italy and Germany, men with interrupted careers withdraw from the employment earlier. As a result, they can expect their pensions lower by 25.8 p.p. and 24.0 p.p. respectively. In Poland, the difference is the lowest at 15.5 p.p. The share of men with the interrupted careers is also higher in the three latter countries, as discussed in section 1.4.

The pattern of interrupted careers of women in Poland and Italy leads to the expected level of theoretical future pensions below 5% of average wage. This is significantly below a poverty line and a minimum pension guarantee. This outcome for Italy is mainly due to the very short work careers of women, who withdraw from employment very early, presumably as they establish families and have children. In Poland, we see higher participation levels, however, given the design of the pension system, in particular the lower contribution rate and no discount rate for annuity calculation, the estimated benefits are low. The gap due to the career interruption in Italy is very high at 41.6 p.p., while in Poland it is much smaller at 13.9 p.p. In Germany and Sweden, career interruptions for women reach respectively 17.9 p.p. and 28.5 p.p.

Figure 15. Theoretical future pensions of men and women under different assumptions on labour market paths by country (% of average wage)

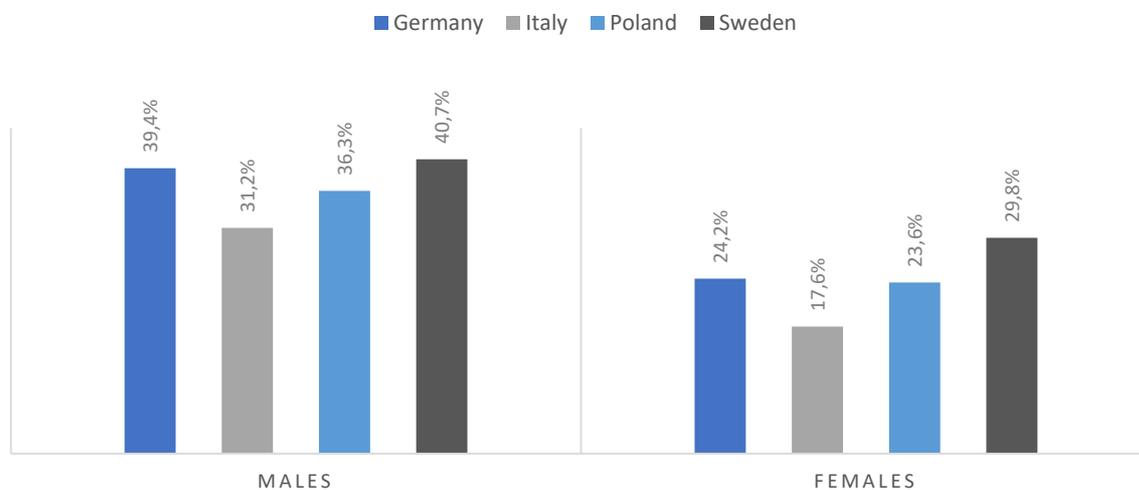


Source: Authors' analysis

### 2.3. Impact of employment paths and pension system design on theoretical future pensions

In order to assess, how differences in age and wage income profiles by sex affect pension levels, we prepared a simulation indicating the pension level in Sweden for workers with wage income and employment rate profiles according to the national characteristics. The results are depicted in Figure 16. As one could expect, for all three countries the level of theoretical future pensions in the Swedish pension system is lower due to their lower labour market participation. The difference is smallest in Germany and largest in Italy. The pattern is similar for men and women.

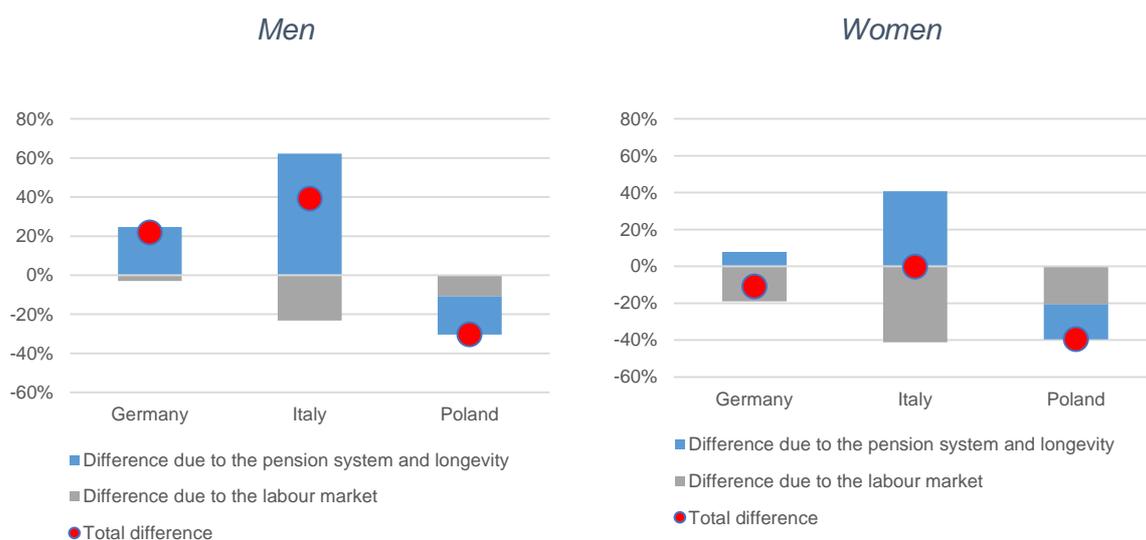
Figure 16. Pensions levels in Swedish pension system for country-specific assumptions on employment rate and wage levels by age and sex (% of average wage)



Source: Authors' analysis

The decomposition of the difference in the level of TFPs between Sweden and the other three countries is presented in Figure 17.

Figure 17. Decomposition of difference between TFPs in Sweden and the other three countries



Source: Authors' analysis

### 3. Summary and conclusions

The labour market plays the crucial role in all types of pension systems. In the pre-paid systems, especially in NDC and FDC, that role is strong and visible also at the individual level. That has a lot of advantages (as discussed in Góra and Palmer, 2017). At the same time, this means that accumulated differences in the aggregated labour income over the life course translate to the differences in pension levels. These differences are less pronounced in other types of pension systems, such as NDB or FDB that do not have a direct link between lifetime earnings and pensions.

Our analysis clearly shows that the patterns of interrupted careers lead to much shorter time spent in employment, compared to full careers, particularly in Italy and Poland. What is also important, career interruptions affect significant share of men and women: one in two women in Germany and Italy, one in three in Sweden and one in five in Poland. Women with interrupted careers in Poland and Italy are at risk of having extremely low old-age pensions in the NDC systems (below 5% of average wage). Women in Germany, if the patterns of interrupted careers remain unchanged, can expect pensions that are below 20% of average wage, while in Sweden they barely exceed a quarter of average wage. This leads to a high social risk of low old-age incomes for a significant group of women in the future.

This risk may be mitigated with two types of policy interventions. The first one, more difficult politically, but sustainable in the long-run focuses on finding ways to improve the labour market outcomes, particularly for the groups that are at risk of the interrupted careers. Longer working lives and higher wages lead to improved lifetime wages and higher pensions. The second type of intervention is through the adjustment of pension rules, which may seem more attractive in the short-term but hides the problems for the time being rather than solving them. Different retirement age for men and women, pension contributions by persons on care leaves for dependent family members can be mentioned here.

A mix of policies including reducing gender differences on the labour market and transparent compensation for selected justified career breaks, such as maternity or childcare leaves<sup>10</sup> the only sustainable policy direction. Measures that address these issues need to be discussed.

There are two directions of the labour market policy that should be seen jointly. The first one is the increase in the labour market participation over the entire life course. Differences at different stages of life accumulate when it comes to receiving pension. At the beginning of the employment activity such policies should focus on smoothing the school-to-work transition. Population ageing, late parenthood and increasing numbers of generations living in parallel as well as more diverse life biographies challenge the concept of “rush hours” to be allocated

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<sup>10</sup> For discussion of solutions applied in NDC countries see: Chłoń-Domińczak, Franco and Palmer (2012)

in the defined periods of the life course. Therefore, reconciliation of work and family over the life course seems to address better needs of people at different stages of their lives. The key issue is the redistribution of work and care within family networks, especially between women and men. Moreover, since family obligations related to children seem to be crucial for establishing a labour market position and career prospects of both women and men, policies supporting reconciliation of work and parenthood are highly relevant. Measures that strengthen women's breadwinner role and foster men's involvement in family care will result in more gender equality in the labour market. Later, policies are needed to support returns to employment after longer spells of remaining outside labour force. Finally, the policies should also aim at prolonging working lives and preventing early labour market withdrawal of both men and women. All these interventions are equally important to reduce the risk of interrupted and short careers.

The gender pay gaps are substantial. They do not diminish for new cohorts of workers and will remain an important contributor to women's pension disadvantage once these women retire. These labour market inefficiencies need to be tackled – we need both better enforcement of equal pay policies, as well as -again - more policies promoting equal shares of unpaid work and child care. These that have been in place so far helped to bring more women into the labour markets over the past two decades, but as our data and analyses show, failed to improve women's pay in relation to men's.

Our analysis presents the nature and approximate scale of selected (in our view the most important) labour market problems affecting the outcome of pension systems at the micro level. We combine the country-specific assumptions on labour market participation with the pension system design. In that way, we can compare the outcomes of the combined effect of pension system design applied in the specific labour market context of selected countries. This expands the up-to-date comparisons in the literature, that focuses primarily on differences in the design of pensions, ignoring the pronounced differences in the employment careers of men and women between countries. We also show that there are differences in the patterns of interrupted careers that lead to the high risk of low and very low pensions.

The paper provides new evidence on the development of NDC pension systems under different labour market performance and institutional settings. For women, differences in expected future pensions are caused to a larger extent by the differences in their employment profiles, more than due to the design of the pension systems and longevity.

The transparent link between contributions and benefits in the NDC system makes the systems sustainable in the long run. They also have clear incentives for individuals for the higher and longer labour market participation, which is necessary in the context of population ageing and shrinking working-age populations. In order to fully exploit the benefits of such systems, it is important to highlight the existing risks related to the existing labour market gaps,

including in particular interrupted careers. These risks need to be tackled through the labour market policies, not by fiddling with the pension system design that would weaken the link between contributions and benefits. Compensation for the care periods, such as maternity or child-care leaves in the form of transparent contributions paid to the NDC system, in the amount that compensates for the pension loss is one of important measures that help reconciling work and family lives, while not affecting the pension system transparency and sustainability. Transparent pension systems are the asset of the countries that we discuss. Changing them to hide the labour market problems would not help to solve the labour market problems and could lead to the de-stabilising of the pension systems.

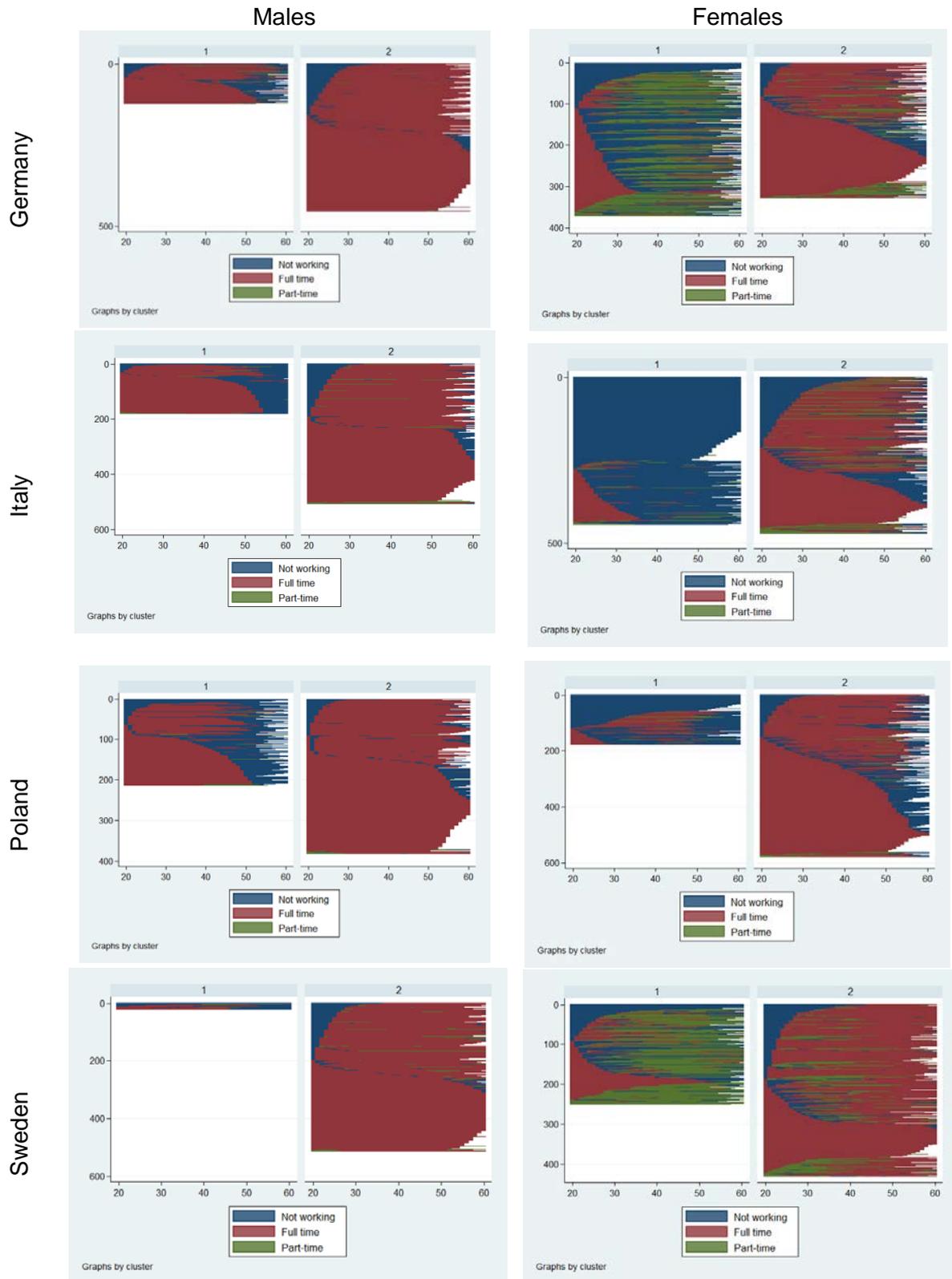
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## Appendix

The results of the sequence analysis and segmentation of work careers in Germany, Sweden, Poland and Italy. Each figure presents the work careers for clusters: 1: interrupted careers and 2: full careers.



Source: Authors' analysis based on SHARE Wave 2 data.