Differences in Gender Pension Gaps in public and private pensions in West Germany: What role do work-family life courses play?

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Abstract

Even though Gender Pension Gaps (GPG) surpass gender wage gaps in most European countries, we know less about how they emerge and relate to gendered life-course inequalities.

This study contributes by applying a life-course-sensitive decomposition to linked survey-register data for Germany (SHARE-RV), decomposing gender gaps in public and private pensions based on common work-family life courses. It considers the interdependencies of employment, family life, and earning positions over the life course, relevant due to pension privatization in Europe.

GPGs occur because privileged life courses (stable civil servant careers for public and high-income employment for private pensions) yield high pensions but are almost exclusively accessible by fathers. Gender differences in access to high-income careers for parents drive the GPG in private pensions more than the gap in public pensions. The study underscores the future risk of high GPGs given the persistently high Gender Wage Gap and pension privatization in Germany.

Keywords: Gender Pension Gap, life courses, pension privatisation, Gender Wage Gap, Sequence Analysis, Kitagawa-Oaxaca-Blinder decomposition

1 Introduction

Across Europe, women receive on average substantially less pension income than men (e.g., Tinios et al. 2015; Hammerschmid and Rowold 2019). In light of the ageing population, these Gender Pension Gaps (GPG) are a pressing matter not just for current cohorts but will increasingly affect a growing number of women in the future. While women might share financial resources on household level, household contexts have become more uncertain. For example, the divorce rates among the old age population increase (gray divorce revolution, Brown and Wright 2017), and the share of elderly women living in single-households is higher compared to men (Ahonen and Kuivalainen 2024). Consequently, a sufficient personal pension is becoming increasingly crucial to prevent women's currently higher vulnerability to old-age poverty compared to men in most European countries in the future (Ahonen and Kuivalainen 2024). Moreover, understanding the causes of gender inequalities in pension income is politically extremely relevant (Kuitto et al. 2021), especially with the rise of private pensions. This shift makes elderly individuals who rely on the redistribution of public pensions, predominantly women, more vulnerable.

Empirical studies predominantly apply decomposition methods and focus on women's lack of (full-time) employment as a driver of the GPG (e.g., Frommert and Strauß 2013; Hänisch and Klos 2014; Cordova et al. 2022). However, the accumulation of pension entitlements is likely to be more complex, to go beyond gender differences in (full-time) employment and to differ by pension type.

The present study adds to the literature by examining underlying heterogeneities regarding gendered work-family life-course independences, the differences between public and private pensions, and the role of earnings over the life course. Its focus on West Germany provides a relevant context for high gender inequalities in the labour market and a comparatively high

GPG with women receiving only about half of the average pension income of men (Hammerschmid and Rowold 2019). West Germany is the ideal context for contributing to the literature illustrating how high levels of gender inequalities in pre-retirement ages are reproduced by strongly earnings-related pension institutions across pension income types.

This article adopts a life-course perspective to examine how gendered work-family life-course patterns interact with different pension pillars in later life, and how these interactions contribute differently to gender gaps in public and private pensions. Specifically, I focus on two main questions:

To what extent are gendered work-family life courses, including earnings over the life course, associated with the Gender Pension Gap?

How do these associations vary between the gender gap in public compared to private pensions?

To address these questions, I use rich linked survey-register data, which provide a unique opportunity to study public and private pension income with detailed and reliable work-family life course information, including relative earnings, and make three main contributions.

First, the scientific discourses are criticised for focussing on employment mostly when it comes to old age income security (Frericks 2020; Rowold et al. 2024) and neglect the theoretically important interdependences of employment and family life-course complexities for analysing Gender Pensions Gaps (Allmendinger et al. 1992; Ginn et al. 2001). Previous decomposition studies on GPGs do not consider family lives and life-course complexities in detail. They i) simplify life courses by only considering one-dimensional summary measures (most commonly the employment duration), ii) focus on a very limited number of employment life-course elements due to multicollinearity, and iii) do not consider the interaction between family and work lives (Rowold et al. 2024).

I address these shortcomings by applying the novel SA-KOB decomposition which quantifies the association of multidimensional life course patterns with the GPG, thereby overcoming the limitations of the standard approach (Rowold et al. 2024). In the first step, Multichannel Sequence Analysis identifies common work-family life-course patterns, i.e., grouping life courses in which work and family states occur in a similar manner. In a second step, I decompose the GPG based on group membership in these life-course patterns revealing i) which part of the GPG is due to the gendered segregation on different work-family life courses and, ii) which part is due to unequal rewards for the same life-course pattern. This approach provides a comprehensive understanding of the complexities inherent in real-life situations, such as the interdependence between work and family, and their relationship to the GPG. It thereby helps to avoid overlooking the impact of certain lived realities.

Second, private (occupational and personal) pensions are identified as particularly disadvantageous for women, with gender gaps therein being particularly high (e.g., Ginn 2004; Frommert 2020). However, the only studies that have assessed gendered private pension income have focused on the Beveridgean pension context of the UK and applied only life-course summary measures (Bardasi and Jenkins 2010; Gardiner et al. 2016; Ezeyi and Vujic 2017). The current literature misses a clear empirical assessment of what the current pension privatisation in Europe (Ebbinghaus 2011) means for GPGs in other pension systems and how gender inequalities in public and private pensions are differently related to gender inequalities in pre-retirement life courses from a holistic perspective. This study fills this gap by decomposing gender gaps in public and private pension income separately for the German context.

Third, previous literature was unable to consider earnings over the life course for decomposing GPGs. Consequently, it is currently unclear how gendered earnings inequalities, as they move over the life course, translate into gendered pension income inequalities in old age. This,

however, is pressing given that the gender pay gap is at high levels in most European countries, especially in those with high female labour participation (Schmieder and Wrohlich 2021), suggesting that female full-time employment alone may not be sufficient to prevent high GPGs. This is particularly pertinent in Germany where the Gender Wage Gap persists at high levels over decades (Schmieder and Wrohlich 2021; Schmitt and Auspurg 2022). My approach represents a novel contribution to the literature, as it decomposes GPGs based on individuals' relative earnings positions over the life course and goes beyond the annual employment status that has been assessed predominantly in the literature so far. Earning differences over the life course likely play a particularly important role for the gender gap in private pensions since earnings determine access and endowment with occupational and personal pensions (Geyer et al. 2021).

In light of pension privatisation, it is crucial to understand how work-family life courses and earnings contribute to gender gaps in different pension types, enabling policymakers to effectively reduce gendered pension disparities in the future.

2 Theoretical and institutional background

2.1 Empirical evidence

The standard approach in the literature analyses the GPG directly by decomposing it into a part that is due to differences in endowments with characteristics (e.g., most commonly years spent in full-time employment) and a part that is due to different returns for the same characteristic (e.g. Even and Macpherson 2004; Bardasi and Jenkins 2010; Bonnet et al. 2020). In line with the international literature, all decomposition studies in Germany found that the difference in years men and women have been full-time employed is the main reason for the GPG (Frommert and Strauß 2013; Hänisch and Klos 2014; Cordova et al. 2022). Some studies also highlight

the relevance of income differences at varying points in the life course (e.g., mid-career earnings, salary in last job) (Bonnet et al. 2020; Even and Macpherson 2004; Levine et al. 1999) or occupational segregation (Levine et al. 1999). However, the relation between earnings with GPGs or women's pensions has not been studied yet in Germany. Cordova et al. (2022) find evidence that parts of the gender pension wealth gap in Germany are due to high levels of gender segregation on industries and company size. Furthermore, for Germany specifically, a large share of the GPG is reduced due to the sum of years women were part-time employed (Frommert and Strauß 2013; Cordova et al. 2022).

Studies on the gender gap in occupational and personal pensions are rare except in the UK. Bardasi and Jenkins (2010) found that only a small part of the GPG in private pensions is due to gender differences in time spent in various employment categories and that the gap is mainly due to differences in returns for these characteristics. They conclude that the gender gap in private pension might be predominantly driven by further employment characteristics they could not include, most importantly earnings. However, Ezeyi and Vujic (2017) find that the wage in the last job before retirement plays only a role for gender differences in access to private pensions, but not for private pension income. For Germany, higher gender gaps in private compared to public pensions are reported (Frommert 2020) and the gender differences in coverage and contributions in private pensions are moderated by career length, hours worked and partly due to the lower income of women (OECD 2021).

Studies not decomposing the GPG but analysing determinants of women's pensions or gender inequality in pension income highlight the role of family lives. Fasang et al. (2013) found a negative impact of the duration of being married on West German and British women's retirement income even when controlling for the employment history. Kreyenfeld et al. (2023) highlight the impact of splitting pension rights resulting in divorce being a 'gender equaliser' for public pension inequality in West Germany. Mika and Czaplicki (2017) find a more modest

motherhood penalty when considering childcare benefits for West Germany, suggesting how the childcare benefits compensate for maternal employment interruptions in the public pension system.

Madero-Cabib and Fasang (2016) were the first to introduce a holistic life course perspective to the field of studies on men's and women's pension income. In their analysis of West Germany and Switzerland, they apply Multichannel Sequence Analysis to categorise typical work-family life courses and reveal the highest pension penalties for typical female work-family life courses compared to the male standard life course of stable married parenthood and full-time employment. Typical female work-family life courses are characterised by leaving the labour force upon family formation and either engaging in unpaid care work until old age or returning to the labour force part-time. Considering only employment trajectories, Möhring and Weiland (2022) take a couple's perspective and show the highest pension incomes of women in dual-earner and the lowest in male-breadwinner couples.

However, these life-course-sensitive studies could not differentiate between which part of the gap is due to compositional life course differences between men and women and which part is due to differences in returns. To address the limitations of the standard decomposition approach as well as of previous Sequence Analysis applications, Rowold et al. (2024) suggest combining Sequence Analysis with the Kitagawa-Oaxaca-Blinder decomposition. They find that the gender gaps in total pension income in West Germany and Italy are driven by parents and the interdependences of work and family occurring only in female life courses.

2.2 Gender, life courses and the pension system

Theoretical and empirical literature suggests that pension systems reward life courses (Ginn et al. 2001; Madero-Cabib and Fasang 2016; Rowold et al. 2024). The life-course paradigm highlights how the development of individuals over the life course depends on the individual

opportunities and constraints that are shaped by the socio-historic context, the interdependences with other individuals (linked lives) as well as the timing of events along an individual's life courses (Elder et al. 2003). Consequently, it is important to consider different socio-historic developments as their cultural and institutional legacies are likely to leave their marks on individuals' life opportunities. Both, welfare states and cultural context are relevant for structuring individuals' everyday lives, pushing or discouraging certain gender arrangements and thus shaping gendered life courses (Pfau-Effinger 1998; Rosenfeld et al. 2004).

The normative influence unfolds especially through the gendered division of labour. The most traditional form assigns men the status of the sole bread-winner and women the role of homemaker and caretaker (Rosenfeld et al. 2004; Meyer and Pfau-Effinger 2006). Institutions impact gendered work-family life courses particularly through family policies as these determine the opportunities for parents to reconcile care with employment responsibilities (Adema 2012).

Women's employment life courses are strongly correlated with their family life courses (e.g., Allmendinger et al. 1992; Muller et al. 2020). Specifically, childbirth and having children impact women's employment behaviour and multiple outcomes (e.g., Gangl and Ziefle 2009). The implications of such dynamics become visible in various gender inequalities in the working sphere such as the overall labour market participation and working hours, gender-specific occupational segregation as well as the gender wage gap (e.g., Gangl and Ziefle 2009; Budig et al. 2016; Kunze 2018). Based on the concept of cumulative advantage or disadvantage (CAD) (Dannefer 2003), these differences between men and women are likely to accumulate over the life course exceeding retirement age (O'Rand 1996).

Given all these considerations, including the role of family lives in addition to employment biographies for the understanding of gender inequalities in pensions is particularly relevant (Allmendinger et al. 1992; Ginn et al. 2001; Meyer and Pfau-Effinger 2006; Frericks 2020). However, gendered life courses and outcomes alone do not necessarily lead to gender inequalities in pension income. GPGs can only emerge if pension institutions reward the gendered life courses differently (Rowold et al. 2024). Given that pension systems are often structured "based on the norm of continuous full-time employment" (Leitner 2001, p. 103), they often do not sufficiently take into account the unequal life-course outcomes of men and women (e.g. Grady 2015).

2.3 The German context

The life course of the cohorts studied (Figure A1) is affected by welfare policies (mostly family policies) and norms in place from 1939 to 2016 (see Figure 1). For the majority of this period, Germany was divided and distinct gender ideologies were implemented in both former states (Rosenfeld et al. 2004). Given that the West German welfare state was long seen "as a prototype of a conservative welfare regime" (Kreyenfeld 2010, p. 354), providing the perfect setting for a context with high gender inequalities in life courses, this study focusses on West Germany. Important characteristics were (and are partly in place today) long maternal leaves, a late publicly regulated and underdeveloped childcare infrastructure with reduced opening hours as well as a joint taxation system. Together, this encouraged women to work part-time if at all (Rosenfeld et al. 2004).

In summary, the institutional and normative context led to the realisation of the male breadwinner/female homemaker or female part-time model, thus establishing a traditionally gendered division of labour (Pfau-Effinger 1998). For example, the maternal employment rates were below 40% in West Germany for the cohorts born between 1930 and 1960 (Trappe et al. 2015).

The German pension system and gender

For the analysis of gender inequalities in pensions, i) access to pension claims and ii) the amount of pensions are important (Ginn et al. 2001). Regarding access to pension claims, eligibility rules and the consideration of time spent for unpaid care work are relevant (Ginn et al. 2001). In Germany, the minimum length of contribution is 5 years, which enables access for individuals with long employment interruptions. Only 7% of West German women (1% of men) do not receive any independent pension income (see Table A1).[1]

Individuals' contributions are recorded as earning points (EP) in the German pay-as-you-go public pension system. 1 EP equals the average income of all insured individuals each year while lower values represent below-average incomes and vice versa. The sum of all EPs determines the retiree's public pension income. Self-employees are usually not covered by the public pension system. Civil servants are insured in a separate, very generous system. The public pension system is thus characterized by a strong link between stable employment outcomes and pension income which is disadvantageous for women's pension income in contexts with high gender inequalities.

However, pension systems often include redistributive tendencies aiming to offset gender inequalities and thus being particularly important for women's pension income (Leitner 2001; Horstmann et al. 2009). This includes benefits for care work and the treatment of part-time work.

In the German pension system, EPs can be topped up for low-income periods and employment interruptions. For children born before 1992, as is the case for 99.4% of childbirths in the analysis sample, earnings points for one year equivalent to an average employment income per

[1] The discussion of the German pension system refers to the pension policies in place from 2006-2015 (which is when pension income was surveyed, see Figure 1).

child are credited until 2014 (childcare benefit). Low earning points acquired by the studied sample are topped up until a maximum equivalent of 75% of the average income if the individuals reach a minimum contribution length of 35 years benefitting particularly part-time employed mothers (Czepek 2020). Overall, the redistribution in the public pension system works slightly in favour of women as the positive gender gap in the replacement rate suggests (Table A1).

Lastly, occupational and personal pensions are argued to be particularly disadvantageous for women due to their positions in the labour market (e.g. Ginn 2004; Möhring 2018). Occupational pensions refer to pension schemes on the firm level sponsored by the employer and personal pensions to personal saving plans (Ebbinghaus 2011). In this study, I refer to private pensions as the sum of both, occupational and personal pensions.

Women have lower access to occupations that guarantee generous occupational pension schemes, as these are typical in male-dominated jobs and in larger companies, in which women are underrepresented (Ginn and Arber 1996; Ginn 2004). Reduced working hours, lower occupational status, shorter tenure and lacking financial resources for the high contributions needed are further obstacles to private pension plans (Ginn 2004). Additionally, private pensions are overall highly linked to stable employment and lifetime earnings (Ginn and Arber 1996), have in contrast to most public pillars almost no redistributive elements and are therefore likely to reinforce (gender) inequalities that emerged in the labour market (Möhring 2015).

Occupational and personal pensions are not mandatory in Germany, but the overall coverage increased in the past decades (Ebbinghaus et al. 2011). Occupational pensions differ largely by industry and company size which leads to inequalities between men and women due to gender-specific occupational segregation (Schmitz-Kießler 2020). 39.9% of men but only 21.7% of women in my sample have an occupational pension (Table A1).

2.4 Expectations

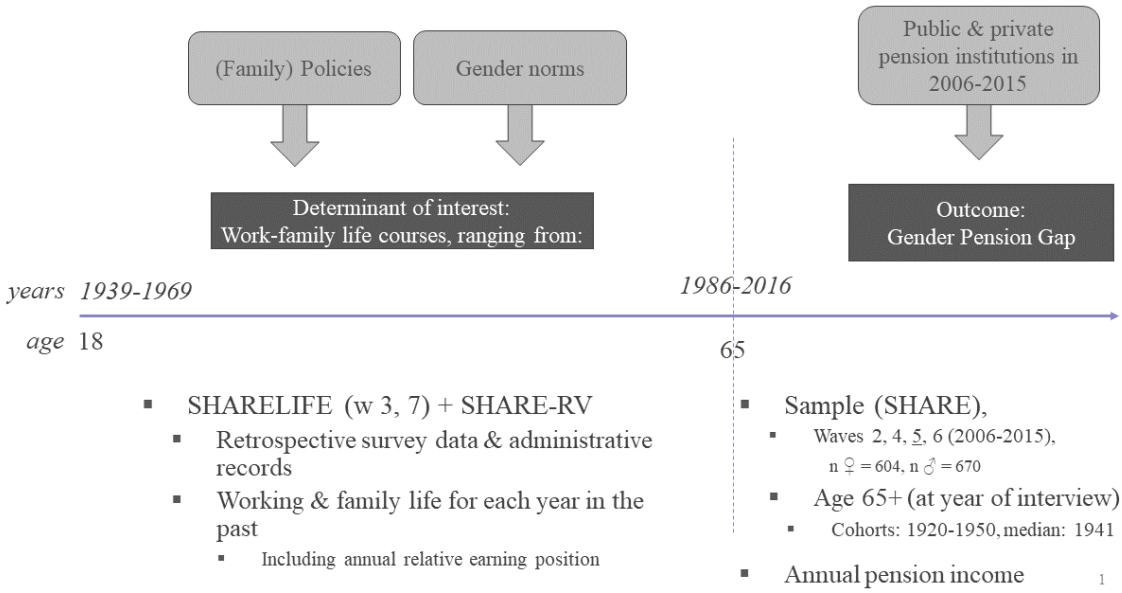
The set of guiding expectations is contingent upon the assumption that the initial step of the analysis will yield work-family life course patterns broadly consistent with previous research (Madero-Cabib and Fasang 2016; Rowold et al. 2024). I expect a share of the GPG to be due to more women having work-family life courses characterised by care work, employment interruptions and part-time employment parallel to parenthood (*expectation 1*), as such activities are not well rewarded by both pension types. Conversely, fathers are shown to be more likely to realize stable careers without employment interruptions in the German context. Stable employment leads to high public and private pensions. Consequently, I expect that a share of the GPG is attributable to life courses characterized by stable careers occurring more often for men (*expectation 2.1*). Furthermore, beyond the mere categorisation of employment types as in previous research, I expect that parts of the GPG are due to the lack of women in stable *high-income* careers (*expectation 2.2*).

Given the stronger link to former labour market characteristics in private pensions (see previous section), I assume a higher reproduction of labour market inequalities in private compared to public pensions. I expect that gender gaps in private pensions will be more associated with gender differences in life courses characterised by unstable working or part-time careers and labour market dropouts (*expectation 3.1*). In particular, I assume that the influence of income inequality over the working career will be more strongly reproduced in private pensions. Consequently, gendered life courses characterised by high- or low-income jobs are likely to be more strongly associated with the gap in private pensions (*expectation 3.2*).

In the context of *public* pension income, the reproduction of life-course inequalities should be partly buffered by the (gender-specific) redistribution tendencies implemented in the public pension system. I expect the gender gap in *public* pension income to be reduced by higher rewards for mothers compared to fathers in life courses with high shares of care-related

employment interruptions and part-time employment (*expectation 4.1*). Specifically, I expect that this phenomenon will occur due to better rewards for the life courses of divorced women compared to divorced men, irrespective of the working life course (*expectation 4.2*).

Figure 1 Contexts and observed outcomes along the life course and data



3 Data and Methods

3.1 Data, sample and variables

I use cross-sectional data for Germany from the Survey of Health, Ageing, and Retirement in Europe (SHARE)[2], retrospective survey data from SHARELIFE[3] (waves 3 and 7 of SHARE) and the linked administrative records of the German Public Pension Insurance (SUF SHARE-RV - source: FDZ-RV; see Figure 1)[4]. The survey and the records data are mutually reinforcing in terms of their benefits and limitations. The survey data provides a comprehensive account of family life courses, including partnerships and childbirth, as well as detailed information on

[2] See Börsch-Supan et al. (2013) for methodological details.
[3] See Brugiavini et al. (2019) for methodological details. The Job Episodes Panel release 7.1.0 is based on SHARE Waves 3 and 7 (DOIs: 10.6103/SHARE.w3.710, 10.6103/SHARE.w7.710).
[4] For details see Börsch-Supan et al. (2018).

occupational and personal pension claims that are not available in the administrative records. The records provide rich and more reliable monthly data on pension-relevant social activities, including the relative earnings, recorded as Earning Points. Additionally, they do not risk being affected by the recall bias retrospective survey data often suffer from (Kreyenfeld and Bastin 2016; Muller et al. 2020).

Sample. The analytical sample is based on the SHARE data. I select respondents aged 65 or older in West Germany. I exclude individuals (i) with missing information on any variables used, (ii) who were part of the labour force and received a salary or unemployment benefits, (iii) with entirely missing retrospective data and (iv) without linkage to the administrative data (see Table A4 for the sample size after each selection step). To maximise the number of observations I pool waves (Table A2).[5] The final sample consists of 604 women and 670 men.

Dependent variable. My outcome measure is *individual annual pension income*, which is surveyed in SHARE. I differentiate between public pension income and private pension income (see Table A3 for all pension items considered). To consider gender differences in pension endowments as well as access to pension claims, values for respondents without any of the different pension income types are set to zero. The dependent variable thus covers access to and amount of pension income. I focus on independent pension income based on individuals' achievements and I do not consider pension income types from derived claims, such as survivor pensions.

I use absolute pension income, only consider regular payments and top-code the highest 1% annual pension income with the 99th percentile.

[5] This broadens the birth cohort range, resulting in cohorts spanning 1920- 1950 (see Figure A1). However, due to the low number of observations I cannot focus on more fine-grained cohorts.

Independent variable. My main explanatory variable is a *typology of work-family life course*. The *family life* categories are exclusively based on the retrospective survey data from SHARELIFE. I differentiate between six categories covering partnership states and the number of children (see Figure A3). 'Single' identifies individuals divorced or not cohabiting or married. 'Married' also includes not cohabiting couples and non-married cohabiting couples. 'Divorce' overwrites all other family states occurring in the same year, except for marriage.

For the *working life* course, I combine administrative records on pension-relevant activities from SHARE-RV with annual retrospective survey data on work life from SHARELIFE (using the Job Episodes Panel by Brugiavini et al. 2019). Priority is given to the administrative records but non-contributory periods to the public pension systems were imputed with the linked survey data (see Appendix 7A3 for more information on linking the survey with the administrative records and Table A5 on the data sources used for different variable types).

I create 11 working life categories (see Figure A3). 'Care work/other' includes mostly care work ('Looking after home or family') and covers all marginal 'other' states, most importantly being 'sick or disabled'. '(Any) part-time or non-contributory employed' covers years with non-full-time short employments, any part-time employment periods and any private employment or short-term employment for which individuals did not gain earnings points. The income quartiles for full-time employment in the private sector states are based on the distribution of the earning points (see Figure A1) and thus cover only employment that is recorded in the public pension records.

3.2 Methods

I apply a two-step combination of Multichannel Sequence Analysis with the Kitagawa-Oaxaca-Blinder decomposition (SA-KOB decomposition, Rowold et al. 2024). The outcome of the first step is a typology of work-family life-course clusters which are then used as independent

variables in the second step to decompose the GPG. When it comes to quantifying the relation of more complex life-course dynamics with group-inequalities, such as interdependences between work and family life transitions, considering a more complete range of life-course states and the interplay of different life-course categories over time, the SA-KOB has been shown to outperform the standard approach which decomposes the GPG usually based on the employment duration (Rowold et al. 2024). In this study, applying the standard decomposition approach using the duration in all family and work life-course categories would lead to severe multicollinearity issues and the exclusion of many life-course categories.

Step I: Multichannel Sequence Analysis (MSA)

I first run a Multichannel Sequence Analysis and cluster analysis. Sequence analysis is an explorative tool to categorise similar trajectories (sequences) into groups using cluster analysis and has become particularly established in the field of life-course research (Abbott 1995; MacIndoe and Abbott 2004). I make use of its strength to operationalise life-course patterns (Aisenbrey and Fasang 2010) and focus on two dimensions, family and work. Among the several approaches suggested to account for more than one temporal process at a time (Piccarreta 2017; Ritschard et al. 2023), I use Multichannel Sequence Analysis (Gauthier et al. 2010). As a result, respondents with a similar working and a similar family life course are clustered in the same work-family life-course groups.

To identify the best cluster solution for the aim of my analysis, I refer to statistical cluster quality measurements (Studer and Ritschard 2016) as well as construct validity (Aisenbrey and Fasang 2010). For the main results, the clusters are obtained from Optimal Matching and substitution costs based on a common future for comparing the sequences and hierarchical

clustering based on Ward's Linkage.[6] For detailed documentation of the cluster selection, please consult Appendix 7A4.

Step II: Kitagawa-Oaxaca-Blinder decomposition (KOB)

In the second step, I use the work-family life-course typology of the MSA to decompose the average absolute Gender Pension Gaps by applying the Kitagawa-Oaxaca-Blinder decomposition (Kitagawa 1955; Blinder 1973; Oaxaca 1973).

Based on separate linear regression models of men and women I apply the 'twofold decomposition' (Jann 2008, p. 455) with the methodological choices suggested for combining it with the MSA (Rowold et al. 2024)[7]:

$$\bar{y}_M - \bar{y}_W = \underbrace{\underbrace{\alpha_M - \alpha_W}_{Intercept} + \underbrace{\bar{X}'_M(\hat{\beta}_M - \hat{\beta}^*) + \bar{X}'_W(\hat{\beta}^* - \hat{\beta}_W)}_{Returns}}_{Unexplained} + \underbrace{(\bar{X}_M - \bar{X}_W)'\hat{\beta}^*}_{Explained}$$

$$with\ \hat{\beta}^* = \begin{matrix} b_{1M} \\ b_{2M} \\ b_{3M} \\ b_{4M} \\ b_{5F} \\ b_{6F} \\ b_{7M} \\ b_{8M} \\ b_{9M} \\ b_{10M} \end{matrix}, \quad \hat{\beta}_M = \begin{matrix} b_{1M} \\ b_{2M} \\ b_{3M} \\ b_{4M} \\ b_{5M} \\ b_{6M} \\ b_{7M} \\ b_{8M} \\ b_{9M} \\ b_{10M} \end{matrix}, \ \hat{\beta}_F = \begin{matrix} b_{1F} \\ b_{2F} \\ b_{3F} \\ b_{4F} \\ b_{5F} \\ b_{6F} \\ b_{7F} \\ b_{8F} \\ b_{9F} \\ b_{10F} \end{matrix}$$

where $\bar{y}_M - \bar{y}_W$ stands for the average GPG. $\bar{X}_M$ and $\bar{X}_W$ denote vectors of mean values of the independent variables and $\hat{\beta}_M$ and $\hat{\beta}_W$ denote coefficient vectors of men and women and α_M and α_W the intercepts, respectively. $\hat{\beta}^*$ is the reference coefficient vector that is based on

[6] For a discussion of the different parameters used in Sequence Analysis refer to Studer & Ritschard (2016).
[7] This includes choosing the reference coefficient based on the majority gender for each life-course pattern (i.e., coefficient from female regression models as reference for both female-majority life-course patterns), normalization of categorical variables and the reassignment of single trajectories after the MSA to bypass extreme cases of the common support problem (see Appendix 7A5). For a detailed discussion of combining MSA with the KOB decomposition, its specifies and limitations refer to Rowold et al. (2024).

the coefficients from the linear regression models of females for the female-majority work-family life courses and based on male coefficients otherwise.

Explained or compositional component: $(\bar{X}_M - \bar{X}_W)'\hat{\beta}^*$. The explained share quantifies the share of the gap that emerges from the gender-specific distribution on the different work-family life-course clusters. It thus reveals which part of the GPG is due to the under- or overrepresentation of women compared to men in life courses, that are rewarded with particularly high or low pension income.

Returns component of the unexplained share: $\bar{X}'_M(\hat{\beta}_M - \hat{\beta}^*) + \bar{X}'_W(\hat{\beta}^* - \hat{\beta}_W)$. The returns component shows which part of the GPG is due to differences in pension income of men and women who have the same work-family life-course pattern. The returns parts of the SA-KOB decomposition have thus the potential to reveal how the GPG is mitigated via higher pension rewards of women compared to men for the same life-course pattern. Such differences in returns might be intended by public policies (e.g., child care benefits).

Controls. Following Rowold et al. (2024) I control for birth cohort categories only to prevent adjusting for elements inherent in the work-family life-course states (e.g., education). However, controlling for cohorts is important, due to the wide range of birth cohorts in the study sample (Figure A1).

4 Results

4.1 Step I: Work-family life-course patterns

Figure 2 shows the results of the first step of the analysis, the Multichannel Sequence Analysis. Each typical life-course pattern consists of a working (left sequence plot) and a family life course (right sequence plot). On the outer side, the gender-specific distribution on each work-family life-course pattern is plotted.

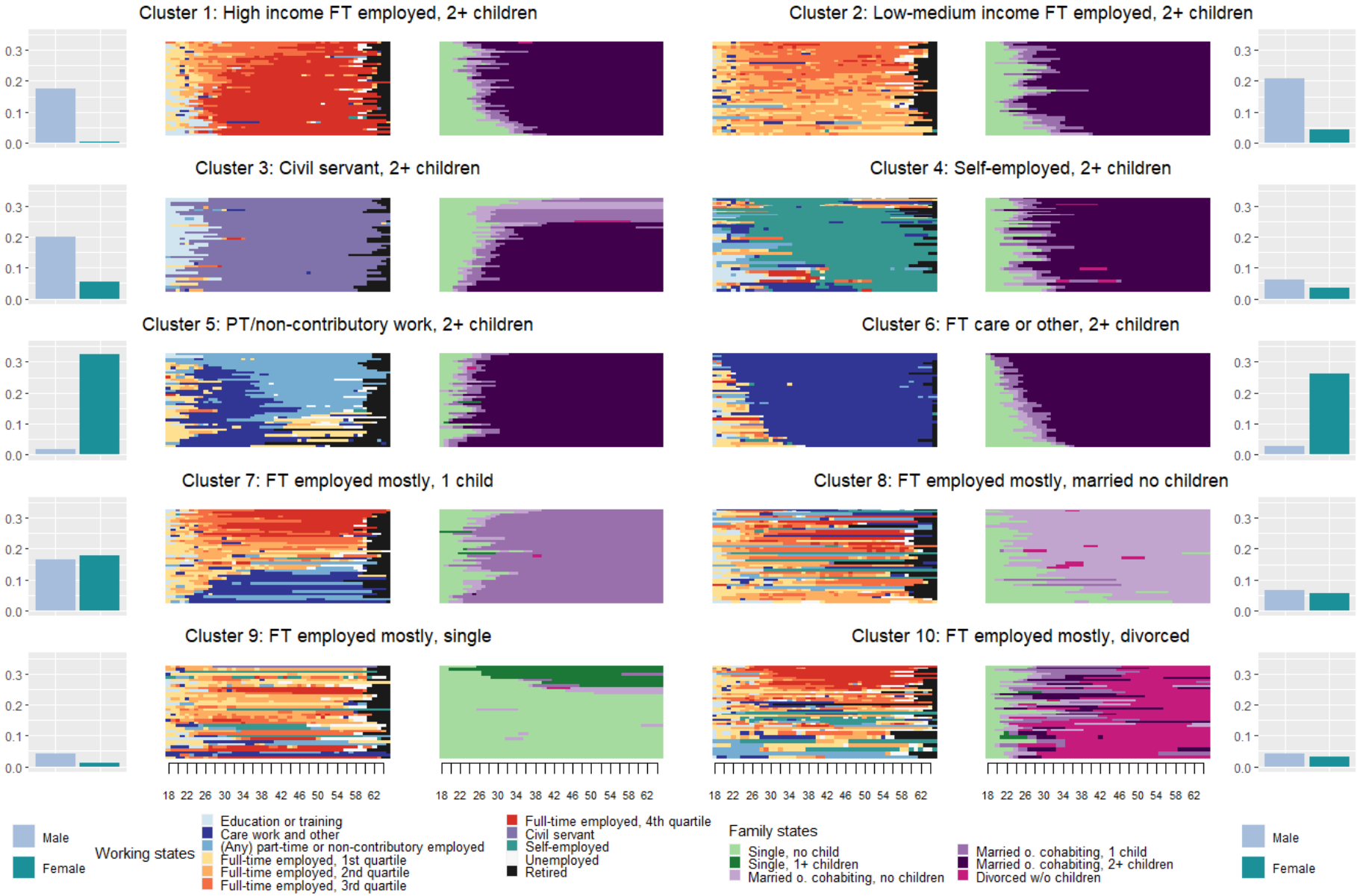
I find ten distinct clusters, with the first six being characterised by stable marriages and having two or more children for most of the individuals (see Table A6 for the cluster characteristics by gender). These work-family life-course patterns are overall in line with previous research (e.g., Madero-Cabib and Fasang 2016; Rowold et al. 2024), but reveal additionally how the earnings in private employment evolve over the life course. As such, the first two clusters contribute to the literature by disclosing two typical earning patterns beyond 'stable' full-time employment parallel to parenthood and marriage.

Cluster 1 uncovers a life course type with stable full-time employment and earnings in the highest quartile or up-ward mobility leading to the highest earnings quartile. Family formation starts in the mid-30s, whereby the age at birth of the first child varies. This life course is dominated by fathers, while almost no mothers in West Germany experience such high-income careers.

Cluster 2 reveals a more volatile employment life pattern. Even though most individuals experience nearly continuous full-time employment in the private sector, there are many shifts in the relative earnings over individuals' life course, including both, upward and downward mobility. Family formation and retirement start earlier than in cluster 1. Occasionally, life courses have short unpaid care interruptions in their careers. While a low share of women (4.3%) can combine volatile full-time employment with parenthood, 20.7% of men experience this volatile life course.

Cluster 3 includes a stable employment pattern characterized by relatively long educational periods followed by continuous civil servant careers. Most individuals are married and have 2 or more children, but about one quarter have only one child or remain childless (Table A6). This life-course pattern is common among men (20%) while only 5.5% of women have stable civil service careers.

Figure 2 Gender-specific distribution on work-family life courses, relative frequency plots



Note: Relative frequency sequence plots (displaying representative sequences for each cluster, Fasang and Liao 2014) with the working domain on the left-hand side and the family domain on the right-hand side in the centre of the graph. One line in these two sequence plots represents a life-course trajectory as observed in the data that has been identified to be representative of the respective cluster. Gender-specific distribution on the life-course patterns on the outer side, showing the share of all men (blue bar) and all women (green bar). Figure A4 depict the life course patterns as state distribution plots. Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Cluster 4 is dominated by continuous self-employment after mostly volatile periods in other forms of employment or care work. The start of self-employment ranges from the early 20s to the early 50s. This typical work-family life course is, again, more prevalent among West German men compared to women but the gender differences are less pronounced (6.1% of men, 3.5% of women).

In cluster 5 most representative life courses start with a short period of full-time employment, mostly in lower-earning jobs. In parallel with the onset of family formation and frequently at an early age, individuals shift from full-time employment to full-time care. After employment interruptions of 5 to 20 years, the individuals return to labour force in part-time or non-contributing or low-income jobs. One-third of all women have this life course, whereas almost no men reconcile parenthood with care and part-time work.

Cluster 6 starts with short education or employment trajectories. Like cluster 5, individuals transition to care work parallel to marriage and childbirth, but in this case into lifelong trajectories of care work. This is the second most prevalent life-course pattern among women (26% of all women), but only 2.7% of all men have similar life courses.

Clusters 5 and 6 show thus a clear temporal interaction between family and work lives, while men-typical life courses do not show such interactions.

Clusters 7-10 have heterogenous working life courses that are mostly dominated by different types of full-time employment but differ by family life. Individuals in Cluster 7 have 1 child, respondents in cluster 8 get married at comparable old ages but have no children. Respondents in cluster 9 are lifelong singles and a higher share of all men experience this life course. Individuals in Cluster 10 experience a divorce and, in most cases, remain divorced afterwards. However, the timing of divorce differs largely from the early 20s to the early 40s. The share of men and women in clusters 7, 8, and 10 is similar.

The gender-specific distribution on the typical work-family life courses mirrors the traditional division of labour that has been facilitated by gender norms and the welfare context in the second half of the 20th century in West Germany. In the second step, I assess how this high level of gender segregation on life courses is associated with the average gender gap in pension income.

4.2 Step II: Decomposition of the Gender Pension Gaps

The GPG in public pensions amounts to 58.3% (10,829 Euros) while the gap in private pensions is higher in relative terms (76.6%, 2,539 Euro). Table 1 depicts the decomposition results in absolute and relative terms. Figure 3 and Returns component. I do not find that the gender-sensitive redistribution implemented in the German public pension system reduces the GPG. Even in clusters with high shares of unpaid care mothers do not benefit from higher pension income compared to fathers (*expectation 4.1 rejected*). This underlines the insufficiency of the pension system to prevent the reproduction of gender inequalities arising over the life course in old age. As an exception, I find evidence of women profiting from the splitting of couples' pension claims upon divorce (in line with Kreyenfeld et al. 2023). Women's better pension returns compared to men's in life courses with longer divorce spells reduce the gender gap in public pensions by two percentage points (*expectation 4.2 confirmed*).

Figure 4 display the shares of the GPGs that are due to the explained and returns components of the SA-KOB decomposition for the different life-course patterns by pension type.

Explained part.

Overall, I find that the high level of gender segregation on the life-course patterns 1, 2, 3, 5 and 6 (visible in Figure 2) is related to the gender gap in both, public and private pension income. The association of life courses with the GPG in the sense of the explained part of the decomposition is not solely a result of the high level of gender segregation, but also of the

gender-biased evaluation through the pension system: men-typical life courses are rewarded with more pension income than women-majority ones (Table A7).[8] In total, the high level of gender segregation on typical life courses explains 40% of the gender gap in public pensions, but only 13% of the gap in private pensions.

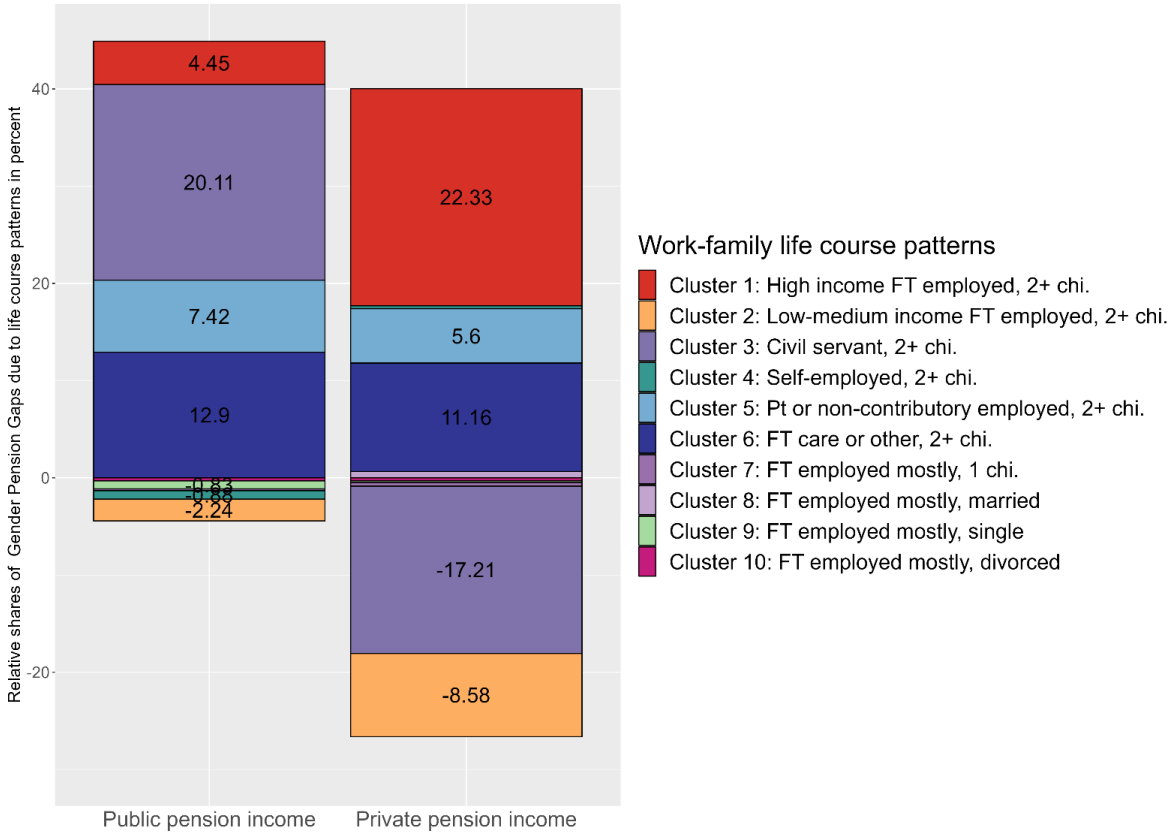
On one hand, the overrepresentation of women in the two care-dominated and poorly rewarded clusters is among the main reasons for the high GPGs in both pension types (*expectation 1 confirmed*). For example, West German women would receive an average of 1,396 Euros more public pensions if as few women as men had engaged in continuous unpaid care work (12.9% of the GPG). Another 804 Euros (7.5%) of the gender gap in public pensions are due to the German part-time legacy encouraging mothers to combine unpaid care duties with paid part-time employment. The relative shares of the gaps explained by these two women-majority life-course patterns are slightly higher for public compared to private pensions. This highlights the poor recognition of care work in the German public pension system and goes against the assumption that life courses dominated by labour-market dropouts and part-time employment are particularly penalized in private pensions (*expectation 3.1 rejected*).

On the other hand, the lack of mothers in stable careers independent of employment type plays a dominant role for women's lower pension income compared to men (*expectation 2.1 confirmed*). However, the association depends strongly on the career type and earnings level. For the dominance of fathers in high-income and low-income full-time employment careers in the private sector I find contrary relationships with the GPG. While the lack of mothers in high-income careers drives the GPG (*expectation 2.2 confirmed*), the gap would be even higher if as many mothers as fathers experienced full-time, but low-wage careers (2% for public and 9% for private pensions). This highlights the relevance of earnings beyond full-time employment for gendered pension inequality. Additionally, as expected, the associations differ largely

[8] Except for cluster 4 for both pension income types and cluster 3 for private pensions.

between pension pillars. The absence of mothers in the high-earnings (1) and the low-earnings cluster (2) is much stronger associated with the gap in private compared to public pensions (*expectation 3.2 confirmed*). 4% of the gap in public compared to 22% of the gap in private pensions is due to more men being able to combine parenthood of two or more children with stable careers in high-income jobs in the private sector. While this is the main reason for the gender gap in private pensions, most of the gap in public pensions is due to the much higher prevalence of men having stable civil servant careers that are highly rewarded in the public pension system (cluster 3, 20% of the gap). Reversely, the lack of civil servant careers for women cushions the gap in private pensions (-17% of the gap). This is most likely because the high public pension income for civil servants disincentivises them to invest additionally in voluntary pension schemes (see different returns by pension type for cluster 3, Table A7).

Figure 3 Shares of the GPG due to the gender-specific distribution on work-family life courses (explained part)



Note: Value depicted = minimum significance level of 10%. Results from Table 1, confidence intervals depicted in Figure A5 and Figure A6. Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

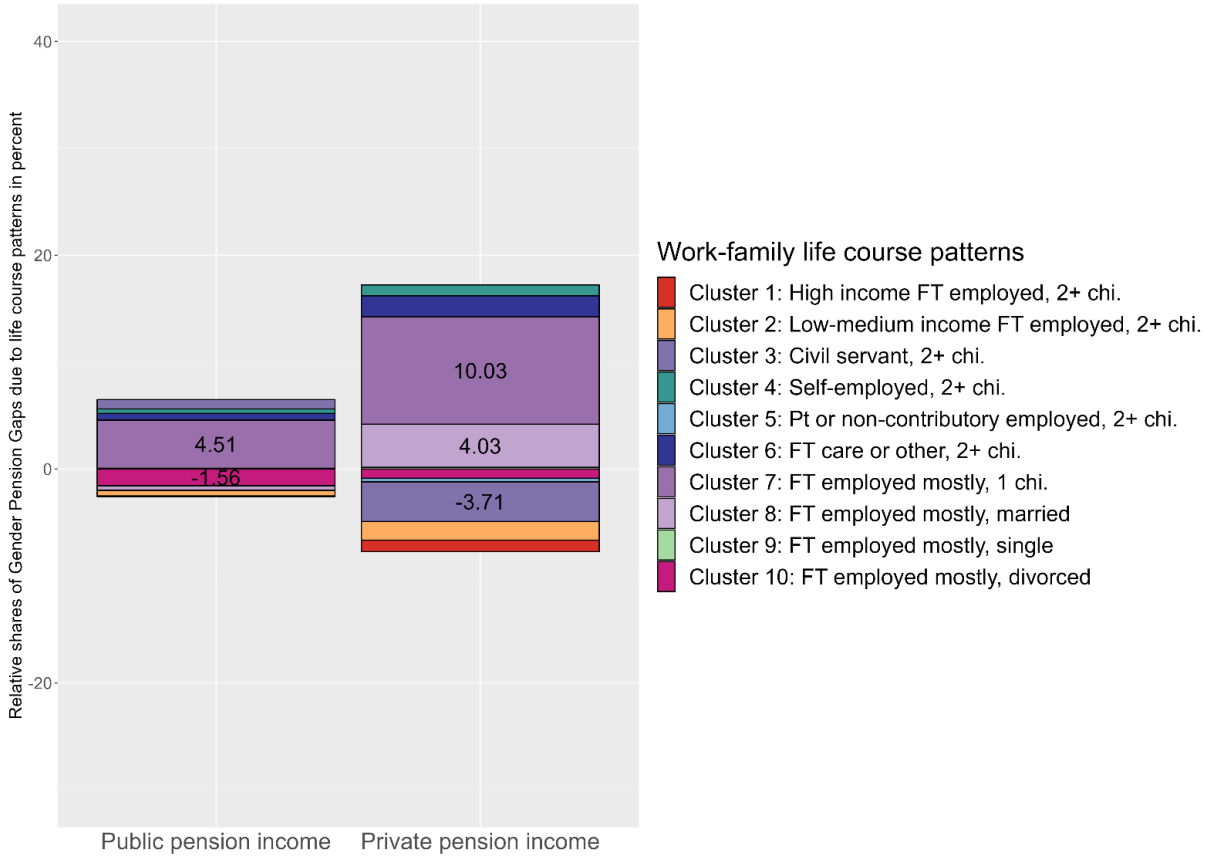
Table 1 Decomposition results of the Gender Pension Gap in public and private pension

	Public pension income				Private pension income			
VARIABLES	Absolute	Shares	Absolute	Shares	Absolute	Shares	Absolute	Shares
Average pension income men	18,588**				3,316**			
	(47.46)				(11.98)			
Average pension income women	7,759**				776.7**			
	(24.52)				(7.222)			
Absolute Gender Pension Gap	10,829**	100.00%			2,539**	100.00%		
	(21.51)				(8.549)			
Total part explained	4,452**	41.10%			379.9+	15.00%		
	(9.624)				(1.676)			
Total part unexplained	6,377**	58.90%			2,160**	85.00%		
	(12.29)				(6.135)			
	explained		unexplained		explained		unexplained	
Sum by life-course patterns		40.46%		3.93%		13.39%		9.50%
Cluster 1: High-income FT employed, 2+ chi.	482.3**	4.45%	-6.657	-0.06%	567.0**	22.33%	-27.21	-1.07%
	(3.746)		(-0.228)		(4.731)		(-1.617)	
Cluster 2: Low-medium income FT employed, 2+ chi.	-243.0*	-2.24%	-54.78	-0.51%	-217.8*	-8.58%	-44.41	-1.75%
	(-2.174)		(-0.943)		(-2.188)		(-1.340)	
Cluster 3: Civil servant, 2+ chi.	2,178**	20.11%	94.34	0.87%	-436.9**	-17.21%	-94.20*	-3.71%
	(7.496)		(1.289)		(-4.142)		(-2.112)	
Cluster 4: Self-employed, 2+ chi.	-94.98+	-0.88%	46.82	0.43%	7.728	0.30%	25.79	1.02%
	(-1.675)		(0.749)		(0.329)		(0.626)	
Cluster 5: Pt or non-contributory employed, 2+ chi.	803.5**	7.42%	-4.621	-0.04%	142.1*	5.60%	-8.550	-0.34%
	(4.379)		(-0.086)		(2.045)		(-0.190)	
Cluster 6: FT care or other, 2+ chi.	1,396**	12.90%	66.82	0.62%	283.4**	11.16%	50.20	1.98%
	(7.465)		(1.120)		(4.617)		(1.021)	
Cluster 7: FT employed mostly, 1 chi.	-19.52	-0.18%	488.2**	4.51%	-9.971	-0.39%	254.8+	10.03%
	(-0.582)		(2.607)		(-0.538)		(1.956)	
Cluster 8: FT employed mostly, married	1.693	0.02%	-43.07	-0.40%	16.11	0.63%	102.5+	4.03%
	(0.131)		(-0.527)		(0.744)		(1.739)	
Cluster 9: FT employed mostly, single	-90.27+	-0.83%	7.748	0.07%	-4.165	-0.16%	4.119	0.16%
	(-1.896)		(0.235)		(-0.126)		(0.211)	
Cluster 10: FT employed mostly, divorced	-32.78	-0.30%	-168.9*	-1.56%	-7.573	-0.30%	-21.70	-0.85%

Note: Results from regression-based Kitagawa-Oaxaca-Blinder decompositions. Based on normalized linear regression models with absolute independent pension income as dependent variable. Reference coefficients from the coefficients of regression models of the gender by which the respective life course is empirically dominated. Controlled for birth cohort. Confidence intervals depicted in Figure A5 and Figure A6. z-statistics in parentheses. ** p<0.01, * p<0.05, + p<0.10.

Returns component. I do not find that the gender-sensitive redistribution implemented in the German public pension system reduces the GPG. Even in clusters with high shares of unpaid care mothers do not benefit from higher pension income compared to fathers (*expectation 4.1 rejected*). This underlines the insufficiency of the pension system to prevent the reproduction of gender inequalities arising over the life course in old age. As an exception, I find evidence of women profiting from the splitting of couples' pension claims upon divorce (in line with Kreyenfeld et al. 2023). Women's better pension returns compared to men's in life courses with longer divorce spells reduce the gender gap in public pensions by two percentage points (*expectation 4.2 confirmed*).

Figure 4 Shares of the GPG due to gender-specific returns for the same work-family life-course pattern (unexplained part)



Note: Value depicted = minimum significance level of 10%. Results from Table 1, confidence intervals depicted in Figure A5 and Figure A6. Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

More generally, I find that a higher share of the gender gap in private compared to public pension is due to differences in returns for the same life-course patterns (especially for clusters

7 and 8). Given the high volatility in the working life courses of clusters 7 and 8, the gender-specific heterogeneity in characteristics such as earnings, part-time employment, and care work in these life courses most likely (Table A6) drives the result. Private pensions thus reproduce such gender inequalities within life-course patterns through more gender-unequal pension returns than public pensions (see Table A7).

Sensitivity analysis

The main results are robust for controlling for survey waves, nativity, and educational level and using different reference coefficients or weights in the KOB (see Appendix 7A6). Using the original cluster solution instead of slightly equalizing the gendered distribution on the clusters to make the decomposition more robust, as well as excluding poorly assigned individuals from the clusters, the magnitude of the explained shares tends to become slightly larger (in line with Rowold et al. 2024).

In the Appendix (xxxxxxxx) I further present analyses to address two major conceptual choices of the main models. First, the main model decomposes the GPG on the mean, though the relationship between life course patterns and the Gender Pension Gap is likely to differ along the distribution. Second, I include additional analyses to assess the sensitivity of the conceptual decision to include zero pensions as well as to analyse the Gender Coverage Gap, i.e., the gender differences in public and private pension receipt. However, both extentiional analyses have to be read with caution due to the low number of observations and have to be proved robust with larger samples.

5 Discussion

This study applied an innovative two-step approach and rich linked survey-register data to assess how work-family life-course patterns relate to the gender gap in public and private pensions in West Germany. I contribute to the recent literature on the GPG, decomposing the GPG while considering holistic life courses that include annual relative earnings, and differentiating between mechanisms shaping the gender gap in public and private pensions. The research design enables discussing the implications of pension privatisation on gender pension disparities, concerning work-family interdependences. The first step of the analysis reveals high levels of gender segregation on work-family life courses. The segregation on the differently well-rewarded life-course patterns makes up for 40% of the gender gap in public and 13% of the gap in private pensions. The SA-KOB decomposition shows that only life courses of parents with two or more children drive the gender gap in pension income since only these life courses are highly gendered. Four main findings stand out.

First, 20% of the gap in public pensions alone is due to almost exclusively female life courses in which mothers drop out of the labour force for the rest of their lives after childbirth or a shorter period before reconciling care work with part-time employment (similar associations for private pensions). Previous studies highlighted the lack of women's full-time employment as the main reason for the GPG in Germany (Frommert and Strauß 2013; Hänisch and Klos 2014; Cordova et al. 2022). Considering unpaid care work linked to parenthood from a holistic life-course perspective on top of formal employment shifts the focus to the relevance of dividing labour between genders for the GPG. Given the empirical evidence suggesting that childbirth drives gender inequalities along the pre-retirement life course (Gangl and Ziefle 2009; Aisenbrey et al. 2009; Budig et al. 2016), the results confirm this inequality to be reproduced in old age by the German pension system.

Additional analyses show that equalising the division of unpaid care work is particularly important to mitigate the gender disparities in public pensions at the bottom of the distribution, where the GPG is most pronounced and the poverty risk is highest. The compositional gender difference in engaging continuously in care work is also the main reason for the gender gap in private pension coverage, while the female-typical part-time life course type tends to mostly play a role for gender differences in private pension incomes among private pension recipients.

Second, gender inequalities in earnings, once women are active in the labour force, are relevant for the GPG as well. This complements previous research on West Germany highlighting the role of (full-time) employment for the GPG without considering earning positions (e.g. Frommert and Strauß 2013; Fasang et al. 2013). If mothers have access to full-time employment, they hold lower-income jobs which lead to lower pension income. While the lack of mothers with high-income careers drives the GPG, the gap would be even larger if the share of mothers with unstable low-medium income careers were as high as that of fathers (particularly for private pensions). Thus, only access to high-income employment ensures mothers' financial independence in old age. Even though previous data has suggested the opposite (Fasang et al. 2013), full-time employment itself is most likely not sufficient, at least in comparison to men's pension income. Low-income employment improves, however, mothers' public pension income at the lower end of the pension distribution as additional analyses show. But to increase women's pensions compared to men's along the whole distribution, mothers need access to better-rewarded employment life courses.

Third, these earnings-related associations are much stronger pronounced for the gender gap in *private* pensions, confirming the stronger reproduction of earning inequalities in the second and third pension pillars even compared to the heavily earnings-related public pension system in Germany. The association of mothers' absence in high-income careers with the gender gap is five times higher in private compared to public pensions. This finding confirms the assumption

of Bardasi & Jenkins (2010) that for private pensions the driving forces for the high gender inequalities in access and entitlements are characteristics beyond labour market participation. The most straightforward reason is that stable high-income careers are much more likely to accumulate financial resources that could be invested in private pensions compared to care-dominated or low-income life courses, whereas public pensions rely less on monetary investments and include redistribution elements. Indeed, the gender difference in high-income compared to low-income careers of parents attributes to more than twice of the gender difference in access to private pensions. However, equalising the access of mothers to low-income careers would still help close the Gender Coverage Gap. At the same time, it would increase the gender gap in private pension benefits among recipients since low-income careers are detrimental to the entitlement with private pensions.

Fourth, even when considering public pensions only, I do not find that the average GPG is reduced by better rewards of mothers compared to fathers with the same life-course pattern due to gender-sensitive adjustments in the pension rewarding structure. The unexplained shares suggest that the only efficient pension policy tool for reducing gender inequality in pension income is the splitting of pension claims after divorce (confirming Kreyenfeld et al. 2023). However, at the bottom of the distribution, women benefit from better pension returns compared to men for the two women-majority life course patterns characterized by continuous care work or part-time employment. Redistributive elements such as childcare benefits and topping-up low EPs thus lead to female public pension advantages which mitigate the compositional disadvantages of women for these life courses and thus the Gender Pension Gap among individuals with low pensions. Still, they cannot make up for the pension loss of women with female-typical life courses due to the lack of careers in private employment or civil service – the GPG is highest at the bottom of the distribution.

This study is subject to several limitations due to data constraints. First, given that the results highlight the relevance of more detailed labour characteristics over the life course (i.e., earnings) other pronounced gendered labour market inequalities might also contribute to the GPG. For example, future research should assess the impact of gender segregation on occupations or firm size, especially amidst the privatisation of pensions given that both are related to gendered private pension income in the UK (Gardiner et al. 2016; Ezeyi and Vujic 2017) and a smaller share of the gender gap in private pension is explainable by the available data in this study. Second, some of the results are subject to a very low number of observations in the linked-survey-admin data. This leads to limited statistical power and robustness, especially for small clusters (e.g., cluster 10 characterised by divorce) and for the extension analyses along the distribution and among pension recipients only. Hence, future research might want to replicate the analysis for contexts providing richer data (e.g., more recent cohorts or countries with higher private pension coverage). This article could also be extended by (i.) applying the design to countries with different pension systems (e.g., Netherlands, UK, Denmark, or Sweden), (ii.) including cohort and period comparisons for better understanding the trend of the GPG, and (iii) simulating pension income for future cohorts in old age.

The results of this study highlight the relevance of the traditional gender division of labour for the reproduction of gender inequalities in old age. Specifically, the GPG is largely the result of German policies that first incentivise a traditional division of labour and then, in terms of pension income, poorly reward life courses that fulfil the high demands of unpaid care work. This stresses how the pension system in later life interacts with the welfare regimes at early life stages in shaping the high level of GPGs. By ignoring this inter-temporal link between welfare policies, the current pension system particularly penalises women who have acted in accordance with gender norms and welfare state contexts and devoted most of their lives to caring for others. In old age, these women must rely on the redistribution in the pension system to achieve

financial independence. However, my results confirm previous studies highlighting the inability of public pensions to buffer the reproduction of gender inequalities over the life course in old age (e.g., Horstmann et al. 2009; Frommert and Strauß 2013). The childcare benefits equivalent to one or two years of employment are nothing else than a mirage for these women who have provided on average 37 years of unpaid care work until age 65. The only equalizing influence of pension policies is confirmed for the intra-couple pension claim splitting after divorce, which makes it the most attractive policy tool for equalizing pension rewards for gender-typical life-course patterns. Such ex-ante policies are important to ensure independent pension income for women whose life courses were shaped in conservative contexts incentivising a traditional division of labour between men and women.

However, for future cohorts, a more sustainable approach to prevent high GPGs is to implement welfare policies aiming to equalize the gendered division of labour and gender inequalities in the labour market. Firstly, facilitating an equal division of unpaid and paid work between men and women is important to ensure access to the labour market for women, especially mothers. However, particularly in the light of the privatisation of pensions and the constant level of the gender pay gap in Germany, the results of this study suggest that this will not be sufficient to equalise pension incomes between genders, given the high reproduction of earnings inequalities in private pensions. Gender inequalities in the labour market, such as the gender pay gap, but possibly also occupational segregation, are likely to be reproduced more strongly for future retirement cohorts. Thus, secondly, for women's pension income, it is of high importance to combat inequalities in the labour market once women are employed.

The potential for the increasing labour market participation of women in Germany to result in a reduction in gendered pension income inequality in the future will be largely contingent upon the success of the German welfare state in addressing significant gender-based disparities in the

labour market, as well as the manner in which low-income and part-time employment, in addition to unpaid care work, will be compensated within the pension system.

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Data availability statement.

The data underlying this article were accessed through SHARE-ERIC. The SHARE data is available upon registration: https://www.share-eric.eu/data/data-access. The SHARE-RV data is available upon successful application: https://www.eservice-drv.de/FdzPortalWeb/dispcontent.do?id=main_fdz_use&chmenu=ispvwNavEntriesByHierarchy90. The unique identifiers for the datasets are documented below. The derived data and results generated in this research are replicable. Replication materials will be made available online.

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7 Appendix

A1 Additional tables

Table A1 Pension policies and indicators for West Germany

Pension characteristics in 2012		West Germany	Source
Public/state pension			
Access	Minimum contribution length	5 years	OECD 2013
	Age for pension qualification/ min pension age	Pensionable age: 65 for men, 65 for women Av. Effective age of labour market exit: 62.1 for men, 61.6 for women	OECD 2013
	Share of 65+ population receiving no independent pension income	1.6% of men, 6.1% of women	Own calculation
Amount	Level of linkage to earnings (Progressivity Index)**	25.4	OECD 2013
	Maximum amount as % of average earnings	150%	OECD 2013
	Child care benefits	1 pension point per child born before 1992; parallel employment allowed; standard level (average earnings)	OECD 2013
	Divorce benefit	Pension rights added up and split for years of marriage equally between partners	Horstmann et al. 2009;
	Gender gap in replacement rate[9]	6.5	Eurostat (2018); European Institute for Gender Inequality (2018)
Occupational & personal pensions			
Access	Share of occupational pension	31.24% in total 39.85% of men 21.69% of women	Own calculation
	Share of personal pension	5.02% of total 6.87% of men 2.98% of women	Own calculation

[9] Absolute difference in the aggregate replacement ratio between women and men. Positive gap = Women have a higher aggregate replacement ratio in comparison to men; women benefit on average more from the pension system's redistribution. Aggregated replacement ratio = Relationship between median gross pension income of 65 to 74-year-olds and median gross earnings of 50 to 59-year-olds.

Table A2 Waves, survey years and n of observations

Wave	Survey year	Men	Women
2	2006-2007	26	26
4	2011	62	41
5	2013	500	435
6	2015	82	102
	Total	670	604

Note: Own calculation based on the analysis sample and SHARE waves 2-6, v7.1.0. Not weighted.

Table A3 Pension types included and definition of dependent variables.

DV I: Public pensions only	DV II: Private pensions only	
Public pension	*Occupational pension*	*Personal Pension*
1. Old age pension 2. Old age supplementary pension or public old-age second pension 3. Early retirement or pre-retirement pension 4. Main or secondary disability insurance pension, or sickness benefits	1. Old age pension from the last, second or third job 2. Early retirement pension 3. Disability or invalidity insurance	1. Average payments of regular life insurance 2. Regular private annuity or private personal pension

Table A4 Sample selection

	Men		Women	
Base sample age cutoff	1475	(50.0)	1475	(50.0)
Non-response pension	1274	(49.5)	1302	(50.5)
Employment	1182	(48.8)	1241	(51.2)
Sample incl. retro data	804	(49.7)	815	(50.3)
Sample incl. SHARE-RV data	670	(52.6)	604	(47.4)

Notes: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Table A5 Data sources used for variable groups

Data source	Dependent variable	Work life course information	Family life course information	Controls
SHARE	x	x, for complementing the records (see 7A3)	x	x
RV (pension records)		x, as baseline		

Table A6 Summary characteristics of life-course clusters by gender

	Cluster 1: High Income Ft Empl., 2+ Chi.		Cluster 2: Low-Medium Income Ft Empl., 2+ Chi.		Cluster 3: Civil Servant, 2+ Chi.		Cluster 4: Self-Empl., 2+ Chi.		Cluster 5: Pt/Non-Contributory Work, 2+ Chi.		Cluster 6: Ft Care, 2+ Chi.		Cluster 7: Ft Empl. Mostly, 1 Child		Cluster 8: Ft Empl. Mostly, Married No Children		Cluster 9: Ft Empl. Mostly, Single		Cluster 10: Ft Empl. Mostly, Divorced	
Work life course (share of spells)	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
FT Employed, 1St Quartile	5.72	3.13	11.78	33.73	1.68	0.63	4.47	3.67	12.15	14.69	7.64	6.20	7.78	17.00	8.96	19.18	12.58	29.95	12.35	19.85
FT Employed, 2Nd Quartile	6.78	5.21	32.61	21.15	1.73	0.44	7.11	1.39	9.72	3.20	2.89	1.62	13.88	10.28	22.14	12.68	22.61	9.38	10.64	17.87
FT Employed, 3Rd Quartile	14.55	21.88	30.22	10.50	0.61	0.13	4.78	0.79	3.47	0.73	5.44	0.91	24.79	5.28	21.80	16.18	15.90	4.69	16.59	9.87
FT Employed, 4Th Quartile	55.54	43.75	5.41	1.92	0.68	0.00	2.18	0.00	2.26	0.72	5.32	1.32	24.55	0.88	15.89	4.84	13.19	3.91	23.36	3.51
PT Or Non-Contributory Emp.	1.31	8.33	3.24	5.61	2.86	1.64	6.40	7.84	41.67	36.43	5.67	7.45	3.90	20.05	5.67	12.13	3.78	13.28	6.25	10.75
Self-Employed	0.48	0.00	0.91	0.72	0.02	0.19	57.27	62.60	2.60	0.47	7.18	0.33	7.25	3.15	8.72	5.33	9.10	10.68	16.29	1.75
Civil Servant	0.16	0.00	0.04	0.96	73.99	76.14	0.20	0.79	0.00	0.14	0.23	0.34	0.38	0.16	0.00	0.49	2.70	0.00	0.00	0.00
Care Work And Other	1.45	10.42	2.70	9.13	0.95	2.59	9.30	13.10	8.85	26.50	58.56	77.40	4.87	29.09	1.55	15.93	4.40	17.45	2.90	15.68
Retired	6.81	6.25	9.22	11.22	7.88	7.58	3.25	5.95	14.24	12.31	4.05	2.25	6.88	9.11	7.61	9.50	6.94	6.51	4.61	10.86
Education Or Training	5.54	1.04	1.21	2.00	9.50	10.61	4.12	3.27	3.82	1.26	2.78	1.77	3.75	1.60	4.65	2.45	3.09	4.17	2.38	4.93
Unemployed	1.66	0.00	2.65	3.04	0.11	0.06	0.91	0.60	1.22	3.55	0.23	0.41	1.97	3.41	3.00	1.29	5.71	0.00	4.61	4.93
Family life course (share of spells)																				
Single, No Child	16.35	0.00	15.00	11.86	19.48	16.16	14.63	10.71	16.67	7.75	15.51	10.73	15.55	10.63	26.74	15.38	81.10	67.71	12.05	10.86
Single, 1+ Children	0.44	0.00	0.07	0.00	0.19	0.00	0.05	0.00	0.00	0.30	0.00	0.78	0.55	1.13	0.00	0.00	12.89	24.22	0.00	1.32
Married O. Cohabiting, No Children	4.63	0.00	3.21	2.80	10.26	9.72	3.96	2.08	2.08	3.22	1.74	3.10	7.82	5.41	70.16	78.92	4.86	4.17	9.30	11.51
Married O. Cohabiting, 1 Child	7.03	2.08	8.08	7.69	17.75	12.69	6.15	9.72	6.60	7.41	6.13	6.05	71.99	78.84	1.84	2.70	0.77	3.91	16.44	5.26
Married O. Cohabiting, 2+ Chi.	70.30	94.79	72.54	76.20	50.72	58.71	73.88	76.88	73.26	79.01	75.58	78.77	2.14	1.13	0.00	0.12	0.00	0.00	16.22	9.21
Divorced W/O Children	1.25	3.13	1.09	1.44	1.60	2.71	1.32	0.60	1.39	2.32	1.04	0.57	1.95	2.86	1.26	2.88	0.39	0.00	45.98	61.84
Education																				
Max. lower secondary (Isced 0-2)	0.85	0.00	9.42	23.08	4.48	0.00	0.00	33.33	8.33	27.55	5.56	39.87	10.00	28.30	11.63	14.71	11.11	37.50	3.57	10.53
Max. post-secondary (Isced 3, 4)	41.53	50.00	79.71	61.54	27.61	12.12	60.98	52.38	75.00	63.78	55.56	50.63	64.55	60.38	60.47	61.76	59.26	25.00	57.14	63.16
Tertiary education (Isced 5,6)	57.63	50.00	10.87	15.38	67.91	87.88	39.02	14.29	16.67	8.67	38.89	9.49	25.45	11.32	27.91	23.53	29.63	37.50	39.29	26.32
Birth cohort																				
1920-1938	28.81	0.00	47.48	38.46	35.07	6.06	58.54	52.38	41.67	31.63	44.44	46.84	31.82	33.64	37.21	29.41	29.63	62.50	21.43	26.32
1939-1944	46.61	0.00	32.37	30.77	40.30	36.36	24.39	23.81	33.33	38.27	33.33	37.34	36.36	27.10	44.19	38.24	40.74	37.50	35.71	42.11
1945-1950	24.58	100.00	20.14	30.77	24.63	57.58	17.07	23.81	25.00	30.10	22.22	15.82	31.82	39.25	18.60	32.35	29.63	0.00	42.86	31.58

(continuation)

	Cluster 1: High Income Ft Empl., 2+ Chi.		Cluster 2: Low-Medium Income Ft Empl., 2+ Chi.		Cluster 3: Civil Servant, 2+ Chi.		Cluster 4: Self-Empl., 2+ Chi.		Cluster 5: Pt/Non-Contributory Work, 2+ Chi.		Cluster 6: Ft Care, 2+ Chi.		Cluster 7: Ft Empl. Mostly, 1 Child		Cluster 8: Ft Empl. Mostly, Married No Children		Cluster 9: Ft Empl. Mostly, Single		Cluster 10: Ft Empl. Mostly, Divorced	
Wave	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
2	1.69	0.00	4.32	3.85	2.99	3.03	7.32	0.00	8.33	3.06	5.56	5.70	4.55	4.67	6.98	2.94	0.00	25.00	3.57	5.26
4	6.78	0.00	10.07	0.00	14.18	6.06	7.32	9.52	8.33	6.63	5.56	6.33	10.91	11.21	6.98	5.88	3.70	0.00	0.00	0.00
5	79.66	50.00	76.98	76.92	70.90	57.58	78.05	71.43	58.33	72.96	88.89	79.75	65.45	63.55	74.42	73.53	85.19	75.00	78.57	63.16
6	11.86	50.00	8.63	19.23	11.94	33.33	7.32	19.05	25.00	17.35	0.00	8.23	19.09	20.56	11.63	17.65	11.11	0.00	17.86	31.58
Interview Year																				
2006	0.00	0.00	1.44	3.85	0.00	0.00	0.00	0.00	0.00	0.51	0.00	0.00	1.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	1.69	0.00	2.88	0.00	2.99	3.03	7.32	0.00	8.33	2.55	5.56	5.70	2.73	4.67	6.98	2.94	0.00	25.00	3.57	5.26
2011	6.78	0.00	9.35	0.00	14.18	6.06	7.32	9.52	8.33	6.63	5.56	6.33	10.00	9.35	6.98	5.88	3.70	0.00	0.00	0.00
2012	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	1.87	0.00	0.00	0.00	0.00	0.00	0.00
2013	79.66	50.00	76.98	76.92	70.90	57.58	78.05	71.43	58.33	72.96	88.89	79.75	65.45	63.55	74.42	73.53	85.19	75.00	78.57	63.16
2015	11.86	50.00	8.63	19.23	11.94	33.33	7.32	19.05	25.00	17.35	0.00	8.23	19.09	20.56	11.63	17.65	11.11	0.00	17.86	31.58
Coverage public pensions																				
No public pension receipt	1.69	0.00	0.72	0.00	2.99	6.06	2.44	9.52	8.33	5.10	0.00	8.23	0.91	10.28	2.33	5.88	0.00	12.50	3.57	0.00
Any public pension	98.31	100.00	99.28	100.00	97.01	93.94	97.56	90.48	91.67	94.90	100.00	91.77	99.09	89.72	97.67	94.12	100.00	87.50	96.43	100.00
Coverage private pensions																				
No private pension receipt	27.12	0.00	47.48	53.85	96.27	93.94	68.29	90.48	75.00	71.94	88.89	93.04	48.18	66.36	39.53	61.76	55.56	75.00	50.00	42.11
Any private pension	72.88	100.00	52.52	46.15	3.73	6.06	31.71	9.52	25.00	28.06	11.11	6.96	51.82	33.64	60.47	38.24	44.44	25.00	50.00	57.89
Sum of Earnings Points From FT Emp	57.80	53.04	40.07	22.65	2.14	0.84	11.76	1.55	11.45	5.87	10.36	4.16	43.51	13.87	38.30	25.84	32.22	13.66	38.21	21.31
Public pension income	18,820	18,360	13,996	9,931	31,044	23,201	11,309	4,265	14,720	7,087	12,899	3,654	17,198	8,658	15,820	10,796	12,450	5,995	12,388	12,014
Private pension income	6,868	14,400	2,346	1,536	359	179	4,168	1,076	3,400	951	918	152	4,071	824	4,778	1,162	3,193	923	2,485	1,388
n of observations	118	2	139	26	134	33	41	21	12	196	18	158	110	107	43	34	27	8	28	19

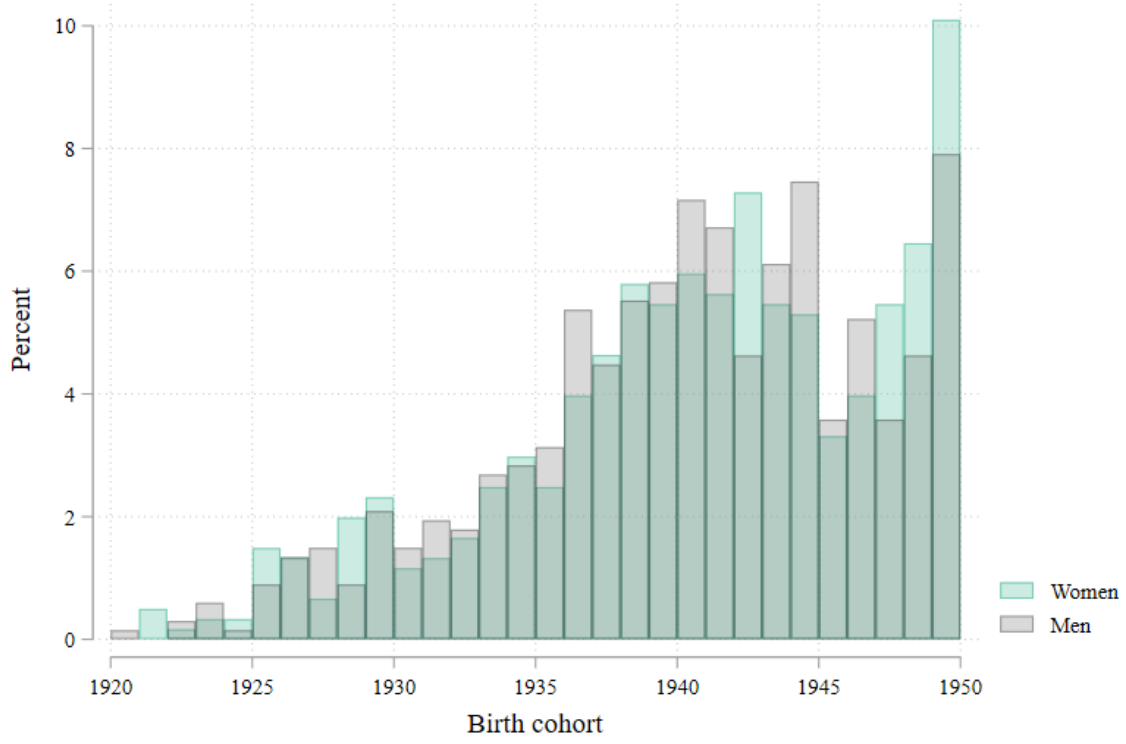
Table A7 Baseline coefficients from linear regression models for public and private pension income

	Public Pensions		Private Pensions	
	Men	Women	Men	Women
Cluster 1: High-income FT employed, 2+ chi.	2961.2	3463.7	3481.3	5535.5
Cluster 2: Low-medium income FT employed, 2+ chi.	-1606.2	-227.6	-1439.4	-321.6
Cluster 3: Civil servant, 2+ chi.	15139.8	13413.1	-3037.1	-1312.9
Cluster 4: Self-employed, 2+ chi.	-4327.5	-5674.2	352.1	-389.7
Cluster 5: Pt or non-contributory employed, 2+ chi.	-2895.6	-2754.9	-747.6	-487.2
Cluster 6: FT care or other, 2+ chi.	-4435.7	-6226.5	81.50	-1263.8
Cluster 7: FT employed mostly, 1 chi.	1524.1	-1257.8	778.3	-673.6
Cluster 8: FT employed mostly, married	149.0	988.1	1417.6	-578.8
Cluster 9: FT employed mostly, single	-3336.7	-3921.7	-154.0	-465.0
Cluster 10: FT employed mostly, divorced	-3172.4	2197.8	-732.8	-42.98
co2038	734.0	269.9	434.5	29.79
co3944	378.0	-305.1	196.4	-236.1
co4550	-1112.0	35.18	-630.9	206.4
N	1274		1274	

Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

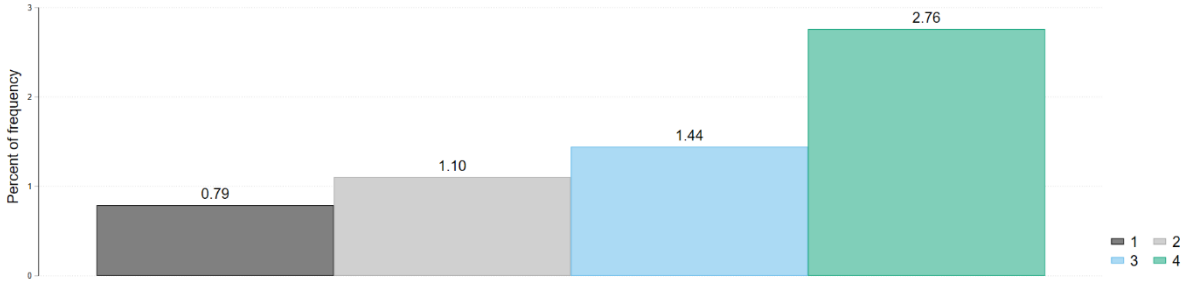
A2 Additional figures

Figure A1 Birth cohorts by gender



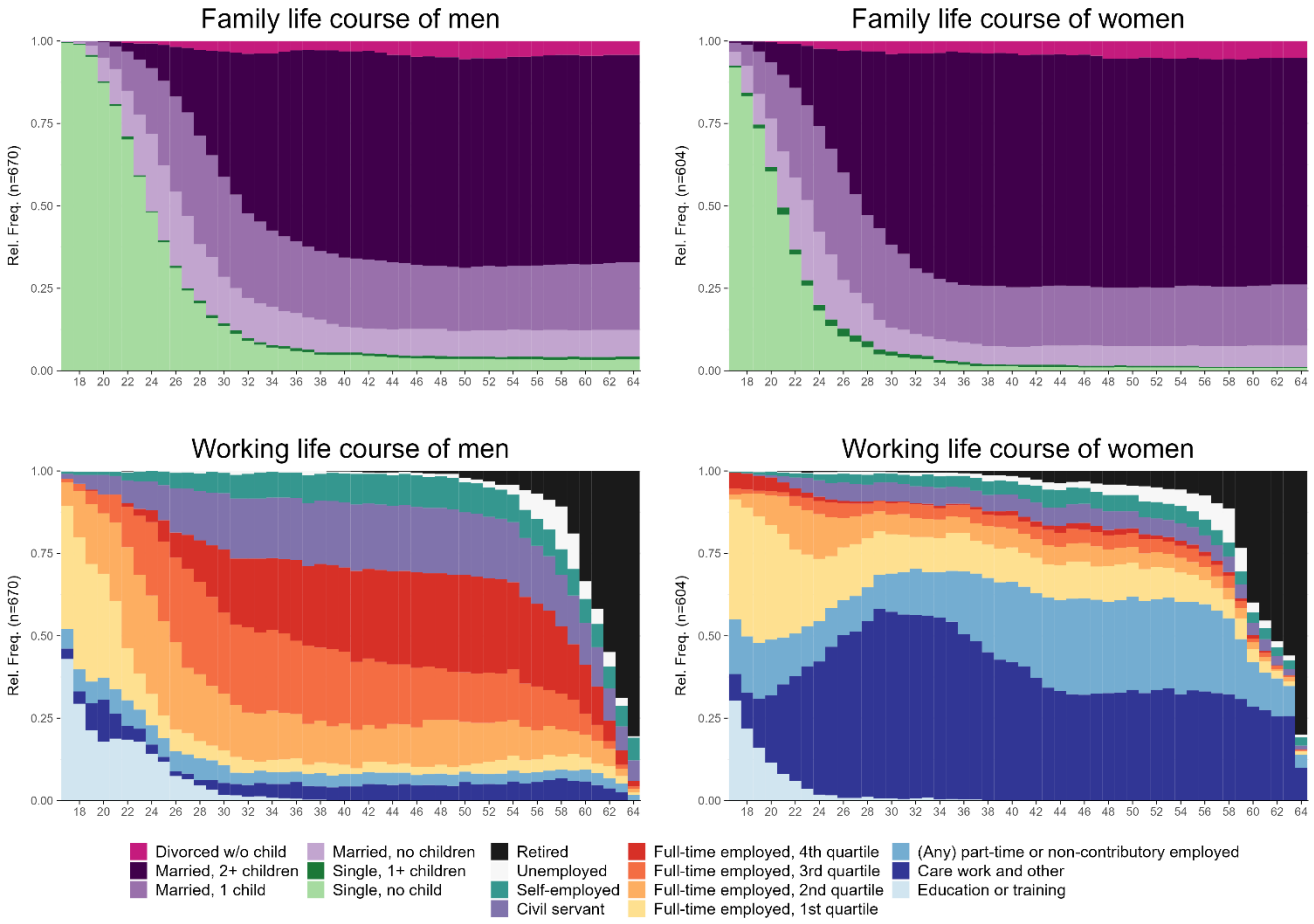
Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Figure A2 Earning point quartiles



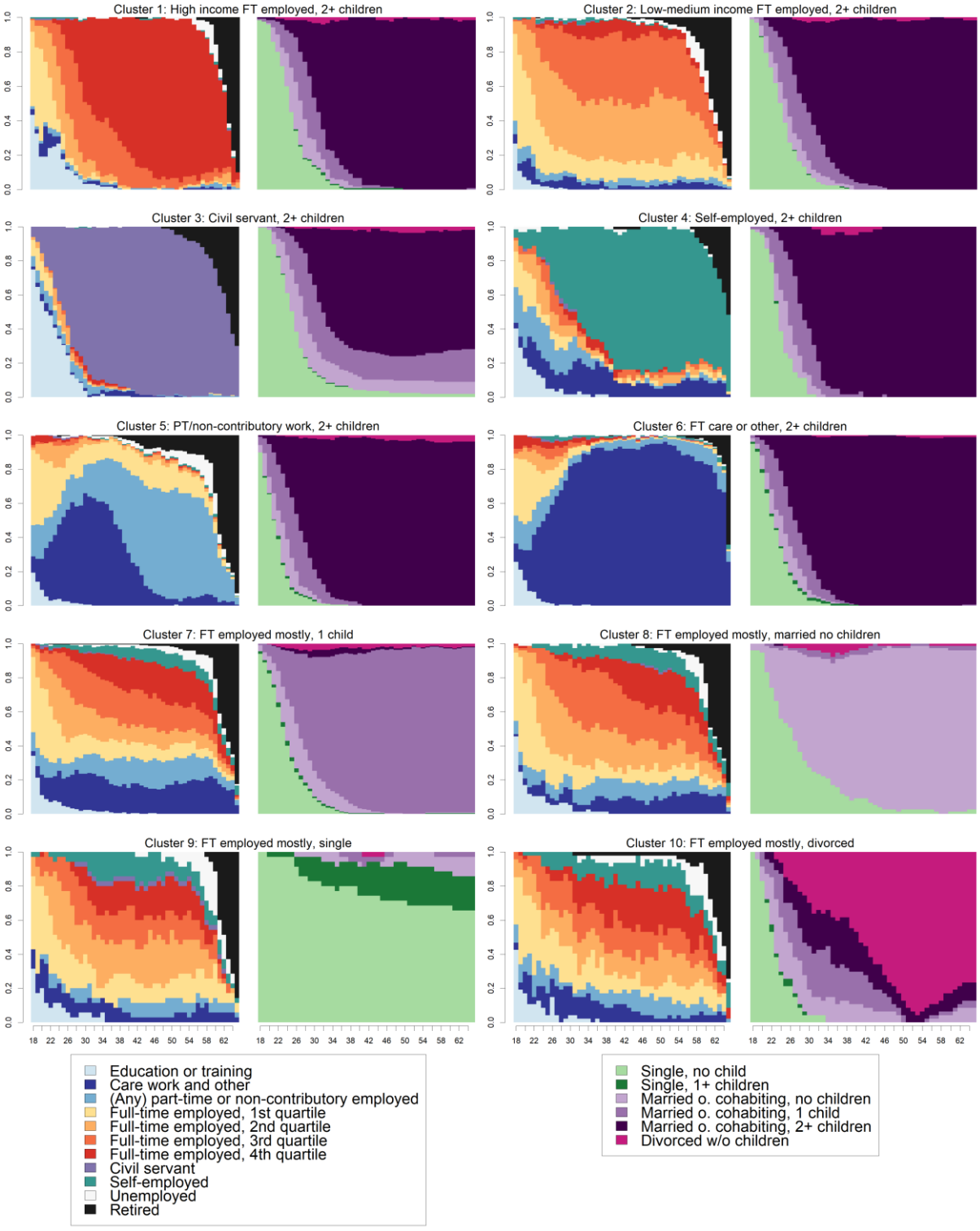
Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Figure A3 Family and work life courses by gender



Note: Sequence distribution plots based on analysis sample showing the share in each life-course state per age, ranging from age 18-65.

Figure A4 Sequence distribution plots by cluster



Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Figure A5 Decomposition results with confidence intervals, public pension income

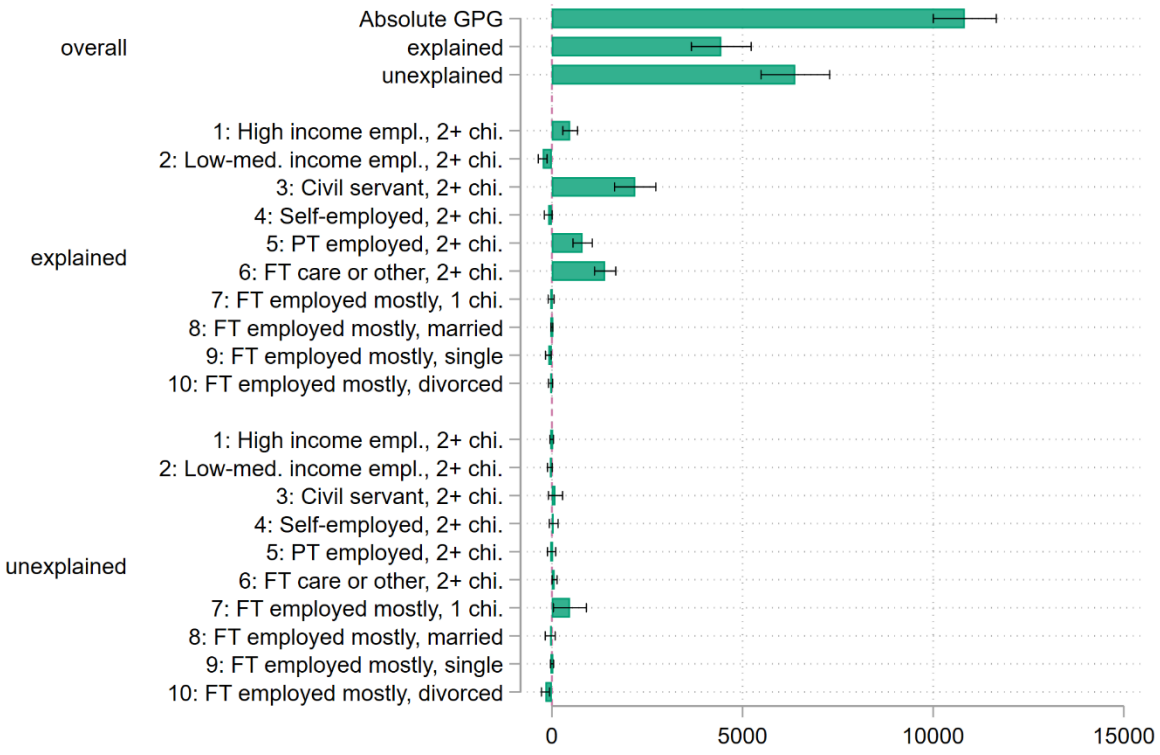
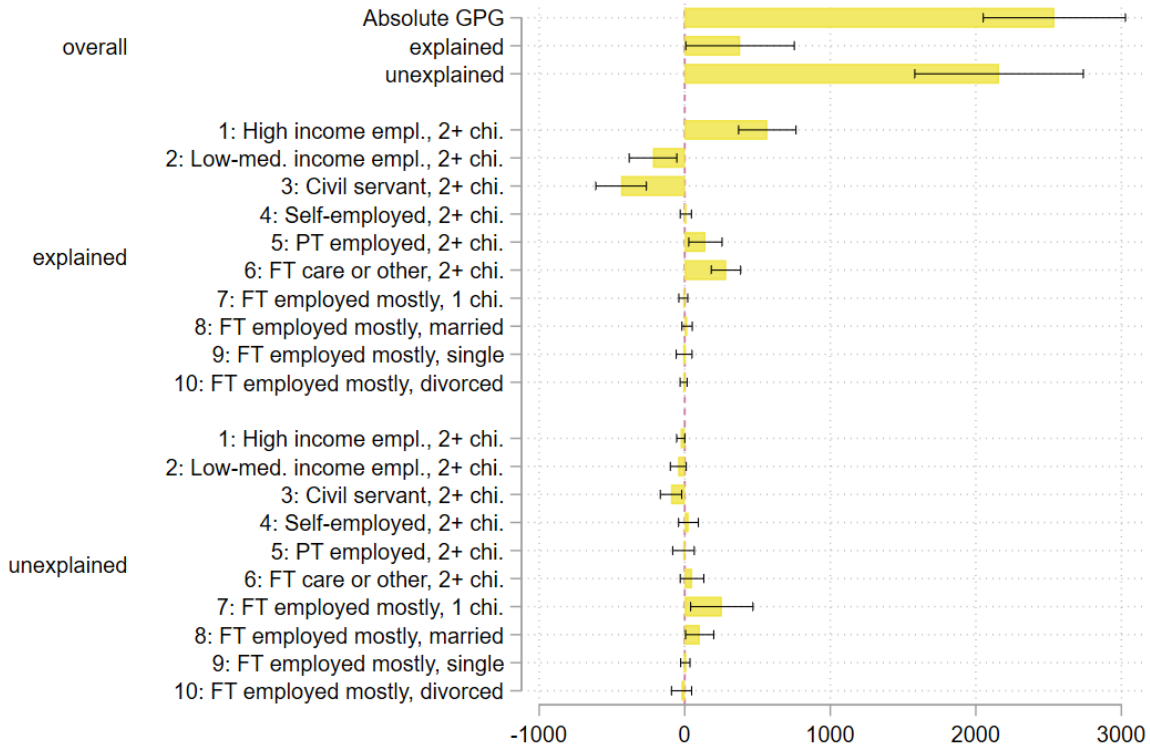


Figure A6 Decomposition results with confidence intervals, private pension income



A3 Combining life course data from the survey and the administrative records

To make use of the benefits of the survey and the administrative data, I construct work life-course states using complementary information from both data sources. Since only the survey data has information on family life-course categories, these are fully based on the SHARELIFE data (see Table A5 for an overview of which data sources are used for which variables).

The data on the working life courses, or pension-relevant activities, is made available on a monthly basis in the administrative records of the German Public Pension Insurance (SUF SHARE-RV - source: FDZ-RV). However, the retrospective survey data provides family and working life courses on annual basis. I thus transform the more fine-grained monthly data of the pension records to annual data, using the mode per year, that is the situation the individuals were most in during the respective year, as has been done before (Bühler et al. 2022).

Any employees or other groups (such as apprentices, persons raising children, non-commercial caregivers, persons with disabilities, persons in military or voluntary service, persons who receive unemployment or sickness benefits, and students with marginal jobs) who are subject to mandatory public pension insurance are covered in the administrative data. Self-employees (with some exceptions) and civil servants as well as judges, professional militaries, and potentially some other groups of occupations are normally not covered in the public pension system and thus do not appear in the data. However, as soon they had at least one month of an insured activity they are included in the data.

Such periods of non-insured activity are recorded as a ‘non-contributory period’ as their social income situation. On top of activities not insured in the public pension scheme,

activities declared as non-contributory may contain unemployment without being registered unemployed, homemaking, or other pension-relevant activities that have not been reported (e.g., education). For further information on the data please consult the SHARE-RV User Guide and the VSKT User Information.

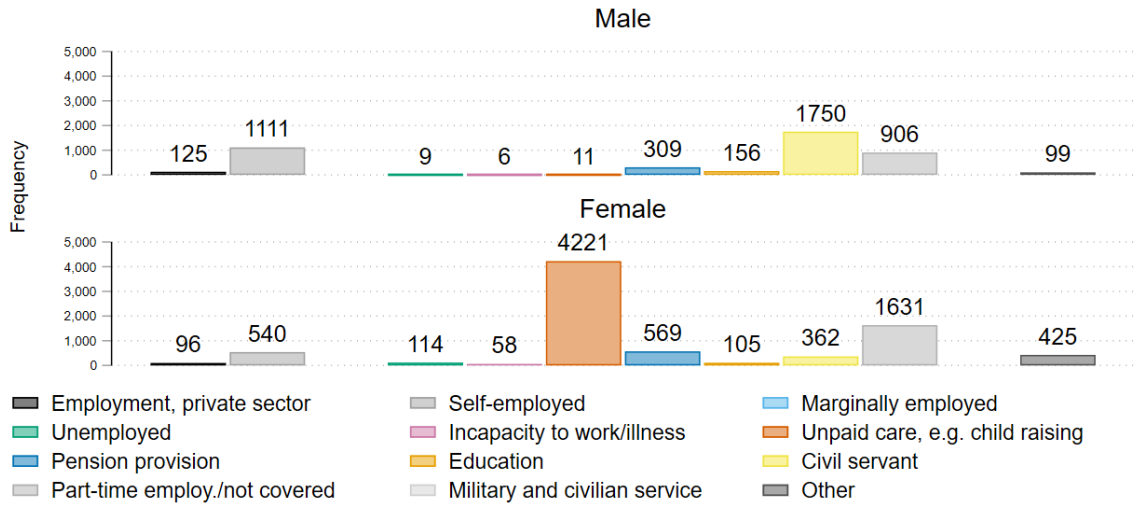
Imputation of non-contributory periods in administrative records

I impute non-contributory periods with the survey information from SHARELIFE since the 'non-contributory period' in the register data is likely to be very heterogenous but makes up for a large share of person-year spells in the register data for my sample (23.03%).

I only impute (full-time) employment spells if full-time employment was reported in the survey data and earning points were available in the register data. That is because I need the earning points for differentiating between different earning quartiles in the private sector. The rest of the reported employment spells in the survey data without information on earnings points in the administrative data (including short-term employment) are coded on part-time employment.

Figure A7 shows for the 'non-contributory periods' in the register data the number of person-year spells that were imputed by the different working states from survey data. Quite large gender differences become visible: whereas for men, the non-contributory periods mostly entail civil service spells followed by self-employment and any non-contributory employment (for which no EPs were recorded), for women the by far most prevalent working state is unpaid care work. In general, the figure reveals the heterogeneity of the social situations combined in non-contributory periods and the importance of differentiating between them. This is even more the case for the analyses with a focus on gender, as is the case here.

Figure A7 States replacing non-contributory periods in administrative records



Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

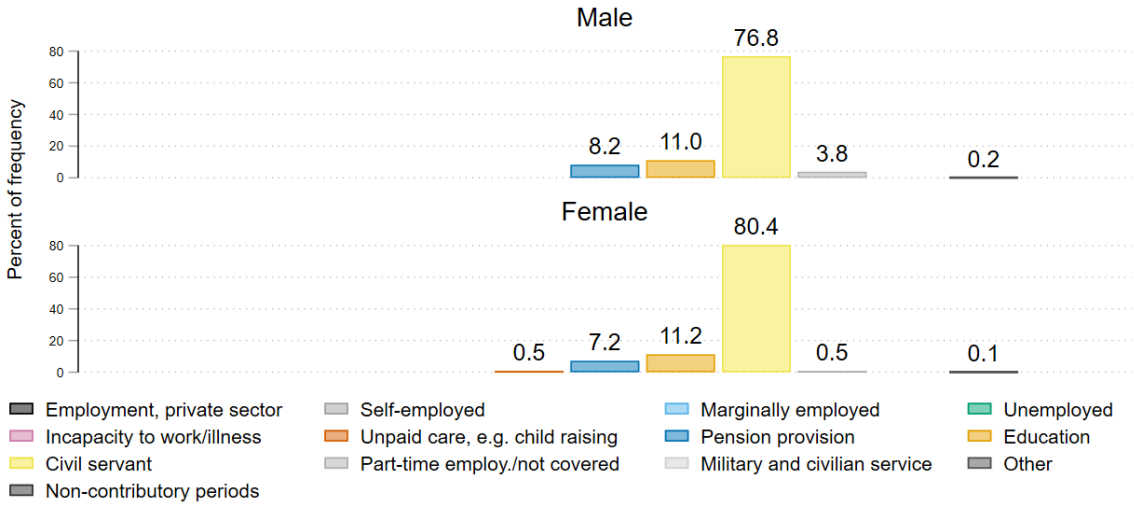
The procedure for civil servants and self-employees

Since self-employees and civil servants are not covered in the administrative records, the information on them is solely based on the survey data. I impute both working states in two different ways.

First, there are individuals not covered at all in the administrative records who have reported for most of their working lives (defined by more than 19 years) to be self-employed or civil servants. These individuals are most likely not included as these employment types are not covered in the administrative records or because they did not agree to link the survey data with the administrative records. I include individuals in the analysis sample who have reported to have worked for at least 19 years as civil servants or self-employed respectively in the SHARE data. The working states of these individuals are thus fully based on the survey data. The 'civil servants' that I include and who are originally not covered in the administrative data, report civil service for 76.8-80.4% of their person-year spells (Figure A8). Self-employees, that I include and who are originally not covered in the administrative data, report to be self-employed for 73.3-74.6% of their person-year

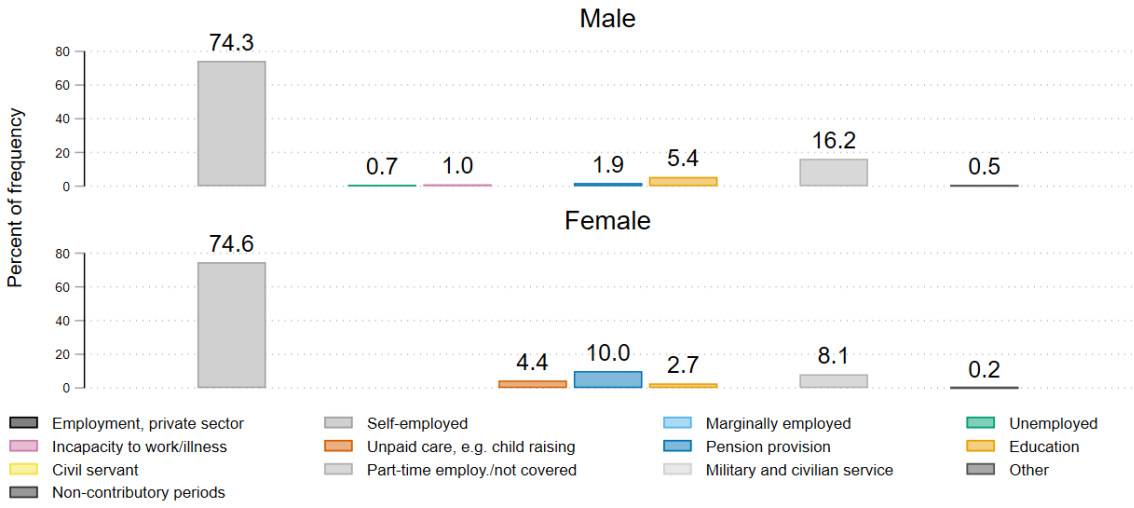
spells (Figure A9). As information on the earning points for the reported years of any (full-time) employment in the private sector is unavailable for these individuals, I code the employment years they have reported as part-time employment (up to 16% of all person-year spells for those individuals).

Figure A8 Distribution on states (based on survey data only) if civil servants missing in register data



Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Figure A9 Distribution on states (based on survey data only) if self-employee missing in register data

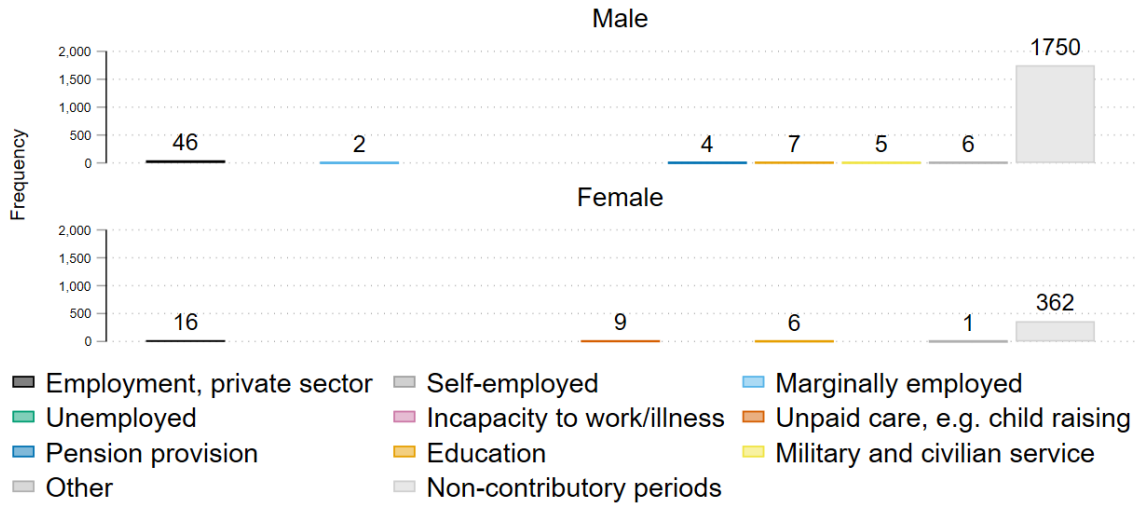


Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Secondly, even if individuals are matched with the administrative records, I mostly lack information on whether these individuals were self-employed or civil servants. In most cases, such periods are coded as 'non-contributory periods'. As described above, I replaced

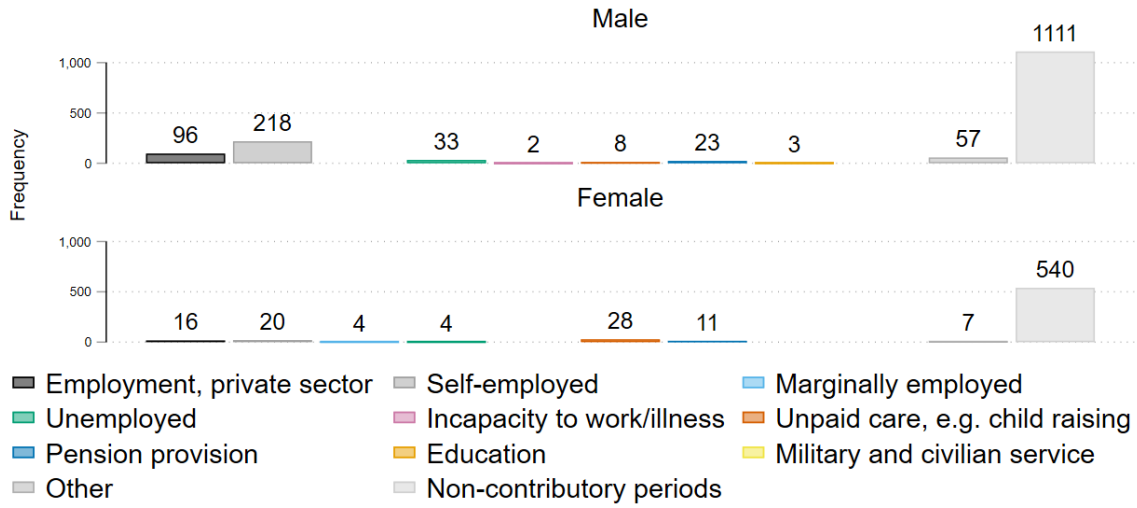
all ‘non-contributory periods’ with civil service or self-employment if these were reported in the survey data. Furthermore, I overwrite administrative records for person-year spells that responded reported to be civil servants or self-employees if the records recorded another working state for less than 12 months for the specific year. However, most of these self-employment and civil service spells overwrite non-contributory periods (Figure A10, Figure A11).

Figure A10 Frequency of states from register data imputed with civil service reported in the survey



Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Figure A11 Frequency of states from register data imputed with self-employment reported in survey

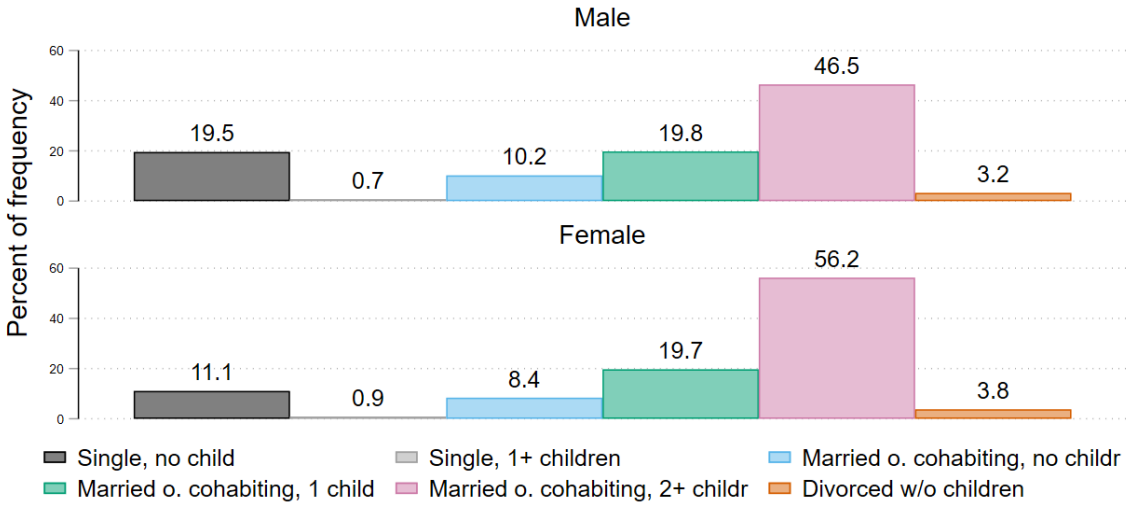


Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

The result: work and family life-course states

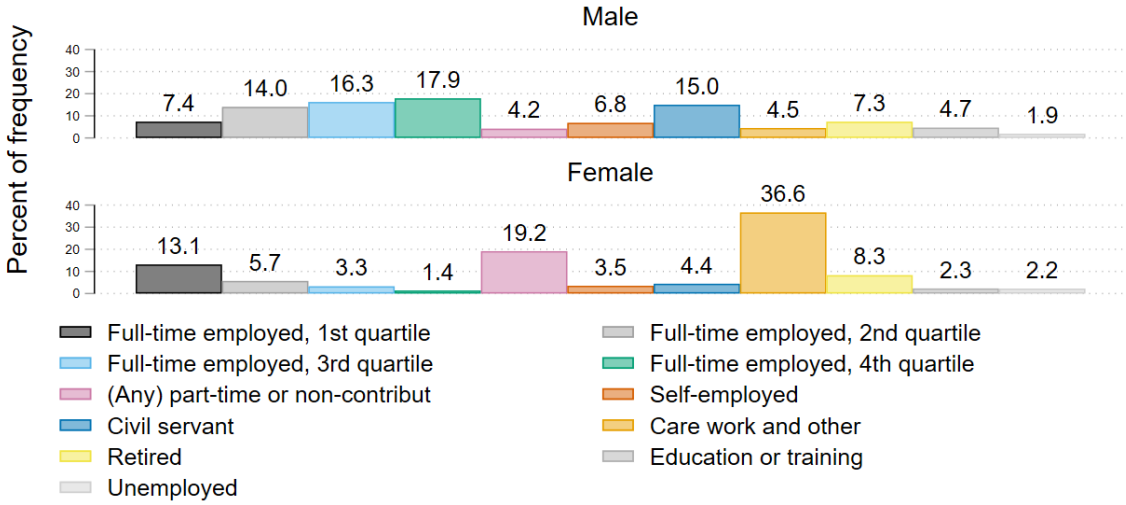
Figure A12 and Figure A13 show the distribution of work and family characteristics over the person-year-spells and Figure A3 depicts the distribution for each age along the life course by gender. Whereas the family life courses are quite similar across genders apart from women entering parenthood at slightly earlier ages, the work-life courses differ strongly by gender, as expected for the conservative context of West Germany.

Figure A12 Distribution on family states by gender, person-year spells



Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Figure A13 Distribution on working states by gender, person-year spells



Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

A4 Multichannel Sequence Analysis: analytical choices and robustness

Sequence Analysis is an exploratory approach. Still, its analytical choices should be guided by theoretical and, where appropriate, statistical measures (Aisenbrey and Fasang 2010; Raab and Struffolino 2022).

For Multichannel Sequence Analyses, that is when several life course domains are considered in the Sequence Analysis jointly, Piccarreta (2017) suggest first considering the correlation between the domains of interest. The idea is that the domains have to be interrelated to some extent to justify a joint MSA over them. Using the Mantel coefficient, I observe an overall weak but statistically significant positive relationship among the domains (.03). Since I theoretically assume that the linkage between the working and family spheres differs largely between genders and that women's working lives are stronger linked to their family life, I conduct the analysis by gender (as suggested by Raab & Struffolino (2022). As assumed, I find that the linear correspondence of family dissimilarities to working dissimilarities is indeed much more positively associated for women (.165) compared to men (insignificant and slightly negative).

In such cases, Raab & Struffolino (2022) suggest considering separate MSAs by subgroups, here gender, to prevent concealing gender-specific joint life-course patterns. However, in combination with the KOB decomposition, I need the *same* covariates, i.e. cluster, per group to decompose the outcome of interest based on the second step (see Chapter 3). Additionally, as in most applications of the SA-KOB decomposition, I assume that life-course patterns differ by the group of interests, and this might be specifically also the case for the linkage between domains. Thus, when combining MSA with the KOB, one must still go for a joint Sequence Analysis, even if the linkage between domains is driven by only one of the groups.

To take advantage of the exploratory nature of SA, I assess different parameters along the analytical choices. First, I apply different versions of optimal matching (OM) to calculate the distance matrix for individual sequences which is used in the next step, the cluster analysis. I apply two different types of data-driven substitution costs, based on transition rates as well as a common future (holding the indel costs constant at max(sm)/2). I then use substitution costs based on transition rates for Hamming distances as well as Dynamic Hamming Distances (DHD), which are more time-sensitive approaches.[10]

As second parameter I use the two most applied clustering approaches in the field, hierarchical clustering based on Ward's Linkage, as well as Partitioning Around Medoids (PAM). Lastly, for the hierarchical clustering outcomes, I guide my choice of the number of clusters retrieved based on standard Cluster Quality Indices (CQI) such as the Average Silhouette Width (ASW), the pseudo R2 as well as Hubert's Gamma (HG). I further disregard solutions suggesting less than 6 or more than 12 clusters for empirical and theoretical reasons.

[10] For a detailed overview of these parameters, see Studer & Ritschard (2016).

This leaves me with a total of 18 cluster solutions which I visually examine to assess the analytical and theoretical fit with the research question and assumptions.

The best-performing solution (ASW of .282) is a cluster outcome with 11 clusters based on OM with substitution cost calculated based on a common future and clustered by Ward. However, the only remarkable difference to the cluster solution using the same parameters but deriving 10 life-course patterns only, is that the 11-cluster solution reveals two instead of one cluster dominated by stable careers in civil service. One of the clusters is characterized by being married and having at least 2 children over the life course, while the individuals in the other cluster have different family life courses, most dominantly being married and having one child. This does not seem to provide added theoretical value important enough to justify the disadvantages with regard to the number of observations per group that each additional cluster brings. The 10-cluster solution contains only life-course patterns that are theoretically highly relevant while still achieving the third-highest ASW among all cluster solutions examined in more detail.

All cluster solutions considered that were clustered by PAM do not include a family life course that is dominated by divorce periods. This is, however, highly relevant concerning the German pension system, since pension claims are split after divorce and therefore pension claims up to the divorce are equalized.

Apart from that, the chosen cluster solution is robust against the cost specification applied. I find very similar clusters when using costs based on transition rates, as well as Dynamic Hamming Distances or normal hamming distances (correlation between different cluster solutions .92-93).

A5 Reassigning single trajectories to address the common support problem.

To improve the robustness of the decomposition, I systematically select and assign single trajectories to the low-n clusters for each group as previously suggested (Rowold et al. 2024). I do the reassignment based on three options.

For the first option, I consider the other four well-performing cluster solutions suggesting 10 clusters (see description in S2). I re-group individual trajectories if they were assigned to one of the low-n clusters in one of the alternative cluster solutions. The low-n clusters for men and women are the high-income cluster (1) for women, the part-time and non-contributory cluster (5) and care work cluster (6) for men. I do not re-group trajectories from other small clusters (most importantly clusters 9 and 10) to not create more common support issues.

For the reassignment of male trajectories, this first procedure succeeds in reassigning a few male trajectories to clusters 5 and 6. All reassigned trajectories indeed have a rather poor fit with the life-course patterns they were previously grouped with in the main cluster solution (measured by silhouette values, not shown), which validates this procedure.

However, no other cluster solution has assigned additional women to the high-income cluster.

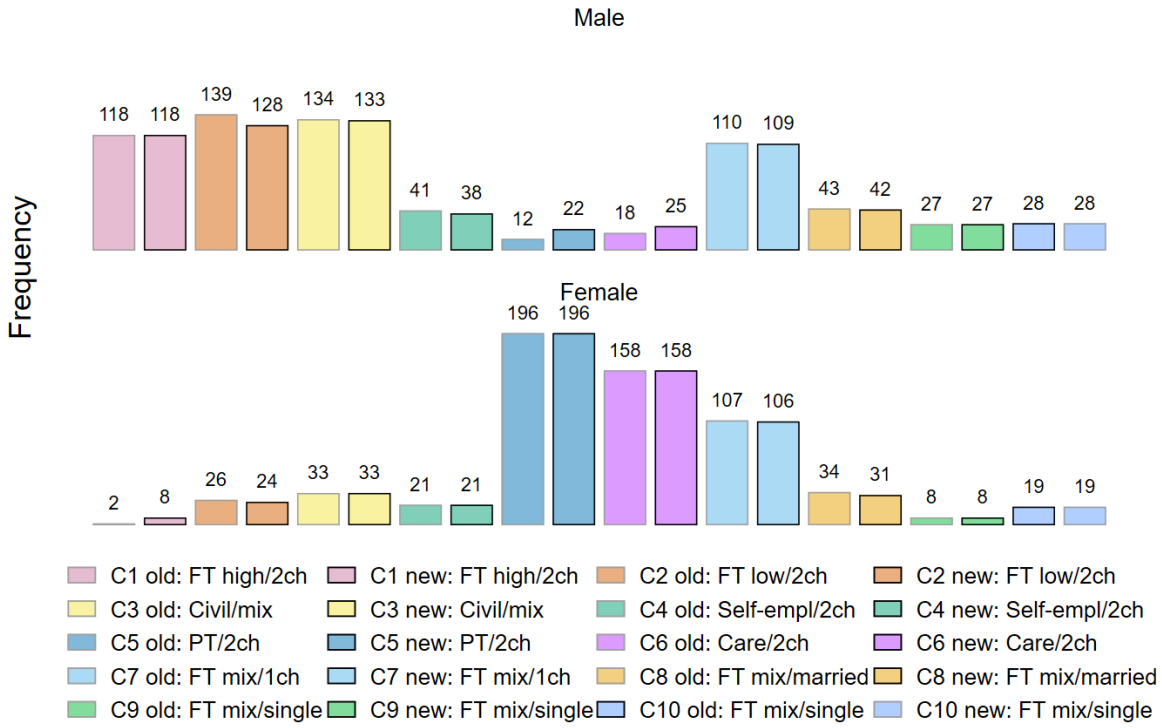
As second option, I combine information on how coherent the individual trajectories are with the overall cluster (silhouette value distribution, using the 10^{th} percentile as the cut-off for identifying poorly assigned individuals) with the sum of years individuals have spent in the life-course states that are important characteristics for the cluster. For men, I only do this for cluster 5 since I already have n=25 men in the care cluster (6).

For women, this option does not identify additional women for the high-income cluster.

Thus, for women only, I apply option 3, in which I only consider the sum of years in high (4^{th} quartile) or medium-high (3^{rd} quartile) earning full-time jobs)as well as the time spent in part-time and care work. I aim to identify women with many years spent in high-earning full-time jobs and few years with care work and part-time employment. Doing this, I identify 6 more women who broadly share the characteristics of life-course pattern 1.

The absolute gender-specific distribution on the cluster before and after the reassignment is visible in Figure A14 and the final relative distribution is given in Figure A15.

Figure A14 Frequency of individuals in clusters before and after reassignment



Note: Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Figure A15 Final distribution on clusters by gender used for decomposition

Note: Used for decomposition. Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

A6 Robustness checks

The results of the robustness checks are available upon request.

a) Adding controls

The decomposition results do not change when controlling for survey waves and nativity.

Controlling for the highest educational level though marginally changes the magnitude of some results. For both pension income types, parts of the gender gaps that are due to more men in life-course patterns 1-3 (parents with high or low-income careers in the private sectors or civil servants) are being picked up by educational differences between men and women (results available upon request). This is because educational differences are partly inherent in the life-course clusters (e.g., clusters 1 and 3 have a higher share of educational periods after age 18, Figure A4). While the parts of the explained shares for clusters 1 and 3 due to educational differences are only marginal, the negative association of more fathers having stable but low-income employment careers is almost fully absorbed by the educational gradient between men and women. For private pensions, educational differences also pick up most of the explained share due to careers characterized by employment interruptions (cluster 5).

The higher share of women with maximal lower secondary as well as the higher share of men with tertiary education (not shown) explain together 13% of the gender gap in public pensions and 28% of the gender gap in private pensions. The mediating role of education in the association between life-course patterns and the GPG suggests that the educational level also influences the (gendered) odds for realizing different life-course patterns.

Furthermore, women benefit from higher public and private pension returns for a low educational level compared to men. For public pension, this might be due to upgrades of female caretakers' pension income. On the other hand, however, parts of the GPGs are due to higher pension returns for men with tertiary education compared to their female peers.

b) Using different reference coefficients

Using different reference coefficients (male, female, or pooled for all covariates) the magnitude of the explained parts changes only slightly, and particularly the results using the reference coefficients from a pooled model are very similar to the main results (similar to Rowold et al. 2024). For public pension, the returns shares are not sensitive to the reference coefficient chosen but for private pension the negative returns share for cluster 2 becomes significant, suggesting that mothers with low-income employment receive better pension rewards than fathers with similar life courses.

c) Using the original MSA solution

As expected and in line with Rowold et al. (2024), the explained shares are larger when using the original, more unequal gendered distribution on clusters. This is particularly the case for the life courses of parents characterized by high-income jobs, part-time employment, and care work (clusters 1, 4, and 5) for private pensions. The explained shares in the main analyses are thus slightly underestimated.

d) Impact of the heterogeneity within the same life-course cluster.

Lastly, I exclude poorly assigned individuals from the clusters to make the life courses within clusters more coherent. First, this tests whether the results are robust to heterogeneities of trajectories within the clusters. Second, it indicates whether the within-cluster heterogeneity is gender-specific which might drive the unexplained shares of the KOB (Rowold et al. 2024). If the trajectories between men and women in the same cluster

systematically differ (i.e., the trajectories of one gender fit better to the cluster), this might be the reason for differences in returns. As an indicator for poor assignment to the clusters, I use the Average Silhouette Width (ASW) which provides a measure for each trajectory on how well it fits the overall cluster characteristics (Kaufman and Rousseeuw 1990). I follow previous suggestions and use cluster-specific relative cutoffs of the ASW (5^{th} and 10^{th} percentile of the cluster-specific ASW distribution) to exclude individuals with a lower ASW from the cluster (for more details, see Rowold et al. 2024).[11]

The results suggest that the unexplained parts, i.e., the gender differences in returns for the same life-course clusters, were not driven by gender-specific within-cluster heterogeneity (results available upon request). As previously shown (Rowold et al. 2024) effect sizes of explained shares tend to be slightly larger.

A7 Analytical extension I: decomposition along the distribution

The literature on the Gender Pension Gap so far mostly focuses on inequalities at the mean. Bonnet (2020, for France), Nolan et al. (2019, for Ireland), Ezeyi & Vujic (2017, for England) and Hänisch & Klos (2014, for total pension income in Germany) are the only ones decomposing the GPG along the distribution. Considering the distribution beyond the mean is highly relevant from a policy perspective. Policies might target women at the bottom of the pension distribution since these women are most vulnerable to poverty if they have to rely on their own pensions.

Decomposing the GPG along the distribution exacerbates the problem of the low number of observations per gender for the clusters. I thus use quartiles instead of more fine-grained

[11] I do not exclude the trajectories that have been reassigned to cluster as described in 7A5.

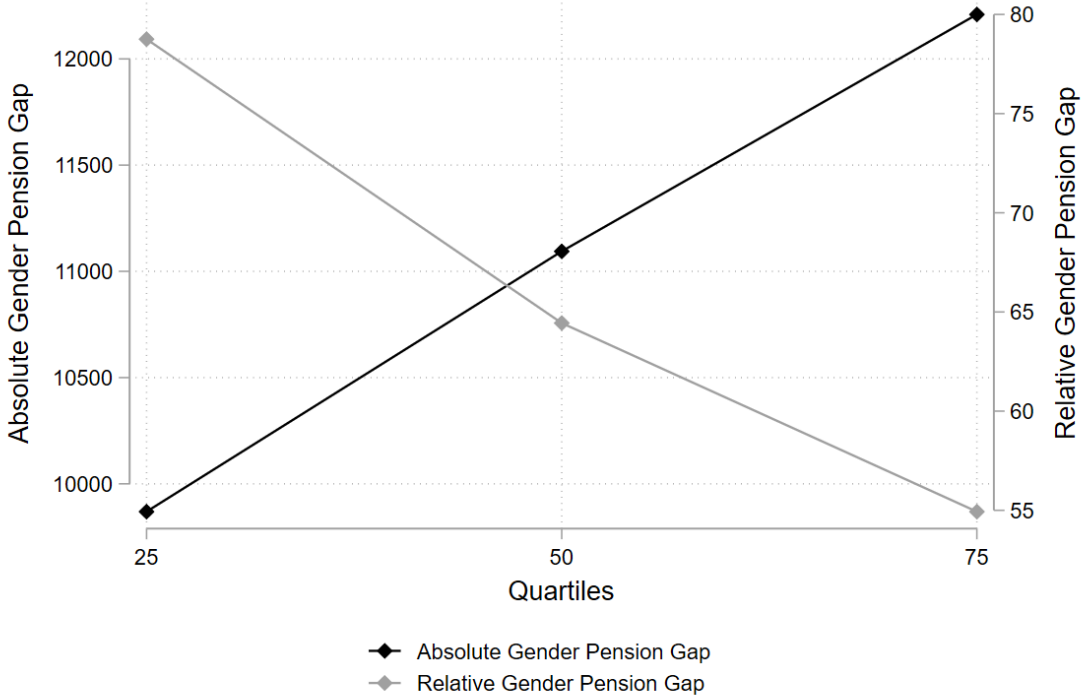
percentiles to mitigate this issue. Still, the results must be interpreted with caution as the limited number of observations restricts the robustness, particularly for smaller clusters.

I apply the RIF (recentered influence function) decomposition which reveals the explained and returns shares, similarly to the KOB, for each characteristic separately (Firpo et al. 2018). However, given that the available implementations of the RIF decomposition do not allow specifying the reference coefficient as flexible as the KOB[12], I present the results using the male coefficients as reference for all variables. Given the large share of no private pension income, I only decompose the GPG in public pension along the distribution.

The absolute gap between men's and women's pension income increases from just below €10,000 at the lowest quarter of pension income, to above €12,000 at the 75th percentile (see Figure A). Conversely, the relative GPG decreases from just below 80% at the 25th percentile to about 55% at the 75th percentile.[13] This corresponds to the notion of 'sticky floors' mostly applied to the phenomena of the gender wage gap being the largest at the bottom of the distribution (Arulampalam et al. 2007). The trend is similar for total pension income (Hänisch and Klos 2014). This also highlights the need to disentangle the driver of the gap at the bottom of the distribution since women with the lowest pensions not only face the largest inequalities but are also most likely to face old-age poverty (Bonnet et al. 2020).

[12] This is at least the case for the oaxaca_rif command (Rios-Avila 2020) used in stata.
[13] Similar patterns are documented for deciles (Rowold 2023).

Figure A1 Gender gap in public pensions over the distribution



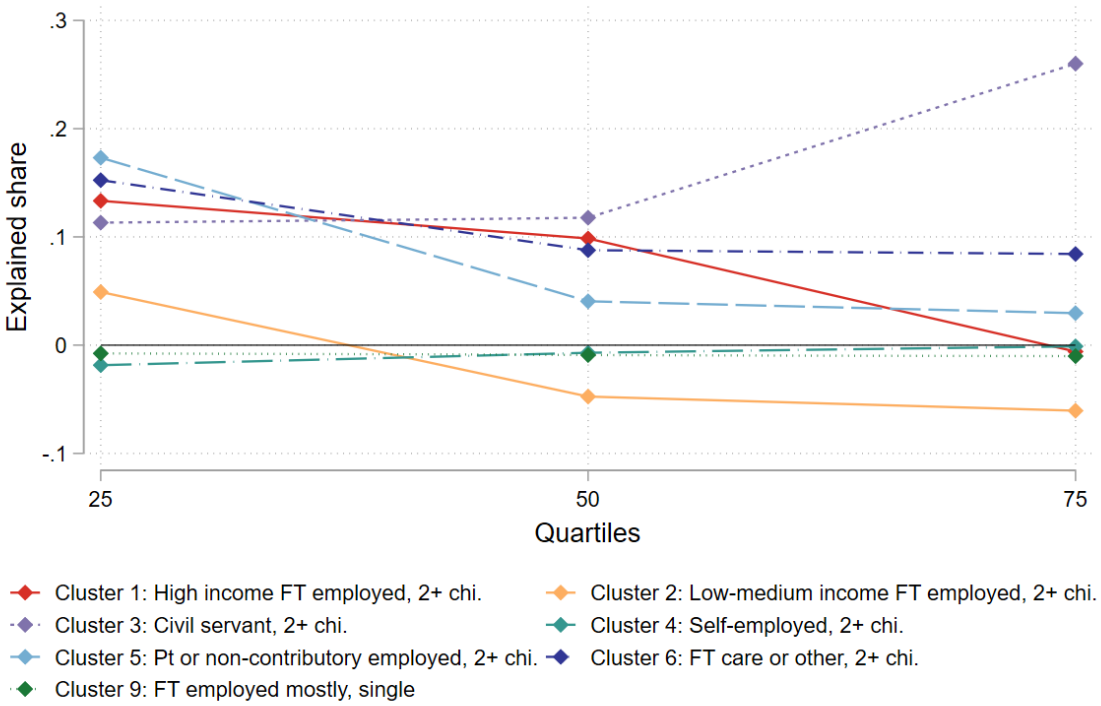
Notes: For the 25th, 50th and 75th percentiles. Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Decomposing these varying gaps across the distribution reveals that some associations vary strongly along the distribution (Figure A2 and Figure A3). For the explained shares, the decomposition at the mean revealed that the gap is reduced because more fathers compared to mothers have stable but low-income careers (cluster 2). However, this relationship is driven by the top half of the distribution. For the bottom of the distribution (1st quartile, i.e., the quarter with the lowest pensions), the association is reversed: about 5% of the gap is due to the lack of mothers with low-income careers. At the median, the 50th percentile, the relationship is already negative. This highlights that any full-time employment in the private sector, even if in low-income jobs, is important to increase women's compared to men's public pension – but only at the lower end of the pension distribution.[14] The association of the GPG with cluster 1 (parenthood combined with high-income careers)

[14] The analysis over deciles confirms this trend: a career in less stable and low-income jobs would be particularly relevant for decreasing the GPG at the very bottom of the distribution (Rowold 2023)

peaks at the bottom of the distribution and decreases along the distribution. For the life courses with careers in the private sector (clusters 1 and 2), my results align with the pattern identified for total pension income and employment years previously (Hänisch and Klos 2014). However, my results confirm this pattern for both, high and low-income careers.

Figure A2 Decomposition over the distribution: selected explained shares



Notes: Results from RIF decomposition. Based on normalized models with absolute independent pension income as dependent variable. Only life course clusters with significant explained shares for at least one decile are depicted. Explained shares are shown in relative terms. Coefficients from male baseline models were used as reference. Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

The association of civil servant careers with the GPG peaks for the highest quartile: the lack of mothers with stable civil servant careers makes up for about one-fourth of the gap at the top quarter of the pension distribution alone. Thus, for equalising the gender gap in public pensions at the top of the distribution, equal access of women to civil service careers is by far the most important component.

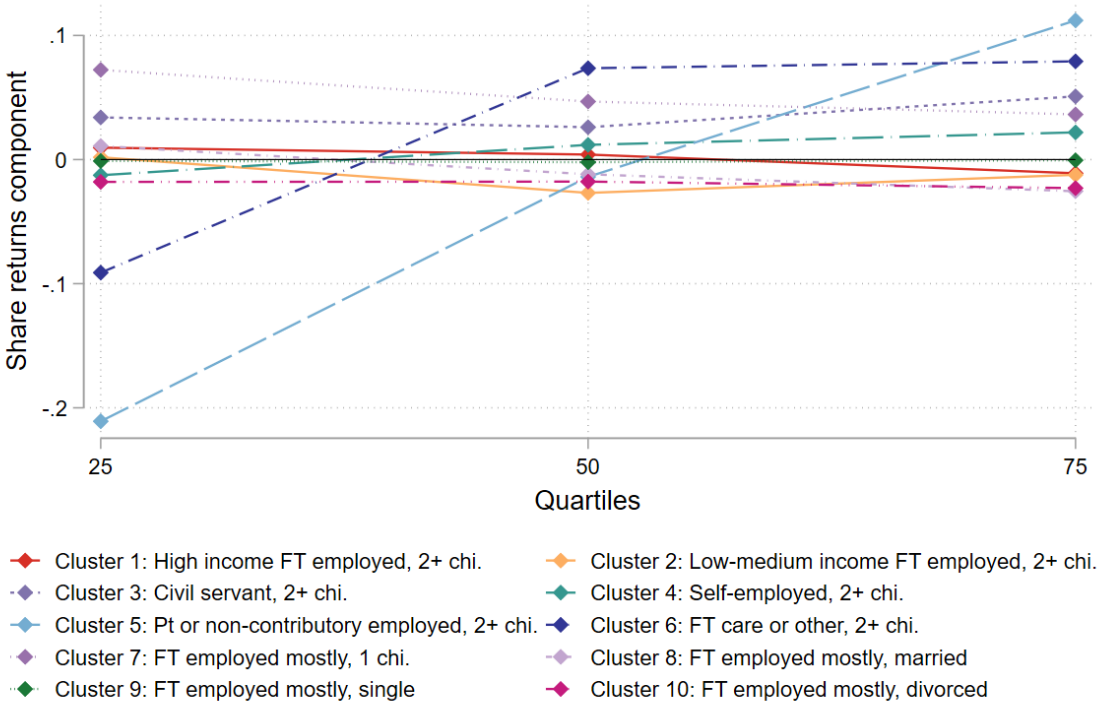
The share of the gap that is attributable to the dominance of mothers in life courses characterized by unpaid care work or care-related employment interruptions and part-time

employment is most pronounced at the lower end of the pension distribution and decreases along the distribution. While it remains significant for life courses of mothers who were consistently engaged in care work (cluster 6), it becomes insignificant for mothers who balance their caregiving responsibilities with part-time employment (cluster 5) from the median pension level onward. Simultaneously, however, the relationship between the returns component and the GPG along the distribution shows a reverse pattern (see Figure A3). At the bottom of the distribution mothers with part-time careers fare better than fathers in the same life course pattern, which more than compensates for the portion of the gap attributed to the much higher representation of mothers in this life course pattern (explained component). However, at the upper end of the distribution, the returns component turns positive. Consequently, women in cluster 5 and at the top of the pension distribution are worse off compared to men with similar life courses due to worse pension rewards, despite the reduced compositional component.

Considering both the compositional and the returns components jointly the results imply that mothers with part-time careers are only at a pension disadvantage compared to men at the top of the income distribution. Elements implemented in the pension system for women with such life courses (e.g., childcare benefits and upgrading of part-time employment reflected in the returns component) apparently help to equalize the overall disadvantage experienced by women at the lower end of the income distribution due to more mothers reconciling their parenthood with part-time employment compared to men (explained part). A similar pattern is evident for mothers consistently engaged in unpaid care work, albeit to a lesser extent. The pension penalty of mothers doing unpaid care work is mitigated due to better returns compared to fathers with similar life courses, but not entirely canceled out. However, from the median pension level onward, men receive higher pensions compared to women in cluster 6, thereby reinforcing the part of the GPG associated with cluster 6.

These are important dynamics that become not evident in the analysis at the mean, partly because they cancel each other out due to opposing associations along the distributions (returns component).

Figure A3 Decomposition over the distribution: returns component



Notes: Results from RIF decomposition. Based on normalized models with absolute independent pension income as dependent variable. Only life course clusters with significant explained shares for at least one decile are depicted. Shares are shown in relative terms. Coefficients from male baseline models were used as reference. Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

In summary, these results suggest that the key for reducing the GPG among individuals with the lowest public pension income is enabling mothers access to any full-time employment. Jointly, 60% of the GPG at the bottom of the distribution are due to the majority of women reconciling their motherhood with continuous unpaid care work, or part-time employment after care-work-related interruptions, instead of having any stable full-time employment or civil service career (clusters 1-3, 5-6). For the center and top parts of the distribution it then becomes more relevant to create access for mothers to particularly well-rewarded employment types such as high-income jobs in the private sector or the civil service to decrease the GPG. This finding is overall in line with results for France (Bonnet

et al. 2020) and links the results of the main analyses to previous evidence in Germany suggesting that the lack of female employment is the main driver of women's low pension income (Fasang et al. 2013).

Moreover, the results beyond the mean suggest that women with women-majority life courses dominated by unpaid care work do profit from redistribution in the pension systems when it comes to pension income compared to men, but only at the bottom of the distribution. While mothers with part-time careers after care-related employment interruptions do even have small pension advantages compared to fathers with similar life courses due to better pension rewards, the disadvantage of mothers with continuous unpaid care work is not fully buffered through more favourable pension rewards. However, it has to be kept in mind that the reference at the bottom of the distribution is at a very low level with an annual pension of €12,531 (men's pension at the 25th percentile, not shown), which is only slightly above the threshold for the poverty risk (€11,749 for singles in 2013, Statistisches Bundesamt (Destatis) 2023). In fact, women's pension income is below the poverty risk even at the median and top of the distribution (€6,122 and €10,016, not shown), which highlights the relevance for policymakers to increase women's pension income not only at the bottom of the distribution.

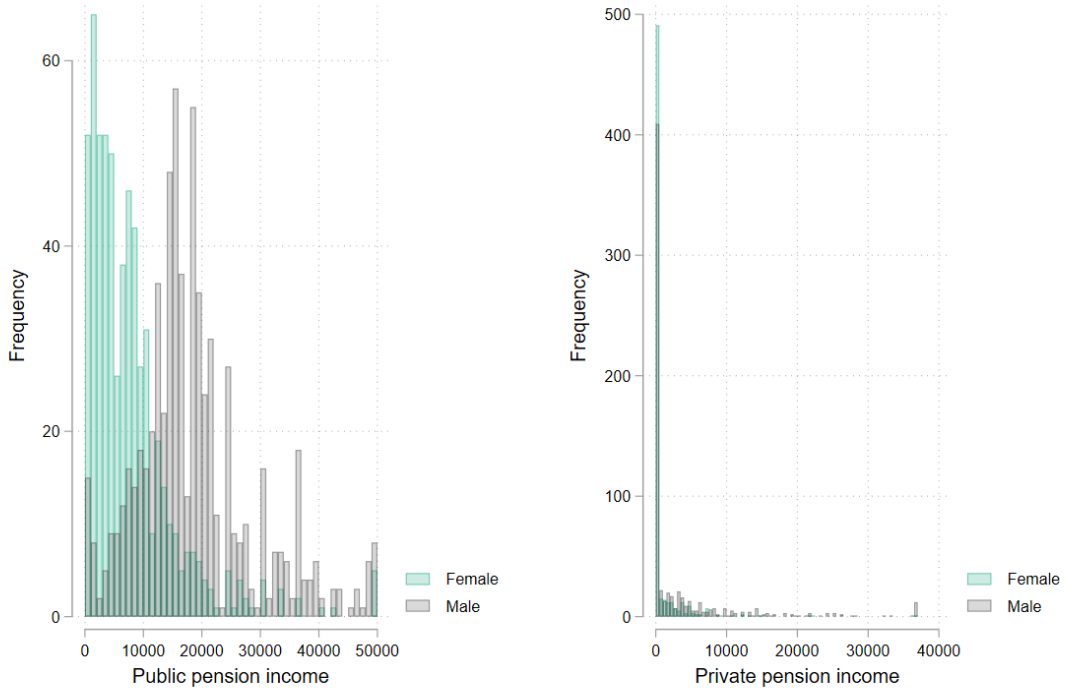
A8 Analytical extension I: decomposition of the Gender Coverage Gap

By including individuals with no pension income with a pension income of zero, the main analysis assesses the gender gap in pension receipt (whether individuals receive any pension income) and the gender gap in pension entitlements (the pension amount individuals receive) jointly. However, previous research shows that determinants of the gender coverage gap and the gender gap in pension entitlements among recipients differ (Even and Macpherson 2004; Ezeyi and Vujic 2017). Additionally, the conceptual decision to include zero pensions leads to zero-inflated distributions, particularly for private

pensions (see Figure A1). Almost 96% receive an independent public pension, but only 34% receive their own private pension (not shown). OLS regressions, which are used as baseline models for the KOB, are not best equipped for modelling such zero-inflated distributions.

There are several ways to deal with zero-inflated distributions. Following the most popular approach in the literature if zero pension income was included and methodologically addressed (Johnson et al. 1999; Even and Macpherson 2004; Bardasi and Jenkins 2010; Gardiner et al. 2016; Ezeyi and Vujic 2017; Zhao and Zhao 2018; see also Rowold 2023 for an overview), I decompose the gender gap in pension receipt (i.e., the Gender Coverage Gap) and the gender gap in pensions among pension recipients separately. Disentangling the mechanism for the gender coverage gap compared to the gender gap in pension entitlements among pension receivers helps to refine the main results, especially regarding private pensions.

Figure A1 Public and private pension distribution by gender



Notes: €1000 bins for public and €500 bins for private pensions. Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

In the following, I first decompose the Gender Coverage Gap (for private pensions only). As the second step, I analyse the Gender Pension Gap among pension recipients only by excluding individuals without pension receipt.[15]

Private pensions

The Gender Coverage Gap in private pensions amounts to 44.5%. More than half of this gap is due to gender differences in work-family life courses (see Table A8, M3). The gender gap in private pensions among private pension recipients is smaller in relative terms but larger in absolute terms (58%, €4,422, see Table A8, M4) compared to the main model, when considering gender differences in access to and entitlement of private pensions jointly (76.6%, €2,539, see Table A8, M2). However, the subsample of private pension recipients is very small and highly selective (291 men and 146 women) which is why the decomposition in M4 must be read with caution.

55% of the Gender Coverage Gap alone is attributable to the much higher share of women with life courses dominated by continuous unpaid care work (cluster 6): 38% of women without any private pension receipt have these life courses, but only 8% of women who receive own private pensions (see Figure A1). For the gender gap in private pensions among private pension recipients, however, continuous care work does not play a significant role (Table A8, M4). Surprisingly, the other female-typical life course pattern characterised by mothers reconciling their care work responsibilities with employment interruptions and part-time employment does not play a role for access to private pensions. Gender differences in the realisation of such life courses tend to be mostly responsible for

[15] I do not consider the selection into pension receipt in the modelling approach for the second step (see for details Rowold 2023)..

differences in private pension income once access is achieved, even though the share is not significant.[16]

[16] The insignificance is most likely driven by the lack of statistical power due to the small subsample of private pension recipients. The effect size of the cluster 5 is in M4 even slightly larger compared to the main model. The interpretability is limited due to the low number of observations per cluster. Merging small clusters did not help but rather skewed the meaning of the clusters due to an increase of within-cluster heterogeneity.

Table A8 Decomposition results of the gender gap in private pension receipt and private pension among recipients

	Private pension income, main model (M2)				Gender Coverage Gap (M3)				Private pensions, recipients only (M4)			
VARIABLES	Absolute	Shares	Absolute	Shares	Absolute	Shares	Absolute	Shares	Absolute	Shares	Absolute	Shares
Average pension income/receipt men	3,316**				0.434**				7,635**	7,635		
	(11.98)				(21.80)				-14			
Average pension income women	776.7**				0.242**				3,213**	3,213		
	(7.222)				(13.85)				-8.246			
Absolute gender pension/ coverage gap	2,539**	100.00%			0.193**				4,422**			
	(8.549)				(7.272)				-6.596			
Total part explained	379.9+	15.00%			0.101**	52.55%			-18.29	-0.004137		
	(1.676)				(3.893)				(-0.0304)			
Total part unexplained (including constant)	2,160**	85.00%			0.0914**	47.45%			4,440**	1.0041368		
	(6.135)				(2.813)				-5.131			
	explained		returns		explained		returns		explained		returns	
Sum by life course patterns	13.39%		9.50%		52.30%		9.08%		-8.62%		-7.92%	
Cluster 1: High income FT employed, 2+ chi.	567.0**	22.33%	-27.21	-1.07%	0.0734**	38.11%	-0.00304	-1.58%	35.09	0.79%	-179	-4.05%
	(4.731)		(-1.617)		(3.628)		(-1.113)		-0.116		(-1.521)	
Cluster 2: Low-med. income FT empl., 2+ chi.	-217.8*	-8.58%	-44.41	-1.75%	0.0293*	15.22%	0.000716	0.37%	-947.1**	-21.42%	-264.5+	-5.98%
	(-2.188)		(-1.340)		(2.524)		-0.208		(-3.325)		(-1.715)	
Cluster 3: Civil servant, 2+ chi.	-436.9**	-17.21%	-94.20*	-3.71%	-0.115*	-59.74%	-0.00655	-3.40%	2.23	0.05%	19.62	0.44%
	(-4.142)		(-2.112)		(-2.520)		(-0.756)		-0.149		-0.302	
Cluster 4: Self-employed, 2+ chi.	7.728	0.30%	25.79	1.02%	-0.00197	-1.02%	0.00641	3.33%	72.99	1.65%	-55.93	-1.26%
	(0.329)		(0.626)		(-0.812)		-1.261		-0.924		(-0.858)	
Cluster 5: Pt or non-cont. employed, 2+ chi.	142.1*	5.60%	-8.550	-0.34%	0.00421	2.19%	-0.00592	-3.07%	261.1	5.91%	85.54	1.93%
	(2.045)		(-0.190)		(0.209)		(-1.620)		-0.863		-1.201	
Cluster 6: FT care or other, 2+ chi.	283.4**	11.16%	50.20	1.98%	0.106**	54.86%	0.00663	3.44%	99.94	2.26%	153.9	3.48%
	(4.617)		(1.021)		(5.350)		-1.637		-1.165		-1.586	
Cluster 7: FT employed mostly, 1 chi.	-9.971	-0.39%	254.8+	10.03%	-0.00235	-1.22%	0.0156	8.10%	58.04	1.31%	96.85	2.19%
	(-0.538)		(1.956)		(-0.582)		-1.302		-0.71		-0.246	
Cluster 8: FT employed mostly, married	16.11	0.63%	102.5+	4.03%	0.00338	1.75%	0.00687	3.57%	-22.2	-0.50%	0.356	0.01%
	(0.744)		(1.739)		(0.837)		-1.341		(-0.441)		-0.00212	
Cluster 9: FT employed mostly, single	-4.165	-0.16%	4.119	0.16%	0.00249	1.30%	0.000667	0.35%	-53.18	-1.20%	-18.44	-0.42%
	(-0.126)		(0.211)		(0.796)		-0.32		(-0.724)		(-0.346)	
Cluster 10: FT employed mostly, divorced	-7.573	-0.30%	-21.70	-0.85%	0.00167	0.87%	-0.00389	-2.02%	112.2	2.54%	-188.8	-4.27%
	(-0.516)		(-0.517)		(0.807)		(-1.135)		-0.922		(-0.901)	
n male	670		670		670		670		291		291	
n female	604		604		604		604		146		146	

Notes: Results from regression-based Kitagawa-Oaxaca-Blinder decompositions. Based on normalized linear regression models with absolute independent pension income as dependent variable. Reference coefficients from the coefficients of regression models of the gender by which the respective life course is empirically dominated. Controlled for birth cohort. z-statistics in parentheses. ** p<0.01, * p<0.05, + p<0.10. Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Another 38% of the Gender Coverage Gap is due to the lack of mothers with stable high-income careers (cluster 1) and 15% due to fewer mothers with unstable low-income careers (cluster 2, Table A8, M3). Given that the gender differences in clusters 1 and 2 are almost identical, equalising the share of mothers with high-income careers would reduce to Gender Coverage Gap in private pensions to a higher degree (twice as much). However, while the gender differences in stable high-income careers do not play a role for the gender gap in private pensions among pension receivers, the gender gap would be even larger, if as many mothers as fathers had low-income careers (Table A8, M4). Thus, while having low-income careers helps to create access to private pensions for women, it does not help to equalise the private pension entitlements between men and women but would even worsen the GPG among private pension receivers. The negative explained component in the main model for stable low-income careers of fathers (Table 1) is thus driven by the much lower pension entitlements of men with such life courses, once they have access. Furthermore, among the private pension recipients, women with low-income careers have higher private pension returns compared to men, which cushions the gender gap in private pensions (Table A8, M4, returns component).

Lastly, the results confirm the assumption that the negative composition part due to women's lack of civil service in the main model is driven by the lack of civil servants to invest in private pensions in the first place. The association of the civil service cluster with the Gender Coverage Gap is strongest among all life course patterns (-60%, cluster 3, Table A8, M3) while there is no association with the gender gap in private pensions among pension recipients (Table A8, M4).

Previous studies applying two-part models have found mixed results. My results somewhat confirm previous results (Johnson et al. 1999) that wage matters for both, gender differences in access to as well as entitlement with private pensions and stand in contrast

to the finding that wage plays a role for the gender gap in private pension receipt only (Ezeyi and Vujic 2017). Other findings suggested that the gender differences in the years in (full-time) employment are more important for explaining the gender coverage gap, while wage differences are more important for explaining the Gender Pension Gap among pension recipients (Even and Macpherson 2004). My results suggest that having a stable full-time employment career and not being engaged in continuous care work is important for gaining access to private pensions in the first place. But earnings differences matter at least as much since raising the share of women with high-income compared to low-income careers would decrease the Gender Coverage Gap twice as much. Wage differences, the employment type and continuous unpaid care do also matter for gender differences in private pension receipt in West Germany. Further, taking a holistic life course perspective the results of this analysis do not confirm the negative role of women's more years of part-time work that previous work has found for women's compared to men's private pensions receipt in England (Ezeyi and Vujic 2017).

Public pensions

For public pensions, I do not decompose the Gender Coverage Gap because of the almost universal coverage of public pensions.

When excluding individuals without any public pensions, the gender gap in public pensions decreases slightly from €10,829 (58,26%, Table A9, M1) to €10,603 (56.02%, Table A9, M5) because mostly women are affected by zero pension (41 women compared to 12 men). Overall, the results from the main analysis are confirmed. Thus, the results for public pensions are not sensitive to pension receipt and are comparable to studies that exclude individuals without any pension claims (Rowold 2023).

Table A9 Decomposition results of the gender gap in public pension among public pension recipients

	Public pension income - main (M1)				Public pensions, recipients only (M5)			
VARIABLES	Absolute	Shares	Absolute	Shares	Absolute	Shares	Absolute	Shares
Average pension income men	18,588**				18,927**			
	(47.46)				(49.02)			
Average pension income women	7,759**				8,324**			
	(24.52)				(25.48)			
Absolute Gender Pension Gap	10,829**				10,603**			
	(21.51)				(20.96)			
Total part explained	4,452**	41.10%			4,592**	43.31%		
	(9.624)				(9.697)			
Total part unexplained	6,377**	58.90%			6,011**	56.69%		
	(12.29)				(11.90)			
	explained		returns		explained		returns	
Sum by life course patterns	40.46%		3.93%		43.00%		3.50%	
Cluster 1: High income FT employed, 2+ chi.	482.3**	4.45%	-6.657	-0.06%	490.1**	4.62%	-20.65	-0.19%
	(3.746)		(-0.228)		(3.981)		(-0.715)	
Cluster 2: Low-medium income FT employed, 2+ chi.	-243.0*	-2.24%	-54.78	-0.51%	-269.0*	-2.54%	-37.15	-0.35%
	(-2.174)		(-0.943)		(-2.544)		(-0.626)	
Cluster 3: Civil servant, 2+ chi.	2,178**	20.11%	94.34	0.87%	2,225**	20.98%	90.57	0.85%
	(7.496)		(1.289)		(7.350)		-1.249	
Cluster 4: Self-employed, 2+ chi.	-94.98+	-0.88%	46.82	0.43%	-97.70+	-0.92%	52.55	0.50%
	(-1.675)		(0.749)		(-1.713)		-0.874	
Cluster 5: Pt or non-contributory employed, 2+ chi.	803.5**	7.42%	-4.621	-0.04%	910.1**	8.58%	11.32	0.11%
	(4.379)		(-0.0864)		(4.785)		-0.227	
Cluster 6: FT care or other, 2+ chi.	1,396**	12.90%	66.82	0.62%	1,432**	13.51%	68.74	0.65%
	(7.465)		(1.120)		(7.465)		-1.192	
Cluster 7: FT employed mostly, 1 chi.	-19.52	-0.18%	488.2**	4.51%	-6.011	-0.06%	383.2*	3.61%
	(-0.582)		(2.607)		(-0.214)		-2.195	
Cluster 8: FT employed mostly, married	1.693	0.02%	-43.07	-0.40%	2.827	0.03%	-19.13	-0.18%
	(0.131)		(-0.527)		(0.270)		(-0.235)	
Cluster 9: FT employed mostly, single	-90.27+	-0.83%	7.748	0.07%	-105.3*	-0.99%	-0.844	-0.01%
	(-1.896)		(0.235)		(-2.127)		(-0.0273)	
Cluster 10: FT employed mostly, divorced	-32.78	-0.30%	-168.9*	-1.56%	-23.05	-0.22%	-157.9*	-1.49%
n male	670		670		658		658	
n female	604		604		563		563	

Notes: Results from regression-based Kitagawa-Oaxaca-Blinder decompositions. Based on normalized linear regression models with absolute independent pension income as dependent variable. Reference coefficients from the coefficients of regression models of the gender by which the respective life course is empirically dominated. Controlled for birth cohort. z-statistics in parentheses. ** p<0.01, * p<0.05, + p<0.10. Own calculation based on the analysis sample and SHARE waves 2–6, v7.1.0. Not weighted.

Differences in the results compared previous literature, most importantly regarding care-work and part-time employment-dominated life courses, are not due to conceptual decisions on how to deal with pension receipt. On the contrary, the explained shares tend to increase even slightly, especially for the two female-dominated clusters (5 and 6).