Family Biographies and Retirement Processes

A comparative analysis of West Germany

and the United Kingdom

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by

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*To my grandmothers Erzsébet Éva Orbán Fasang (*1923 - †2000)*
*and Nettie Arvilla Stoffer Nelson (*1920 - †1987)*

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Abstract

Over the past decades population aging put retirement policies at the center of political debate and academic research. Women are at a higher risk of poverty in retirement across advanced societies and therefore a key target group for social policy. Yet, retirement research has largely concentrated on how employment histories determine labor market exit of men. In a comparison of West Germany and the United Kingdom this thesis addresses how gender inequality in old age emerges over the life course and which role institutions play in this process. Two main arguments are put forward. To advance our understanding of gender inequality in retirement it is necessary to (1) develop alternative retirement measures beyond labor force exit, and (2) include family events over the life course as predictors of retirement outcomes.

Based on the conceptual foundation of differential life course sociology alternative measures of retirement are proposed and empirically explored with recent advances in sequence analysis. Divorce and child care periods are included as determinants of retirement outcomes in event history analysis. Based on household panel data, results from both methodological approaches underline the power of pension institutions in shaping retirement processes and pension consequences of family events. The thesis concludes that changing family arrangements call for a shift in the design of pension systems to compensate not only full employment histories of male breadwinners, but diversified work life histories of men and women.

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Chapter 1

Introduction

When thinking about retirement, we may think about a life phase of leisure that heralds old age and a well-earned reward for a life-time of hard work. We may also think about pension accounts and complex eligibility regulations that contribute to the diversity of retirement experiences. What we probably do not think about, is what precisely we mean by 'retirement': is retirement a one-time transition that changes everything from one day to another, or is it rather a chain of events that gradually reduces employment, simultaneously increasing leisure time and reliance on other income sources? Furthermore, while it is clear that retirement occurs at the end of a work history, we may neglect that retirement also takes place within the context of a family biography usually marked by marital relationships and possibly raising children. At first sight family biographies may seem unrelated to retirement. Family provisions in pensions, as derived benefits for spouses or childcare credits, make the connection obvious.

The objective of this thesis is twofold. First, we aim to gain a better understanding of retirement as a transition process that evolves over time. Second, we examine how this process is determined by family biographies in specific institutional contexts. We focus on two aspects of the family biography that pose particular life course risks for retirement: divorce and childcare interruptions. Pension penalties stemming from family biographies likely become most apparent when people are forced to rely on their own resources as single persons in later life. Employment interruptions related to

caring responsibilities can jeopardize possibilities to accumulate independent pension entitlements. A common theme underlying these two objectives is the emergence of gender inequalities in retirement outcomes resulting from gendered life courses.

Why do these topics deserve attention? First, the analysis of retirement as a process over time can improve our comprehension of the link between institutions on the macro level and retirement transition processes on the individual level. This is important to identify the structural forces that drive an increasing individual variability of retirement postulated in recent research (e.g. Han and Moen 1999). Second, given the increasing pluralization of family forms (Brüderl 2004, Elzinga and Liefbroer 2007), designing institutions that can ensure adequate pension provision demands an understanding of how family biographies influence retirement processes.

To address these issues, we compare retirement transition processes of the cohorts born between 1930 and 1940 in West Germany[1] and the United Kingdom. The life courses of these cohorts evolved within a strong male breadwinner context in both countries (Lewis and Ostner 1994), but they were subject to very different pension systems (Ginn et al. 2007). We can therefore use the cross national comparison to examine how different pension systems shape retirement processes after work-life histories that evolved in a similar family and gender structure. We address the following research questions in the comparison of Germany and the United Kingdom:

1. How do labor market and pension policies shape retirement transition processes?
2. How does divorce affect the timing of pension entrance of men and women?
3. How do childcare interruptions affect the timing of pension entrance of women?

In addition to these substantive questions, the thesis pursues a methodological interest. The analysis of retirement as a process requires a methodological approach that can account for the process character of retirement and has a strong exploratory orientation. These are strengths of recently evolving advances in sequence analysis (e.g. Elzinga 2006a, 2006b, Lesnard 2006). Therefore, sequence analytical tools are applied in addition to event history methods to assess the added value of recently

[1] From this point we refer only to the former FRG with Germany, if not stated otherwise.

developed sequence metrics for the analysis of life course transitions in general and retirement transition processes in particular.

1.1 Previous research

Previous comparative studies of retirement and old age pensions have concentrated largely on the macro-level, focusing on institutions and nation states as the units of analysis (Pierson 2001, Schmähl and Horstmann 2002, Ebbinghaus 2006). Kohli et al. (1991) centered a cross-national analysis around the institutionalisation of pathways to retirement in the form of diverse early retirement, disability and unemployment schemes for older workers. Maltby et al. (2004) took a broader perspective on aging and social exclusion of the elderly. Although embedded in an overarching comparative frame, both Kohli et al. (1991) and Maltby et al. (2004) applied different research methods and strategies across a relatively large number of countries, ranging from qualitative case studies to analyses based on government statistics or longitudinal micro data. Complementing these macro-level comparisons, Blossfeld et al. (2006) used individual longitudinal data to compare the effect of increasing uncertainty resulting from globalization on late career exits across countries. Studies specifically comparing retirement in Germany and the United Kingdom based on micro-level data have focused on early labor force exit (Oswald 1999, Schils 2005) and income inequality generated by redistributive effects of the respective pension systems (Zaidi et al. 2005, Mattil 2006).

Despite increasing theoretical emphasis on retirement as a process of sequentially linked states (e.g. Kohli et al. 1991, Moen 2003), research on retirement has commonly relied on static operationalizations of retirement as a one-time transition. Typically, studies define retirement as labor force exit (e.g. Hurd and Boskin 1984). Other operationalizations have included self-report retirement (Drobnic 2002), first receipt of a pension, a sudden and discontinuous drop in hours of work (Burtless and Mott 1985), or leaving a firm (Stock and Wise 1990). Such definitions of retirement restrict the analysis to people who have experienced such a one-time transition. As a

consequence, relatively little is known about other transition processes and population groups who do not generally experience these transitions, such as women who specialized in child-rearing and homemaking and 'marginalized' men with weak labor market attachment. Such selective samples conceal, for instance, the extent of actual gender disparities in retirement, since only a small number of women are included (Allmendinger et al. 1993). Defining retirement as labor force exit may also lead to invalid comparisons between different segments of a cohort, since labor force participation rates above age 50 vary widely from country to country (Gruber and Wise 1997). More generally, definitions of retirement as a one-time transition widen the gap between theoretical and empirical retirement research in sociology.

Previous research concerning family influences on retirement can be classified into two main streams: first, research stemming from labor market and mobility research (e.g. Allmendinger 1990, Blau 1998, Drobnic 2002, Hank 2004) and second, research stemming from family research (e.g. Szinovacz et al. 1992). Retirement research stemming from labor market and mobility research focuses mainly on labor market influences on retirement timing and income, adding family and household-related variables as additional explanatory factors. Retirement studies stemming from family research focus both on the impact of household characteristics on retirement outcomes (planning, timing, income, adjustment) and on retirement as a determinant of family outcomes, as marital quality or kin relationships (Moen et al. 2001). Both research streams have predominantly examined how spousal characteristics influence retirement, with the objective to explain joint spousal retirement timing (Allmendinger 1990, Blau and Riphahn 1998, Drobnic 2002, Henretta et al. 1993, O'Rand et al. 1992). As female labor force participation increases across cohorts, increasingly more and more couples are facing the retirement decision together (Blau 1998, Drobnic 2002), motivating a focus on married dual earner couples in this line of research. For instance, a stable finding across several national contexts is that women are more affected by their husband's characteristics and retirement than vice versa (e.g. Allmendinger 1990, O'Rand et al. 1992). In addition, couples apparently prefer to retire together, though only socio-economically more advantaged couples succeed in realiz-

ing such a preference. In contrast to the wealth of research concerning married dual earner couples, little research has addressed retirement outcomes of unmarried and divorced persons (Morgan 1992, Ginn 2003).

Similarly, restrictive samples also limit the knowledge gained from studies on retirement consequences of parenthood. Most studies on the impact of parenthood have been based on exclusively female samples (Hank 2004, Ginn 2003, Stegmann and Mika 2007), and have focused on either financial pension penalties (e.g. O'Rand and Landerman 1984) or self-report retirement (e.g. Hank 2004) as outcome variables. Research has suggested that child rearing delays self-report retirement (at least among West German women working after age 50), presumably because women seek to make up for labor market interruptions during their reproductive phase by prolonging employment (Hank 2004). Similarly, employment during child rearing years was associated with earlier retirement among American women, especially following their husband's retirement (Henretta et al. 1993). Studies that include both men and women suggest that parenthood has a highly gendered impact on retirement economic status, such that mothers are worse off and fathers better off than their childless peers (O'Rand and Landerman 1984). However, the restricted samples used in this research, i.e. women working after age 50 (Hank 2004) or unmarried women (O'Rand and Henretta 1982) complicate drawing general conclusions about the effects of parenthood on retirement. Such samples over-represent working women who accumulate independent pension entitlements. Thus, the results of these studies are not informative on how parenthood affects women who do not re-enter the labor market or do not regain stable labor force attachment after child birth, precisely those women whose retirement is likely most affected by their family biography.

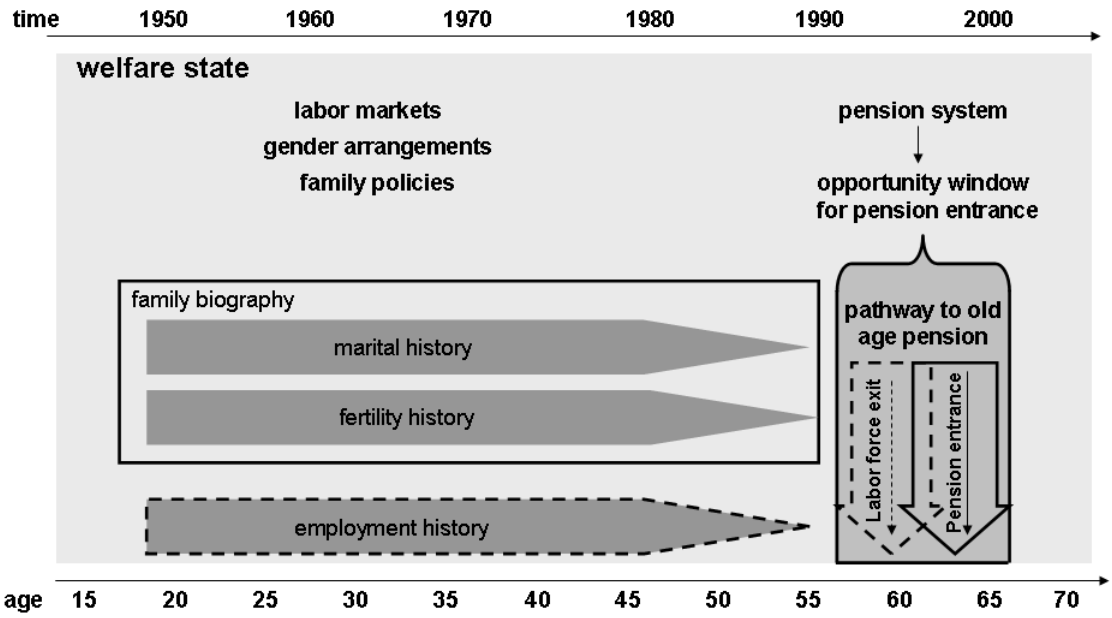
In sum, static one-time conceptualizations of retirement and selective samples have yielded gaps in retirement research, limiting our knowledge to selective population groups and 'traditional' one-time retirement transitions between employment and old age pension. Despite a theoretical emphasis on the process character of retirement (Kohli et al. 1991, Moen 2003) to date, little is known about non-traditional retirement processes, such as those experienced by homemakers and people with weak

labor market attachment in later life. An assessment of how family events over the life course, as divorce and parenthood, contribute to the emergence of specific retirement transition patterns under various institutional contexts requires a comprehensive cohort perspective including also non-traditional retirement processes.

1.2 Conceptual framework

Figure 1 illustrates the conceptual framework for the analyses and clarifies how the thesis contributes to the literature. The time lines at the top and bottom of the graph mark calendar time and age for the study cohort, born 1930-1940. Retirement

Figure 1.1: Conceptual framework



research has focused largely on the impact of employment histories on labor force exit, the elements framed with a dashed line in figure 1. Specifically, we seek to extend this view by adding the two factors framed with a solid line:

First, we include family biographies as an explanatory variable for retirement outcomes. The family biography is given by the marital and fertility history. We focus on two aspects of the family biography that pose specific life course risks for pension entrance, namely divorce and childcare interruptions.

Second, to grasp the process character of retirement we propose the concept of pathways to old age pension (section 3.1.). Pathways to old age pension are defined as the succession of primary income sources within the opportunity window for pension entrance set by national pension policies. Central transitions within pathways to old age pension are the labor force exit transition, and the pension entrance transition. They have to be analyzed separately because they affect different parts of the population and do not necessarily occur simultaneously. Instead, they may overlap or be separated by a gap. We focus on holistic pathways to old age pension and the pension entrance transition, the central transition within pathways to old age pension, as the outcomes of interest. We can therefore include people not employed in later in life in our analysis, crucial to examine family influences on retirement.

In addition to individual employment and family biographies, institutional structures of the welfare state shape pathways to old age pension. Labor market structures, gender arrangements, and family policies shape family biographies and employment histories. Through national eligibility conditions, pension systems determine the opportunity window for pension entrance, the age bracket within which people can theoretically begin to receive old age pension benefits. This opportunity window for pension entrance demarcates the temporal boundaries of pathways to old age pension.

1.3 Structure of thesis

Chapter 2 contrasts the historical emergence of pension institutions and recent reforms of the German and British pension systems, followed by an assessment of family provisions in pensions in the two countries. Each section ends with a brief clarification of the regulations in effect for the study cohort. We close by providing an overview of aggregate pension indicators and explain the comparative logic that guides the analysis.

In **chapter 3** we propose the concept of pathways to old age pension to analyze retirement as a process including non-standard transition processes. This part of the analysis is placed within the conceptual framework of differential life course sociology

(Mayer 2005). Standardization (Brückner and Mayer 2005) and turbulence (Elzinga 2006b) are specified as theoretically meaningful properties of pathways to old age pension. Hypotheses on the standardization and turbulence of pathways are derived from theories on the institutionalization of the life course (Mayer 2005, Leisering 2003). In particular, we discuss political economy approaches that emphasize labor market structures (Mayer 1997, Ebbinghaus 2006, Buchholz et al.2006), life course effects of social policies (Leisering 2003, Rein and Schmähl 2004, Guillemard 2000), and the relationship between individual differences and institutional structures. We hypothesize that pathways to old age pension will be less turbulent and more standardized in Germany compared to the United Kingdom. Three hypotheses on income inequality related to turbulence and standardization are discussed: status maintenance, cumulative advantage, and status leveling (Mayer et al. 1999, O'Rand and Henretta 1999, Dannefer 2003, DiPrete and Eirich 2006).

In **chapter 4** we place the analysis of pension entrance as an outcome of divorce and childcare interruptions within the framework of rational choice theory. We adopt a sociological approach to rational choice theory (Coleman 1990, Esser 1996, Hedström and Swedberg 1998) by specifying a behavioral model as an auxiliary assumption and focusing on how divorce and childcare interruptions alter the 'logic of the situation', the restrictions to pension entrance. Based on a discussion of bounded rationality (Simon 1957, Savage 1954, Kahneman 2003) and behavioral retirement economics (Thaler 1991, Aaron 1999), we assume that boundedly rational actors will follow simple behavioral rules and generally enter old age pension as early as possible. We derive hypotheses from the historic specificity of the 'logic of the situation' (Blossfeld and Prein 1998) as the study cohort faced the pension entrance situation. Before summarizing our hypotheses, we briefly discuss implications of family theories for family biographies and retirement.

In **chapter 5** we contrast the methods employed in the thesis: sequence analysis (Abbott and Tsay 2000) and event history analysis (Tuma et al. 1979). Taking the methodological development in life course sociology as a starting point, we elaborate the complementary strengths of the two methods. We draw attention to the most

recent and promising developments in sequence analysis (e.g. Elzinga 2003, 2006a, 2006b, Lesnard 2006) and argue that recent developments of sequence analysis followed criticism of the pioneering work, particularly optimal matching analysis. The critical debate triggered a 'second wave' of sequence analysis (Aisenbrey and Fasang 2007) that led to new technical implementations. We bring these new technical approaches together and highlight the added value they bring to the analysis of life course trajectories in general and the retirement transition process in particular in addition to traditionally applied event history methods.

In **chapter 6** we apply several recent advancements of sequence analysis to compare the structure of pathways to old age pension in Germany and the United Kingdom (Elzinga 2003, 2006a, 2006b, Lesnard 2006). Turbulence is applied to assess within person variability of pathways across time. Sequence distances indicating standardization reflect between person variation of pathways to old age pension. By bootstrapping (Efron and Tibshirani 1993) sequence metrics, we move beyond the pure exploratory application of sequence analysis and can assess statistical significances of cross-country differences. Exploiting the descriptive, exploratory power of sequence analysis we subsequently identify prevalent pathways to old age pension in the comparison countries. We close with an examination of income inequalities across pathways.

In **chapter 7** we specify event history models on the impact of divorce and childcare interruptions on pension entrance timing. We descriptively examine the hazard rates of entering old age pension and the central independent variables over the life course: fertility, marital and employment histories. Subsequently, we elaborate our modeling strategy and present discrete time logistic regression models (Allison 1982). We specify single risk models of entering state pensions in Germany. For the United Kingdom we calculate competing risk models of entering state pensions, or occupational and/or private pensions. First, all models are calculated separately for men and women within each country, followed by an integrated model including gender interaction effects. We examine how the results for Germany change when using a self-report measure of retirement versus using a pension entrance measure reconstructed

from income information.

Chapter 8 concludes by highlighting the substantive and methodological contributions of the thesis. Substantively, we approached the emergence of gender inequalities in pensions from two perspectives. First, as they evolve during the retirement transition process, and second how they are generated by family events earlier in the life course. We relate the standardization and turbulence of pathways to old age pension to specific national institutions and discuss prevalent pathways identified that show highly gendered structures in both countries. Different types of gaps between employment and old age pensions show different temporal structures and call for specific policy interventions to narrow them. With regard to the impact of divorce and childcare interruptions our results underline the powerful impact of policies that directly connect family events to pensions, as pension sharing upon divorce and possibilities to accumulate pension entitlements through typical female employment patterns coined by discontinuity and part-time work. Not only the content of these regulations, but also the way they are implemented, e.g. as defaults or legal options, is decisive.

Methodologically, our contribution is twofold. First, we explore recent advancements in sequence analysis for retirement research and critically discuss the added value of sequence analysis in addition to the insights gained with event history analysis. Second, we bring together lessons learned about the ambiguity of different conceptualizations of retirement, e.g. pension entrance, labor force exit, or self-report retirement, a recurring topic throughout the thesis. We close with a non-technical summary of policy implications, limitations of the analysis, and avenues for future research.

Chapter 2

Old age pensions in West Germany and the United Kingdom

Comparative research is frequently based on the classification of countries into overarching welfare regimes (e.g. Esping-Andersen 1990). Following this line of research, old age pensions in Germany and the United Kingdom can be placed in different welfare state traditions. Germany represents the protectionist conservative welfare regime based on the principle of subsidiarity. The United Kingdom is classified as a liberal welfare state assigning primary responsibility for the provision of welfare to the individual. Public Pay-as-you-go (PAYG)[1] financed pensions have been dominant in the protectionist 'Bismarck' pension system in Germany following World War II. In the United Kingdom the subsidiary so called 'Beveridge' pension model is dominant, in which occupational pensions have a strong tradition accompanied by a higher institutional differentiation of pension provision.

The comparative welfare regime approach has been criticized as overly generalizing and static, neglecting that welfare sub-systems in single countries may differ from overall regime types and are subject to change over time (Offe 1993, Kasza 2002). Critics argue that social policies are not well captured in static regime types. Social policies rather create an ever changing opportunity structure in which individual life

[1] Pay as you go financing means that pension expenditure in the current period is financed from social security contributions in the same period, i.e. that current employees finance current pensioners.

courses evolve. This is particularly relevant in the field of old age pensions, because large time lags between entitlement accumulation and benefit receipt generate strong path dependence in pension policy (Myles and Pierson 2001).

We take this into account with a dynamic perspective on changing pension regulations in Germany and the United Kingdom over time. We clarify the pension regulations in effect for the cohort born 1930-1940, a group of people united through "their unique location in the stream of history" (Ryder 1965: 844). The comparative logic underlying our approach follows a case oriented difference in similarity design (Tilly 1984, Ragin 1987) emphasizing the historically specific opportunity structure encountered by the study cohort. We attempt to "artificially open an observation window with regard to an already continuously flowing stream of history" (Blossfeld and Prein 1998: 20). We hold the male breadwinner context across the study cohorts working lives constant (Lewis and Ostner 1994), while the pension systems in effect for the study cohort in Germany and the United Kingdom were at the height of institutional differences (Rein and Schmähl 2004, Ginn et al. 2007).

In both Germany and the United Kingdom the traditional 'housewife model' of the male breadwinner family remained dominant long into the post World War II period (Pfau-Effinger 2005: 29). This is expressed in a high percentage of women working part-time for family reasons,[2] and correspondingly a high amount of care taking place at home. Family values separate a public sphere in which men are employed, from a private sphere in which women provide childcare along with the construction of 'childhood' as a life phase in which children require special care in the private household (ibid.).

In Germany a generous, nearly universal state pension system with numerous early entrance routes was effective for the study cohort. In the United Kingdom a highly differentiated pension system was in place in which state pensions provided only subsistence income and early entrance options did not exist. This enables us to examine how maximally different pension systems shape retirement processes as outcomes of family biographies that evolved in similar gender and family structures.

[2]Even by the end of the 1990s 24 percent of women were working part-time for family reasons in West Germany and the United Kingdom (Pfau-Effinger 2005: 29).

We can assess how divorce and childcare interruptions in male bread winner societies are penalized or rewarded in a 'Bismarck' compared to a 'Beveridge' type pension system.

The chapter is structured as follows. After sketching the historical emergence of the pension systems in Germany and the United Kingdom, we contrast gender arrangements and family provisions in pensions. Both sections close with a clarification of the regulations in effect for the study cohort (1930-1940) during the observation period (1990-2005). We conclude with a brief overview of relevant pension indicators in the two countries and an explication of our comparative design.

2.1 Historical emergence and basic institutions

It is often not trivial to clarify pension regulations in effect for a specific birth cohort, since pension reforms tend to be introduced with complex transitional arrangements. Characteristics such as date of birth, date of pension entrance, number of contribution years, or combinations of these and similar criteria may lead to different pension options for otherwise similar people. The regulations in effect for the study cohort cannot be traced without an understanding of the development of pension reforms in the comparison countries. In the following we place the pension regulations in effect for the study cohort within the temporal development of pension reform. The analysis shows that the pension systems in effect for the study cohort were at the height of prototypical institutional differences, while they recently show converging tendencies (Ginn et al. 2007).

Germany

Germany was the first European country to introduce a state pension in 1889 under Bismarck with the 'gesetzliche Rentenversicherung' (GRV). Benefit levels were generally low fostering high old age poverty and frequent reliance on charity and family support in old age (Schulze and Jochem 2007). Since pensions were static and not adjusted to prices or wages, their value detoriated over time widening the gap between

pensioners and employees.

Major reforms during the 20th century were implemented in 1957, 1972 and 1992/1999.[3] They demarcate formative periods of the pension system: (1) establishment of a generous PAYG system (1957-1971), (2) expansion of early retirement options (1972-1990), and (3) incremental retrenchment of early retirement and reduction of benefit levels (1992-2001). Reforms since 2001 introduced a paradigm shift towards a retrenchment of state pensions and an expansion of private pensions.

The *1957 reform* laid the foundation for the pension system in effect in the second half of the 20th century. It was motivated by the objective to let pensioners take part in the economic boom following World War II (Schmähl 2007). For the first time state pensions were intended to go beyond supplementary subsistence income and function as earnings replacement. Contrary to common beliefs, PAYG financing was not a constitutive element of the GRV coined by Bismarck and only introduced in 1957 (Börsch-Supan 2000).[4] Core element of the 1957 reform was the replacement of the static pension by a dynamic pension calculation. The new dynamic pension was progressively linked to relative average income achieved during working life and regularly adjusted to national gross wage levels (ibid.). This maintained the relative value of pensions to earnings. Even though there was no minimum pension, the majority of pensions was far above the social assistance level, granting an average wage replacement of 70 percent for full life time employment histories (Hentschel 1983, Börsch-Supan and Schnabel 1998).

Several regulations of the 1957 reform were targeted at specific population groups, among others women and the unemployed. State pension age was 65, but early entrance at age 60 became possible for the unemployed and for women (Deutsche Rentenversicherung 2007: 234). Women born before 1957 could enter old age pension at age 60, conditional on 15 contribution years of which at least 10 had to be after

[3] This refers to the Federal Republic of Germany (FRG). In the German Democratic Republic (GDR) the original GRV stayed in effect until 1990 with only minor modifications.

[4] The introduction of PAYG financing was a pragmatic solution, because the pre-war pension funds no longer existed. The PAYG principle was then known as the 'Mackenroth thesis' (Kreislauftheorie), also inherent in Beveridge's original plan for the United Kingdom elaborated below: all expenditures should be financed with income from the current period in compulsory social insurance (Schmähl 2007).

age 40. This regulation became known as the *woman's pension.*

The *Pension Reform Act 1972* improved the pension protection for vulnerable groups (Meyer and Pfau-Effinger 2006: 84). Core elements were an increase in pensions for low income and part-time workers, the expansion of early retirement options, and the extension of voluntary insurance coverage to the self-employed (Deutsche Rentenversicherung 2007, Schulze and Jochem 2007: 672). Women, the unemployed, and severely disabled could enter old age pension at age 60 given sufficient contribution periods. Pension entrance at age 63 was enabled conditional on 35 contribution years that would classify persons as 'long time insured' (langjährig Versicherte) (Deutsche Rentenversicherung 2007: 248).[5] Taken together, the early retirement regulations introduced a flexible retirement window between 60 and 65 (Flexible Altersrente). None of these early entrance options was related to actuarial deductions in pension level (Börsch-Supan 2000: F30). This set strong incentives for early retirement and the employment rate of men aged 63 plummeted from 67 percent in 1972 to about 20 percent in less than 20 years (Ginn et al. 2007). In light of rising unemployment following the first oil crisis in 1973, the newly available early retirement options appeared as an easy, socially acceptable way to externalize older workers. This trend was intensified following the second oil crisis in 1979 fueling the debated about the necessity of additional early retirement regulations (Deutsche Rentenversicherung 2007: 250).

The *1980s* were coined by an increasing coordination of labor market and pension policy to foster early retirement, either through generous unemployment benefits or subsidized firm level arrangements (Teipen and Kohli 2004). Unemployment benefits were paid for a longer period of time for older workers until they could enter normal old age pension at age 60. A commonly applied practice was to externalize older employees into transitory unemployment as early before age 60 as prolonged unemployment benefits were paid, optionally topped up by employer compensations. This became known as the *59er regulation*, because many employees stopped working at age 59 to receive unemployment benefits until entering old age pension at age 60

[5]Higher education and military service were credited as insurance periods within the necessary 35 years (Börsch-Supan 2000: F30).

(Koller 2001). In effect employees could exit employment as early as age 57,5 for some time (Teipen and Kohli 2004). The *'59er' regulation* can be understood as a coalition by the state and employers to externalize older workers burdening the unemployment insurance and old age pension reserves (Maltby et al. 2004).

In addition to early pension entrance via unemployment, legislation during the 1980s facilitated firm level early retirement with the *1984 pre-retirement law* (Vorruhestandsgesetz) and the *1989 partial retirement law* (Altersteilzeitgesetz) to vacate jobs and mitigate youth unemployment (Deutsche Rentenversicherung 2007). According to the pre-retirement regulation employees between age 58 and 63 could stop working while continuously receiving 65 percent of their last gross income.[6] Usually jobs were not filled, but simply lost and pre-retirement was used as an option to circumvent job protection of older workers. To counteract this misuse, pre-retirement was replaced with partial retirement in 1989. In partial retirement full-time employees could reduce their working time by half at age 58 and enter old age pension early at age 60, equal to the unemployed. They would receive 70 percent of their salary while working 50 percent, and accumulate pension entitlements as if they were working 90 percent of their prior full-time job. In 1996 partial retirement was extended from 2 to 5 years. At the same time pension age after partial retirement was augmented to age 63 from 60, but pension entrance at age 60 remained possible with deductions (Klammer 2003). After 1996 partial retirement could be implemented in form of a *block model*. Out of 5 years in total persons continued to work full-time for 2,5 years beginning from age 57 or 58, and then completely stopped working at age 60 or 61. They would receive 70 percent of their previous income over the entire 5 year period. After 1996 partial retirement was heavily used in form of the block model (Klammer 2003).

The *1990s* were coined by high unemployment and soaring expenses related to the unification process. Partial retirement and the *59er regulation* further reduced the shrinking contribution base of the PAYG system, on top of high unemployment

[6] If a pre-retirees job was filled with an unemployed or labor market entrant, labor costs for the pre-retiree were subsidized. The pre-retirement regulation affected all full-time employees who had reached age 58 and were born before 1931 in 1988.

and increasing marginal employment exempt of pension contributions (Börsch-Supan 2000). During this time the reserves of the PAYG system repeatedly fell below the required minimum levels (Meyer and Pfau-Effinger 2006: 87), putting cost containment on the top of the political agenda for pension reform.

The so-called *Blüm*[7] *I (1992)* and *Blüm II (1999)* reforms, driven by the aftermath of reunification in 1989, increased eligibility requirements for early retirement and introduced a stepwise reduction of state pensions. In contrast to the incremental adjustments in the Blüm reforms, the so called *Riester (2001)* and *Rürup (2004) reforms*[8] introduced a paradigm shift in German pension policy with a renunciation of dynamic PAYG funded pensions (Hinrichs 2003, Ginn et al. 2007, Schmähl 2007). Instead, private and predominantly static pensions were extended. In 2001 the level of state pensions was capped at 64 percent of previous earnings. To counterbalance the overall loss in state pensions, voluntary private pensions were subsidized and the *Grundsicherung* was introduced in 2003 as a means tested benefit for pensioners (Meyer and Pfau-Effinger 2006). Grundsicherung provides the same amount as social assistance and the means test is applied to a couple's income and assets.

Occupational pensions were subsidized through tax incentives and social insurance contribution rebates.[9] People are encouraged to save into a personal pension scheme with tax breaks and flat rate state contributions that top up own savings, known as the *Riester Pension*. Due to tax progression higher earners benefit from the tax breaks, while lower earners should benefit from the flat rate state support (Himmelreicher and Viebrok 2003). The Riester Pension recently has come into increasing public debate as a classic case of the so called *pension poverty trap* (Ginn et al. 2007). Because Riester Pensions are taken into account for means-testing, low income pensioners may forfeit means-tested benefits if they accumulated Riester Pensions. This discourages

[7]Norbert Blüm was secretary of state for employment and social order between 1982 and 1998.

[8]Walter Riester followed Norbert Blüm as secretary of state for employment and social order from 1998 until 2002. Bernd Rürup headed an expert commissions for sustainability of social insurance in Germany ('Sachverständigenkommission zur Neuordnung der Besteuerung von Altersvorsorgeaufwendungen und Alterseinkommen' and 'Kommission für die Nachhaltigkeit in der Finanzierung der sozialen Sicherungssysteme'.

[9]Since 2002 it is mandatory for employers to offer employees the possibility to pay part of their wages into a funded pension scheme. Employers are not required to make contributions, but in effect often do.

personal savings of those hardest hit by the retrenchment of state pensions and most likely in the greatest need of additional personal savings: persons with low income and discontinuous employment careers.

In addition to the retrenchment of state pensions, the unemployment insurance and assistance was cut between 2003 and 2005 with the so called Hartz reforms. The *'59er' regulation* was abolished and since 2005 the duration and generosity of unemployment payment was reduced to incentivize re-entry to the labor market of older unemployed persons (Mika and Baumann 2007). In combination with tightened unemployment benefits recent pension reforms have led to rather pessimistic outlooks on the financial security of future pensioners heralding a new period of pre-retirement precarity in Germany (ibid.), after old age poverty was well below the European average over the past decades (Council of the European Union 2003). Current issues in the pension debate center on details around the 2006 agreement to gradually raise state pension age to 67 beginning from 2012 and the adequacy of future pension provision. Tables 2.4 and 2.5 in the appendix to this chapter provide an overview of the major reforms of the German pension system in the 20th and early 21st century.

United Kingdom

The first state old age pension system in Britain was established by the Liberal government in 1908 (Schulze and Moran 2007: 59). Pensions provided tax financed means-tested benefits at age 70 that were generally below subsistence level. Major reforms of the British pension system during the 20th century were implemented in 1946, 1975, and 1986. They demarcate three formative periods of the pension system since 1940 (Ginn 2003): (1) the establishment of state and private schemes (1940-1974), (2) an expansion of state pensions (1975-1980), and (3) state pension retrenchment combined with the promotion of private pensions (since 1980). Reforms since 2000 have made private pensions more widely available and strengthened the minimum safety net for pensioners.

The *1946 National Insurance Act* (NI) laid the foundation for the post World War II pension system, following suggestions of Lord Beveridge formulated in 1942. The

Beveridge Report suggested flat-rate benefits for flat-rate contributions in a uniform National Insurance system that would provide subsistence income for pensioners, the disabled, unemployed, and widowed (Schulze and Moran 2007: 59). At the same time benefit levels were supposed to be low enough to encourage voluntary additional savings and generally failed to provide pensions above poverty level (Ginn 2003: 11, Schulze and Moran 2007). In contrast to Germany, the provision of pensions above subsistence minimum was left to private and occupational pension providers, boosting the institutional differentiation of pension provision into numerous pension schemes (Hannah 1986: 39). Occupational pensions already had a strong tradition before the Beveridge reforms in the United Kingdom.[10] However, the low level of state pensions promoted the expansion of occupational pension coverage from 13 percent of the workforce in 1936 to 47 percent in 1967 and around 50 percent in the 1970s (Hannah 1986).

In 1961 the first state earnings related scheme was introduced for those excluded from occupational pensions, the *Graduated Pension*. Participation in the Graduated Pension was mandatory, but it was possible to contract out into occupational pension schemes that met certain standards.[11] Given the low level of Basic State Pensions (BSPs), the Graduated Pension was too small to meet a large demand for earnings related pensions (Ginn 2003). This further increased the importance of occupational pension coverage for pensions above poverty level.

The *1975 Social Security Benefits Act* revitalized state pensions with the objective to raise BSP above means tested benefits and maintain the relative value of pensions to earnings. Indexation of BSP was linked to rises in national earnings or prices, whichever was higher (Blake 2004). The Graduated Pension was replaced by the State Earnings Related Pension Scheme (SERPS). SERPS was designed to provide pensions at 25 percent of previous earnings taking the 20 years with the highest earnings as the assessment base (Ginn 2003). Contributions to SERPS through the National Insurance scheme were compulsory for all employees earning above the lower

[10] The first occupational pension scheme originated as early as 1810 for the disabled in civil services (Schulze and Moran 2007: 60).

[11] Employers had to pay above a minimum required to replace the state second tier to their pension scheme.

earnings limit, unless contracted out to an approved occupational pension scheme. SERPS would have only fully matured in 1998 due to a relatively long transition period (Schulze and Moran 2007: 60). However, SERPS as introduced in 1975 was short lived since state pensions were cut back again in the 1980s.

Beginning with the *1980s* the privatisation of old age pensions was fostered with a substantial retrenchment of state pensions The indexation of BSP was limited to prices, instead of either prices or earnings whichever was higher, eroding the relative value of BSP to earnings. They have continuously fallen further below means tested benefits since (Ginn 2003, Blake 2004). In the *1986 Social Security Act*, the most drastic reform during this period, SERPS was scaled back from a maximum of 25 percent to 20 percent of previous earnings. A comparison with the average 70 percent replacement rate provided by German state pensions puts these numbers into perspective. The assessment base for SERPS was extended to the entire working life from the best 20 years (Schulze and Moran 2007). The combined effect of changes in SERPS has reduced SERPS benefits by approximately two-thirds (Blake 2004).

Since 1988 contracting out of SERPS and occupational pension schemes into personal pension schemes was promoted with National Insurance rebates and tax breaks. As a consequence, opting out of SERPS or advantageous occupational pensions into dubious personal schemes under high pressure sales techniques became a wide spread and consequential problem that erupted with the 'mis-selling scandal' in 1993 (Ward 1996, Blake 2004). An estimated 90 percent of persons who contracted into personal pension schemes had been given inappropriate advice (Blake 2004). Many contracted into personal pension schemes to which employers did not contribute, that came with high administrative charges, and provided poor investment returns (Disney and Johnson 1997).

Recent reforms legislated in 1995, 1999, 2000, and 2004 mark a trend towards an expansion of pension coverage (Ginn 2003, Schulze and Moran 2007). The *1995 Pension Act* set up a protective legislative framework against fraud and mismanagement of pension funds (OPRA) reacting to increasing protest following mis-selling scandals (Ward 1996, Ginn 2003). The exclusion of part-time workers from occupational

pension schemes, unlawful in the EU since 1986, was prohibited in 1995 (Ginn 2003).

The *Welfare Reform and Pension Act* 1999 aimed to make occupational and private alternatives more widely available and strengthen the minimum social safety net for pensioners (Schulze and Moran 2007: 60). Core elements of the reform were the introduction of a special means tested benefit for pensioners, the Minimum Income Guarantee (MIG), and Stakeholder Pensions (SHPs). SHPs are a more regulated form of personal pensions provided by the same companies, but directed towards people with modest incomes. Employers with more than five employees who do not operate an approved occupational pension scheme are required to offer an SHP. This provides a supplementary pension option for more part-time workers in small private sector firms, previously excluded from occupational and private pensions (Schulze and Moran 2007).

In the *2000 Child Support, Pensions and Social Security Act* SERPS was replaced with the State Second Pension (S2P), which was enacted in 2002 (Ginn 2003, Schulze and Moran 2007). While SERPS had been fully earnings related, S2P provides higher flat rate benefits for people below a certain earnings threshold. However, according to projections, BSP and S2P combined will provide pension levels below which means-tested benefits are payable (Ginn 2003). Similar to the *Riester Pension* in Germany, the pension poverty trap is a problem in the reformed British system: additional savings or earnings bring no financial gain, because of the loss of means tested benefits. Over the past two decades old age poverty was well above the European average in the United Kingdom (Council of the European Union 2003). Aware of the problem of an insufficient S2P level, the British government raised the means-tested social assistance for pensioners above poverty line (Meyer and Pfau-Effinger 2006) by replacing MIG with the so called *Pension Credit* in 2003. In contrast to the *Grundsicherung* in Germany, Pension Credit is above the social assistance that non-pensioners receive. The most recent legislative changes with the *2004 Pension Reform* established a Pension Protection Fund (PPF) to compensate for a loss of occupational pensions in case of employer bankruptcy. Table 2.6 and 2.7 in the appendix to this chapter provide an overview of pension reforms in the United Kingdom.

Regulations in effect for the study cohort

In this section we briefly clarify pension regulations in effect for the study cohort. The basic structural differences in the pension systems in effect for the study cohort (1930-1940) in Germany and the United Kingdom are contrasted in table 2.1.

Germany

The PAYG system in effect for the study cohort in Germany provided generous highly regulated state pensions that foster early labor force exit and high financial security for pensioners. A positive feature is low old age poverty. Ongoing points of criticism have been the systems vulnerability to labor market changes, financial unsustainability and discouragement of older workers labor force participation, which have motivated the current paradigm shift in German pension policy.

For the study cohort occupational and private pensions were of minor relevance. While occupational pensions were fairly wide spread, in 1999 they were the least important pillar accounting for only 7 percent of pension income followed by 10 percent from private pensions, mainly life insurances. The majority of 78 percent of pension income was provided by state pensions (Council of the European Union 2003: 32).

All members of the study cohort had a claim on a public pension when reaching the normal retirement age of 65 conditional on a minimum of 5 contribution years (Börsch-Supan and Schnabel 1998). The self employed could contribute to the state pension system. Normal state pension age was 65. After 35 years of insurance, pensions were available at age 63. The severely disabled, long-term unemployed, and women could enter old age pension at age 60. To be eligible to the *woman's pension*, women had to be employed for 10 years after age 40 and 15 years in total, implying a disproportionately high pension reward for female employment after age 40.

Pension claims were based on two factors: (1) earnings points given by individual gross earnings in a specific year divided by the average gross earnings of all insured persons in this years, and (2) the number of contribution years (Schmähl 2003). For benefit levels it was in principle irrelevant, whether earnings points were accumu-

lated during stable or discontinuous employment careers (Stegmann and Mika 2007). Part-time employment often accumulated pension entitlements, since a substantial fraction of part-time jobs was located in the public sector providing high fringe benefits (Blossfeld 1997).

The study cohort is the first and last cohort that benefited in large numbers from both institutionalized early retirement via unemployment and generously subsidized partial retirement. All cohort members could enter old age pension following unemployment or partial retirement at age 60. Persons born 1937 or later had to accept gradually fading in benefit deductions (Koller 2001: 7). Complicated transitional arrangements with a stepwise increase of retirement age depending on month of birth, contribution periods and time of pension entrance slowly fade out the *'59er' regulation* after unemployment, thus the changes for persons born between 1937 and 1940 refer to only a few month difference compared to other members of the study cohort.

The study cohort experienced the retirement transition process at the height of generous state subsidized partial retirement. They just missed the pre-retirement (Vorruhestand) regulation from 1984, but fully fell into the partial retirement (Altersteilzeit) window open throughout the 1990s and early 2000s. Legislation in 2000 and 2005 gradually tightened the partial retirement option and it will be fully closed by 2009. The study cohort is also the last cohort for whom the early entrance option for women and severely disabled at age 60 is effective.

In sum, the retirement transition processes of the study cohort evolved in an opportunity structure coined by high unemployment and institutionalized early entrance options, most prominently unemployment and partial retirement arrangements (Teipen and Kohli 2004). The foundation laid by the 1957 PAYG financed pension insurance combined with numerous early retirement options introduced throughout the 1970s and 1980s created a highly regulated, practically universal state pension system of unprecedented generosity in the history of German pension provision in effect for the study cohort (see table 2.1). Older cohorts did not benefit in large numbers of institutionalized pre- and partial retirement, cohorts who retired before 1957 could not rely on state pensions for subsistence. For younger cohorts subsidized firm

Table 2.1: Core features in pensions for the study cohort

West DE	UK
• universal state pensions • mandatory participation • generous state pensions • numerous early pension entrance options and institutionalized bridges	• high importance of occupational and private pensions • voluntary participation in occupational and private pensions with limited access • state pensions at or below subsistence level • no early entrance options or institutionalized bridges

level early retirement and early entrance regulations are closed at generally far lower state pensions, later state pension age and increasing importance of private pensions.

United Kingdom

The market-based British system in effect for the study cohort was financially sustainable and non-distortive for the labor market (Schulze and Moran 2007, Blake 2004). Debated problems of the system remain relatively high inequality and old age poverty raising doubts about its political sustainability (Ginn 2003: 19). They have recently induced a stepwise expansion of pension protection.

The pension system in effect for the study cohort was set up as a three pillar mixed system based on (1) mandatory state pensions, (2) voluntary occupational pensions and (3) voluntary private pensions (Schulze and Moran 2007). State pensions remain the most important pillar in the United Kingdom, followed by occupational pensions. While additional private pensions including investment income are wide spread, they provide only a small fraction of pensioner income (see figure 2.4).

The *state pension pillar* consists of the flat rate BSP and supplementary state earnings related pension scheme SERPS, later State Second Pension (S2P). For the study cohort primarily SERPS was relevant, because only few cohort members accumulated S2P after its introduction in 2002. The transitional arrangement between SERPS and S2P was that people would receive their accrued SERPS entitlement

combined with their accrued S2P entitlement.[12] Both types of state pensions, BSP and SERPS/S2P are financed on a PAYG principle through National Insurance contributions (Schulze and Moran 2007).[13] The self-employed contribute to BSP, but are not covered by the state earnings related pensions SERPS/S2P (Schulze and Moran 2007: 61).

State pension age is 65 for men and 60 for women for the study cohort. Eligibility to a full flat rate BSP is dependent on 90 percent contribution of the potential working career between 16 and 65 for men and between 16 and 60 for women, i.e. 44 years for men and 39 years for women. Eligibility to any BSP requires a minimum qualifying period of ten years (Schulze and Moran 2007: 64/65). Drawing SERPS/S2P is possible on reaching official pension age with a minimum contribution period of one year. The adverse affects of the reduction of SERPS from the best 20 years to life time earnings and lower benefit levels in 1986 affected everybody contributing to the system until SERPS was replaced by S2P (1988 - 2002).[14] For the study cohort primarily the original SERPS was relevant.[15] It was possible to contract out of SERPS/S2P into various forms of approved occupational schemes, particularly incentivized since 1988.

The *second and third pillar* in the British system are given by voluntary occupational and private pensions. Approved contracted out schemes take three basic forms: (1) final salary, so called defined benefit (DB) occupational pension plans, (2) defined contribution (DC) occupational pensions plan, also called money purchase plans, and (3) personal pensions, that include stakeholder pensions (SHPs) since 2001. Those

[12]SERPS accrual was replaced by S2P accrual on April 5th 2002. If a person had 15 years of SERPS and 2 years of S2P he or she would get the SERPS entitlement accrued in 15 years combined with the S2P entitlement accrued in the remaining 2 years. People already in old age pension were not affected by the changes (Debora Price, personal communication).

[13]National Insurance contributions are general social security contributions and cover not only old age pensions, but sickness, disability and job seeker's allowance - the relatively meager counterpart to German unemployment benefit.

[14]Jay Ginn, personal communication.

[15]The original SERPS applied to people with a state pension age before April 1999. Persons whose state pension age was in the period between April 1999 and April 2009, women born after 1939 and men born after 1934 would get between 20 percent and 25 percent for post April 1988 accrual only. The 20 percent restriction would apply in full to those who reach state pension age in April 2009, thus this does not apply to the study cohort.(http://www.rlcm.co.uk/scotlife/Web/Site/Adviser/TechnicalCentralArea/InformationGuidance/General/TheStateSecondPensionExplainedPage.asp [29 January, 2008]).

who lack access to option 1 and 2, the occupational pension schemes, can choose between first pillar SERPS/S2P and third pillar SHPs.[16] In the mid 1990s 150.000 private occupational and personal pension schemes were available (Schulze and Moran 2007: 62), creating and overwhelming complexity and intransparence of personal pensions. Generally personal pensions provide poor value for people with low income and discontinuous employment histories (Ginn 2003). Incentives for contracting out and pressure selling between 1988 and 1994 were mainly directed at younger cohorts, but affected people in the study cohort, despite them being too old and/or low paid for contracting out to be advisable.[17] A significant percentage of the low paid and those aged over 40 had chosen a personal pension over SERPS, or left their occupational pension (Ginn and Arber 1996).

Female part-time workers were usually excluded from occupational pensions, because part-time jobs were concentrated with small employers in the private sector that did not provide occupational pensions (Ginn and Arber 1993). Recent changes with the 1995 Pension Act and the introduction of SHPs in 2001 came to late to substantially effect the study cohort. Earnings below the lower earnings limit did not accumulate entitlements to state pensions. This also applied to persons who worked more than one part-time job below the lower earnings limit, since earnings are taken into account per job and not in total.[18]

Quite the opposite to the situation the study cohort faced in Germany, institutionalized early retirement or partial retirement did not exist in the United Kingdom (Schulze and Moran 2007). Concurrent employment while drawing pension benefits was possible. Occupational and private pensions could be drawn from age 50, albeit usually at high deductions if drawn before state pension age.[19]

In contrast to Germany, the opportunity structure in which the retirement transition processes of the study cohort in the United Kingdom evolved, fully placed the

[16] To qualify for contracting out of SERPS/S2P or as SHPs, occupational and private pensions have to be adjusted to prices and the benefits must be expected to be at least as high as SERPS/S2P benefits.

[17] Jay Ginn, personal communication.

[18] Debora Price, personal communication.

[19] Jay Ginn, personal communication.

responsibility of managing the transition process on individuals. Institutionalized transition routes or early exit options did not exist. On the contrary, individual responsibility was fostered by high institutional differentiation fueled with a boost in personal pension schemes following retrenchment of state pensions in 1986. Younger cohorts in the United Kingdom should benefit from SHPs, more generous means tested benefits with the Pension Credit and the stronger redistributive feature of S2P compared to SERPS. Older cohorts were not affected by the retrenchment of state pensions in 1986. The study cohort was arguably the most vulnerable group to disadvantageous contracting out following pressure selling strategies. They were too old for contracting out to be advisable, but shortly before their retirement transition contracting out was most incentivized and least regulated.

One consequence of the basic institutional differences summarized in table 2.1, is that the German and British pension systems primarily differentiate on country specific outcomes. The German pension system foremost stratified in terms of options for the *timing* of entrance to state pensions. The British pension system on the other hand, primarily differentiated in terms of access to different *pension types*, i.e. state pensions, occupational pensions, and private pensions.

2.2 Gender arrangements and family provisions in pensions

Throughout the life courses of the study cohort, Germany and the United Kingdom are classified as strong male bread winner societies (Lewis and Ostner 1994, Pfau-Effinger 2005). The male breadwinner model is defined as an arrangement that assumes employment and financial independence as the norm for men and economic inactivity combined with financial dependence, mostly through marriage, as the norm for women (Meyer and Pfau-Effinger 2006). Gender norms in pensions are expressed in the degree to which pensions reward or penalize a male breadwinner model throughout working life and foster female dependence in retirement (ibid.). They become manifest in family provisions in pensions (O'Grady-LeShane and Williamson 1992).

Table 2.2: Pension policies enforcing/rewarding a male breadwinner model

strong enforcement of male breadwinner model	• extensive derived benefits • barriers to independent female entitlement accumulation
moderate enforcement of male breadwinner model	• extensive derived benefits • realistic possibility of independent female entitlement accumulation
no enforcement of male breadwinner model	1. independent pensions above poverty level for men and women (independence model) 2. insufficient pensions for men and women

Source: Own representation following Meyer and Pfau-Effinger (2006)

Family provisions in old age pensions take two basic forms: derived benefits for dependent spouses and care credits. Meyer and Pfau-Effinger (2006: 81) propose three prototypical gender arrangements in pensions (see table 2.2): strong, moderate, and no enforcement of the male breadwinner model. We use these ideal typical models as a guideline to classify gender arrangements in pensions in Germany and the United Kingdom for the study cohort. We first present a basic framework for family provisions in pensions, followed by an examination of specific policies in Germany and the United Kingdom and a clarification of the regulations in effect for the study cohort.

Strong enforcement of the male breadwinner model in pensions is given when married women face strong barriers to independent entitlement accumulation and are expected to claim derived pensions from their husbands instead. Entitlements accrued in one relationship are lost as soon as a woman re-marries and are thus fully dependent one a woman's relationship status. Typical forms are derived rights for widows and dependent spouses accrued by a male breadwinner. Means-testing based on household income can forfeit means tested benefits for women, because of a husband's higher income.

In pension systems that *moderately enforce a male breadwinner model* married women can accumulate pension entitlements both through derived benefits and employment. Policies are partly the same as in a strong enforcement of the male bread-

winner model; e.g. derived benefits for dependent spouses and widows, or means-tested benefits based on household income. The decisive difference is that it is realistically possible for women to generate independent entitlements through employment, regardless of working hours and type of contract. Some pension credit for care can also occur in this type of pension system. Dependence on a male breadwinner in retirement is still likely, but not as strong as in pension systems that strongly enforce a male breadwinner model.

No enforcement of a male breadwinner model in pensions can take two forms: sufficient independent pensions for men and women (independence model), or insufficient pensions for men and women. The independence model can be realized through generous citizenship pensions or employment related pensions that cover all types of employment and care interruptions. In the second option, gender equality through insufficient pensions, low pensions equally push men and women towards the labor market. This would be realized in a system of state pensions below poverty line in which men and women have equal access to occupational and private pensions.

These incentives in pension systems do not necessarily translate into expected individual labor market behavior and household divisions of labor. We understand gender arrangements in pensions as a reward system that does not directly function as an incentive for behavior across life courses, particularly if they collide with more immediate incentives set by family and labor market policies.

Our research questions are directed at two family events that pose specific life course risks with regard to retirement; divorce and childcare interruptions. Family provisions particularly relevant in this context are barriers to entitlement accumulation for married women, pension sharing upon divorce, care credits in pensions, and options to accumulate entitlements with typical female employment histories coined by discontinuity and part-time work. The subsequent comparison of gender arrangements and family provisions in pensions for the study cohort highlights the importance of a dynamic perspective to take into account different modes of implementation of family provisions. Whether family provisions are introduced with retrospective or prospective effect, or as the default instead of an option that has to

be actively claimed, creates different entitlements situations.

Barriers to entitlement accumulation for married women

In *Germany* generous male bread winner pensions were designed to provide also for female homemakers, but men received no additional supplement for a dependent wife. (Meyer and Pfau-Effinger 2006: 84, O'Grady-LeShane and Williamson 1992). While the absence of derived benefits for dependent spouses could foster independent female entitlement accumulation, other barriers were effective. Until 1967 women could contract out of state pensions at marriage and receive their accumulated pension entitlements as a lump sum, the so-called *marriage refunds* (Stegmann and Mika 2007). After the abolition of this regulation, women could return their marriage refunds to the pension system and contract back in. This was promoted by very favorable conditions, which led most women to contract back in.[20] After 1967 independent female entitlement accumulation was neither hindered through derived benefits, nor direct barriers, supporting only a moderate enforcement of the male breadwinner model.

In contrast, in the *United Kingdom* explicit derived benefits for dependent spouses played a major role in the post World War II pension system (Meyer and Pfau-Effinger 2006). Men would receive an independent pension topped up by a derived pension for a dependent spouse. Since women often were younger than their husbands, coverage was frequently inadequate for couples until the wife turned 65 (Ginn 2003). To mitigate this problem the lower state pension age of 60 was introduced for women in 1940.[21] Since 1946 a man's National Insurance contributions earned entitlements to a basic flat-rate category A pension for himself and a reduced 60 percent category B pension for his wife. This was payable to a wife at age 60, provided her husband had reached state pension age of 65 and the derived 60 percent pension exceeded her own entitlements (Ginn 2003: 52).[22] As a consequence, a wife who earned entitlements in

[20]The proportion of women who made use of this option is impossible to quantify exactly, also from the official records of the statutory pension system (Stegmann and Mika 2007: 205).

[21]The regulation followed representations of the National Spinsters Association and married men whose wives were several years younger and therefore not yet eligible for a derived pension at the time the men turned 65 (Ginn 2003).

[22]From 2010 this right will be extended to dependent husbands, although 60 percent of their wives entitlements will rarely exceed their own entitlements (Ginn 2003).

her own right could receive no more than a wife who stayed at home, despite similar caring responsibilities (ibid.). For most of the post war period, category B pensions remained about 10 percent below the level of means tested benefits and were thus fully inadequate to live on (Ginn 2003: 12).

In addition to extensive derived benefits, there were direct barriers to independent female entitlement accumulation in the United Kingdom. Similar to the marriage refunds in Germany, married women could opt for reduced National Insurance contributions that would earn no pension entitlements, often referred to as the *small stamp* or *married woman's exemption* (Ginn 2003, Meyer and Pfau-Effinger 2006). The full effect of the married woman's exemption is only understandable in combination with a regulation called the *half-test*. The half-test meant that women who paid contributions for less than half their working life since marriage simply lost the value of all their contributions, including those accumulated as a single person. In combination with the half-test it hardly made sense for women to contribute independently to the system unless they where determined to be full-time employed continuously throughout their working lives. As a consequence, 75 percent of women did not pay independent National Insurance contributions beginning of the 1970s (Meyer and Pfau-Effinger 2006: 91). In 1975 the half-test was abolished and the married woman's exemption was gradually phased out.[23] Derived spouse's benefits were not regulated in occupational and private pensions, but usually occupational pensions would include derived pensions for widows.[24]

In Germany the minimum qualifying period for a state pension of 5 years is only half the minimum period for BSP of 10 years in the United Kingdom. Therefore, women with short employment histories are more likely to have an independent pension in Germany, albeit on a low level, compared to the United Kingdom.

[23]Married women who were already paying reduced National Insurance contributions under the *married woman's exemption* were allowed to continue after 1978, but divorced women were required to pay the full stamp.

[24]In SHPs, the more regulated form of private pensions, voluntary contributions of up to 3600 GBP per annum can be made on behalf of a non earner. For the study cohort this is irrelevant, since SHPs were introduced after most of them were past state pension age.

Pension sharing upon divorce

Pension sharing upon divorce is one component of the financial consequences of divorce. The German welfare state generally is more protective of the economically weaker spouse upon divorce including the division of property and pensions, alimony and child support (Ginn 2003, Price 2003, DiPrete and McManus 2000). Further, tax-splitting among spouses in Germany sets higher incentives to remain married and implies stronger financial penalties on divorce for high income spouses who lose the tax benefits of marriage (see DiPrete and McManus 2000).

In *Germany* the *1976 Marriage Law* introduced high protection of the economically weaker spouse in case of divorce, particularly if the duration of marriage was long and involved a traditional household division of labor (Zugewinngemeinschaft). Equal pension sharing of the entitlements acquired during marriage were implemented as a default upon divorce (Versorgungsausgleich)(Mayer and Pfau-Effinger 2006: 84). It was possible to avoid pension sharing by actively renouncing it (Solcher 1978). Nevertheless, pension sharing was the norm and generally implied a transfer of men's accumulated benefits to their divorced wives (Bieber 1999).

In the *United Kingdom* the 1973 *Matrimonial Causes Act* introduced pension sharing. In contrast to Germany, sharing of state and occupational or private pensions had to be actively claimed in a court process (Price 2003). Among couples consulting a solicitor orders involving pensions were rare, despite mostly large disparities of husbands and wives accrued pension entitlements (Price 2003). Particularly if retirement was distant pension sharing was usually not ordered (ibid.). Often 'clean break' arrangements were made that off-set a claim on the husband's pension against other assets as the house for women, because women generally remained in charge of childcare (Ginn 2003).

The 1995 and 1999 pension reforms introduced regulations that increasingly required courts to consider pension assets in financial settlements on divorce in the United Kingdom (Ginn 2003: 61). However, off-setting of pension sharing for other assets remain the norm also since 2000 (Price 2003). In effect, pension sharing upon divorce has rarely been practiced in the United Kingdom. This is attributed to a wide

public unawareness of its existence and the necessary effort to claim pension sharing in a court process (Meyer and Pfau-Effinger 2006: 95). If women were awarded any of their husband's pension the fraction was usually very low (Price 2003).

Childcare credits

In *Germany* childcare credits were introduced in 1986 with retrospective effect (O'Grady-LeShane and Williamson 1992, Meyer and Pfau-Effinger 2006: 84). A woman was credited at 75 percent of average earnings for one year per child, if she had given up employment for caring. With the reform of 1992, contribution free child rearing credits were expanded to three years and counted in addition to maternity leaves (Schulze and Jochem 2007). The 1999 reform increased childcare credits to 100 percent of average wages and awarded them also to mothers who continued to work (Meyer 1998). An important feature of the introduction of care credits in pensions in Germany is that they were retrospectively effective. Women born after 1921 receive one contribution free childcare year for each child born before December 31st 1991. For children born after this date they receive three contribution free childcare years per child (Deutsche Rentenversicherung 2007). Considering the minimum of five contribution years to be eligible to any state pension, a woman who has five children can be eligible without ever having been employed, albeit to a low pension (Prinz 1997).

In the *United Kingdom* childcare credits were first introduced in 1975 and enacted in 1978 in form of Home Responsibilities Protection (HRP).[25] In HRP years of family caring count towards eligibility for BSP, if the carer gives up employment (Ginn 2003, Meyer and Pfau-Effinger 2006: 91). HRP can reduce the number of contribution years required for BSP by 16 years per child. Total care time is limited by the requirement that contributions have to be paid for half the regular qualifying years, usually 20 years, to receive any BSP (Meyer and Pfau-Effinger 2006: 91).[26] Women in marginal jobs below the lower earnings limit qualify for HRP, if they are simultaneously caring for a child under 16. HRP credits were enacted prospectively and only granted for

[25]SERPS introduced the first indirect recognition of caring responsibilities with the reduced assessment base of the best 20 years, improving benefits for women with care interruptions.

[26]A carer who paid National Insurance contributions for 20 years may qualify for a full BSP, if the remaining years are covered by HRP (19 to sum up to 39 years for a full BSP).

care provided after 1978. Consequently, only women who cared for children under age 16 after 1978 profited from this regulation. SERPS did not include care credits but since 2002 S2P credits family care at the lower earnings limit (Schulze and Moran 2007). Occupational schemes generally lack a credit system for family or childcare.[27]

In sum, in Germany care credits affect all members of the study cohort equally, provide a higher benefit level, but are awarded for a shorter duration of time compared to the United Kingdom.

Employment consequences of childcare interruptions

Pension penalties on childcare may further arise from limited possibilities to accumulate pension entitlements in typical female carer's employment profiles coined by discontinuity and part-time work. Not only whether women return to full-time or part-time employment after child rearing, but also possibilities to accumulate pension entitlements with discontinuous and part-time employment is decisive for their pension position.

In both countries female carers are typically concentrated in part-time work. Part-time work is generally associated with job insecurity, lack of career development, lack of fringe benefits and lower hourly pay (Blossfeld and Hakim 1997, O'Reilly and Fagan 1998). Women mostly work part-time in their prime earning years between age 30 and 54, when usually opportunities for wage gains and occupational advancement are highest (Ginn 2003: 6).

In Germany the quality of part-time work is mixed with a relatively high number of part-time jobs in the service sector but also in the public sector providing high job protection and fringe benefits (Blossfeld and Rohwer 1997). Pension penalties for part-timers exist (Bieber and Stegman 2000), but part-time jobs generally provide the possibility to accumulate pension entitlements.

In the United Kingdom female part-time workers are concentrated in small firms in the private sector that usually do not offer occupational pension schemes (Ginn 2003). As a consequence they are excluded from occupational pensions and usually lack the

[27] Debora Price, personal communication.

earnings capacity to invest in a private pension plan (Ginn and Arber 1998). Part-timers who work in several part-time jobs below the lower earnings limit accumulate no state pension entitlements, even if they earn above the lower earnings limit in total. This applied to a substantial number of women in the United Kingdom.[28] Taken together, options to accumulate pension entitlements through part-time work were considerably better in Germany.

The higher importance of occupational and private pensions in the United Kingdom generates additional pension penalties for typical female carer's employment histories. Discontinuous employment limits access to occupational and private pensions. Further, returns to interrupted employment careers are generally lower in occupational and private pensions (Ginn 2003). Women's full-time employment tends to peak in their 20s before child rearing, they are at a higher risk to leave occupational schemes early to take on care responsibilities, and typically have flatter earnings profiles lowering their returns in occupational pensions.[29] On top of this the same size of an occupational or private pension fund buys about 10 percent less annuity for women than men in the United Kingdom due to women's longer life expectancy (ibid.).

Regulations in effect for the study cohort

We close by briefly clarifying the family provisions in pensions in effect for the study cohort (table 2.3).

Germany

The German pension system never strongly supported a male breadwinner model, because it always recognized not just marriage but also employment as a basis for entitlement accumulation of married women (Meyer and Pfau-Effinger 2006). After the abolition of the marriage refund in 1967, pension regulations did not actively discourage independent female entitlement accumulation. In subsequent reforms women's pension rights were continuously strengthened through the improved recognition of part-time and low paid work (1972), default pension sharing upon divorce (1976) and

[28] Debora Price, personal communication.
[29] This particularly, refers to defined benefit (DB) plans.

the retrospective recognition of childcare responsibilities (1986). The pension system in effect for the study cohort largely embodied a moderate enforcement of the male breadwinner model.

Nevertheless, women who contracted out of state pensions for the 'marriage refund', and did not actively contract back in and did not accumulate independent entitlements after 1967 have no claim a pension in Germany (Prinz 1997). Women in the study cohort were in the middle of their reproductive phase aged 27 to 37 in 1967. Consequently, women who worked only before marriage and motherhood may have had no pension entitlements, even though they contributed before marriage. The introduction of pension sharing in 1976 implies that only women who divorced after 1976 benefited from this regulation. Women in the study cohort received one contribution free childcare year at 75 percent of average earnings per child. Part-time employment generally provided the option to accumulate pension entitlements and employment after age 40 was particularly rewarded with the *woman's pension* option at age 60. Upon widowhood a widow pension of 60 percent of the deceased spouses entitlements was the norm.

While the German pension system only moderately rewarded a male breadwinner model, more immediate policies across the study cohorts working lives strongly encouraged a traditional household division of labor (Meyer and Pfau-Effinger 2006). The absence of affordable childcare, gender segregation and discrimination on the labor market (Brückner 2004, Fasang 2006), and tax incentives for a male breadwinner division acted as immediate barriers to independent female pension accrual through employment.

United Kingdom

In contrast to Germany, the British pension system strongly enforced a male breadwinner division until 1975. In both basic state and earnings related pensions women were assumed to accumulate entitlements through marriage not own employment (Meyer and Pfau-Effinger 2006: 93). In addition to derived benefits for spouses, strong barriers as the married woman's exemption and the half-test hampered inde-

Table 2.3: Family provisions in pensions for the study cohort

	West DE	**UK**
barriers to female pension accumulation	• 'marriage refund' until 1967	• married woman's exemption until 1975 • 'half-test'
regulations for women	• woman's pension option at age 60	• lower state pension age of 60 compared to 65 for men
derived benefits for:		
spouses	• none	• 60% supplements in BSP
divorcees	• default pension sharing (1976)	• legal option for pension sharing (1973)
widows	• 60% of deceased spouses state pension	• 100% of deceased spouses BSP • 100% of deceased spouses SERPS until 2002, 50% after 2002 • variable in occupational & private pensions
childcare credits:	• 1 year care credit at 75% of average earnings per child, retrospectively effective	• none for childcare before 1978, then credits to BSP at lower earnings limit for children under 16
overall enforcement of male bread winner division:	• moderate	• strong until 1975, moderate after 1975

Sources: Ginn (2003), Meyer and Pfau-Effinger (2006), Schulze and Jochem (2007), Schulze and Moran (2007)

pendent female entitlement accumulation. The reform of 1975 rapidly changed the pension system toward moderate enforcement of a male breadwinner model. Since then, not only marriage, but also employment and caring accumulated pension entitlements for women.

For the study cohort in the United Kingdom the traditional male breadwinner division was strongly enforced in pensions until they reached midlife. External childcare provision was equally insufficient as in Germany and gender segregation and discrimination in the labor market arguably entailed higher pension penalties due to the higher importance of occupational pensions from which women were usually excluded. While the half-test no longer applied to the study cohort, women could forgo independent entitlements with the married woman's exemption, similar to the German marriage refund. Even though this regulation was phased out, married women who already paid the 'small stamp' could continue to do so, as long as they remained married. Consequently, women in the study cohort may have no independent entitlements, even though they were employed for some time.

Women did generally not benefit from pension sharing upon divorce, since the pension sharing option since 1973 was seldom used in favor of off-setting pension entitlements against other assets and 'clear break' arrangements (Price 2003, Ginn 2003). The fact that care credits were not introduced retrospectively as in Germany creates a complex intersection of female employment and fertility patterns with the period specific introduction of care credits in 1978. Women born in the early 1930s who had children early received less or no care credits, while women born in the late 1930s and/or had children late were credited for care. The study cohort was aged 38-48 in 1978 and many of them may still have cared for children below age 16. The introduction of care credits in S2P was too late to substantially affect the study cohort. Widow pensions at 100 percent of the deceased spouse's BSP and SERPS/S2P were the norm. Due to the overall higher pension level in Germany, 60 percent of state pensions in Germany generally granted a higher standard of living for widows compared to 100 percent of BSP in the United Kingdom.

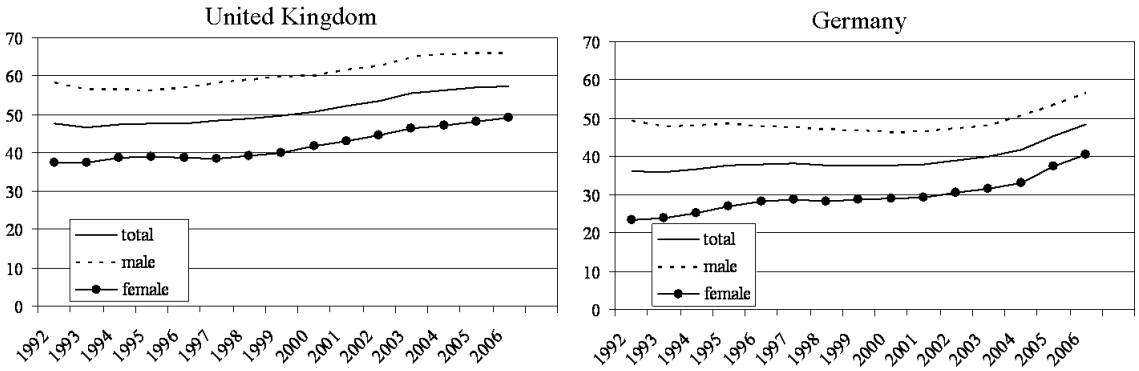
Similar to the situation in Germany, typical female employment patterns diverged

from incentives for the household division of labor in the British pension system (Meyer and Pfau-Effinger 2006: 94). Particularly toward the end of the strong male breadwinner enforcement in pensions in 1975, women had started to take up employment in greater numbers, despite a lack of pension rewards for employment.

2.3 Pension indicators

In this section we present relevant pension indicators for the time period in which the study cohort experienced the retirement transition process (1990-2005).[30] Figure 2.1 shows the employment rates for men and women age 55-64 from 1992 until 2006 in Germany and the United Kingdom. In both countries the employment rates of men are roughly 20 percent higher compared to women. In Germany the employment rate is lower at 35-40 percent, compared to the United Kingdom at 50-60 percent. This is in line with high unemployment rates and institutionalized early retirement options in Germany during this time period. After 2000 there is a slight increase of employment

Figure 2.1: Employment rate for persons aged 55-64



Source: Eurostat (2008)

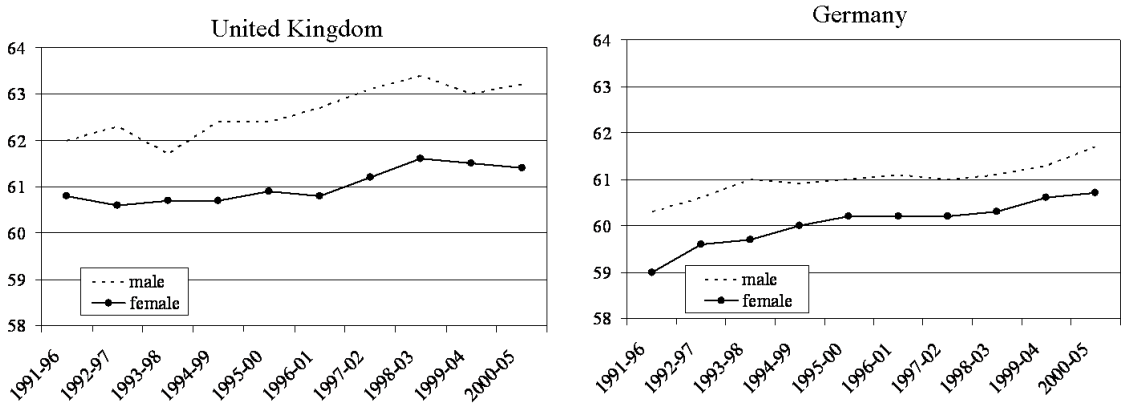
rates in Germany, related to reforms that pushed persons aged 55-64 towards the labor market through the retrenchment of state pensions and abolition of early retirement routes as the *'59er' regulation* and firm level pre-retirement programs.

Figure 2.2 shows the average effective retirement age of synthetic cohorts divided into 5 year age groups (OECD 2006). The average effective retirement age is cal-

[30]Statistics are for re-unified Germany.

culated as a weighted average of (net) withdrawals from the labor market at different ages over a 5-year period for workers initially aged 40 and over (OECD 2006). Corresponding to the higher employment rates for the age group 55-64 in the United

Figure 2.2: Average effective retirement age



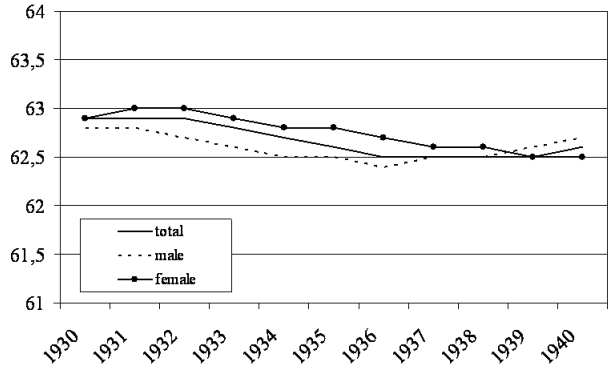
Source: OECD 2008, estimates based on European Union Labour Force Survey, own graphical representation

Kingdom, the average effective retirement age in the observation period was higher compared to Germany. In the United Kingdom the average effective retirement age ranges between 61 and 62 for women and 62 and 63 for men. Note that women tend to exit the labor force after official state pension age of 60, while men tend to exit the labor force before official state pension age of 65. This suggests considerable gaps between employment and receiving state pensions for men but overlaps for women. The difference between men and women is larger in the United Kingdom compared to Germany. The average effective retirement age below age 61 across most of the observation period in Germany indicates a large gap between labor force exit and the state pension age of 65.

As noted above, the German and British pension system in effect for the study cohort differentiated on country specific outcomes. The universal German system primarily stratified in the timing of pension entrance, the British system primarily differentiated in terms of access to different pension types. This is also reflected in the availability of national statistics. While in Germany, the bulk of official pension statistics is on average pension entrance age of specific cohorts and subgroups of the

population (e.g. Deutsche Rentenversicherung 2007), British pension statistics focus on income sources of persons above state pension age from various pension types and employment (e.g. Department for Work and Pensions 2008). Figure 2.3 shows

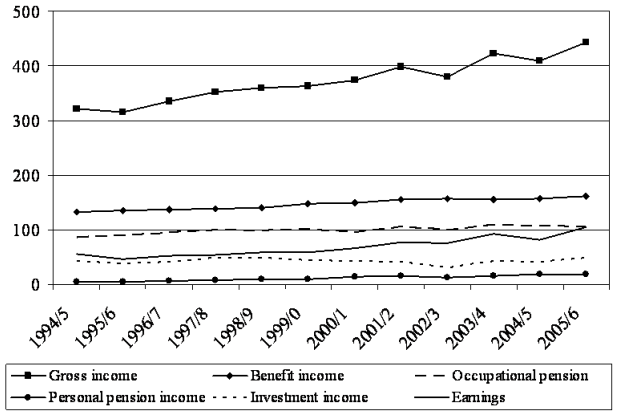
Figure 2.3: Average pension entrance age by birth cohort, West DE



Source: Deutsche Rentenversicherung 2007, own graphical representation

the average entrance age to old age pension for the birth cohorts 1930 to 1940 in West Germany. Men's average pension entrance age is between 62.5 and 63, roughly 1.5 years above the average labor force exit age during the period when these birth cohorts experienced the retirement transition process (figure 2.2). This suggests an average gap of 1.5 years between labor force exit and pension entrance for men. For

Figure 2.4: Income recently retired pensioners, UK



Source: Department for Work and Pensions 2008, GBP/week at 2005/06 prices, own graphical representation

women this average gap is larger around 2.5 years with average labor force exit at 60 and average pension entrance age between 62.5 and 63. Note that on average women

enter old age pension later than men even though the *woman's pension* creates a gender specific early entrance option. Real gaps between employment and pension entrance will tend to be underestimated for women, because women not employed in later life are excluded from the calculation of the average effective retirement age.

Figure 2.4 shows the income sources for recently retired pensioners during the 1990s and early 2000s in the United Kingdom. Income from state benefits including state pensions is the most important source of income, followed by occupational pensions and earnings from employment. Personal pensions play a minor role. Since 2000 the average gross income of recently retired pensioners shows an increasing tendency, assumably related to the expansion of state benefits for pensioners with S2P and the Pension Credit.

The gaps and overlaps between average effective retirement age and state pension age suggest that retirement is not a seamless transition between employment and normal old age pension for substantial parts of the population in both countries.

2.4 Comparative logic

The comparison of Germany and the United Kingdom follows a case oriented difference in similarities design (see Ragin 1987). The pension systems in effect for the study cohort were at the height of institutional differences, while the male breadwinner context in which the study cohorts working lives evolved was similar in Germany and the United Kingdom. The objective of difference in similarities designs is to study the causally decisive difference between otherwise relatively similar objects. It is also referred to as the method of 'variation finding' (Tilly 1984) based on John Stuart Mills indirect method of difference (Ragin 1987). The underlying logic is straightforward: we assume that the institutional structure of the pension system is causally related to different retirement transition processes as outcomes of family biographies in countries with similar gender and family arrangements. This enables us to examine how different pension regulations in otherwise similar relevant country contexts shape the retirement process as an outcome of family events, i.e. divorce

and childcare interruptions.

With the case oriented design we follow an individualizing comparisons by treating each case as a unique entity (Tilly 1984).[31] Case oriented designs focus on how conditions in unique entities combine to produce specific outcomes (Ragin 1989: 52). With the small number of only two comparison cases the strength of our analysis lies in its contextual specificity, rather than generalizing comparative features. On a more general level it becomes very difficult to link contextual features to concrete micro level life course outcomes (Mayer 2005).

We take a dynamic perspective with a cohort design contrasting two countries in a specific temporal period to avoid the frequently criticized static perspective prevalent in the regime literature (Offe 1993, Kasza 2002, Meyer and Pfau-Effinger 2006). The institutional analysis in this chapter highlighted that retirement processes of the study cohort evolved under specific historical conditions. Detailed institutional analysis is a precondition for the development of bridge hypotheses as descriptive statements about the 'logic of the situation' (Blossfeld and Prein 1998, Esser 1998) for pension entrance. We will come back to this in chapter 4.

Three research questions are addressed in this thesis: how welfare institutions shape retirement as a process, and how two aspects of the family biography that pose specific life course risk for retirement affect pension entrance timing: divorce and childcare interruptions. In the following we will briefly elaborate the advantages of our comparative design with regard to the these research questions.

Structure of retirement transition processes

Our comparative design enables us to contrast how maximally different pension systems in effect for the study cohort shape the structure of retirement transition processes. A generous, nearly universal state pension system with numerous early entrance routes for specific population groups in Germany, as opposed to a highly differentiated pension system into state pensions, occupational, and private pensions that provide a lower pension level, and no institutionalized early entrance routes in

[31] The case oriented tradition is based on Max Weber's concept of the ideal type (Weber 1922, 1968).

the United Kingdom (see table 2.1).

Divorce

The *1976 Marriage Law* in West Germany and the *1973 Matrimonial Causes Act* in the United Kingdom create a setting that closely approximates a quasi experimental design to assess the impact of pension sharing on pension entrance timing. Pension sharing was introduced in both countries at about the same time in the study cohorts life course, but as the default in Germany and only as an option that had to be actively claimed in the United Kingdom. Germany in this sense is the experimental group in which pension sharing was the default, while the United Kingdom is the control group in which pension sharing was only an option and hardly practiced (Price 2003, Ginn 2003). It is a quasi experimental design, because treatment, in this case default pension sharing, is not randomized. Due to non-random assignment of treatment, in quasi-experiments alternative explanations have to be carefully considered and the researcher relies on plausibility and logic to assess whether alternative explanations are operating in a way that might explain any observed effects (Shadish et al. 2002).

Pension sharing directly changes entitlement positions and pension entrance options in the short term. An alternative way in which divorce can affect pension entrance timing is through a shift in employment after divorce that alters the accumulation of pension entitlements and pension entrance options. In our comparative design we can expect divorce to affect men's and women's subsequent employment in similar ways in Germany and the United Kingdom. Both countries were coined by a strong male breadwinner division. Continuous full-time employment was the norm for men and discontinuous and marginal employment was prevalent for women. If we can hold gender specific employment patterns following divorce constant across countries, differences in pension outcomes following divorce can legitimately be attributed to the different implementation of pension sharing. Stigmatization and financial consequences of divorce are similar in Germany and the United Kingdom (Uunk 2004, Andress et al. 2006), albeit the German welfare state is generally more protective of the economically weaker spouse upon divorce (Price 2003, DiPrete and McManus

2000). Whether or not divorce affected subsequent employment similarly in the comparison countries is an empirical question that will be addressed in chapter 7.

Childcare interruptions

In Germany care credits were introduced with retrospective effect in 1986, while HRP credits were only awarded for care provided after 1978 in the United Kingdom. Consequently, only women who cared for children under age 16 after 1978 profited from this regulation in the United Kingdom, while all women of the study cohort were affected by childcare credits equally in Germany.

In addition to this difference of retrospectively and prospectively enacted care credits, there is cross-country variation in possibilities to accumulate pension entitlements with typical female carer's employment profiles. In Germany the possibility to accumulate pension entitlements through part-time work are better compared to the United Kingdom (Blossfeld 1997, Ginn and Arber 1998). Further, returning to employment after child rearing is particularly rewarded by the *woman's pension*, the option for women to enter old age pension at age 60 if they contributed to the pension system for 15 years of which 10 were after age 40. Female carers in the United Kingdom are further disadvantaged, because of their limited access to occupational pensions, which are of higher importance compared to Germany.

In this chapter we placed the pension regulations in effect for the study cohort within the temporal development of pension reform in Germany and the United Kingdom. We discussed gender arrangements and family provisions in pensions relevant for the impact of divorce and childcare interruptions on retirement processes. We emphasized that the two pension systems selected on different outcomes: in Germany in terms of pension entrance timing and in the United Kingdom in terms of access to different pension types. An overview of relevant aggregate retirement indicators showed that retirement is not a one-time seamless transition from employment to old age pension at state pension age for substantial parts of the population in both countries. We concluded by explicating our case oriented difference in similarities design.

The next two chapters contain the theoretical foundation of the analysis. In chapter 3 we propose the concept of pathways to old age pension to grasp retirement as a process, rather than a one-time transition. Based on the framework of differential life course sociology we derive hypotheses about how the German and British pension system shape the structure of pathways to old age pension. In chapter 4 we build on a rational choice framework to develop hypotheses on the impact of divorce and childcare interruptions on pension entrance timing.

2.5 Appendix chapter 2

Table 2.4: Reform overview Germany I

1889:	*Introduction of GRV under Bismarck*
1957:	*From supplementary pensions to earnings replacement*
	• introduction of PAYG financing • dynamic pension calculation • early retirement for women and unemployed
1972:	*Expansion of early retirement*
	• men and women can enter at age 63 without deductions conditional on 35 years of insurance (flexible retirement)
1984:	*Pre-retirement law*
	• subsidized labor force exit beginning from age 58 while receiving 65% of previous gross earnings until entrance to old age pension beginning from age 60
1986:	*Introduction of childcare credits*
	• introduction of 1 year contribution free childcare credit per child at 75 % of average wages with retrospective effect
1989:	*Partial retirement law I*
	• reduced working time of 50% at 70% of previous wage beginning from age 58 until old age pension entrance at age 60

Sources: Schulze and Jochem (2007: 677), Mika and Baumann (2007), Deutsche Rentenversicherung (2007)

Table 2.5: Reform overview Germany II

1992	*Blüm I: retrenchment of early retirement*
	• change from gross to net indexation • deductions for early retirement • phase out unemployment related retirement at age 60 • increase of childcare credit from one to three years
1996:	*Partial retirement law II*
	• expansion of partial retirement to a five year period and introduction of the block model • stepwise increase of pension entrance age after partial retirement from 60 to 63
1999	*Blüm II: further retrenchment of early retirement*
	• increase of child credits from 75% to 100% of average wage • increase in retirement age for disability pensions from age 60 to 63
2001	*Riester: retrenchment of state pensions % expansion of private pensions*
	• introduction of voluntary subsidized private pensions • replacement rate from state pensions capped at 65% • introduction of means-tested social assistance minimum pension (Grundsicherung) • reduction of widow pension from 60% to 50% of deseased benefits
2004	*Rürup: retrenchment of state pensions*
	• increase of pension age following unemployment and partial retirement from 60 to 63 • loss limitation to 46% replacement rate of previous wage • abolition of credit points for higher education • change of assessment base for pension indexation to real contributory base • introduction of taxation of pension benefits
2006:	*Agreement to gradually raise retirement age to 67 from 2012*

Sources: Schulze and Jochem (2007: 677), Mika and Baumann (2007), Deutsche Rentenversicherung (2007).

Table 2.6: Reform overview United Kingdom I

1908:	*Introduction of state pensions*
	• non-contributory flat rate state pensions below subsistence level
1925:	*Widows', Orphans', and Old Age Contributory Pension Act*
	• contributory supplement to non-contributory state pensions
1946:	*National Insurance Act based on Beveridge Report (1942)*
	• National Insurance retirement (NI) to provide for subsistence while fostering private pensions for additional provision
1961:	*Graduated Pension as first state earnings related scheme*
1975:	*Social Security Benefit Act: expansion of state pensions*
	• indexing of basic state pensions (BSP) to rises in national earnings or prices, whichever higher
	• abolition of 'half-test' and phasing out 'married woman's exemption'
	• introduction of family care credits with Home Responsibilities Protection (HRP), enacted in 1978
	• replacement of Graduated Pension with SERPS, an extended state earnings related pension
1986	*Social Security Act: retrenchment of state pensions*
	• introduction of private pension plans as subsidized contracting-out possibilities
	• cut-back of SERPS with extension of benefits from best 20 years to life time career (44 years for women, 49 years for men), reduction of SERPS replacement rate from 25% to 20% of assessment base
	• reduction of widow pension from 100% to 50% of former spouses benefits

Sources: Ginn (2003), Department for Work and Pensions (2005), Meyer and Pfau-Effinger (2006), Schulze and Moran (2007: 68-69)

Table 2.7: Reform overview United Kingdom II

1995	*Pension Act*
	• regulation to protect occupational pension funds against fraud (OPRA) • increase in female retirement age from 60 to 65 by 2020 beginning from 2010 • abolition of the exclusion of part-time workers from occupational pension schemes
1999	*Welfare Reform and Pension Act*
	• introduction of Minimum Income Guarantee (MIG) as special means-tested benefits for pensioners • introduction of Stakeholder Pensions (SHP) to provide second tier pensions for low income employees
2000	*Child Support, Pensions and Social Security Bill*
	• replacement of earnings related SERPS benefits with S2P (took effect in 2002) • earners with income below LEL are treated as if they earned the lower earnings threshold in S2P • care credits are taken into account in S2P
2004	*Pension Act*
	• establishment of Pension Protection Fund (PPF) to protect defined benefit (DB) schemes in case of employer insolvency and under-funded plans • replacement of OPRA by Pensions Regulator • introduction of rewards for later retirement

Sources: Ginn (2003), Department for Work and Pensions (2005), Meyer and Pfau-Effinger (2006), Schulze and Moran (2007: 68-69)

Chapter 3

Life course theory: pathways to old age pension

We place the analysis of pathways to old age pension in the conceptual framework of *differential life course sociology* (Mayer 2005), evolved from more general theories on aging, generations, and human development. The objective of differential life course sociology as an emerging research program is to disentangle the link between institutions and life course patterns. Central premises are that for the development and testing of hypotheses about causal linkages, it is most conducive to (Mayer 2005: 48): (1) compare single countries rather than overall regime types, (2) disaggregate national institutional arrangements to distinct policy fields and match them to specific life course outcomes, which (3) can be treated separately as dependent variables.
In this chapter we address the question:

- How do labor market and pension policies in West Germany and the United Kingdom shape retirement transition processes?

The chapter is structured as follows. We start by proposing the concept of *pathways to old age pension* that allows a comprehensive cohort perspective on retirement as a sequentially linked process. *Standardization*, *differentiation* (Brückner and Mayer 2005), and *turbulence* (Elzinga 2006b) are discussed as summary concepts to capture theoretically relevant properties of pathways.

We derive contextual hypotheses about the impact of labor market and pension policies from theoretical approaches to the institutionalization of the life course. In particular, we focus on the political economy of the life course emphasizing labor market structures (e.g. Mayer 1997, 2005), life course effects of social policies (e.g. Leisering 2003) and the relationship between institutional context and individual differences (Caspi and Moffitt 1993).

3.1 The concept of pathways to old age pension

Retirement transitions are processes that often consist of intervening states between employment and old age pension, such as unemployment, invalidity, or caring (Moen 2003). In particular two transitions have to be distinguished: exit from labor market activity and receiving an old age pension. There can either be gaps between them, or they may overlap. These gaps and overlaps complicate the conceptualization of retirement and pose a challenge for research designs. In the life course literature two concepts embrace the sequential character of retirement transition processes: *pathways to retirement* (Kohli et al. 1991) and *midcourse* (Moen 2003). After briefly discussing these concepts with regard to strengths and weaknesses for the research question at hand, we propose *pathways to old age pension* as an alternative, defined as the succession of primary income sources within the opportunity window for old age pension entrance.

Pathways to retirement (Kohli et al. 1991) are defined as institutionally designed bridges between employment and old age pension.

> "A pathway is an institutional arrangement or - in most cases - a combination of different institutional arrangements that are sequentially linked to manage the transition process, that is, the period between exit from work and entry into the normal old-age pension system." (Kohli et al. 1991: 6)

Pathways to retirement are institutionalized patterns, rather than empirical regularities. Instead, Kohli et al (1991: 7) refer to 'personal routes' to describe individually

arranged transition processes with support from various institutionalized and personal sources. Prevalent institutional pathways are state early retirement schemes, unemployment, or disability insurance. Collectively regulated private arrangements, as certain occupational pensions are not considered *institutionalized* pathways to retirement (ibid.). The concept of institutionalized pathways to retirement is work centered and characterizes retirement transition processes of large parts of the employed population. With regard to our research question a weakness of this concept is the exclusion of non-standard transition processes that are neither seamless from employment to old age pension, nor coined by institutionalized arrangements designed as short term bridges between employment and normal old age pension. The fact that individuals may actively choose between the institutional options available to them equally receives little attention. Essentially, individual pathways are more complex than any single institutional pathway (O'Rand and Henretta 1999: 123). As a consequence, institutionalized pathways to retirement cannot grasp the actual complexity of individually experienced retirement transition processes.

Midcourse suggests a broader perspective focusing on individual retirement processes. *Midcourse* denotes the emergence of a new life stage spanning the age range between 50 and 80, in which people shift between primary labor market career, second careers and retirement; accompanied by simultaneous household and family changes (Moen 2003):

> Midcourse "(...) connotes the period in which individuals begin to think about, plan for, and actually disengage from their primary career occupations and the raising of children, launch second or third careers, develop new identities and new ways to be productively engaged, establish new patterns of relating spouses, children, siblings, parents, friends, and leave some existing relationships and begin new ones." (Moen 2003: 247).

In contrast to the institutional focus inherent in *pathways to retirement* (Kohli et al. 1991), *midcourse* (Moen 2003) refers to the individual and household level by spanning multiple life domains, stressing the principle of 'linked lives' (Elder et al. 2003). While pathways to retirement demarcate institutionally designed transition routes between

the two life stages employment and old age pension, midcourse introduces a new life stage in itself, assuming the erosion of the work centered normal life course (e.g. Heinz 1991).[1]

The common presumption underlying the idea of pathways to retirement and midcourse, is an insufficiency of one-time definitions of retirement to grasp the inherent logic of transition processes as the succession of sequentially linked states. They differ in their scope and boundaries. Pathways to retirement mark diachronous institutionalized transition routes delineated by labor market and welfare institutions. Midcourse comprises and intermingles parallel changes in several life domains within a relatively fuzzy chronological age bracket.

We argue that both concepts have weaknesses for a comprehensive comparative analysis of how labor market and pension policies shape individual retirement transition processes. While the concept of midcourse displays a level of complexity that makes it difficult to access empirically as a separate life course outcome, institutionalized pathways to retirement cannot grasp the actual complexity of individual retirement processes and are blind to non-standard transition processes.

The high complexity of *midcourse* stems from its broad scope encompassing multiple life domains, including the work and family domain. In the subsequent analysis, family processes are taken into account as corollaries and determinants of retirement processes, but not as integral parts of the retirement transition process itself to arrive at a retirement concept of manageable complexity.

Concerning the concept of institutionalized *pathways to retirement*, the criterion of exit from employment as marking the beginning of an institutionalized retirement pathway entails a questionable restriction to the population employed in later life. While no exact age definition is specified in *pathways to retirement*, it is implicitly clear that exit from employment at age 35 or 40 would not be regarded as marking the beginning of a retirement pathway. Empirical applications based on this concept

[1]Partly these two concepts reflect the institutional context and research traditions in which they were developed. While *pathways to retirement* were put forward in the continental European research tradition at a time of highly regulated retirement transition processes in these countries, midcourse was developed in the North American context characterized by more differentiated pension arrangements.

usually focus on persons aged 55 or older (Kohli et al. 1991, Maltby et al. 2004).

As a result, the impact of earlier labor market selection at the intersection of family biographies and employment histories on retirement outcomes is neglected. Consider as an example persons who did not re-enter the labor market after child birth but accumulated sufficient pension entitlements to be eligible for an own pension before child birth. In male bread winner societies this primarily refers to women. They mark only one of the groups typically neither included in standard models of retirement, nor adequately covered by the analysis of institutional pathways to retirement. Another example are transition processes characterized by 'muddling through' (Moen and Roehling 2005) various phases of non-standard employment, inactivity, or state support during the retirement transition process. This will equally affect marginalized men with discontinuous and weak labor market careers.

One can argue that the restriction to the population employed in later life is less problematic in analyses explicitly focusing on the determinants of labor force exit. But this type of analyses may also lead to questionable results when not accounting for differential probabilities of being in employment in later life. Processes of cumulative advantage on labor markets selectively channel people into different labor market and pension positions in later life (Allmendinger et al. 1993, DiPrete and Eirich 2006). When studying the link between institutions and retirement processes, the restriction to persons employed in later life simply means that part of the affected population is excluded from the analysis per definition. This is particularly problematic in cross national research, since the excluded population may be very different in terms of size and socio-demographic background under different institutional contexts. In fact, we would expect it to be quite different according to national labor market and family policies. A comprehensive cross national comparison of retirement processes, therefore has to include non-standard retirement transition processes, and pension entrance of persons not employed in later life in a cohort perspective.

To include non-standard transition processes in the subsequent analyses and establish a link between individual trajectories and subsystems of the welfare state, we propose the concept of *pathways to old age pension*:

> *A pathway to old age pension* is the succession of sequentially linked primary income sources within the opportunity window for old age pension entrance given in the national pension system.

Constitutive for *pathways to old age pension* is the succession of primary income sources from employment, state transfers, and old age related pensions. This includes part-time, full-time and self-employment; survivor pensions, unemployment, disability or low income related state transfers, as well as old age pensions provided by the state, employers or independent institutions. A specific case is receiving no own income at all. We link individual trajectories to income sources that are institutionally defined on the macro level, such as unemployment benefits or different types of old age pensions. We avoid the a priori definition of retirement as an absorbing state, since employment can reoccur as the primary income source after a period of old age pension as the primary income source.

Pathways to old age pension is purposefully a rather open concept to enable a comprehensive cohort analysis in cross national comparisons. Specifying retirement processes conditional on certain beginning and end states necessarily entails a restriction to persons who experience these transitions. In order to avoid the exclusion of specific subpopulations, the time bracket in which sequentially linked primary income sources are regarded as *pathways to old age pension* is set as the opportunity window for old age pension entrance. The opportunity window for old age pension entrance is defined as the age bracket, in which the transition to old age pension can theoretically occur, given the eligibility conditions specified in national old age pension policies. In most countries this will span a five to ten year period around official state pension age.[2]

Pathways to old age pension enables the inclusion of persons who never enter old age pension but remain without an independent source of income, or live on survivor pensions in later life. With the focus on the succession of primary income sources

[2]The opportunity window for pension entrance strictly often also differs for subgroups of national populations, e.g. by gender, sector, occupation, or cohort. In within country analyses of pathways to old age pension this is an important distinction. To uncover salient national differences, it is more conducive to define the opportunity window for pension entrance on the national level.

within the opportunity window for old age pension entrance, we simply treat the absence of an event, in this case old age pension entrance, as a specific case of the process under study.

An obvious point of criticism is the restriction to one primary income source, when effectively it may be the combination of several income sources that is relevant for people's life situation. However, this can easily be resolved by considering frequently occurring combinations of income sources, e.g. public and supplementary occupational pensions, as a combined primary source of income. To what extent the combination of income sources to a combined primary source of income is sensible, is both a conceptual and an empirical question. Social policy analysis can inform us about which combinations of income sources are institutionally designed to occur in combination with each other.[3] Empirically, there are two straightforward guidelines for the meaningful combination of income sources: the frequency with which two sources of income occur simultaneously, and the difference in income level they provide. If two sources of income occur in combination very frequently, and provide similar levels of income, one is well advised to treat them as a combined source of income, considering that they are approximately equally relevant for the effective income situation. The inclusion of assets and investment income as a primary income source is an additional critical point. On a conceptual level investment income is in principle unproblematic to include as a possible primary source of income. In practical applications, however, the specification of investment income as an independent individual source of income may be ambiguous, because it is usually regarded as a household level income source.

In terms of a trade-off between specificity and openness, the concept of *pathways to old age pension* is in a sense a middle ground between institutional *pathways to retirement* (Kohli et al. 1991), and *midcourse* (Moen 2003). The pathway to retirement is a specific, and consequently quite restrictive concept. In contrast, the concept of midcourse is more open and inclusive, but to a degree that makes the disentanglement of

[3]This rationale may hinder the identification of non-standard transition processes, by focusing only on institutionally designed combinations of income sources and should thus be combined with a careful consideration of which income sources may be prevalent in non-standard transition processes.

various components and the operationalization for empirical research difficult, since it denotes an entire new life stage spanning multiple life domains. The concept of *pathways to old age pension* seeks to optimize the trade-off between specificity/restriction and openness/comprehensiveness for a differential cross national cohort comparison of retirement transition processes shaped by national labor market and pension policies.

Pathways to old age pension enable a comprehensive comparison including non-standard transition processes, and are sufficiently precise to be empirically accessible. Since non-standard transition processes typically are subject to more indirect, unintended influences of institutional regulations, they may constitute the primary source of cross national variation in retirement transition processes. The variety of heterogeneous non-standard transition processes indicates to what extent retirement transition processes are orderly and uniform and thus may reflect the degree of institutional control of this life course transition (Kohli and Rein 1991, O'Rand and Henretta 1999).

3.2 Properties of pathways to old age pension

After defining the concept of pathways to old age pension, it is necessary to specify which properties of pathways should be compared to capture the impact of welfare and pension policies. Brückner and Mayer (2005: 35) propose the following empirical characteristics for the assessment of differences in life course patterns:

- prevalence, the extent to which a given transition or state occurs
- age variance, the degree to which transitions occur at specific ages
- duration variance, the extent to which people stay a similar amount of time in a given state or stage
- inter-event dependency, the extent to which the occurrence of one event or state is associated with the occurrence of another event or state

- sequence uniformity, the extent to which the temporal sequence and ordering of events and states are uniformly distributed

In essence, these criteria center around a temporal component (age and duration variance), and an occurrence and precedence related component (prevalence and inter-event dependency) of states within sequences. The last bullet point summarizes between person variation of overall sequences resulting from the more specific properties above.

Pathways to old age pension defined as the succession of sequentially linked income sources will foremost depend on institutionally regulated access to transfers from these income sources. Institutionally regulated access is given by eligibility criteria, typically either based on age graded or functional criteria (Neugarten 1982). Prevalent functional criteria are the accumulation of entitlements, belonging to specific subgroups of the population (e.g. women), or need.

Age graded eligibility connects access to income sources to chronological age. Consequently, they will affect the timing of transitions within sequences. Time limits of state transfers restrict access to income sources to fixed durations, and thus will affect state duration variance. Functional eligibility criteria condition access to transfers on membership in 'welfare classes' (Leisering 2003), often reflected in immediate previous states, e.g. the unemployed, or the disabled. Functional eligibility criteria will primarily have an impact on the occurrence and order of states within sequences, because they condition later states on earlier ones.

Due to the central role of age graded and functional eligibility criteria for welfare transfers (e.g. unemployment, disability and social assistance) and pension transfers, we assume that the sequence properties most directly affected by these policies are the timing of transitions within sequences, the state duration variance, and the occurrence, and order of states. Timing and duration variance can be subsumed as *temporal sequence properties*, while the occurrence and order of states within sequences are *precedence related sequence properties*.[4]

[4]The occurrence of states can be understood as a subcomponent of order, since the sequential occurrence or non occurrence of states determines order.

Temporal and precedence related sequence properties can vary between individual trajectories, but also across individual trajectories over time. We distinguish two levels: intra-personal variation across time, and inter-personal variation within populations. Intra-personal variation refers to the extent pathways to old age pension are orderly over time, while inter-personal variation captures the degree to which they are uniform across populations.

Access to state transfers and old age pensions is predominantly regulated through combined age graded and functional eligibility criteria. Therefore, labor market and pension policies will simultaneously affect timing and precedence within sequences. Together temporal and precedence related sequence properties reflect the institutional frameworks under which pathways to old age pension evolve. They only amount to theoretically meaningful patterns of life courses, e.g. the differentiation or standardization of life courses as elaborated below, in combination with each other. Each of these indicators alone can be indicative of multiple processes of social change (Brückner and Mayer 2005: 35). Consequently, we need summary concepts of sequence properties in order to understand their simultaneous and interdependent development as an outcome of national labor market and pension policies.

Turbulence

To capture the process of increasing intra personal variability across life courses, Brückner and Mayer (2005) propose *differentiation*, defined as "the process where the number of distinct states or stages across the life time increases" (p. 33). Differentiation refers to the diachronous dimension of a sequence of life states in one life domain.

Elzinga and Liefbroer (2007) argue that intra personal variability is more complex than the number of distinct states and stages across trajectories. They propose the measure of *turbulence* (see section 5.2.1) to capture the full complexity of variability across individual life courses. In contrast to differentiation, turbulence reflects an increase in the number of distinct subsequences, rather than states or stages. Because subsequences consist of states in a particular order, they additionally account for the

order of states (see Elzinga 2006b).

Further, turbulence includes state duration variation as a source of intra personal variability across time (see section 5.2.1). Comparing two pathways with an equal number of subsequences, but different duration variations, the pathway in which duration variation is higher, indicating that most time was spent in only one state, displays greater stability and is considered less turbulent. Consider as an example two trajectories x and y of three years length with three states A, B and C. In sequence x A, B, and C occur for one year each. In sequence y A and B occur for one month only, and almost the entire three year period is spent in state C. In y, A and B are only transitory in nature and play a marginal role for the sequence as a whole. Intuitively y displays far larger stability and less variability compared to x, and should thus be considered less differentiated or turbulent.

State duration variance is high, when state durations are very uneven, because some states occurred for a very short time compared to others. If about equal amounts of time were spent in different states, state duration variation is low, therefore turbulence increases with decreasing state duration variance. A pathway, in which a person remains in the same state at all times is minimally turbulent. A pathway characterized by a high number of ordered subsequences is highly turbulent in terms of order. If state duration variance is high, turbulence is attenuated, because a pathway displays relatively high stability if the majority of time was spent in only one state. Substantively this means that a high number of distinct subsequences is not overvalued, if they are only short term transitory phases in an overall stable trajectory. Instead, sequences that are continuously characterized by varying states of approximately equal duration are considered more turbulent. In sum, turbulence can be understood as an extension of differentiation additionally accounting for precedence relations and state duration variation in sequences.

Starting point was the assumption that age graded and functional eligibility criteria to welfare transfers and old age pensions will manifest themselves in combined patterns of temporal and precedence related sequence properties. By taking into account precedence relations, and state duration variance, turbulence includes both a

temporal and a precedence related component. It is thus an appropriate summary measure to grasp the intra personal variability of pathways to old age pension as the joint outcome of functional and age graded eligibility to welfare and pension transfers.

Although we strictly assume that the temporal and precedence related sequence properties only convey meaningful information in combination with each other, their analytical distinction further illuminates our understanding of how distinct sequence properties contribute to the overall intra personal variability of pathways to old age pension. This can be empirically implemented by calculating turbulence separately with and without the inclusion of duration variance (see section 5.2.1).

Standardization

Inter personal variability of pathways can be subsumed as the degree of *standardization* denoting "processes by which specific states or events and/or sequences in which they occur, become more universal for given populations or that their timing becomes more uniform." (Brückner and Mayer 2005: 32). Life course patterns are de-standardized if certain life states, events, and their sequences affect small parts of the population, occur at dispersed ages, and dispersed durations (ibid).

Standardization is understood as the inter personal analog to turbulence, equally decomposable in a temporal and precedence related component. The precedence related component of standardization is marked by the extent to which states, events and the sequences in which they occur become more universal. The degree to which timing and state durations becomes more uniform constitutes the temporal component.[5]

Pathways to old age pension are maximally standardized, if all members of a population enter state old age pension seamlessly from full-time employment at age 65. They are de-standardized if a population is divided into small groups that enter

[5]The precedence related components of turbulence and standardization both refer to the variability of distinct ordered subsequences. In contrast, the temporal component reflects rather different things on the intra and inter personal level. Timing in turbulence, is limited to state duration variation across individual trajectories. The temporal component of standardization includes both the inter personal age and state duration variance.

varying forms of old age pension from varying previous income sources with high age and state duration variance. Again we assume that the temporal and precedence related components of standardization only amount to theoretically meaningful life course patterns in combination with each other, because access to income sources is jointly determined by age graded and functional eligibility criteria. Single sequence properties as a higher occurrence of states can be indicative of multiple processes of social change, as de-institutionalization, de-standardization, or de-differentiation (Brückner and Mayer 2005). The distinction between temporal and precedence related components enables us to ensure that several criteria for standardization are met. In order to implement this theory driven distinction empirically, the inter personal distances resulting from single sequence properties can be isolated in separate sequence analyses (see section 5.2).

3.3 The institutionalization of the life course

We proposed the concept of pathways to old age pension to follow micro trajectories through institutionalized income sources in a comprehensive cross national cohort comparison. Further, we specified turbulence and standardization as theoretically rooted summary measures of temporal and precedence related properties of pathways to old age pension. They are assumed to vary with welfare and pension policies, due to the age graded and functional eligibility criteria inherent in these policies.

Following a differential life course approach (Mayer 2005), we subsequently discuss theoretical considerations on the institutionalization of the life course to arrive at contextual hypotheses on the degree of turbulence and standardization of pathways to old age pension for the study cohort (1930-1940) in Germany and the United Kingdom.

Empirical regularities in pathways to old age pension reflect social structures resulting from the aggregation of individual trajectories. The institutionalization of pathways to old age pension refers to the process by which institutional conditions

generate these empirical regularities. In contrast to social structures, institutions are long term social arrangements connected to clear behavioral expectations, informal norms, and formal rules or legislations (Mayer and Diewald 2007).

Several forms of institutionalization of life courses are distinguished.[6] Most importantly; age norms and roles, age graded social policy regulations, and indirect institutionalization of life courses through temporal sequences of participation in specific institutions. Indirect and often unintended institutionalization of the life course can generate highly differentiated life courses, connected to standardized and formalized transitions (ibid.). Finally, the social organization of the life course can be understood as an institution in itself that functions as an orientation framework for individuals. An example is the tripartite work centered normal life course (Kohli 1986) given by the succession of three major life stages education - work - retirement. As a prevailing norm the institutionalized life course has security giving functions by making life courses more predictable (ibid).

Structural lags (Riley and Riley 1994) between institutions and life realities emerge, when norms and institutions manifest previous and not current practices. Life courses then reflect the legacy of earlier policies (Leisering 2003: 210ff). This is particularly prevalent in old age pensions, because they imply long term investments and accumulated rights that are not easily changed by short term policies (Myles and Pierson 2001).

In the literature several approaches toward a theory of the welfare state and the life course are prevalent (Mayer and Müller 1986, Mayer and Schöpflin 1989, Levy 1996, Leisering 2003, Mayer 2005). A fairly general assumption is that extensive state regulation will produce more continuous and standardized life courses compared to more fluid life courses under restrained government intervention (Mayer and Schöpflin 1989, Leisering 2003). Similarly, predictability of life courses is related to life course continuity (e.g. Kohli 1986).

A basic commonality underlying these approaches is the conceptualization of the life course as aggregate temporal patterns of life reflecting social structures as opposed

[6] see Mayer and Diewald 2007 for an overview.

to a biographical reconstruction of single life courses. A distinction into *political economy* and *social policy* approaches can be made based on the macro level institutions they emphasize (Leisering 2003).[7] Based on the analysis of longitudinal micro data, *political economy* approaches (Schömann and Becker 1995, Mayer 1997, Allmendinger and Hinz 1998, DiPrete 2002) place higher emphasis on markets, particularly labor markets, in addition to welfare state characteristics. In contrast, *social policy* approaches (Leisering and Leibfried 1999, Guillemard 2000, Rein and Schmähl 2004) focus on life course effects of social policies, primarily based on institutional and qualitative data.

Labor markets, welfare and pension systems jointly shape pathways to old age pension. Labor market structures constitute push factors by promoting or hindering employment continuation, while welfare and pension policies function as pull factors out of the labor force (Ebbinghaus 2006). Both labor market push factors, and pull factors of welfare institutions have to be taken into account for the analysis of cross national differences of life course patterns (DiPrete at el. 1997). Family related labor market selections early in the life course also constitute push factors out of employment, not immediately related to retirement but consequential for old age pensions.

The differences in primary unit of analysis - the individual as opposed to the state and social policies - has long been put forward as a barrier for linking the two research traditions (Mayer and Schöpflin 1989: 190). A corollary of the difference in primary unit of analysis is that the political economy of the life course has been more precise about life course outcomes generated by institutional contexts. For example the concepts of differentiation and standardization (Brückner and Mayer 2005) discussed above stem from this tradition. On the other hand, the analysis of life course effects of social policies tends to be more explicit about distinct policy features.

Subsequently, we discuss implications and predictions from both research traditions for the structure of pathways to old age pension and associated patterns of income inequality.

[7] They are not opposing lines of research, rather complementary approaches that differ in their specific research foci.

3.3.1 The political economy of the life course

An explicit comparative political economy of the life course was first put forward by Mayer (1997), linking 'varieties of capitalism' (Hall and Soskice 2001) to life course patterns through open and closed positions in labor markets (Sørensen 1986). As a heuristic framework open, liberal, and deregulated market societies are contrasted to closed, corporatist, and coordinated market societies. The liberal type is related to loose mutual trust between the state, employers, and individuals, while coordinated societies are assumed to rest on high mutual trust (Mayer 1997). In the simplest form dichotomous regime types are contrasted, as liberal vs. coordinated, or traditional vs. modern (Mayer and Müller 1986). They have been further differentiated in multiple regime types, most famously based on Esping-Andersen's typology of welfare regimes (Esping-Andersen 1990), and their impact on life courses patterns (Mayer 2005, Blossfeld et al. 2006).

In liberal market societies as the United Kingdom, the state largely remains outside the contractual relationship between employers and employees. Unregulated occupational defined contribution (DC) pension plans are an exemplary case of low mutual trust between the state, employers and individuals in pension provision. The rationale of low mutual trust suggests that transition processes in sensitive life course phases will be differentiated into short term shifts between varying, partly marginal states. Liberal societies are seen as prototypical of late labor force exit with low replacement rates, and high inequality in old age (Ebbinghaus 2006). The family sphere is also coined by higher fluctuation, and a stronger relation of family changes to changes in economic well-being in later life (Zaidi et al. 2005).

In contrast, in corporatist societies as Germany, the state is more active and regulative, there are strong trade unions and employer associations (Mayer 1997). PAYG funded pension systems are an exemplary case of strong, long term mutual trust relationships between the state and individuals that entail high predictability of retirement and old age. Due to the power of unions and work councils, lay-offs are difficult and costly. The state takes responsibility for the social consequences of downsizing in times of economic restructuring or recession. The private insurance

against social risks is at most complementary to state insurance, and of minor importance. As a result labor force exit is early, with high replacement rates and medium inequality in old age (Ebbinghaus 2006). The notion of high mutual trust suggests that transition processes in sensitive life course phases are usually highly regulated and continuous. Higher trust also prevails in the family sphere (Mayer 2005), with welfare transfers based on the principle of subsidiarity, fostering cohesion and stability of nuclear family arrangements.

Buchholz et al. (2006) distinguish between 'employment maintenance' and 'employment exit' as two ideal typical strategies to adjust the qualification structure of the workforce to accelerated structural change under globalization beginning from the late 1980s. Corporatist societies with a history of strong state intervention and segmented labor market structures will adopt employment exit strategies and externalize older employees through early retirement and unemployment bridges. Liberal societies coined by a tradition of weak state intervention will rely on flexible, unregulated labor markets to allocate older workers to jobs, following a market-induced maintenance strategy.

The labor market structures assumed to be most influential in shaping labor market exit patterns are employment relation systems, occupational systems and employment sustaining policies (Buchholz et al. 2006). Employment relation systems refer to the degree of employment protection and labor market segmentation. Occupational systems define the importance of occupational certification and training for career mobility. Employment sustaining policies are given by the extent of active labor market policies.

In the corporatist society given in Germany, employment protection is still high (Schömann et al. 1998) and certification based occupations hinder mobility between occupations and jobs (Müller and Shavit 1998). A lack of active labor market policies particularly for older workers further contributes to discourage their employment (Schömann 2006). Liberal societies as the United Kingdom are coined by low employment protection and high importance of on-the-job training facilitating mobility between occupations and jobs, even though involvement of the state in active labor

market policies is low.

Employment exit regimes are expected to induce fewer job to job moves, less re-entries from unemployment to employment, and an increase in early retirement among older workers (Buchholz et al. 2006). In contrast, market induced maintenance regimes are expected to destabilize career exits through increasing job loss, more short term unemployment spells, and more re-entries into employment. These effects are assumed to accelerate with the structural change since the late 1980s.

In sum, according to political economy approaches that emphasize push factors in labor markets, the labor market exit transitions within pathways to old age pension will be more standardized and continuous, thus less turbulent in the corporatist coordinated market economy given in Germany. In the liberal market based system in the United Kingdom, more variance and discontinuity of labor market exits, i.e. higher turbulence and lower standardization is expected. These considerations primarily apply to persons employed in later life. Pathways to old age pension of persons who have been out of the labor force long before entering old age pension will rely more heavily on non-labor market related welfare and pension policies, as well as earlier push factors out of the labor force.

3.3.2 Life course effects of social policies

Leisering (2003) proposes an overarching model to link government and life courses as a whole based on the specification of life course policies and modes of operation that link policies to life course outcomes. Life course policies are social policies, that *intentionally* shape life courses (Leisering 2003: 210). A central distinction is made between positive and negative life course policies (ibid). In order to avoid the normative connotation inherent in *positive* and *negative* we subsequently refer to *active* and *passive* life course policies. Active life course policies intentionally shape life course patterns by means of 'politico-administrative intervention' (ibid.). Passive life course policies in contrast, intentionally leave the formation of the life course to non-state forces as markets, companies, the family or charity. The intentional non-intervention, or lack of state regulation can have massive consequences for life

course outcomes. The retrenchment of state transfers fosters open markets that will propel the establishment of private and corporate providers, and thus entails higher institutional complexity for the provision of the respective insurance or service. A prototypical passive life course policy is the state incentive for contracting out of the British state pension system with the Thatcher reforms 1986, followed by a steep increase of available private and occupational pension plans (Hannah 1986, Schulze and Moran 2007, see chapter 2). We assume that passive life course policies that entail higher institutional complexity will lead to less standardized pathways to old age pension, simply because more institutional alternatives are available. In contrast, active life course policies will tend to shape a limited number of alternative transition routes.

Leisering (2003) distinguishes three core fields of social policy: education, risk management (including social assistance, social insurance, and personal services, e.g. counseling), and old-age pensions. They are centered around work and reflect the basic idea of the tripartite work centered life course (Kohli 1986), but allow for more flexibility and a closer link to social policy by replacing employment with risk management. They cut across three modes of operation, as the mechanisms by which policies shape life course patterns: *structuration/differentiation*, *integration*, and *normative modeling* (Leisering 2003: 211).

Structuration/differentiation denotes the process by which policies create distinct conceptual life stages and related transitions that define social identities and membership in welfare classes, e.g. 'the old-age pensioners'.

Integration refers to the process by which life's discontinuities and transitions are bridged by social policies, creating continuity and predictability of transition phases between life stages. Active risk management policies provide tight integration of life stages by preventing sudden and steep income loss during employment interruptions. In the context of old age pensions, tight integration refers to security of expectations, predictability and continuity of the transition process.

Normative modeling captures sometimes implicit social policy agendas that shape life courses. The threat of status loss and the necessity of state intervention to

prevent it, is the norm guiding active risk management systems. Earnings-related old age pensions put a premium on the normal life course coined by life time employment histories (Leisering 2003). Combined with the normative model of a male breadwinner division this generates distinct male and female normal life courses (Allmendinger et al. 1993) that will lead to equally gendered pathways to old age pension.

Policies can generate tight integration of pathways to old age pension either through extended risk management policies, e.g. disability or bridge unemployment, or through pre-termed old age pensions in form of early retirement schemes. The interdependence of the two policy fields becomes evident in a tendency of risk management and pension policies to function as institutional equivalents during the retirement transition process (Guillemard 2000), e.g. through unemployment as an institutionalized bridge to early pension entrance.

Two forms of integration are distinguished according to the temporal orientation of policies: if benefits reflect previous life course patterns, they are *life course sensitive*; if they affect subsequent life courses they are *life course relevant* (Leisering 2003). Old age pensions are both life course sensitive, since they usually depend on some form of prior contribution, and life course relevant, as eligibility implies subsequent pension receipt often until death. Guaranteed earnings related pension schemes are an exemplary case of life course sensitive policies that produce high stability of expectation and predictability of retirement transition processes. State transfers that entail subsequent eligibility to other transfers, e.g. if prior unemployment enables earlier old age pension entrance, are life course relevant. Active life course relevant policies will have homogenizing effects across populations, since all persons affected by a life course relevant policy will be subject to similar forces thereafter.

Higher predictability inherent in life course sensitive policies is often related to a better ability to plan, and higher individual control over life courses generating continuity across life courses (e.g. Kohli 1986). However, insufficient contributions in an earnings related scheme lead to a predictable lack of benefits from this scheme, but not to higher individual control or continuity. Life course sensitive policies will only generate higher continuity, if predictability is combined with institutional options to

Table 3.1: Life course policies, turbulence, and standardization

	characteristics of pathways to old age pension	
life course policies	turbulence	standardization
active	-	+
passive	+	-

prepare for and control the transition process.

Table 3.1 summarizes the expected impact of active and passive life course policies on turbulence and standardization of pathways to old age pension. Integration is the mode of operation by which life course policies create predictability and continuity of pathways. We assume that active risk management and pension policies will provide higher continuity, thus lower turbulence across pathways to old age pension, because they prevent sudden and steep income loss with a limited number of institutionalized bridge arrangements. Active life course sensitive pension policies that provide institutional options to prepare and control the transition process will create continuity and mitigate turbulence across pathways. In contrast, passive life course policies will lead to more turbulent pathways, simply because more institutional options are available, compared to a limited number of alternative institutional transition routes shaped by active politico-administrative state intervention. Further, higher institutional complexity of open markets for services otherwise provided by the state, entail lower predictability of future pension provision.

High intra-personal variability reflected in high turbulence will not happen in a standardized way, unless strong regulations intentionally produce uniformity across populations. It follows that high turbulence will tend to go along with low standardization, if the intra-personal variability indicated by turbulence is not highly regulated. Therefore we assume that active life course policies increase inter-personal standardization of pathways, while passive life course policies will decrease standardization.

In *Germany* life course policies are largely active, both life course sensitive, and life course relevant (Leisering 2003). Major benefits in risk management systems are

dependent on prior contributions, and state transfers frequently change subsequent eligibility to other state transfers. Particularly throughout the 1990s, when most of the study cohort experienced the retirement transition process, the state largely took responsibility for gaps between employment and old age pension through active life course policies, predominantly through institutionalized bridges of prolonged unemployment, and firm level early retirement schemes (see chapter 2). Through the premium on life time employment histories, gender differences are strongly reinforced. For the study cohort weak external childcare provision and high tax incentives for male bread winner arrangements discouraged women's returns to employment after child birth.[8] Thus, the active life course policies are mainly directed at intentionally shaping male breadwinner life courses, while female life courses are to a greater extent shaped by non state forces, primarily their family biographies. This will lead to highly gendered pathways to old age pension (Allmendinger et al. 1993). The strong active life course policy orientation reflects the high mutual trust relationship in corporatist market societies emphasized in the political economy approach (Mayer 1997).

While the British pension system is mainly characterized by passive life course policies, the active elements of British pension policy, the basic and supplementary state pensions (BSP, SERPS/S2P), are highly life course sensitive, since they are closely tied to contribution periods. Private and occupational pensions are also tightly linked to contributions, with defined benefit plans providing higher continuity compared to the insecurity of defined contribution plans that shift risk from employers to employees (Shuey and O'Rand 2004). Risk management policies are strongly work centered with low minimum benefits designed to incentivize employment. For the study cohort pension policies were normatively modeled on a strong male breadwinner division with extensive derived benefits, disincentives for independent female entitlement accumulation and the exclusion of female part-timers from occupational pensions (Ginn 2003, Meyer and Pfau-Effinger 2006), see chapter 2. This equally suggests highly gendered pathways to old age pensions. The strong passive life course

[8] This has changed with recent reforms and the introduction of the so called 'Elterngeld'. All discussions in this section relate to the situation in effect for the cohort born 1930-1940.

policy orientation reflects low mutual trust in liberal deregulated market societies (Mayer 1997).

Old age pensions in Germany and the United Kingdom in effect for the study cohort were both life course sensitive. But policies in the two countries fundamentally differed in the way of life course sensitivity. The German old age pension system was characterized by active life course sensitive policies, while in the United Kingdom old age pensions were coined by passive life course sensitive policies. In addition, we find more active life course relevant policies in risk management in Germany, also assumed to foster continuity, thus low turbulence, and higher standardization across pathways to old age pension.

It is debatable to what extent pension and risk management policies in Germany were intentionally designed to actively shape the retirement transition process. They may rather reflect non-intended consequences of purposeful behavior of individual or collective actors (Coleman 1990), such as early retirement regulations brought about through collective bargaining. The strong active orientation of pension and risk management policies is arguably primarily a side effect of political pressure to mitigate the social consequences of high unemployment following German reunification during the 1990s, and was not intentionally directed at structuring the retirement transition process.

3.3.3 Institutional context and individual differences

One possibility to conceptualize the relationship between institutions and micro level life course patterns is to understand it as a reciprocal system of positive and negative incentives (Mayer 2005: 33). Life course policies change the opportunity and incentive structure for individuals through the availability and generosity of cash benefits (Leisering 2003: 210). Life course patterns are the joint outcome of structural incentives and individual behavior in response to these incentives. A central question then is, whether institutional selection or individual choice is of primary importance, whether individuals are active agents or passive objects in the processes that shape life course outcomes (see Mayer 2003: 466).

Institutional contexts differ in the degree to which they permit individual differences, such as preferences and abilities, to manifest themselves (Caspi and Moffitt 1993). Evidence indicates that the variability of inter individual differences in terms of cognition, personality, and social skills increases with age (Lindenberger 1992).[9] For example the ability to understand complex social policy regulations, e.g. concerning old age pensions will vary more among individuals with increasing age. Higher variability of inter-individual differences with age implies that individual differences should be more salient with increasing age.

A general distinction can be made between strong and weak, or structured and unstructured situations (Mischel 1977, Caspi and Moffitt 1993). Weak situations accentuate individual differences, while strong situations constrain behavioral choice and evoke similar responses from most individuals. Situations are strong to the degree they induce uniform expectancies regarding appropriate behavior, provide adequate incentives for the performance of this behavior, and require skills that everyone has to the same extent (Mischel 1977: 347). In contrast, situations are weak to the degree that they are complex, do not generate uniform expectancies about appropriate individual behavior, do not offer sufficient incentives for this behavior, or fail to provide the learning conditions required for the successful genesis of the behavior (ibid.).

The impact of individual differences on behavior tends to be accentuated during transitions to new, ambiguous, and uncertain situations. Thus, individual differences will be most salient during transitions to new life phases that are embedded in weak situations. Based on work by van Gennep (1960), Caspi and Moffitt (1993) argue that societies develop 'rites of passage' to diminish extreme individual differences during major life transitions characterized by novelty and ambiguity. 'Rites of passage' are preexisting schemes that help people categorize and organize changing events. They function as heuristics that guide people's behavior in complex situations (Tversky and Kahneman 1974). They provide predictability and continuity that attenuates in-

[9] This refers to the finding that aging is a highly individualized process (Neugarten 1982). Some persons remain high cognitive and physical skills until age 90, while others experience cognitive and physical decline as early as age 50.

dividual differences throughout transition processes. The tripartite normal life course (Kohli 1986) can be understood as an overarching 'rite of passage' for managing life courses.

Contribution related old age pensions generate strong path dependence across individual life courses. As a consequence, the existence of strong or weak institutional contexts is not only relevant during the retirement transition process, but throughout the adult life course by shaping the accumulation of pension entitlements. Mandatory universal pension systems, in which access is regulated through highly age graded eligibility at official retirement ages, create strong situations: they generate uniform expectancies about the appropriate time for retirement and provide clear incentives for this behavior, or rather control it, through mandatory participation in the pension scheme. No specific skills are required to choose the best pension plan, if participation is mandatory. Accompanied with respective age norms, they provide clear 'rites of passage', and thus will attenuate individual differences throughout the retirement transition process.

Highly differentiated, complex pension systems largely based on functional eligibility, generate weak situations. Complex, differentiated pension systems are difficult to understand, and therefore do not generate uniform expectancies about retirement transition processes. If the choice of pension plans is largely individualized, individual differences in terms of risk aversion, myopia, and accumulated resources as education, will be accentuated and lead to increased inequality in pensions. Voluntary occupational and private pension plans are one example for highly individualized pension plans (Shuey and O'Rand 2004). If not accompanied by massive consultancy on which plan to choose, these systems will fail to provide the learning conditions required for successful genesis of the desired behavior - in this case optimal planing and preparation of a smooth and continuous retirement transition process.

Two aspects of individual behavior have to be separated: (1) preferences, and (2) individual differences in personality traits and abilities to plan for, and manage the retirement transition process. While strong situations may provide a greater degree of security and continuity, they may also restrict individual options and choices. The

degree of individual choice is related to social inequality. If resources are distributed very unequally in a given society, more people have to accommodate than have the opportunity to realize individual preferences (Mayer 2003: 466). Consequently, if the impact of individual differences is accentuated in weak situations, weak institutional contexts should entail more leverage to realize individualized preferences, (at least) for the upper strata in a given society.

In sum, the relative impact of institutional structures and individual differences on observed life course outcomes will depend on two factors: whether institutional structures pose a strong or weak situation as defined by Caspi and Moffitt (1993), and the level of inequality (Mayer 2003). This is additionally reinforced by the path dependence of contribution related pensions over the life course. Lack of investment in a pension plan or selection of a plan that provides poor returns early in life cannot be reversed.

We find a typical weak situation in the United Kingdom: pensions are institutionally highly differentiated and do not generate uniform expectancies about pathways to old age pension. Investment in pension plans is largely individualized, heightening individual differences in terms of risk aversion, myopia and abilities to make beneficial decisions for the future. Pension regulation is also weak, failing to provide the learning conditions required for successful pension provision for all members of society.

In contrast the pension system in effect for the study cohort in Germany constitutes a strong institutional context with a generous mandatory state pension system attenuating individual differences in abilities to make beneficial choices on pension accumulation. Institutionalized early entrance options provide clear 'rites of passage' and highly structured transition routes to guide the transition process to a new life stage.

We assume that the variability between pathways to old age pension, will be higher in differentiated, weak institutional contexts compared to universal, strong institutional contexts. First, highly differentiated institutions generate more variable pathways, simply because more institutional options are available. Second, the

impact of institutional differentiation will be amplified by the higher salience of individual differences in weak situations. If this is the case, an increase in turbulence and decrease in standardization of pathways through high institutional complexity in the United Kingdom will be additionally amplified by an accentuated salience of individual differences in this weak institutional context.

3.4 Summary of hypotheses

We expect that pathways to old age pension will be continuous and standardized in Germany, because:

1. high mutual trust between individuals, the state, and employers, characteristic for the *corporatist* structure in Germany, fosters long term obligations, predictability, and continuity

2. the *employment exit regime* in effect for the study cohort in Germany coined by employment protection, a certification based occupational structure, and minor active labor market policies, promotes uniform early retirement, low job to job mobility in late careers, and inhibits re-entry to employment after unemployment for older workers

3. generous *life course relevant risk management* policies during pathways to old age pension of the study cohort prevent sudden income loss and entail higher subsequent standardization of pathways

4. *active life course sensitive pension policies* in effect for the study cohort generate high predictability of pathways to old age pension

5. the relatively low institutional complexity combined with clear 'rites of passage' to manage the transition process *attenuates the impact of individual differences* on the structure of pathways to old age pension

We expect that pathways to old age pension will be turbulent and de-standardized in the United Kingdom, because:

1. low mutual trust between individuals, the state and employers in *liberal* societies fosters short term shifts of 'muddling through' various income sources

2. the *employment maintenance regime* given in the United Kingdom for the study cohort is characterized by low employment protection and high importance of on-the-job training facilitating job mobility in late careers and re-employment after unemployment for older workers

3. low *risk management* transfers of limited duration necessitate more movement between different primary income sources during pathways to old age pension of the study cohort

4. the dominance of *passive pension policies* in effect for the study cohort fosters institutional differentiation that will lead to higher turbulence and lower standardization of pathways to old age pension, simply because more institutional pension options are available

5. the high institutional complexity fostered by passive life course policies combined with the absence of clear 'rites of passage' will *accentuate the impact of individual differences* on the structure of pathways to old age pension

The hypotheses can be summarized as follows:

Hyp 1: Pathways to old age pension of the cohort born 1930-1940 will be less turbulent in West Germany compared to the United Kingdom.

Hyp 2: Pathways to old age pension of the cohort born 1930-1940 will be more standardized in West Germany compared to the United Kingdom.

Income inequality across pathways

Beyond the structure of pathways to old age pension we are interested in associated patterns of income inequality with turbulence and standardization. Are inequalities amplified or attenuated throughout the transition process? does higher turbulence go along with greater income mobility and lower inequality? or is higher turbulence associated with moves between equally precarious low income sources? Three dominant hypotheses of intra cohort inequality across time are prevalent in the literature (O'Rand and Henretta 1999, Mayer et al. 1999): status maintenance, also referred to as socioeconomic continuity, cumulative advantage, and status leveling.

According to the *hypothesis of status maintenance*, status differences are preserved across critical life course transitions. Resources obtained early in the life course, particularly in the transition from education to work, have persistent effects across time and serve to maintain individuals' relative status within cohorts. Educational attainments affect placement in the labor market that determines future earnings and the accumulation of assets and pension entitlements. Consequently, economic status in later life will be a linear function of earlier status achievement and there will be no change in intra cohort inequality across pathways to old age pension. This implies stable inequality on the population level.

The *hypothesis of cumulative advantage* predicts increasing inequality within cohorts on the basis of initial advantage or disadvantage (Dannefer 2003, DiPrete and Eirich 2006). Age and socioeconomic situation interact with each other in a way that persons from lower classes are even worse off and persons from higher classes are comparatively better off in old age (Mayer et al. 1999: 229). Economic transitions are critical temporal thresholds that increase relative inequality. If this is the case, we would expect population level inequality to increase throughout pathways to old age pension.

Following the redistribution or *status leveling hypothesis*, the stratification effects of markets are attenuated by the transition to income from other sources than earnings. Progressive redistribution in social security benefits will off-set prior market inequalities, thus intra cohort inequality will decrease following entrance to state

transfers in pathways to old age pension. This trend may further be intensified by selective mortality. If members of lower socioeconomic classes are exposed to higher health and mortality risks, people who survive until the retirement transition process represent a positive selection of the population (Mayer et al. 1999).

Life course sensitive policies reinforce inequalities across time, because earlier positions in the social structure determine later ones through the intertemporal redistribution of income over the life course. Active life course policies will entail a stronger vertical redistributive element attenuating inequality with an increasing proportion of income drawn from pensions or other state transfers.

In Germany inequality will be transmitted through the intertemporal redistribution of income in the earnings related pension scheme (Mayer et al. 1999). Status maintenance can be expected due to the the income related pension level in the dynamic pension calculation that links pensions to prior earnings (see chapter 2). This suggests status maintenance across pathways to old age pension. However, this status maintenance effect may be mitigated through progressive redistribution in the PAYG system. Then we would expect status leveling due to pension caps at the upper earnings limit that attenuate intra cohort inequality throughout pathways to old age pension (Leisering 2003).

We argued that early life course events have cumulative effects on later life course outcomes particularly in weak situations in which individual differences are more salient (Caspi and Moffitt 1993). If this is the case, the high institutional differentiation and complexity of pensions in the United Kingdom should foster mechanisms of cumulative advantage, and inequalities would be additionally amplified through transition processes between major life stages. Because pension provision above subsistence level is largely individualized, persons who voluntarily invested in occupational and private plans early in the life course have an initial advantage that can be assumed to generate pension entitlements in a cumulative process. During pathways to old age pensions this would then widen the gap between people who have supplementary pensions and those who rely on state pensions only, suggesting cumulative

advantage expressed in increasing population level inequality across pathways to old age pension.
We hypothesize that:

Hyp 3a: Inequality will be maintained, or show a decreasing tendency across pathways to old age pension coined by low turbulence in West Germany.

Hyp 3b: Inequality will be accentuated across more turbulent pathways to old age pension in the United Kingdom.

Corporatist, coordinated market societies are associated with stabilizing and homogenizing tendencies of inequality across the life course, and across population groups (Esping-Andersen 1990, Mayer 2005). These homogenizing tendencies are hypothesized to manifest themselves in lower lifetime inequalities. In contrast, liberal market societies will generate diverging greater life time inequalities. Therefore, we expect that:

Hyp 4: A higher standardization of pathways in West Germany will go along with lower income inequality across pathways to old age pension compared to the United Kingdom.

Chapter 4

A rational choice framework: the timing of pension entrance

After a holistic perspective on pathways to old age pension we now address the impact of divorce and childcare interruptions on pension entrance timing - the central transition within pathways to old age pension. Divorce and childcare interruptions pose risks for retirement, because divorced people rely on their own resources in later life and childcare interruptions can jeopardize possibilities to accumulate own pension entitlements. Previous research about family influences on retirement largely assumed a joint household strategy of spouses based on family theories (e.g. Allmendinger 1990, Henretta et al. 1993). Our analysis requires an approach that supposes individual strategies to include divorced and other non-married persons in later life. We rely on a behavioral rationale that specifies how actors decide when to enter old age pension under given restrictions. We therefore place the analysis within the framework of rational choice theory. We briefly discuss implications of family theories that have been applied to retirement processes at the end of this chapter.

Rational choice theories (Coleman 1990, Lindenberg 1985, Simon 1993) assume that individual action is purposeful and aimed at the attainment of certain goals. They can be subsumed as a class of theories that meet three criteria (Diekmann and Voss 2004): (1) actors are the starting point (methodological individualism), (2) actors with certain preferences can chose between at least two behavioral alternatives

given their resources and restrictions, (3) the theory includes a decision rule that specifies how actors will behave under given conditions. As such the rational choice framework can be understood as a toolbox for theory building, rather than one coherent theory (e.g. Hechter 1998). We use it as a general framework to generate falsifiable hypotheses. In this chapter we address the questions:

- How does divorce affect pension entrance timing of men and women in West Germany and the United Kingdom?
- How do childcare interruptions affect pension entrance timing of women in West Germany and the United Kingdom?

With regard to the first research question our comparative design allows us to distinguish between a situation with *default* pension sharing upon divorce in Germany after 1976, and only *optional* pension sharing upon divorce after 1973 in the United Kingdom. Concerning the second research question we can contrast the impact of *prospectively* enacted care credits in pensions that affect cohort members differently in the United Kingdom, compared to *retrospectively* enacted care credits that affected all members of the study cohort equally in Germany. Further, possibilities to accumulate pension entitlements through typical female carer's employment patterns coined by discontinuity and part-time work are better for women in Germany (see chapter 2).

The chapter is structured as follows. We first place our approach within rational choice theory in sociology. Based on the behavioral economics literature (Thaler 1991, Aaron 1999, Kahneman 2003), we discuss systematic deviations from strict rationality with regard to retirement and summarize the behavioral assumptions we make to derive hypotheses. Subsequently, we formulate bridge assumptions on the 'logic of the situation' of pension entrance following divorce and childcare interruptions in the comparison countries. Divorce and childcare interruptions can affect pension entrance timing in two ways. Directly, through family provisions in pensions that determine what a family biography 'is worth' in terms of options for pension entrance timing. Indirectly by mediating employment histories and the accumulation of pension enti-

tlements. We close with a brief discussion of implications from family theories for the impact of divorce and childcare interruptions on pension entrance timing.

4.1 Rational choice theory

The objective of rational choice theories is to explain behavior under given preferences and restrictions. Genuine sociological rational choice theories are directed at social, rather than individual outcomes (Hechter 1998: 283). A central concern is the specification of aggregation rules that connect purposeful individual action to possibly unintended or suboptimal consequences on the macro level (Coleman 1990). Our analysis, however, focuses on an aggregate individual outcome, the timing of entrance to old age pension of a birth cohort in Germany and the United Kingdom. This is a 'demographic', rather than a social outcome that emerged as an unintended consequence of purposeful individual behavior (Hechter 1998). Instead of aggregation rules, we focus on the macro-micro transition, on how institutions shape the impact of divorce and childcare interruptions on pension entrance timing.

In a general sense the term rational means that individuals act intentionally, i.e. they pursue goals, and they do so in a 'more or less intelligent' way (Lindenberg 2006: 548). A basic problem is that individuals intentions and preferences are often not observable. Post hoc rationalizations explaining a result by changed preferences are not falsifiable, and thus tautological. One possibility to avoid this type of tautology is to measure preferences empirically. Then correlations between self-reported preferences and behavior are taken as indicators of explanatory power. However, people may be unaware of their own preferences or unwilling to communicate them (e.g. due to social desirability). Rating scales to assess preferences are often not validated implying the danger of measurement artifacts (Braun 1998). The most relevant point of criticism of the measurement of preference for our analysis, arguably is that structural parameters are only implicitly reflected in directly measured subjective utilities.

An alternative strategy to avoid ex post preference rationalizations in a rational choice framework is the model building approach (Coleman 1990). From this perspec-

tive it is not necessary to fully determine and describe preferences, instead the focus lies on the representation of the decision situation. A behavioral rationale is postulated without measuring it. Then it is empirically tested whether the hypothesized behavior, taking into account individual restrictions and structural conditions, complies with actual behavior. The assumed behavioral rule is taken as a basic premise for the formulation of bridge hypotheses (Coleman 1990). Bridge hypotheses connect social structure and individual action to explain individual behavior dependent on social variables (Esser 1998). Bridge hypotheses are descriptive statements about the logic of the actors' situation. "They translate variables from the objective situation into independent variables of an action theory which will explain the actors' situation specific action as a dependent variable" (Esser 1998: 95). To arrive at valid and empirically testable bridge hypotheses one cannot rely on theory alone, but has to include empirical information, e.g. by institutional analysis as presented in chapter 2 (Kelle and Lüdemann 1998: 113).

We follow the model building approach, because it is more explicit about structural restrictions for pension entrance timing. We assume but do not test an underlying behavioral rationale. The behavioral rationale in this context can be understood as an auxiliary assumption that does not necessarily have to be true in an absolute sense (Hedström and Swedberg 1998: 72). Following basic propositions of the positivist scientific tradition (Popper 1966), the precise reconstruction of the 'logic of the situation' through bridge assumptions enables the formulation of testable hypotheses (Hedström and Swedberg 1998).

From a life course perspective the rational choice framework has been criticized as an attempt to provide general accounts of behavior in universal 'time-less' theories, neglecting the historic specificity of time and space in which individual action takes place (e.g. Blossfeld and Prein 1998). Two goals need to be achieved (Blossfeld 1996: 182): the identification of particular historical structures and processes, and the specification of causal mechanisms that enable to trace the encounters of intentionally acting individuals as a series of choice processes. We take this into account by following one birth cohort in two countries through the historically specific insti-

tutional contexts they encountered, their location in time and space. The detailed assessment of national pension regulations and family provisions in pensions in effect for this cohort elaborated in chapter 2, guides the subsequent formulation of bridge hypotheses.

The existence of at least two behavioral alternatives is one of the preconditions for the applicability of rational choice (Diekmann and Voss 2004). We therefore briefly discuss freedom of choice in the timing of pension entrance.

Freedom of choice in the timing of pension entrance

Arguably, pension entrance is often so clearly defined by structural factors that the actual decision making process becomes trivial. This is the case if pension entrance occurs as a shift from one benefit category to another at state pension age. Pension entrance timing is then determined by institutional regulations that generate welfare classes defined by transfer receipt, as the 'unemployed' or 'pensioners' (Leisering 2003). These 'social security clocks' regulate inequality in later life (O'Rand and Henretta 1999). The most disadvantaged elderly depend exclusively on state transfers and their pension entrance is defined by these benefits (ibid.).

On the conceptual level pension entrance timing can still be understood as a choice situation, even if it is experienced as a shift from one benefit category to another. In principle individuals always have the possibility to forfeit benefits or take up a new job as their primary income source. However, if no realistic alternative income source is available, pension entrance upon eligibility is a clear dominant alternative.[1] For the study cohort particularly in Germany firm level pressure to enter early retirement in times of downsizing may have additionally limited perceived and actual choice on pension entrance timing (Schömann et al. 2007, Aleksandrowicz et al. 2008). Firm level pressure to enter early retirement comes to the fore when older workers have little outside opportunities to find a new job, since looking for a new job or taking on a second career are in principle available alternatives for older workers pressured

[1] If we would assume a situation of total coercion on pension entrance timing, we would be outside the application range of the rational choice framework, because the existence of at least two behavioral alternatives is a basic presumption that delineates their application range (Diekmann and Voss 2004).

into early retirement.

Savings can broaden options for pension entrance timing, because a good entitlement position will enable earlier pension entrance and more flexibility in pension entrance timing. Consider as an example the possibility to enter early at age 63 for the long time ensured in Germany. Family biographies, employment histories and pension systems jointly determine the options individuals face for pension entrance timing. The degree of perceived and actual choice can be assumed particularly low for people involuntarily not employed before pension entrance, who enter old age pensions as soon as they become eligible. Choice on the timing of pension entrance will be higher for persons in stable high quality jobs. Assuming that the degree of choice is related to social inequality (Mayer 2003), we can expect persons who accumulated substantial independent pension entitlements to have a greater degree of temporal flexibility in their pension entrance timing, compared to persons for whom pension entrance occurs as a shift from one benefit category to another. The importance of savings and benefit accrual over the life course anchors late life inequality on pension entrance options in early life stages, particularly through voluntary occupational and private pension plans (Shuey and O'Rand 2004).

While we give priority to the reconstruction of the logic of the situation and the historically specific restrictions individuals face for pension entrance timing, we rely on a behavioral model as an auxiliary assumption, discussed in the following.

4.2 Behavioral assumptions

The mechanisms of individual action in rational choice theory remain problematic (Hechter 1998), and the choice of a specific behavioral rationale often seems rather arbitrary. The behavioral core of rational choice theories are decision rules specified in decision theory (see Rapoport 1998 for an overview). A general distinction is made between normative and descriptive decision theory. Normative decision theory addresses how people *should* behave. The objective is to derive optimal decision strategies under highly idealized conditions, meeting rigorous criteria of mathemati-

cal formalization. Usually axioms for strict rationality in normative decision theory include at least the following (Rapoport 1998): full awareness of own preferences, stability of preferences over time, transitivity of preferences, and invariance to irrelevant alternatives.[2] We will refer to these axioms as strong rationality assumptions. Descriptive decision theory, on the other hand, is concerned with describing, and ideally predicting, *actual* behavior and aims at predictive power, rather than mathematical rigor. This generally necessitates to relax one or more of the axioms above.

Decision rules in rational choice theories were traditionally based on maximization of *expected utility* (EU) (von Neuman and Morgenstern 1947). EU theory focuses on decision making under risk, i.e. decision situations in which outcomes of choice are not certain, but will happen with an objective and *known* probability. Carriers of utility are final states that are irrelevant of reference points and can be represented by cardinal utility functions. *Subjective expected utility* (SEU) theory (Savage 1954) replaces the assumption of an objectively given probability of outcomes in EU theory with a subjective probability that individuals assign to outcomes. SEU theory has been extended also to situations of uncertainty, i.e. decision situations in which the probability of outcomes is *unknown*. Basic assumptions of SEU theory are a fixed and known set of behavioral alternatives, the assignment of subjective probabilities to outcomes, and maximization of a subjective utility function. Basic to EU and SEU theory is the presumption that individuals are aware of their preferences, are capable of anticipating future consequences of choices, and maximize utility accordingly. This presumption is challenged by proponents of bounded rationality, a concept pioneered by Herbert Simon (1955, 1957). They argue that anticipations of future consequences of choices are subject to substantial error. Errors are assumed to be systematic and related to limitations of human capabilities and situational characteristics.

Evidence supports that individuals commonly fail standard tests of strict rationality. People seem to have instable preferences over time (Loewenstein and Elster 1992), cannot always establish a clear preference order among alternatives (Simon 1957), are not invariant to irrelevant alternatives (Kahneman and Tversky 1979), and may be

[2] Transitivity means that if $A > B$ and $B > C$ then $A > C$; invariance to irrelevant alternatives means that the way behavioral alternatives are presented does not affect choice.

either unaware or unwilling to communicate their preferences (Braun 1998). As a result, maximization rules based on strong rationality assumptions in EU and SEU theory are primarily applicable in normative decision theory (Rapoport 1998). Stable empirical counter evidence has brought models of bounded rationality to the center of descriptive decision theory, following the objective to integrate empirically stable anomalies and derive hypotheses from systematic deviations to strict rationality.

Theories of *bounded rationality* (Simon 1955, 1957) acknowledge that intendedly rational behavior is restricted within technical boundaries of human capabilities (March 1986) as information gathering and computational capacities. Simon (1955) referred to these boundaries as internal constraints on rational choice, in addition to external structural constraints. The distinction between internal and external constraints can be understood as a heuristic, rather than clear-cut distinction "[...] the state of information may as well be regarded as a characteristic of the decision-maker as a characteristic of his environment" (Simon 1955: 100).

Internal constraints on rationality suggest a number of simplifications in the decision making process. Simon proposed to replace the cardinal utility function in EU theory by a simple pay-off function that only distinguishes between satisfactory and unsatisfactory alternatives. Instead of utility maximization, a strategy of 'satisficing' is put forward, proposing that decision making is guided by feasibility, rather than optimality (Simon 1955: 108). In satisficing people chose the first satisfying behavioral alternative they are aware of. This means that people would enter old age pension as soon as they are aware of a satisfactory option considering perceived available alternatives.

Prospects theory (Kahneman and Tversky 1979) emphasizes sensitivities to situational characteristics as the origin of irrational behavior in the strict sense.[3] Similar to Simon's concept of bounded rationality (1955), prospect theory proposes a simplification of the pay-off function distinguishing only between gains and losses. This implies that relative changes in welfare not absolute outcomes determine utility. The decision making process is conceptualized as a two-phase procedure of first editing,

[3] A 'prospect' is a lottery or any decision situation with several possible outcomes.

then evaluation of behavioral alternatives. In the editing phase people simplify the decision problem by applying a set of editing operations. In the evaluating phase they chose the edited prospect with the highest value.

Editing operations include coding and the detection of dominant alternatives. People code outcomes in terms of gains and losses by evaluating them relative to a reference point. The reference point is usually given by the status quo, or a fixed expectation or aspiration, but may shift with the way a problem is presented. This implies that a change in pension entitlements due to divorce or childcare interruptions would be evaluated relative to the pension position expected otherwise. The detection of dominant alternatives refers to a scanning of alternatives, in which all but one or a few alternatives are rejected without further evaluation. For people who have no realistically attainable alternative income source, entering old age pension as soon as they become eligible is a dominant alternative.

Editing of pension entrance prospects depends on the context in which it appears, i.e. how it is 'framed' in the historically specific country contexts given in Germany and the United Kingdom. One of the central effects predicted by prospect theory is the *reflection effect* that people doom losses larger than gains, also known as loss aversion.[4] The reformulation of prospects to gains and losses during editing is the central mechanisms underlying framing effects. The basic principle of framing is the passive acceptance of the formulation given - a bias towards the status quo. A particular type of framing effect is designating one alternative as a default option (Kahneman 2003). "The option designated as the default has a large advantage in such choices, even for decisions that have considerable significance." (Kahneman 2003: 1459). This has also been shown in relation to retirement saving by automatic enrollment in 401(k) plans in the US (Madrian and Shea 2001). Subsequently, we discuss behavioral assumptions prevalent in the analysis of retirement.

[4]Reflection of prospects around zero, i.e. replacing a positive by a negative sign before outcomes, reverses people's preference order. This implies risk aversion for gains and risk seeking for losses expressed in a utility function that is convex for losses and concave for gains.

Behavioral assumptions in retirement research

Traditionally economic analyses of retirement assumed that strictly rational actors maximize utility by balancing stable preferences for leisure and income (Boskin 1977, Quinn 1977, see Burtless 1999 for an overview). Retirement was conceptualized as labor force exit, often implicitly assumed to coincide with pension entrance. People retire when the value of additional consumption made possible by employment is offset by the loss suffered from giving up more leisure. Adoptions of the life cycle model or permanent income hypothesis on consumption and savings (Modigliani and Brumberg 1954, Friedman 1957) to retirement (Burkhauser and Quinn 1983), assumed that workers are well informed and farsighted in their retirement decision striving to maintain a stable level of consumption over the life course. From this perspective retirement decisions will be personally optimal under given situational constraints. People may make random mistakes, but systematic improvements are impossible (Aaron 1999).

Propositions of *bounded rationality* raise doubts, whether individual decisions on issues as complex as retirement can potentially be optimal in the economic sense, i.e. that they cannot be systematically improved based on available information or information that can be obtained at a cost not greater than it is worth (Aaron 1999). Proponents of behavioral economics (Aaron 1999, Loewenstein and Elster 1992, Benartzi and Thaler 2007) argue that contrary to strict rationality assumptions, individuals typically do not have clearly defined and stable preferences on retirement, lack information necessary for the evaluation of retirement options, do not have the mental capacity to analyze even the information available to them, and are heavily influenced by social networks and framing effects in their retirement decision (Aaron 1999).[5] Due to the time lags between benefit accrual and benefit receipt, problems of intertemporal choice as myopia and self control issues arise in pension entrance. The high complexity of pension regulations suggests the reliance on behavioral heuristics

[5] Advancements in behavioral economics have been driven by empirical counter evidence to strict rationality and subsequent attempts to integrate this counter evidence into existing theory. Theory development thus follows an inductive rather than deductive approach.

to simplify complexity.

Intertemporal choice

People often have done little or no planning when they approach pension entrance (Lusardi 1999: 103). Research on intertemporal choice has produced stable evidence on the existence of time inconsistent preferences (Loewenstein and Elster 1992). *Myopia* and *self-control* are empirically stable effects that can explain a lack of retirement planing and preparation (Lusardi 1999, Ainslie and Haslam 1992a, Shefrin and Thaler 1992).

Myopia, the tendency to be shortsighted in the evaluation of outcomes, leads people to both save to little when young and undervalue the pensions they can expect in the future (Aaron 1999). A systematic explanation for myopia introduces discount functions that express the relation between value and time. Exponential discount functions reflect consistent choices over time. Empirically, discount functions rather seem to follow a hyperbolic form, suggesting that discount rates applied to outcomes in the near future are higher than discount rates applied to the distant future (Aaron 1999). This captures the effect of myopia and implies that choices may reverse as time passes (Ainslie and Haslam 1992a). As a result behavior may appear irrational and impulsive (Rachlin and Raineri 1992).

Myopic individuals underestimate pension consequences of family and labor market choices, because they overvalue present pay-offs over pensions in the future. Offsetting of pension sharing for immediate gains as a house in divorce trials, as has been common in the United Kingdom (Ginn 2003, Price 2003), is a case in point. Combined with framing effects 'myopic loss aversion' can lead to hypersensitivity to short-term losses (Benartzi and Thaler 2007). This means that loss averse individuals who discount the near future at a higher rate will be particularly eager to avoid short term losses.

Poor self-control, difficulties in delaying gratification, are an additional explanation for inconsistent preferences over time (Ainslie and Haslam 1992b). A myopic person simply prefers short term consumption over long term consumption, unaware

that a lack of pension entitlements may be regretted in the future. Persons with low self-control know that they should be saving for retirement to meet future needs, but are unable to restrain from immediate consumption. Low self-control may inhibit adequate individual retirement saving through procrastination even if, or precisely because, individuals are aware of its importance (O'Donoghue and Rabin 1999). People will not want to decide in a hurry to avoid suboptimal investment decisions and keep procrastinating investment in any pension plan.

If people are predictably myopic and have low self control they make systematic and not random errors in the preparation for retirement. Institutions can function as commitment devices that constrain behavior to be rational, self-controlled and unselfish at time points prior to reversal of choice (Rachlin and Raineri 1992: 116). Myopia is often put forward as a justification for government intervention. Mandatory participation in pension schemes that create 'strong situations' (Caspi and Moffitt 1993) can promote adequate saving myopic individuals will not accumulate for themselves (Aaron 1999). Besides a lack of individual investment in pension accumulation due to myopia or low self control, access to certain pension types is often structurally limited. Even if persons would be farsighted and self-controlled in their retirement planning, access to voluntary occupational and private pensions is often restricted, e.g. for people with typical female employment profiles coined by interruptions and part-time work.

Reduction of complexity

Pension systems are complex and even experts have difficulties to fully understand them. Evidence suggests that people lack even rudimentary information relevant for the retirement decision (Aaron 1999, Ginn 2003, Williams and Field 1993).

Pension entrance is a decision under uncertainty and intersects with multiple life domains (O'Rand 2002), making a full evaluation impossible. Pension regulations may change during retirement and lifetime until death is unknown. Post retirement changes in marital quality, or other relationships are difficult to foresee. Unplanned and unexpected adverse events, such as unemployment, bad health or divorce, but

also positive events as inheritances in mid life may alter pension entrance options in the short term, making farsighted planning difficult (Lusardi 1999). Retirement belongs to a class of large decisions such as marriage or selection of a college that one makes once or only a few times in life, also referred to as the 'one shot nature of retirement' (Aaron 1999). This implies that individual learning and experimenting are not possible. People generally lack own practice in the retirement decision. Expert guidance cannot replace learning, if individuals are not fully aware of their own preferences in choices they have never experienced.

Theories of bounded rationality emphasize simplification in decision making, assuming that individuals are unable to fully evaluate complex decision situations (Simon 1955, Kahneman and Tversky 1979). Precisely the limits to rationality are put forward as the source of predictable behavior in complex situations under uncertainty (Heiner 1983). Instead of increasing the elaboration of behavioral rules with the complexity of the decision to be made, Heiner (1983) proposes that behavior reverts to simple rules precisely in complex and uncertain situations, because individuals selectively evaluate only part of the available information. Simple rules are likely to guide behavior in recurring or likely situations of high complexity, while people may be unaware how these rules have arisen (ibid.).

Institutions are 'social rule mechanisms' for individuals to manage decision situations of high complexity encountered by large parts of the population (ibid.), e.g. pension entrance. These social rule mechanisms can be understood as behavioral heuristics that simplify choice, similar to 'rites of passage' (Caspi and Moffitt 1993) as pre-existing schemes that help people categorize and organize changing events.

Given the high complexity, uncertainty, and one shot nature of the pension entrance decision, individuals that are subject to computational limits (Simon 1957), rely on mental short cuts or heuristics (Tversky and Kahneman 1979). Tversky and Kahneman (1974) propose availability and anchoring as important judgmental heuristics in decision making. Availability means the tendency to assess the probability of an event by the ease with which occurrences can be brought to mind. Anchoring reflects the tendency to make decisions starting from an initial value, as a bias to the

status quo in the framing of behavioral alternatives.

Summary of behavioral assumptions

We assume that individuals generally revert to simple behavioral rules in the timing of pension entrance, because of the high complexity and uncertainty involved (Heiner 1983). These simple behavioral rules include acceptance of the first satisfactory alternative (Simon 1997), loss avoidance (Kahneman and Tverksy 1979), and an orientation at available and accessible heuristics (Tversky and Kahneman 1974) on appropriate pension entrance timing. If pension entrance occurs as a shift from one benefit category to another, entrance at the earliest possible age, when turning eligible, appears as a dominant alternative making actual choice trivial. In Germany the wide spread use of institutionalized early entrance options suggests early pension entrance as an available and accessible heuristic to guide behavior. In the United Kingdom occupational pensions create scope for early entrance, while the absence of early entrance options in state pensions makes entrance to state pension at state pension age the earliest option available.

Therefore, we assume that individuals will enter old age pension as early as possible on average. This behavioral assumption has to be strictly understood as an auxiliary assumption that serves the purpose to derive testable hypotheses in the model building approach to rational choice. The abstraction from reality is what defines it as an auxiliary assumption that does not necessarily have to be true in an absolute sense for the formulation of hypotheses on the impact of divorce and childcare interruptions on pension entrance timing (Hedström and Swedberg 1998). Our interest lies in the country specific 'logic of the situation' given by national restrictions to pension entrance timing related to divorce and childcare interruptions. For the specification of hypotheses we then rely on bridge assumptions that grasp the country specific 'logic of the situation' for pension entrance timing. We assume this auxiliary behavioral rule constant across countries and population groups, while in principle behavioral strategies may vary across countries, subgroups of the population, and over time in the succession of cohorts.

We argue that it is reasonably stable *across countries*, because the study cohort's work life histories evolved in similar gender and family structures in both countries. It can therefore be assumed that divorce and childcare interruptions do not alter preferences on pension entrance in a country specific way. An alternative approach would be to assume that divorce and child caring interruptions alter individual's pension entrance preferences differently in Germany and the United Kingdom. Because both countries were coined by a male breadwinner model (Lewis and Ostner 1994, Pfau-Effinger 2005), in which external childcare hardly existed (Meyer and Pfau-Effinger 2006) and stigmatization of divorce was on a similar level (Uunk 2004, Andress et al. 2006), we assume that pension entrance preferences following divorce and childcare interruptions will be similar across countries and concentrate on country specific variation in structural restrictions.

Behavioral strategies that guide the timing of pension entrance may vary across *subgroups of the population*. For example high skilled, high income employees may delay pension entrance as long as possible, because of intrinsic rewards to work. Further, benefit deductions for early entrance can function as an incentive to delay pension entrance for those employed in later life (e.g. Börsch-Supan 2000a). We assume that between group differences in behavioral rationales are reasonably stable across countries, i.e. the highly educated in high quality jobs in Germany and the United Kingdom would have a preference to enter later, but that this is similar across countries and is thus less distortive in the country comparison.

The strategy of entering as early as possible can be assumed particularly applicable for the *study cohort*, due to the wide range of available and very favorable early entrance options in Germany. In the United Kingdom the absence of early entrance options in state pensions makes pension entrance at state pension age the earliest pension entrance option possible. In both countries employment after state pension age hardly occurred for the study cohort (Council of the European Union 2003). For successive cohorts this behavioral assumption may be more problematic, because they face higher deductions for early entrance and higher incentives to prolong employment beyond state pension age in both countries (see chapter 2).

Assuming that individuals on average enter old age pension as early as possible is one among alternative auxiliary behavioral assumptions. We chose this behavioral assumption, because it is well applicable for the study cohort in the comparison countries as elaborated above and is conducive for the analysis of structural restrictions to pension entrance timing. Pension entrance options depend on an individual's pension entitlement position. Persons who have accumulated more entitlements will on average be able to enter earlier. We assume that the mechanism through which divorce and childcare interruptions affect pension entrance timing is by changing pension entitlement positions and thus options for pension entrance.

4.3 Family biographies and pension entrance: bridge assumptions

Life courses evolve in selective and cumulative processes over time, shaped by historically specific institutions and intentionally acting individuals (Blossfeld and Prein 1998, O'Rand 2002). Pension systems are historically specific institutions that produce heterogeneous levels of investment to and accumulation of entitlements (Disney and Whitehouse 2002, DiPrete and Eirich 2006). Whether intentionally or not, they interact with individual behavior and can generate inequality by gender or other statuses (Allmendinger et al. 1993). Selection effects related to family biographies channel persons into situations with varying options for pension entrance timing (O'Rand and Henretta 1982, Henretta et al. 1993).

We assume that divorce and childcare interruptions affect pension entrance timing by altering pension entitlement positions that determine options for pension entrance. Divorce and childcare interruptions can change entitlement positions in two ways: directly through pension regulations that immediately connect them to pension entitlements and indirectly by changing employment that alters entitlement accumulation in a cumulative process.

A critical issue is the separation of direct and indirect effects of family events on

pension entrance timing.[6] If divorce leads to earlier pension entrance, is this due to an improved entitlement position through increased employment (indirect effect), or caused by a surplus of pension entitlements assigned in pension sharing (direct effect)? Do childcare interruptions delay pension entrance due to a lack of employment per se (indirect effect), or because typical forms of female carer's employment as part-time work do not generate pension entitlements (direct effect)?

Direct and indirect effects can generally be expected to occur in combination with each other. Nevertheless, the dominance of one or the other may vary and generate country specific outcomes. The separation of direct and indirect effects is important, because they suggest different routes for policy intervention. For example indirect effects of childcare interruptions would suggest measures to increase women's employment participation per se, while direct effects suggest that possibilities to accumulate pension entitlements in part-time and discontinuous work need to be improved.

If divorce and childcare interruptions induce similar employment changes (indirect effect) in Germany and the United Kingdom, we can attribute cross-country differences in pension entrance timing to the direct effects of country specific regulations that connect family events and pensions. For divorce this refers to regulations on pension sharing among spouses upon divorce. For childcare interruptions this refers to childcare credits and options to accumulate pension entitlements in typical female employment patters, e.g. through part-time work (see chapter 2). We can control for total labor force participation in the models on pension entrance timing. However, 'controlling' is a limited tool, as it may be specific employment patterns and related quality of employment that matters and is impossible to fully control for. Subsequently, we specify hypotheses on the impact of divorce and childcare interruptions on pension entrance timing.

[6] A similar to difficulty arises with regard to the separation of gender effects on top of the impact of family events (DiPrete and Eirich 2006). We address this problem by calculating separate models for men and women, assuming that all women would be equally affected by gender discrimination, but that divorce and childcare interruptions lead to different pension entrance timing among women.

4.3.1 Divorce

We assume that our comparative design enables us to hold indirect effects of divorce through changed employment reasonably constant across countries and are primarily interested in direct effects through pension sharing regulations. Since we approximate a quasi experimental design and not a real experimental setting alternative explanations have to be carefully considered. This requires a discussion of possible indirect effects, i.e. how divorce may mediate employment and thus the accumulation of pension entitlements of men and women in male breadwinner societies.

Indirect effects via employment

In male breadwinner societies, continuous full-time employment is the norm for men regardless of their marital status. Divorce will arguably have a greater effect on women's employment participation, because women are expected to give up employment based on marriage (Meyer and Pfau-Effinger 2006). The extent to which divorce alters female employment depends on the timing of divorce in the life course and women's labor market relevant human capital (Ginn 2003).

Divorce early in the life course may increase female labor force supply and improve their odds for pension eligibility enabling early entrance (Morgan 1992). On the other hand, in male breadwinner societies women who have children and divorce at young ages usually continue to be mainly responsible for childcare, hampering their capacity to build up own pension entitlements also after divorce (Ginn 2003: 61). Women who divorce in midlife may be better able to improve their pension position through employment, because the care intensive years of children are over. On the other hand, they have limited time to do so until state pension age. Further, women with little labor market relevant human capital may experience difficulties to find jobs that provide pension benefits (Ginn 2003: 61). Lacking a male breadwinner in the household, divorced women with limited skills or experience in marginal employment may continue working in low quality jobs beyond state pension age if pensions are unavailable and low wages have prohibited savings.

Among European countries Germany and the United Kingdom both are coined by

intermediary adverse economic consequences following divorce, measured as the difference between pre- and post divorce income (Uunk 2004). British and German women recover rather quickly from the negative economic effects of divorce and stigmatization of divorcees can be assumed similar across countries in the male breadwinner societies that prevailed during the study cohorts working lives (Andress et al. 2006).

Direct effects through pension sharing

Pension sharing upon divorce can alter pension entitlements in the short term. Better pension entitlement positions enable earlier pension entrance. As a consequence divorce will have a different effect on pension entrance timing under the condition of pension sharing than under the condition of no pension sharing. The impact of divorce on pension entrance timing conditional on pension sharing can be understood as a series of two choice processes. First, whether people make use of pension sharing. Second, the timing of pension entrance of divorced men and women depending on whether pension sharing was applied or not. We only model the second decision directly, the timing of pension entrance in response to divorce. Regarding the first choice, utilization of pension sharing, we make the following assumptions.

If actors were perfectly rational it would be irrelevant, whether pension sharing is introduced as a default or a legal option. Perfectly rational actors would always chose the option most beneficial for them, regardless whether they actively have to forgo a default option, or actively claim a legal option. If we, however, assume boundedly rational actors that are sensitive to framing effects (Fetherstonhaugh and Ross 1999, Kahneman 1999) and biased to the status quo in the decisions they make (Kahneman and Tversky 1979), default pension sharing will lead to a higher utilization of pension sharing compared to optional pension sharing. Divorce is often experienced as an emotional trauma arguably further limiting myopic individual's ability to rationally calculate long term consequences (Ginn 2003: 59). Therefore, we assume that pension sharing will be implemented extensively if framed as the default and rarely if framed as an option.

The empirical content of this assumption is backed by evidence that in the United

Kingdom off-setting of pension sharing against other assets, usually housing to females was common practice (Ginn 2003, Price 2003). Regulations on pension sharing were poorly understood and there was a wide unawareness that pension sharing even existed (Meyer and Pfau-Effinger 2006). As a result, pension sharing was rarely implemented in the United Kingdom after its introduction in 1973, but was the norm in Germany after 1976 (Bieber 1999). We can make the empirically informed bridge assumption that in Germany we have a situation in which pension sharing upon divorce was the norm after 1976, while in the United Kingdom we have a condition in which pension sharing was not implemented also after its introduction as a legal option in 1973.

With regard to the second choice process, the timing of pension entrance we are actually interested in, pension sharing will on average enable earlier entrance of the economically weaker spouse due to an improved entitlement position. In male breadwinner societies this typically refers to women. The economically stronger spouse experiences a sudden loss of entitlements in the case of pension sharing. In male breadwinner societies this typically refers to men. Early pension entrance may no longer be possible due to a downgraded entitlement position. In addition, loss aversion, the tendency to react particularly sensitive to losses (Kahneman and Tversky 1979, Benartzi and Thaler 2007) may induce a desire to compensate for the loss of pension entitlements through prolonged employment.

Hypotheses

The introduction of pension sharing in the marriage law of 1976 in Germany and 1973 in the United Kingdom generates a period effect of divorce before and after the introduction of pension sharing. Because the introduction of default pension sharing in Germany on average improved the entitlement position of women and downgraded the entitlement position of men after divorce we assume that:

- *Hyp 5a:* Divorce after the introduction of default pension sharing (1976) leads to earlier pension entrance of women in West Germany compared to women who were never divorced.

- *Hyp 5b:* Divorce after the introduction of default pension sharing (1976) leads to later pension entrance of men in West Germany compared to men who were never divorced.

For the United Kingdom we expect no direct effects of pension sharing, as it was rarely used. The timing of pension entrance may still be changed by indirect effects of divorce via changed employment. For women we expect divorce to delay pension entrance as divorced women are pushed to the labor market by insufficient independent pension entitlements and the lack of a male breadwinner in the household. For men in the United Kingdom we expect no effect of divorce, since a divorce is unlikely to change their employment participation and did not change their pension entitlement position directly through pension sharing. We hypothesize that:

- *Hyp 5c:* Divorce leads to later pension entrance of women in the United Kingdom, regardless whether it occurred before or after the introduction of optional pension sharing (1973), compared to women who were never divorced.

- *Hyp 5d:* Divorce has no effect on the pension entrance timing of men in the United Kingdom, regardless whether it occurred before or after the introduction of optional pension sharing (1973).

4.3.2 Childcare

This part of the analysis focuses exclusively on women. To derive hypotheses on the impact of childcare interruptions we again assume direct and indirect effects of childcare interruptions on pension entrance. Fertility histories can affect options for pension entrance indirectly by altering employment histories that determine the accumulation of pension entitlements and directly through care credits in pensions. A second direct effect arises from the ability to accumulate pension entitlements in typical female carer's employment profiles, most importantly through part-time work. If occupational and private pensions are of major importance, as in the United Kingdom, further direct penalties result from limited access to these pension types.

We argued that the historic specificity of pension institutions in effect for the study cohort is reflected in a selection on country specific outcomes. The generous, universal state pension system in Germany primarily differentiated in the timing of pension entrance with numerous early entrance options. The British pension system coined by subsistence state pensions and high institutional differentiation stratified primarily in terms of access to different pension types. Because of the limited access of female carer's to occupational and private pensions we specify the competing risks of entering state pensions only, compared to state pensions combined with occupational or private pensions as the dependent variable in the United Kingdom for this part of the analysis. In Germany we examine the single risk of entering state pensions.

Indirect effects via employment

Motherhood can decrease women's labor force supply and entitlement accumulation by ending, interrupting, or precluding their employment careers (O'Rand and Landerman 1984, O'Rand and Henretta 1982). Indirect effects on the accumulation of pension entitlements result from changing patterns of labor force participation related to child rearing. Several basic patterns of fertility related employment interruptions are possible for women in male breadwinner societies, assuming insufficient external provision of childcare:

1. *Preclude:* family responsibilities related to child rearing fully preclude employment careers in exchange for full-time homemaking and child rearing

2. *End:* women work before motherhood but never return to employment after child rearing

3. *Interrupt return part-time:* women work before motherhood and re-enter to part-time employment after a childcare interruption

4. *Interrupt return full-time:* women work before motherhood and re-enter to full-time employment after a childcare interruption

5. *Double burden:* women work continuously (excluding short periods of maternity leave) and combine the double burden of child rearing and employment

To what extent the above fertility related employment patterns jeopardize the accumulation of pension entitlements depends on options to accumulate pension entitlements with the respective employment profile.

Direct effects through pension regulations

Childcare credits, specific pension regulations for women, and options to accumulate entitlements with female carer's employment profiles determine the direct impact of childcare interruptions on pension entrance. Childcare interruptions will delay pension entrance, if not compensated by care credits in pensions, because they interrupt entitlement accumulation through employment and thus downgrade entitlement positions. Therefore, we assume that mothers generally enter old age pension later compared to childless women.

The availability of childcare credits improves entitlement positions and thus will lead to earlier pension entrance for women who receive to them. In Germany retrospectively enacted care credits of one year at 75 percent of average income applied to all women in the study cohort. Therefore, care credits are not a source of variation among mothers. In the United Kingdom only care periods for children under age 16 after 1978 accumulated state pension benefits, generating a complex intersection between the period effect of this regulation and women's care periods. The duration of childcare after 1978 should increase the probability to enter state pensions due to an improved state pension entitlement position.

Part-time employment will lead to earlier pension entrance, if it improves entitlement positions. In Germany possibilities to accumulate pension entitlements through part-time work were on average better compared to the United Kingdom (Blossfeld and Hakim 1997, O'Reilly and Fagan 1998). Therefore, a return to part-time employment can be expected to lead to earlier pension entrance in Germany. In the United Kingdom part-time work provides very limited access to occupational pensions and low earnings inhibit investment in private pensions that are of far higher importance compared to Germany (Ginn and Arber 1993). Therefore, we assume that mothers who returned to part-time work will have a lower probability to enter an occupational

or private pension in the United Kingdom.

In addition to care credits and options to accumulate pension entitlements through part-time work, specific pension regulations for women may intersect with mothers entitlement accumulation. In Germany, employment later in life was disproportionately rewarded with the *woman's pension* option at age 60 conditional on 15 contribution years of which 10 had to be after age 40. Due to the relatively low minimum requirement of 5 years contribution to be eligible to a state pension, even mothers who worked for a short period of time are eligible to a (low) state pension at age 65. In the United Kingdom the minimum contribution period to state pensions is higher at 10 years and the *married woman's exemption*, as well as the *half-test* strongly discouraged female pension accumulation, regardless of motherhood (see chapter 2).

Hypotheses

In the same way early entrance can be understood as an advantage in the German pension system, access to occupational and private pensions is an advantage in the British system. Moreover, access to different pension types is related to options for pension entrance timing in the United Kingdom, because occupational and private pensions provide more individualized eligibility conditions and thus in principle more flexibility in the timing of pension entrance.

For Germany we hypothesize that:

- *Hyp 6a:* Motherhood will delay pension entrance compared to childless women due to insufficient entitlements.
- *Hyp 6b:* Return to part-time employment after child rearing will lead to earlier pension entrance of mothers.
- *Hyp 6c:* Return to full-time employment after child rearing will lead to earlier pension entrance of mothers.
- *Hyp 6d:* Continuous employment besides child rearing will lead to earlier pension entrance of mothers.

In the United Kingdom childless women will have the highest probability to accumulate occupational or private pensions. The odds of returning to a job that provides occupational pensions after child rearing are low. Part-time jobs were prevalent for mothers, but generally not covered by occupational pension plans throughout the working lives of the study cohort (Ginn 2003). Therefore, we expect that only returning to a full-time job will increase the probability to enter occupational pensions, while this is not the case for part-time employment. Continuous employment besides child rearing should equally increase the probability to enter an occupational or private pension. For the United Kingdom we expect that:

- *Hyp 7a:* Motherhood decreases the probability to enter occupational/private pensions compared to childless women due to insufficient entitlements.
- *Hyp 7b:* Return to part-time employment after child rearing decreases the probability to enter occupational/private pensions.
- *Hyp 7c:* Return to full-time employment after child rearing increases the probability to enter occupational/private pensions.
- *Hyp 7d:* Continuous employment besides child rearing increases the probability to enter occupational/private pensions.

4.4 Implications of family theories

Family theories are not directly transferable to our research questions, because they aim at explaining family processes, as divorce or fertility, while we treat them as determinants of pension entrance timing. Family theories, however, point toward important selectivities with regard to the population likely to experience divorce and have children. Therefore, we briefly discuss implication of family theories for our research questions. We conclude that they are most informative on joint retirement of spouses, but provide little guidance on how divorce and childcare interruptions alter pension entrance.

From a *structural functionalist* perspective, joint labor force exit of spouses has been linked to gendered divisions of labor over the life course (Allmendinger 1990). Central strategies that guide labor force exit of spouses are the avoidance of labor market competition and status inconsistency among spouses to enhance marital stability (Parsons 1949, Oppenheimer 1977, Allmendinger 1990, Allmendinger et al. 1992). Wives who specialized in the household are expected to exit before their husbands to avoid jeopardizing the familie's economic status, which is determined by the employment status of the household head. Spouses will exit jointly, if they have invested in a joint family business. For couples with high status consistency labor force exit will follow individual preferences with a high prevalence of the husband retiring first, due to age differences among spouses that foster status compatibility.

More generally, Allmendinger et al. (1992) argue that the household is the superior unit of analysis for the examination of spousal influences on labor force exit. This highlights the interdependence among spouse's labor force exit, but implies the exclusion of couples in which women do not work in later life. Moreover, a focus on the household as the unit of analysis cannot incorporate the impact of divorce on retirement processes, because single persons are excluded per definition. The assumption of joint household strategies is also questionable in light of possibly diverging interests of spouses (Lundberg 1999).

Similar to structural functionalism, *symbolic interactionism* (Mead 1934, Goffmann 1959) assumes that family roles will continue into retirement. In contrast to the positive functionality ascribed to specialized family roles in structural functionalism, symbolic interactionism is interested in family roles and family members as significant others in the subjective interpretation and construction of the retirement transition process. Family members function as significant others in the construction of every day realities and affect pre-retirement attitudes and post-retirement adjustment (Cox and Bahk 1979). Even though structural functionalism and symbolic interactionism emphasize very different processes and levels of analysis, they have been criticized in similar respects: mainly their descriptive nature and lack of explanatory power (Hill and Kopp 2002). Over the past decades parallel to sociology in general, there

has been a trend to more explanatory approaches building on rational choice theory, primarily exchange theory and economic theories of the family (Hill and Kopp 2002: 70).

From the perspective of *exchange theory* (Thibaut and Kelly 1959, Homans 1958, Blau 1964) joint retirement is a situation of social interdependence for spouses. The value of labor force exit and pension entrance will depend on the labor force status of the spouse. On one hand continuing labor market activity of the spouse can generate higher income enabling earlier labor force exit of the other spouse. On the other hand, the value of leisure may be higher if shared with a spouse. In this case a prolongation of employment until joint pension entrance is likely. An approach that integrates general premises of life course sociology and exchange theory is the *family organizational economy* (Treas 1991). The family organizational economy refers to a history of exchanges between spouses in terms of the division of labor and the distribution of rewards among couples over the life course. The family organizational economy puts forward that early family roles constrain later roles and thus have continuing effects until retirement, despite renegotiation among couples later in life (Henretta et al. 1993).

Economic analyses of retirement have typically employed a traditional family model in which all decisions are made the (male) household head treating dynamics within the household as a 'black box'. The *new home and family economics* coined by Gary Becker (1976, 1981) propose a unitary model assuming a joint household utility function that is maximized by all household members. The household does not only generate utility by consumption, but produces basic commodities that contribute to joint household utility. Married spouses will coordinate their labor force exit and pension entrance in a way that maximizes joint household utility. Similar to the approach taken by Allmendinger et al. (1992), the household is emphasized as the appropriate unit of analysis with the joint household utility function. Unitary models of this type allow for the interdependence of husband's and wive's consumption through household goods and complementarity between spouses leisure time.

Concerning the impact of divorce on retirement processes two points of criticism

of unitary models become apparent (Ott 1998, Lundberg 1999): the assumption of altruism among household members and the static nature of the unitary model, both related to the joint household utility function (Ott 1998). The maximization of joint household utility assumes that the household head distributes jointly maximized goods among household members in the most efficient way out of altruistic motives. Outcomes are necessarily efficient and questions of distribution between spouses do not arise. However, husbands and wives interests in labor force exit and pension entrance timing may diverge. Moreover, the assumption of a joint household utility function is only sensible for an existing household entailing a static perspective that cannot explicitly address changes in household composition. These shortcomings are particularly relevant with regard to retirement, because the long term decisions of married couples must take into account the chance of widowhood or divorce (Lundberg 1999).

Family bargaining models (Lundberg and Pollak 1994) combine neoclassical elements with game theory and drop the assumption of a joint household utility function. Household internal dynamics are at the center of interest allowing for asymmetric resources and strategic bargaining among self-interested household members. Household members maximize individual utility, but resource allocation is jointly decided upon in a bargaining process. Bargaining models permit for an individual life cycle including marriage, divorce, and widowhood rather than focusing on the life cycle of a married couple as in unitary models (Lundberg 1999: 256). An analysis of responses to legal changes of pension sharing upon divorce requires the consideration of self interested and strategic behavior of husbands and wives, because men and women are differently affected by these regulations.

Lundberg (1999) examines implications of family bargaining models for retirement based on criticism of a general exclusion of women in economic retirement analysis. The bargaining power of spouses approaching retirement depends on individual control of pensions and other retirement assets. Wives with a history of market work and pension assets in their own are likely to have a stronger bargaining position within marriage than wives who stayed at home. Employment over the life course, however, is

itself an outcome of a bargaining process. Concerns about selfish or myopic decisions by husbands are relevant for poverty of female widows or divorced women, because husbands may make unilateral decisions about saving and retirement following their own preferences and expected life span and not their wives.

All family theories discussed above, even though based on very different presumptions, point towards the interdependence of husbands and wives retirement. None of them is very informative about the impact of divorce and childcare interruptions on pension entrance. This may be one reason for the focus on dynamics among married spouses in previous research on family influences on retirement (section 1.1).

The family bargaining approach highlights the necessity to incorporate diverging self interests of husbands and wives in the analysis of divorce and widowhood. Nevertheless, pension benefits are more easily integrated in the bargaining approach as a *determinant* of family processes as e.g. divorce, than as an *outcome*. The bargaining approach points to selectivities with regard to the population likely to experience divorce (see also Wagner and Weiss 2006, Blossfeld and Müller 2002). If divorce is the outcome of a bargaining process, there will be a self-selection into divorce for people whose outside utility was greater than remaining in the marriage. In the extreme this would mean that people for whom pension consequences of divorce are most detrimental do not divorce, because outside utility of at least one spouse is too low. Considering myopia, the complexity of pensions and the emotional trauma of divorce, it is a strong assumption that individuals rationally make divorce dependent on subsequent pension entitlements. Nevertheless, there may be a self-selection of divorcees who did not face the most severe pension penalties of divorce. Similarly, persons who face the highest opportunity costs of childcare interruptions in form of forgone earnings and pension entitlements, may chose to have no or only few children.

Family theories highlight that the impact of divorce and childcare interruptions on pension entrance timing can only be understood in a dynamic perspective taking into account self interests of individuals. Divorce and childcare interruptions are embedded in life courses in which early life events are connected to later life events. Their consequences are dependent on institutional selection processes. Therefore, the

impact of divorce and fertility related employment interruptions on pension entrance will vary with the institutional regulations that connect them as elaborated in our hypotheses.

4.5 Summary of hypotheses

Table 4.1 and 4.2 summarize the hypotheses specified in chapter 3 and 4. The first column in both tables indicates the number of the hypotheses, the dependent variable is specified in the second column, and the two last columns indicate the expected effects for Germany and the United Kingdom. The hypotheses on the structure of

Table 4.1: Hypotheses on pathways to old age pension: overview

Hyp	**dependent variable**	**DE**	**UK**
1	turbulence	low	high
2	standardization	high	low
3a/b	inequality of personal income over time	stable	increasing
4	inequality of household income	low	high

pathways to old age pension are based on a number of contextual factors elaborated in chapter 3 not separately listed in table 4.1 (see section 3.4). The predictors for the timing of pension entrance we are theoretically interested in are listed in column three of table 4.2. For the impact of childcare interruptions on women's pension entrance we specified country specific outcomes related to the institutional structure

Table 4.2: Hypotheses on pension entrance: overview

Hyp	**dependent variable**	**predictor**	**group**	**DE**	**UK**
5a/c	pension entrance timing	divorce after	women	+	-
5b/d		pension sharing	men	-	?
6a-d	pension entrance timing	motherhood	women	-	
		return part-time		+	
		return full-time		+	
		continuous employment		+	
7a-d	P(occ./priv. pensions)	motherhood	women		-
		return part-time			-
		return full-time			+
		continuous employment			+

of the national pension systems: the timing of pension entrance for Germany and the access to occupational/private pensions for women in the United Kingdom. For hypotheses 5 and 6 a positive sign in table 4.2 indicates earlier entrance, a negative sign later entrance. A positive sign for hypotheses 7 indicates a higher probability to enter occupational or private pension, a negative sign a lower probability. The hypotheses in table 4.1 will be addressed in chapter 6 with sequence analysis and relative distribution methods, those formulated in table 4.2 in chapter 7 using event history methods.

Chapter 5

Event history and sequence analysis in life course research

Our research questions call for specific methodological approaches. Recently evolving techniques of sequence analysis enable the analysis of retirement as a process. The impact of divorce and childcare interruptions on pension entrance timing can be examined with event history tools. In this chapter we place sequence and event history analysis in the development of life course sociology, discuss strengths and weaknesses of the methods, and elaborate the added value of recently developed sequence techniques.

The emergence of life course sociology as a subfield in sociology is strongly connected to the development of event history methods. Regarding the central role of temporal processes in life course research, event history methods naturally lend themselves to many life course related questions enabling precise modeling of timing and durations. As a result life course sociology and event history analysis have become almost inseparable (Blossfeld et al. 1989, Mayer and Tuma 1990).

While most insights in quantitative life course research have been gained focusing on transitions, the concept of the trajectory has been emphasized as theoretically superior (Rosenfeld 1992, Sackmann and Wingens 2001), thus leading to a gap between theory and empirical applications in life course research. This is where sequence analysis comes into play with the ability to grasp trajectories as entities. So far, the

Table 5.1: Event history and sequence analysis in life course sociology

	event history analysis	**sequence analysis**
theoretical concept	transition/duration	trajectory
objective to identify	probability of single transitions/durations	temporal patterns of sequential equivalence
scientific tradition	stochastic data modeling	algorithmic modeling
assumptions about data	generated by stochastic process	none/'black box'

prominence of sequence analysis, first introduced to the social sciences by Andrew Abbott in the form of Optimal Matching (OM), was mainly driven by criticism culminating in the 2000 debate between Abbott and Tsay (2000), Levine (2000) and Wu (2000). Initial adoption of sequence analysis in the field of life course sociology was additionally complicated by a discussion more or less implicitly treating the two methods as competing, rather than complementary.[1]

One central premise of life course sociology is that societal change is driven by two dynamics: movement across individual life courses and the replacement of cohorts (Mannheim 1964, Sackmann and Wingens 2001). Since individuals are agents of social change, the micro level is one focus in the analysis of social change (Blossfeld 1989, Mayer 1995). Social change on the micro level can be conceptualized in two ways: either as the timing and frequency of durations and discrete transitions that mark crucial life course events, or taking a holistic perspective on how patterns of life course 'trajectories' as a whole change in the succession of cohorts (see table 5.1). In contrast to modeling the probability of single transitions in a causal relationship to a set of covariates, the objective in sequence analysis is the identification of patterns of 'sequential equivalence' (Han and Moen 1999).

Researchers have increasingly emphasized the potential value added from a more holistic perspective on careers and life course related processes. For example, Rosenfeld (1992) notes, that "There is a need to continue to examine complete working histories. A problem with much of the work on job shifts is that one loses sight of complete career lines." (p. 57). With the early establishment of event history analysis as the dominant research method in life course sociology directed towards discrete

[1]See the debate between Abbott and Tsay (2000), Wu (2000), and Levine (2000) in *Sociological Methods & Research*.

transitions, substantial research on trajectories and the development of appropriate methods fell short.

In this following we contrast event history and sequence analysis in the context of life course sociology to substantiate their complementary relationship with regard to life course questions. The chapter is structured as follows. First, we discuss the potential of the two methods to grasp core concepts of life course theory, and the scientific and statistical traditions they stem from (see overview in table 5.1). Subsequently, we resume criticism of sequence analysis and methodological advances described as a 'second wave' of sequence analysis (Aisenbrey and Fasang 2007).

5.1 Scientific traditions of event history and sequence analysis

Event history analysis is rooted in the scientific, statistical tradition or 'culture' (Breiman 2001a) of stochastic data modeling. Sequence analysis stems from the algorithmic modeling tradition (Breiman 2001a, Breiman 2001b, Cox 2001, Efron 2001, Hoadley 2001, Parzen 2001) (see table 5.1). The fundamental difference between these traditions lies in the assumptions made about the underlying processes that produce the data we observe. While the data modeling culture assumes that data are generated by some underlying stochastic process, the algorithmic tradition makes no assumptions about the processes that generate data. On the contrary, the algorithmic approach seeks to uncover patterns in data to identify the processes that produce them.

The fact that algorithmic modeling has no explicit probabilistic base raises issues about several sources of bias and how researchers should deal with them to obtain meaningful results. The data modeling culture may not have found definite answers, but agreed upon commonly accepted ways to address them. These include biases arising from the method of ascertainment or validation, appropriate handling of missing and incomplete data, and data that evolve over time involving complex interdependencies. For proponents of data modeling these issues are the major grounds

for criticism of algorithmic approaches (Cox 2001). They center around three critical questions: how do we determine whether something is a valid result? how do we treat missing and censored observations? and how do we deal with complex interdependencies over time?

As asserted above, from a theoretical point of view event history analysis is limited in its applicability to holistic trajectories. From a methodological point of view, event history models work best when data are generated by a well-behaved stochastic process that justifies confidence intervals and significance tests as modes of ascertainment and, e.g. imputation as a feasible tool for dealing with missing data (Tuma et al. 1979). In life course related applications of event history analyses central assumptions are seldom tested and often not plausible, e.g. the correctness of a specific parametric form of the hazard in parametric models or the proportional hazard assumption in the Cox model (Box-Steffensmeier and Jones 2004).

With the focus on discrete transitions and durations, persons who never experience the transition of primary interest, assumably non random samples, are generally treated as censored. Censoring may occur for very different reason. While it is possible to specify different reasons for censoring as competing risks, societal groups that do not experience the transition of primary interest in event history models are usually grouped together in one category of censored cases and are often under researched. Consider as an example persons who do not experience a seamless transition from employment to old age pension. Since the algorithmic modeling culture relies on no distributional assumptions, methods in this tradition are highly useful as an exploratory starting point that can include non-standard transition processes.

In this light it seems rather paradox that the two methods have been discussed as competing, considering that they rest on fundamentally different assumptions and follow different objectives. This naturally puts them into a complementary relationship to each other. The methodological tools of event history analysis have strongly guided the selection of life course related research questions. As a result, accumulation of additional insight with event history tools is largely a matter of additional data collection and refined instruments of measurement in some fields of life course

research. Sequence analysis is one answer to the question of how we can additionally exploit the richness of available longitudinal data.

In sum, sequence analysis provides an added value as a complementary approach in life course sociology in the aspects where event history analysis has limitations: it addresses the theoretically emphasized concept of a trajectory; it is not based on any assumptions about the processes that generate data, and it provides a comprehensive perspective with equal information on persons who do not experience certain predefined transitions that are of primary interest. The identification of patterns of social processes over time is an important precondition that often receives little attention, before turning to the question of which mechanisms produce them (Stovel and Bolan 2004).

5.2 Criticism and advancements: the second wave of sequence analysis

The form of sequence analysis that has so far received the most attention in the social sciences is Optimal Matching (OM) (Abbott 1995, Abbott and Forrest 1986, Abbott and Hrycak 1990, Abbott and Tsay 2000, MacIndoe and Abbott 2004). OM is a set of dynamic algorithms to analyze complex sequences of even or uneven length (Sankoff and Kruskal 1983, Abbott and Forrest 1986). The basic rationale of OM is that the resemblance between sequences can be expressed as the cost of turning one sequence into another by applying a set of transformation operations. This is done in pairwise comparisons either of every subject in the sample with every other subject in the sample, or with specified reference sequences. There are three types of transformation operations: substitution of a state in one sequence; insertion and deletion of a state (indel operations). Each type of operation is assigned a 'cost'. The sum of the transformation costs between two sequences denotes the distance between them. Given a set of costs, the OM algorithm evaluates all possible solutions and returns the cost of the most efficient set of transformations as the dissimilarity between the sequences. The pair wise dissimilarities can then be entered into multidimensional

scaling procedures to identify natural groupings of sequences. One can summarize a typical OM procedures in 3 steps (Aisenbrey 2000):

1. theoretical specification of state space and transformation costs
2. OM algorithm, to produce pair wise distances between subjects
3. multidimensional scaling or clustering

The two types of transformation costs emphasize two different dimensions in the analysis of sequence patterns; the sequencing and the occurrence of states across sequences. Substitutions emphasize the sequencing of events. One state is approximated by another at a given time point, thus they maintain the temporal order within sequences. Insertion and deletion (indel) operations emphasize the occurrence of events, rather than their temporal order. Since they conduct temporal movements within sequences, they imply a distortion of time. Indel operations enable the analysis of sequences of unequal length, since sequences can be aligned by inserting additional states to the shorter sequence or deleting states from the longer sequence. If the theoretical interest lies in the timing and sequencing of events, one is well advised to either abstain from indel operations all together, or put them at a high cost compared to substitutions (MacIndoe and Abbott 2004). Since a major value added in sequence analysis lies in the potential to give timing and sequencing such a prominent role, indel operations have been viewed quite skeptically. As pointed out by Lesnard (2006: 9) "Indel operations make the identification of subrythms harder and should hence be seldom and carefully used."

OMs level of prominence over the last decade was more driven by voices of criticism (Levine 2000, Wu 2000) than by substantive insights gained with the method. OM has become the standard sequence analysis to the extent that OM-like techniques are almost regarded as synonymous with sequence analysis in general (Elzinga 2003). As a result, much of the criticism that has been voiced against OM has been understood as criticism of sequence analysis in general.

The criticism can be divided into two types. First, a basic opposition to the algorithmic modeling culture, relating to a difference in scientific tradition and the

belief that a probabilistic base is essential to any approach to data. The second type of criticism has addressed more specific attributes of OM. Building on the theoretical framework laid out by Andrew Abbott the critical discussion of OM has been followed by a 'second wave' of methodological advancements of sequence analysis (Aisenbrey and Fasang 2007). These applications are characterized by problem oriented step-wise technical innovations both within the framework of OM and through the development of alternative sequence analytical techniques. In the next section we summarize main points of criticism, and relate them to methodological advances of second wave applications.

Table 5.2 provides an overview of criticism directed towards sequence analysis/OM, second wave extensions of OM, and second wave introductions of new forms of sequence analysis. The focus is limited to developments in sociology. The list is by no means exhaustive and does not include advances of sequence analysis in demography, e.g. based on work by Billari and coauthors on monothetic divisive algorithms for non recurrent sequences (Billari 2001, Billari and Piccarreta 2005), or a machine learning approach to the timing, sequencing and frequency of life events (Billari et al. 2000).

Modes of ascertainment and validation

Initial OM applications were criticized as a way of arbitrarily 'fishing for patterns' (Wu 2000), lacking standards for validation (see table 5.2). Modes of ascertainment generally rely on conventions, such as confidence intervals, or r-squares. Thus, objections to sequence analysis based on a lack of accepted modes of ascertainment are rather an indicator of immaturity of the method, than grounds for general rejection. In exploratory sequence analysis, modes of ascertainment primarily refer to validation of cluster solutions following sequence analysis. Most frequently applied cluster stopping rules are not readily transferable to cluster analyses following sequence analysis, since they do not take into account the sequential character of the data (Brzinsky-Fay 2007).

Table 5.2: Criticism of sequence analysis and second wave solutions

Criticism	Extensions OM	Extensions SA
Modes of ascertainment		
weak validation of distinct groups of similar sequences (Wu 2000)	within & between cluster distances	
transformation costs arbitrary, weak link to theory (Levine 2000), resulting distances meaningless	data based transformation costs (Rohwer and Trappe 1997), construction of distances against reference sequence (Brückner 2007, Scherer 2001)	
Missing and incomplete data		
unequal sequence length due to censoring should not contribute to distance between sequences	variable indel costs for unequal sequence length resulting of censoring or related to process (Stovel and Bolan 2004)	
Complex processes over time		
does not account for temporal order of events in sequence, $ab = ba$ (Wu 2000)	testing of different OM cost specifications against a matching coefficient and reversed order coefficient (Stark and Vedres 2006)	DT coefficients (Dijkstra and Taris 1995) no transformation operations, similarity through maximizing common ordered pairs between sequences Elzinga's non-alignment technique (2003): extension of DT coefficients, sequence similarity as maximization of sequence attributes (e.g. order)
does not account for non linear dependence of transformation costs on time (Wu 2000)		Dynamic Hamming dissimilarity (Lesnard 2006), data based time dependent substitution costs, no indel operations

A data based and sample specific, thus essentially 'algorithmic modeling' approach, is the comparison of within and between cluster distances, first mentioned in the context of sequence analysis by Abbott and Hrycak (1990). This technique goes back to the cluster stopping rule proposed by Calinsky and Harabasz (1974). Sequence analysis is a technique of general pattern search that picks up strong signals in the data, rather than nuanced differences. Thus, within cluster difference should be substantially lower than between cluster difference, if there really are clear patterns in the data. Lacking conventions about an acceptable ratio of within to between cluster distances, Aisenbrey and Fasang (2007) propose as a rule of thumb that the mean within cluster distance should be at least half of the mean between cluster distances to indicate truly distinct groups of sequential equivalence. The relative improvement of the ratio for a set of cluster solutions can inform the researcher about which cluster solution provides the best trade-off between accuracy and general pattern identification. It should not be understood as a method that reveals the one and only valid cluster solution, but gives a solid, data based indication of distinct groupings in the data.

Another frequently raised point of criticism related to the validity of results obtained with OM is an often weak link between theory, time, and transformation costs (Levine 2000). Traditionally, some theoretical rationale about the hierarchical order of states according to closeness to a designated destination state was used as a basis for cost specification. A first advancement was the application of sample specific substitution costs based on the frequency of transitions from one state to another in a given data set (Rohwer and Trappe 1997). Substitutions of states with high transition frequency are less costly. This approach is particularly useful for exploratory research, since the resulting cost setting is fully derived from the data. The second way to make more sense of distances is to construct distances against specific baseline or reference sequences. This includes comparisons of specific dyads of sequences, e.g. hypothetical prospective sequences and actual sequences (Brückner 2007), and the construction of distances against either an empirical or a theoretical ideal type (Scherer 2001).

Missing data and incomplete observations

In principle, sequence analysis requires complete sequences without gaps. Both gaps within sequences and censoring at the end or beginning of a sequence are problematic. There are two basic options to deal with them in sequence analysis applications: complete sequences can be approximated using similar rationales to fill in missing values as applied in the data modeling tradition, such as imputations based on certain distributional assumptions. This, however, comes at a high cost of lower exploratory power of the method, since it imposes distributional assumptions that may hinder the discovery of unexpected patterns.

Alternatively one can specify a specific missing value state that comes at an either theoretically motivated or data based transformation cost. This is suboptimal as well, since clusters with many missing values will be regarded as similar to each other only because they have missing values in common. A central distinction is, whether one can assume that data are missing at random (MAR) or missing not at random (MNAR).[2] If the MNAR assumption holds, groupings of sequences with many missing values may actually reflect a substantively meaningful group, since there is a common underlying process that leads to the occurrence of missing values. If the MAR assumption holds, groupings of sequences based on similarity due to a high occurrence of missing values are meaningless artifacts. In this case imputation may be less distortive and thus a more viable option. Alternatively one could argue that if the MAR assumption holds, it is justifiable to exclude sequences with missing values from the analysis, since their exclusion will not change the results of the patterns found for the remaining sequences.

A specific case of the missing value problem is unequal sequence length resulting from censoring, thus unrelated to the process of interest (Wu 2000). As long as unequal sequence length is related to the process of interest and should meaningfully contribute to the derived distance, it is not a problem of incomplete observations, but appropriate cost specification. Problems arise when unequal sequence length is

[2] See Winship and Mare 1992 for an overview of models for selection bias.

partly or fully caused by censoring (see table 5.2). In order to minimize the influence of dissimilarity resulting purely from data censoring, Stovel and Bolan (2004) allow for variable indel costs depending on sequence length. A fixed indel cost is applied for the alignment of same length sequences, while for the alignment of sequences of unequal length, reduced indel costs of roughly one fourth of the fixed indel cost are applied. Thus, distance resulting from unequal sequence length contributes less to overall distances. An additional possibility is the differential assignment of indel costs depending on whether a sequence is censored or not. Refined specifications of variable indel costs provide the possibility of treating distances between partially censored sequences in a way that maintains the ability to derive meaningful measures of sequence resemblance.

Order and timing in complex processes over time

Sequence analysis does not distinguish between causes and effects in the course of a sequence, but understands the sequence as a holistic product of possibly multiple interrelated processes (see table 5.2). Sequence analysis addresses interdependence of causes with the assumption that processes are endogenous. To a certain extent it is argued that "When the end state is to some greater or lesser degree a product of earlier states (stronger or weaker forms of path dependence), then the idea that there are 'independent' causes no longer holds" (Stovel and Bolan 2004: 562).

Related issues are multidimensional and parallel processes. Problems arise, if we are interested in parallel processes that are not readily transferable to a finite state space. The problem of multidimensionality can be addresses by either specifying combined states of several dimensions a priori, or by running separate sequence analyses over different dimensions and then summing up the distances. For example, Han and Moen (1999) construct complete career types including several dimensions of careers, such as employment status or firm size, from the age of 30 until retirement and include them as predictors of retirement related outcomes. These are feasible approaches, but there is a limit to how much information can be meaningfully incorporated in one sequence analysis, without loosing track of what produces the distances. Finding

better ways to relate holistic sequences to endogenous parallel processes remains a challenge for future development of sequence analysis.

Arguably the core criticism of OM based sequence analysis has been the inability of OM to account for the order of events and the direction of time (Wu 2000). For example, transformation costs for substitution or insertion/deletion of the state 'employment' with 'old age pension' are the same regardless of the preceding and subsequent state. By inserting or deleting states, the order of elements is neglected by possibly deleting certain states altogether in the process of alignment. This is difficult to relate to any form of actual social process and therefore has questionable implications for the substantive meaning of resulting distances.

In addition, non linear dependencies of sequences over time are neglected if transformation costs are the same at each time point of the sequence (Billari 2001). Transformations may mean something totally different at the beginning or the end of a sequence. Consider the example of the substitution of the state 'employment' with 'old age pension' 10 years before the official retirement age, compared to the same substitution at the official retirement age. Entering old age pension early will be considered exceptional, indicating either that a person is fortunate enough not to have to work any longer, or on the contrary that the older worker was no longer employable. In contrast, entering old age pension at the official retirement age is a socially accepted regularity that is prevalent among the population. The issue of nonlinear dependencies of trajectories on time is a major point of criticism, because sequence analysis is attacked in an area - the ability to account for trajectories as entities that evolve dynamically over time - that it declares as its major strength over other methods.

Several methodological developments of sequence analysis provide alternatives to traditional OM that can account for the order and timing within sequences (see table 5.2). In a combination of network analysis with OM, Stark and Vedres (2006) developed a method to specify indel and substitution costs in a way to maximize sensitivity to temporal ordering. They specify two coefficient that indicate temporal order within sequences and test different OM cost specifications against them to identify, which of the OM specifications is most sensitive to temporal ordering. The

two coefficients are specified as a matching coefficient and a coefficient that punishes reverse temporality. The matching coefficient counts the matches between two sequences, i.e. years with the same state. This coefficient is one, if two sequences are identical or a shorter sequence is fully contained in a longer one. The coefficient that punishes reverse temporality is one for two sequences that are identical in the exact reverse order of each other. Distances from different OM cost specifications are then specified as the dependent variable in a linear regression analysis, in which the matching and reverse order coefficient enter as independent variables. A high positive beta coefficient for the reversed order coefficient and a high negative beta coefficient for the matching coefficient in the regression analysis are taken as indicative for the temporal sensitivity of the respective OM specification.[3]

Their results indicate that among a set of possible cost specifications, substitution costs based on transition frequencies and indel costs slightly above the maximum substitution cost, at 2.01 in their application, provide the highest sensitivity to temporal ordering.[4] In their application the 2.01 indel cost equals the maximum substitution cost plus the difference between the maximum and the second-largest substitution cost, suggested by Abbot and Hrycak (1990). The approach taken by Stark and Vedres (2006) remains within the traditional OM framework based on indels and substitution costs as central transformations.

Two other forms of sequence analysis have been proposed to account for the order and timing within sequences outside the OM framework (see table 5.2): non-alignment metrics (Dijkstra and Taris 1995, Elzinga 2003, 2006a, 2006b) and the modified dynamic hamming dissimilarity measure (Lesnard 2006). They are sequence tools that allow to emphasize and isolate different aspects of timing and order within sequences. The resulting distances are more accessible to theory, because they are more explicit about which sequence characteristic the calculation of distance is based

[3]A positive beta coefficient of the reversed order coefficient in the regression analysis indicates that if two sequences are in the reversed order of each other, distances between these two sequences is high.

[4]Other cost specifications tested are a longest common subsequence approach with substitution costs of 2 and indels of 1, the same constant substitution costs of 2 at indel costs of 2, and a substitution cost matrix based on transition frequencies with indels at 2 (see Stark and Vedres 2006 appendix C).

on. It is possible to discriminate between different concepts of distance and test, whether sequences are distant in one respect but similar in another.

In the subsequent comparative sequence analysis of pathways to old age pension in Germany and the United Kingdom, non-alignment metrics for the analysis of sequences and the hamming dissimilarity measure are applied. This enables to test, whether and how the results obtained with two new, different, and both theoretically meaningful concepts of distance vary. The two approaches will be discussed in more detail to clarify the substantial advancement they put forward for the applicability of sequence analysis in the social sciences, and enable a better understanding of their subsequent application to pathways to old age pension.

5.2.1 Non-alignment metrics for sequences

New forms of sequence analysis that take into account the order of elements within sequences based on non-alignment techniques include DT coefficients (Dijkstra and Taris 1995) and sequence similarity conceptualized as precedence relations (Elzinga 2003). Since they do not employ the transformation operations of OM, arbitrary specification of transformation costs is avoided. Central to both is the idea of relating ordered pairs of sequence elements to each other to determine sequence similarity. DT coefficients are useful for sequences without repetitions. The measures proposed by Elzinga (2003) can be understood as an extension of the DT coefficients that are also applicable to sequences with repetitions.

DT coefficients rely on four basic assumptions, or 'axioms' (see also Elzinga 2003): (1) sequences that have no states in common are maximally dissimilar, (2) sequences that have the same states in the same order are maximally similar, (3) the more states sequences have in common, the more similar they are, and (4) the more common order there is among common states in two sequences, the more similar they are. Like OM, DT coefficients determine sequence similarity from the number of transformations needed to turn one sequence into the other. They differ in the type of transformations taken into account. Instead of the transformation operations of OM, substitution and insertion/deletion, DT coefficients are based on the number of

moves of sequence elements necessary to turn one sequence into another in a three step procedure. Elements are discarded from sequences in a three step procedure until two sequences are equal. The total number of moves made indicates agreement between both reduced sequences: the more moves, the higher the distance between them.

A basic point of criticism of DT coefficients relates to the discarding of states, in the steps of reduction, which in fact contain substantial information about the sequence. This creates problems particularly for recurring states in sequences, limiting their applicability to sequences without repetitions (Elzinga 2003).

The non-alignment metrics proposed by Elzinga (Elzinga 2003, 2006a, 2006b, 2007) are more general and comprehensive than DT coefficients. They are based on the idea of maximizing a predefined attribute of sequences making the theoretical meaning of distances more explicit. They rely neither on the transformation operations of OM, nor the discarding of states as DT coefficients. Distances express dissimilarity in terms of the sequence attribute the researcher chooses, e.g. the length of the common prefix or postfix (first or last spell in the same state of a sequence), or the number of common ordered or matching subsequences. Duration can either be ignored, included as the minimum shared time of two sequences in a specific state, or subsequences can be weighted by duration length (Elzinga 2007). Formally distance d between a sequence x and y is defined as (Elzinga 2006a: 7):

$$d\left(x,y\right) = A\left(x,x\right) + \left(y,y\right) - 2A\left(x,y\right)$$

with A denoting the attribute of interest. While in principle, any theoretically motivated attribute of sequences can be maximized, sequence attributes that are currently implemented in available software (CHESA, Elzinga 2007)[5] are the longest common prefix and postfix of sequences, the number of matching or common subsequences, and the number of positions with a common symbol.

Maximizing the number of common subsequences places the highest emphasis on

[5]CHESA is freeware and downloadable from the authors webpage http://home.fsw.vu.nl/ch.elzinga/.

the order of elements over all other attributes. While maximizing the number of matching subsequences will only consider the order of adjacent states, e.g. a and c in acd, maximizing the number of common subsequences will also take into account the common precedence of a and c in abc.

Turbulence

In addition to the maximization of sequence attributes, Elzinga (2006b) proposes a turbulence measure to capture average variability across individual trajectories. Turbulence can be calculated with or without including state duration variation. Without taking into account duration, turbulence increases with the number of distinct subsequences. Note that the number of distinct subsequences takes into account the common order of states within sequences beyond the number of distinct states occurring within a sequence. When ignoring state duration, turbulence $T(x)$ of an n-long sequence x is defined as (Elzinga 2007: 33):

$$T(x) = log_2 \phi(x) \leq |x|$$

where $\phi(x)$ denotes the number of distinct subsequences of x and $0 \leq T(x) \leq n$.

There are two ways of handling duration in turbulence. The format in which sequences are stored is central to understanding them. Sequences can either be stored in OM format or in XT format. A sequence of three time points of employment (E) followed by two time points of old age pension (P) would be be represented as $EEEPP$ in OM format, and as $E/3\ P/2$ in XT format.

If the data are coded in XT format turbulence as specified above fully ignores durations. If the data are coded in OM format, duration will be treated as a string property when applying the turbulence measure above. Therefore, one way of treating duration is to code the data in OM format and treat it as a string property. The number of time points spent in the respective state will then be taken into account in the identification of distinct subsequences.

A second option to include duration based on XT formatted data is the following. If x is an n-long sequence with associated durations in XT format, then $t_i(x_i)$ denotes

the duration associated with states x_i and $t(x) = \sum_{i=1}^{n} t_i(x_i)$ is the total duration of the sequence. The variance of these two durations, the duration associated with a state x_i and the total duration of the sequence, is denoted by s_t^2. The maximal variance of these two durations equals (Elzinga 2007: 33):

$$s_{t,max}^2 = (|x| - 1)(|x| - t(x))^2 / |x|^2$$

and turbulence is redefined, now including duration, as:

$$T(x) = log_2 \left(\phi(x) . \frac{s_{t,max}^2(x) + 1}{s_t^2(x) + 1} \right)$$

with $\phi(x)$ denoting the number of distinct subsequences, s_t^2 denoting the variance of state duration and $s_{t,max}^2$ the maximum of that variance given the total duration of the sequence, and $s_{t,max}^2 = (n-1)(1-\bar{t})$, with $\bar{t}$ denoting the average of the state durations of sequence x (Elzinga and Liefbroer 2007: 7).

Substantively this means that sequences, in which most time was spent in one state are considered less turbulent than sequences, in which a considerable amount of time was spent in several different states. If a very short time period was spent in one state and a long period of time in another in a two state sequence, the variance of time spent in different states will be high, and turbulence will be low, since the sequence is actually quite stable. Turbulence will increase with a decrease of variance of time spent in each state, with low variance indicating that approximately equal amounts of time were spent in each state.

In sum, duration is ignored in the first turbulence formula without duration applied to data in XT format. If the turbulence formula without duration is applied to sequences stored in OM format, duration is treated as a string property. If the turbulence formula including duration is applied to sequences stored in XT format, duration is included as the state duration variance of a sequence.

Compared to earlier indicators for the variability across individual trajectories, e.g. the average sequence length, or the number of distinct states, the turbulence measure including duration can additionally take into account the order and duration

variation across states. The order of states in sequences is included by focusing on the number of distinct subsequences, rather than the number of distinct states. The state duration is included according to the second turbulence formula above.

Translated to the subsequent analysis of pathways to old age pension, high turbulence reflects pathways with a high number of subsequences and similar amounts of time spent in each state. Thus pathways with no or short intermediary states of e.g. unemployment or income support between employment and receiving an old age pension will be considered less turbulent than sequences with many varying intermediary state of longer durations that display very little overall stability.

5.2.2 The modified dynamic hamming dissimilarity measure

The dynamic hamming dissimilarity measure, developed by Laurent Lesnard (2006), is a form of sequence analysis that only applies the substitution operations of OM, not indel operations. As a result, it can only handle sequences of equal length. While the dynamic hamming measure is more restrictive than OM in this sense, it has the crucial advantage of accounting for non-linear dependencies over time, with time point and sample specific substitution costs.

Technically, the dynamic hamming procedure calculates separate substitution cost matrices at each point in time based on the frequency of transition between two states at this given time point. As a result we obtain pair wise distances at each time point that then are summed up to an overall distance. Formally substitution costs for each pair of states are calculated at each time point based on the sum of 4 probabilities (Lesnard 2006: 11):

$$s_t\left(a,b\right) = \left\{ \frac{4-[p(X_t=a|X_{t-1}=b)+[X_t=b|X_{t-1}=a)(X_{t+1}=a|X_{t1}=b)+[X_{t+1}=b|X_{t1}=a)]}{0} \right\} \begin{matrix} if a \neq b \\ otherwise \end{matrix}$$

From a probabilistic point of view the dynamic hamming dissimilarity measure implies that two events are close if the probability of transition between the two states before and after t is high (Lesnard 2006).

The dynamic hamming measure is particularly suitable for exploratory analyses,

because substitution costs are closely oriented at information from the data in the spirit of algorithmic modeling. As a consequence of its limited applicability to equal length processes, unless a missing value state is specified, it is a feasible approach to two types of analyses. Either processes that naturally are of equal length for every subject, such as one day in time diary research (Lesnard 2006), or setting chronological time, such as a certain meaningful time bracket, for example an 'opportunity window' for a process to take place. This includes age brackets for eligibility to certain types of benefits as old age pensions set by social policies.

The hamming measure therefore naturally lends itself to questions directed at the impact of age graded institutional settings on individual trajectories. First, the specification of an 'opportunity window' marked by institutional boundaries for eligibility will be rather straightforward. Second, non linear dependencies of individual trajectories on time will usually be of prime importance in these processes.

Translated to the subsequent analysis of pathways to old age pension the time point specific substitution costs of the hamming measure imply the following: a transition from employment to old age pension is considered more costly, thus producing more distance, at a time point (age) when few persons in the sample experience this transition. It is less costly at a time point when this particular transition is very frequent in the sample. Substitutions of states will thus be 'cheaper' and sequences will be considered less distant at typical retirement transition peaks coined by age specific incentives in national pension systems. Typical retirement transition peaks in the German system are age 61, 63 and 65 (Börsch-Supan 2000a). In the United Kingdom age 60 and 65 stand out as crucial age markers for National Insurance retirement, while entrance age to occupational and private pensions is highly individualized.

The major advancement of the dynamic hamming measure and the non-alignment metrics are that they make the meaning of distances more explicit, and enhance theory guided analysis of different characteristics of sequences.

5.3 Summary and concluding remarks

Despite major advancements in a 'second wave' of sequence analysis, sequence analysis is still a comparatively underdeveloped tool. Core remaining challenges in sequence analysis are the combination of multi dimensional processes and meaningful handling of uneven sequence length. More precise theories are needed in order to specify theoretically informed hypotheses about the shape of trajectories and the concept of distance of interest. A promising starting point for this is the elaboration of the trajectory concept as discussed by Sackmann and Wingens (2001).

The potential of sequence analysis is manifold and rapidly developing with recent advancements as the hamming measure, or non-alignment metrics. One of the areas, in which sequence analysis can enhance substantive research is the link between micro and macro processes. Micro level trajectories grouped to sequentially equivalent groups based on sequence distances reflect social structures generated by macro level institutions. Additional potential arises from the possibility of a quantitative representation of sequentially linked states that are qualitative in nature.

Similar to taking distances generated by sequence analysis as an indicator for the degree of family pluralization across cohorts (Brüderl 2004), distances are a promising indicator of life course structuring in cross national comparative research (Elzinga and Liefbroer 2007), particularly if the meaning of distance is as explicit as enabled by recent developments of sequence analysis. The distribution of distance and turbulence, but also the number of distinct pathways identified and the degree to which they are distant provide informative indicators of how national institutions shape crucial life course phases. Sequence index plots (Kohler and Brzinsky-Fay 2005) and cluster dendograms exploit the power of visual representation to make sense of complex processes over time.

A comprehensive sequence analytical approach has additional advantages in comparative research, considering that the proportion of people who experience the transition of primary interest in event history models may vary widely across countries and reasons for censoring may be country specific. Consider for example an analysis of the determinants of the transition to retirement as a discrete change between

employment and old age pension, where only half of the population experiences this transition in one country, while it is nearly universal in another. The censored cases would represent different proportions of the population and may distort the comparison, particularly if we know nothing about the reasons for censoring.

Sequence analysis is not one uniform method, but different implementations are suitable for different questions and further adaptation to sub-fields of the social sciences is important (see Billari and Piccarreta 2005 for the role of sequence analysis in demography). As formulated by Abbott (1995), sequence analysis will probably always be less standardized than methods in the data modeling tradition, since it requires more customized approaches depending on the data and problem at hand. The higher differentiation of sequence tools enhances the link between sequence analysis and theoretical argumentation by making the meaning of distances more explicit. Refined tools of sequence analysis can fertilize further theoretical elaboration of the under researched trajectory concept in life course research, which in turn has to guide the subsequent development of sequence analysis.

To tackle remaining challenges more systematic comparison of sequence metrics that represent different concepts of distance on the same data are necessary to fully understand the substantive implications of different algorithms. On one hand, it is frequently argued that it is desirable in terms of the robustness of patterns, if the same substantive results are obtained with different sequence analysis specifications. On the other hand, this is not very supportive for the ability of different sequence analysis specifications to discriminate between distinct meaningful characteristics of sequences. The ability to discriminate between various concepts of distance and translate them into appropriate techniques that can pick up isolated characteristics of sequences is crucial to relate them to sociological theory.

Chapter 6

Results: pathways to old age pension

In this chapter we use sequence analysis to grasp retirement as a process that evolves over time. In chapter 3 we placed the analysis within the framework of differential life course sociology and proposed the concept of pathways to old age pension. Turbulence and standardization summarize the intra personal variability and inter personal uniformity of pathways to old age pension. Turbulence and standardization refer to processes that evolve over time. They are properties of trajectories. It follows that the trajectory as a holistic entity is the appropriate unit of analysis.

The chapter is structured as follows. First, turbulence and standardization of pathways are compared to test the hypotheses that pathways are more standardized and less turbulent in Germany compared to the United Kingdom (*Hyp 1* and *Hyp 2*). Recent developments of sequence analysis enable us to discriminate between temporal and precedence related properties of sequences. By calculating turbulence (Elzinga 2006b) with and without the inclusion of duration variation we isolate the precedence related component of turbulence from overall turbulence including state duration variation (see section 5.2.1). Standardization of timing is indicated by the hamming dissimilarity measure (Lesnard 2006). The standardization of the precedence of states within pathways to old age pension is assessed by maximizing the number of common subsequences with non-alignment techniques (Elzinga 2003, 2006a). By separating

the temporal and precedence related components of turbulence and standardization we can assure that several criteria for them are met and assess their relative impact on overall turbulence and standardization.

In a second part, sequence distances are used as the basis for ward clustering to identify groups of sequential equivalence that reflect prevalent 'typical' pathways to old age pension in the comparison countries. The objective of the cluster analysis is twofold. First, to make use of the exploratory potential of sequence analysis to uncover regularities in non-standard pathways to old age pension. Second, to exploit the descriptive power of sequence analysis to gain a better understanding of the sequential patterns of retirement transition processes and the social structures they reflect. We close with an examination of income inequalities across pathways to old age pension.

6.1 Data and sample

The analyses are based on the German Socioeconomic Panel 1984-2005 (GSOEP), and the British Household Panel 1991-2005 (BHPS).[1] We use the original West German sample A of the GSOEP and the original sample of the BHPS including England, Scotland and Wales.

Pathways to old age pension are operationalized as the succession of primary income sources on a monthly basis. Due to the longer panel period of the GSOEP, a broader age bracket can in principle be observed for Germany. To enhance the comparability of the analysis we specify an equal age bracket capturing the opportunity window for the transition process to old age pension in both countries. Given that the crucial age markers for entrance to old age pension lie between age 60 and 65 in both countries, with some early retirement options before 60, the opportunity window for pension entrance is set as age 58 to 66 in both countries. This enables to identify early entrance pathways, as well as transitory pathways that lead through

[1] The GSOEP is conducted at the German Institute for Economic Research (DIW). See Haisken-DeNew and Frick (2005) for details. The BHPS data are collected at the Institute for Social and Economic Research (ISER) at the University of Essex. For details see Taylor et al. (2007).

e.g. unemployment or inactivity before entering old age pension. Further, we can assess, whether entrance to old age pension is delayed beyond the normal retirement age of 65 in the comparison countries.

The income information is retrospectively collected for the previous year in each annual panel wave in the GSOEP and the BHPS. Trajectories of the primary income source between age 58 and 66 can be reconstructed for the cohort born 1932-1940 in the observation period covered by both panels, i.e. income information from 1990-2004. We reduce the study cohort by two years from 1930-1940 to 1932-1940 to enable the analysis of income source trajectories in the full age bracket from 58 to 66. In addition we filled in missing income information in the last months for persons born 1940 (see appendix chapter 6).[2] Monthly income information for 97 months throughout the age bracket of 58 to 66 is available for 715 cases in the German sample and for 750 cases in the British sample. In the GSOEP, income information was collected on an exact monthly basis until 1994, after that only the number of months per year income was received from a specific source is reported. Exact monthly income trajectories after 1994 were reconstructed according to a set of rules described in the data appendix to this chapter.

The specification of the primary income sources as the relevant state space is complicated by a general trade-off between comparability and country specific detail in in-depth cross-country comparisons. On one hand, it is theoretically desirable to allow for country specific state spaces, since relevant income sources vary with institutional context. The existence of different income sources is a meaningful cross-country difference, and thus should contribute to the resulting distances between sequences. On the other hand, we have to avoid that distances obtained with sequence analysis are artifacts of differential state space specification.

Therefore, we run the analysis of turbulence and standardization separately for an imposed common state space, and a theoretically preferable country specific state space. If the substantive results on turbulence and standardization remain robust, it is justifiable to base the subsequent cluster analysis of prevalent pathways on country

[2] A similar analysis with income sequences between age 55 to 67 possible due to the longer observation period of the GSOEP for West Germany is available in Aisenbrey and Fasang (2007).

specific state space.

Table 6.1 gives an overview of the country specific and common state space specifications. We consider income from employment, old age pensions, state transfers, and periods of no own income. In the GSOEP, income from disability and old age pensions cannot be reliably distinguished, because it is reported in one income category. Income from occupational pensions can equally not be unambiguously identified. Therefore, it is particularly important to run the analyses on a common state space, in which disability and state pensions are combined for the United Kingdom as well, to ensure robustness across state space specifications.

For Germany we specify eight states without combinations, since joint occurrence of income sources is seldom.[3] For the United Kingdom eleven states are specified, allowing for combinations between state pensions (NI retirement) and other pension types. Joint occurrence of NI retirement with occupational or private pensions is quite frequent, and often income obtained is on a similar level.[4] Occupational and private pensions vary highly in the pension level they provide, but in many cases their combination with NI retirement is essential for living maintenance.

6.2 Sequence distances as comparative life course indicators

The sequence index plots in figure 6.1 and 6.2 present pathways to old age pension for the country specific and common state space for the study cohort. Chronological age is displayed on the x-axis, case numbers on the y-axis. The color shadings indicate different primary income sources. Sequence index plots contain essentially the same information as survival curves for pathways that follow a seamless transition between only two states. In addition, transitory states are visible, e.g. bridge unemployment in Germany, illustrated by the areas shaded in orange. Duration vari-

[3]The joint occurrence of old age pension and widow pension is most frequent. 7 percent of those who receive old age pension simultaneously receive widow pension.

[4]Of those receiving NI retirement, 37 percent simultaneously receive an occupational pension, 12 percent a private pension.

Table 6.1: State space

state no.	common state space	West DE[a]	UK
1	full-time employment	full-time employment	full-time employment
2	part-time employment	part-time employment	part-time employment
3	self-employment	self-employment	self-employment
4	unemployment/income support	unemployment	other/income support
5	no own income	other income/transfer	disability related
6	state pensions incl. disability	no own income	no own income
7	occupational/private/widow pension	old age pension/incl. disability	NI retirement
8		widow pension	occupational pension
9			NI retirement & occupational pension
10			NI retirement & pension spouses employer
11			NI retirement & private pension

[a]Income from disability and occupational pensions cannot be reconstructed unambiguously from the GSOEP data. Since occupational pensions, even though relatively wide spread are of little relevance as the *primary* source of income in Germany, we consider this a relatively minor problem.

Figure 6.1: Sqindexplots, country specific state space

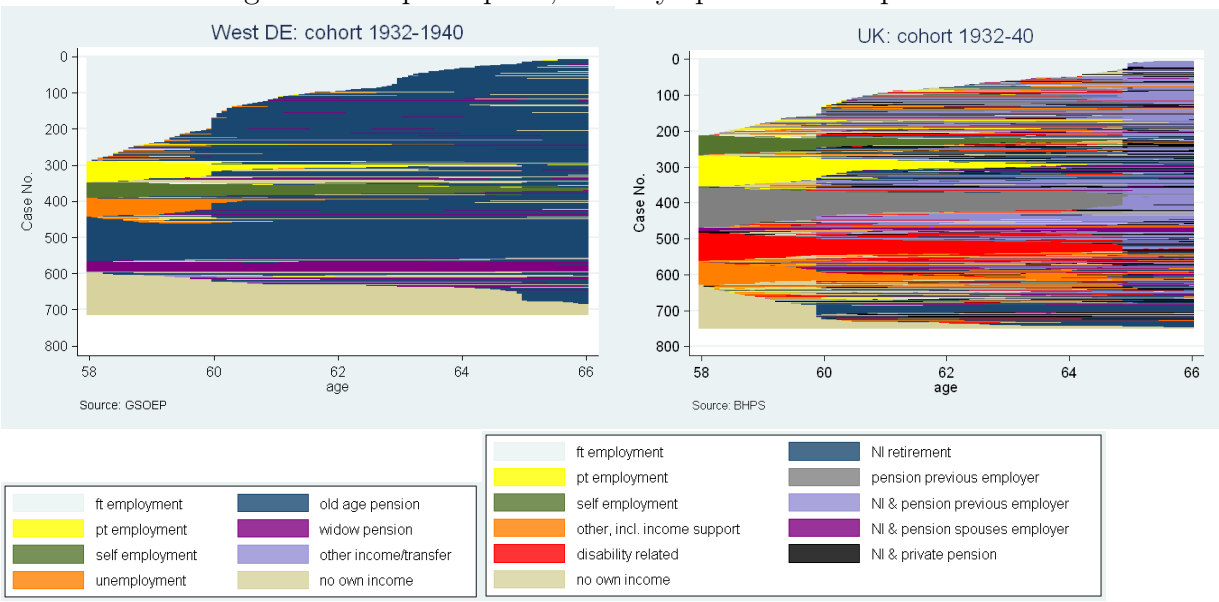
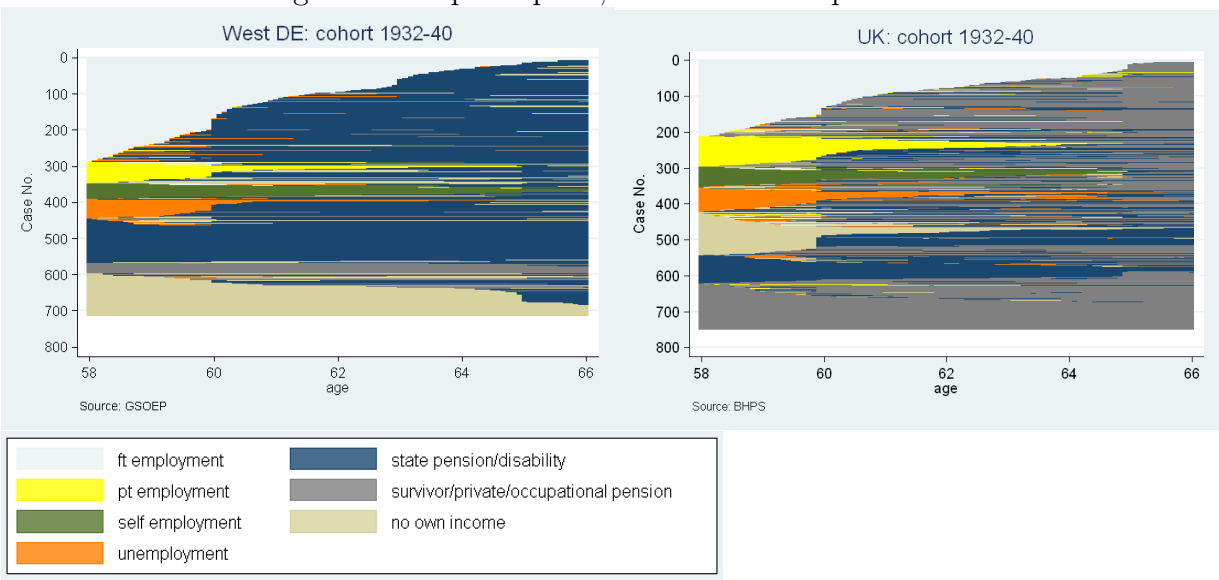


Figure 6.2: Sqindexplots, common state space



ation of prevalent states and recurrent patterns, such as intermittent phases of income support throughout pathways in the United Kingdom, are easy to grasp. Sequence index plots demonstrate the power of visual representation for understanding processes across time.

In Germany age 60, 63, and 65 stand out as crucial age markers for entrance to old age pension from employment, or periods of no own income. Unemployment is the dominant transitory state across pathways. The prevalence of early pension entrance, few moves between different types of employment, and no re-entries to employment after unemployment are characteristic for employment exit regimes coined by high employment protection and certification based occupational structures (Buchholz et al. 2006).

In the United Kingdom, transitions between employment and old age pensions are far more variable and diversified, particularly between age 60 and 65. The occurrence of more than one intermediary state is prevalent. Shifts between different forms of employment and re-employment after a period of income support as the main income source reflect the hypothesized pattern for market induced employment maintenance regimes, characterized by low employment protection combined with weak active labor market policies (Buchholz et al. 2006). A cross sectional snapshot of labor market status between age 58 and 66 in the United Kingdom would overestimate the labor market attachment of older workers, disregarding that it is often not very stable as the primary income source. In contrast to the individualized and variable intermediary states in British pathways, transitory unemployment in Germany is highly standardized around age 59 and 60.[5]

In line with *hypotheses* 1 and 2, the sequence index plots suggest lower turbulence and higher standardization of a few homogeneous pathways in Germany. The picture

[5]The proportion of persons employed at the beginning of pathways is approximately in accordance with official labor force participation rates for Germany across the observed time period. Labor force participation for the population aged 55-64 ranges between 35.8 and 41.8 percent between 1992 and 2004 (see chapter 2). The official employment rate for persons aged 55-64 in the United Kingdom is higher compared to the proportion in the study sample ranging between 46.7 and 56.4 between 1992 and 2004 (see chapter 2). Possible reasons for this are that the age brackets under consideration slightly vary, several periods are combined in the sequence index plots, or a slight over representation of retired persons in this age group in the BHPS (Taylor et al. 2007).

is particularly clear in the comparison based on country specific state space, but the general tendency remains unchanged for the common state space. The subsequent analysis will shed light on the relative size and statistical significance of country differences in turbulence and standardization.

Turbulence

In order to separate the temporal and precedence related component of intra personal variability across pathways, we calculate turbulence with and without duration variation (see section 5.2.1). Excluding duration variation, turbulence is exclusively based on the number of distinct ordered subsequences. We calculate turbulence separately for the country specific and common state space to ensure robustness across state space specification. Based on the common state space, turbulence is a conservative measure of cross-country variation, because it ignores that different income sources are relevant in Germany and the United Kingdom, and thus contribute to substantively meaningful cross-country variation. Cross-country differences are expressed as the percentage difference between mean turbulences, taking Germany as the reference point in table 6.2.

Mean turbulence of pathways to old age pension is considerably higher in the United Kingdom, but the cross-country difference is diminished when including duration variation. This means that high cross-country differences in the number of distinct subsequences are attenuated when accounting for the duration variation of states. Since turbulence decreases with increasing state duration variation, this implies that part of the high number of subsequences across pathways in the United Kingdom is restricted to short periods of time. Pathways to old age pension consequently are coined by short term frictions, rather than ongoing discontinuity in the United Kingdom.

The statistical significance of the cross-country differences can be assessed using bootstrap methods (Efron and Tibshirani 1993, Elzinga and Liefbroer 2007). In bootstrapping, random subsamples are drawn from the data and the turbulence measure is calculated for each random subsample. The sum of the subsamples constitutes a

Table 6.2: Turbulence

state space	**country specific**			**common**		
	West DE	**UK**	**%diff**	**West DE**	**UK**	**%diff**
ignoring duration						
mean	2.26	3.75	**65.9%**	2.25	3.26	**44.8%**
std deviation	1.05	1.78		1.05	1.75	
median	2.00	3.00		2.00	3.00	
including duration						
mean	4.03	6.03	**49.6%**	4.03	5.28	**31.0%**
std deviation	2.37	2.68		2.37	2.80	
median	3.91	5.70		2.91	5.01	

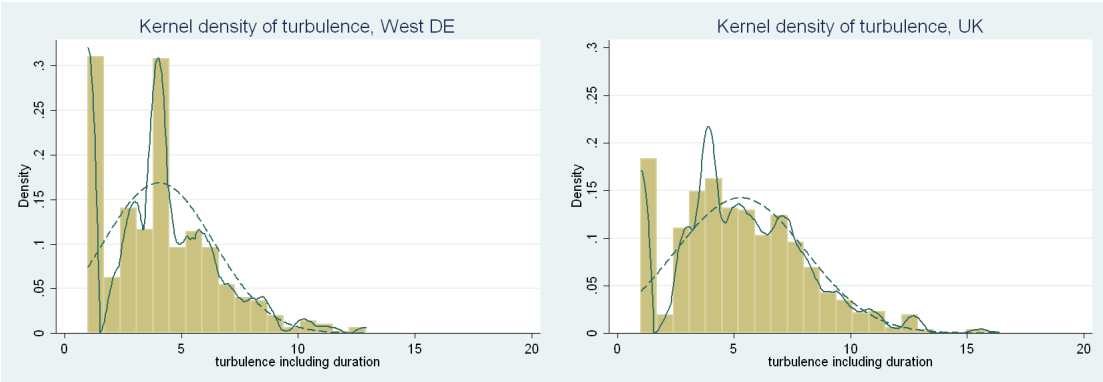
Note: percentage differences are calculated with reference to Germany.

new sample containing the subsample specific mean turbulences. Then the variance of the subsample specific mean turbulences and the confidence intervals around these means can be specified. We calculated 90% confidence intervals for mean turbulence by taking 5000 bootstrap samples per country. Table 6.6 in the appendix contains two ways of calculating bootstrap confidence intervals. First, based on standard-normal sampling distribution theory, assuming a Gaussian distribution. Second, using the bias corrected and accelerated method (BCa) that is more general and robust (Efron and Tibshirani 1993). Non-overlapping confidence intervals indicate a significant cross-country difference in mean turbulence.

The confidence intervals vary little with the two bootstrap methods and are larger for the United Kingdom, reflecting the higher variability of turbulence (appendix table 6.6). The country specific confidence intervals do not overlap, suggesting that turbulence across pathways to old age pension is significantly higher in the United Kingdom compared to Germany. However, the percentage difference is lower when including state duration variation.

Figure 6.3 illustrates the distribution of turbulence by country based on the common state space, including duration. Distributions are expressed in density units. They are overlaid with a kernel density estimator illustrated by the solid line, and a

Figure 6.3: Distribution of turbulence (common state space)



normal density illustrated by the dashed line.[6] We find two peaks at the lower end of the distribution in both countries. The lowest peak reflects pathways that remain in the same state at all times and thus are minimally turbulent. The lower peaks are more pronounced in Germany, indicating a higher proportion of pathways with minimal or low turbulence. The distribution of turbulence in the United Kingdom comes closer to the normal density, affirming that higher average turbulence is not due to extreme outliers at the upper tail of the distribution. The difference rather lies in a more even distribution in the United Kingdom with a higher density in the upper tail, while in Germany two extreme peaks at the lower end are dominant.

The results support *hypothesis* 1 that turbulence across pathways to old age pension for the study cohort is higher in the United Kingdom compared to Germany. The inclusion of duration variation attenuates mean cross-country differences exclusively based on the number of distinct subsequences. Consequently, a considerable part of the higher number of distinct subsequences across pathways to old age pension in the United Kingdom is limited to short durations. They are short term frictions in overall relatively stable trajectories. When excluding state duration variation, intra personal variability of pathways to old age pension in the United Kingdom is exaggerated by not accounting for the short term nature of distinct subsequences within overall stable trajectories.

This finding emphasizes the added value of the distinction between a temporal

[6] The kernel density function estimates the probability density function of a random variable. We use the Epanechnikov kernel.

and precedence related component in turbulence, and highlights the necessity to find summary indicators of relevant sequence properties in order to derive substantively meaningful information about life course patterns (Brückner and Mayer 2005). Our results support that the employment maintenance strategy (Buchholz et al. 2006) paired with passive pension policies (Leisering 2003) in the United Kingdom leads to short term frictions during pathways to old age pension, rather than the emergence of the retirement transition process as a new life stage of ongoing discontinuity.

Standardization

We assume that higher turbulence across pathways will go along with lower standardization, if the higher intra personal variability indicated by turbulence is relatively unregulated, as is the case in the United Kingdom. Analogous to the distinction between a temporal and precedence related component in turbulence, we examine two indicators of standardization (table 6.3). First, standardization of timing indicated by the modified hamming dissimilarity measure (Lesnard 2006). Second, standardization of the precedence of states within pathways indicated by the maximization of the sequence attribute 'number of common subsequences' (Elzinga 2006a). Both measures are calculated in pairwise comparisons of all pathways in the sample. They imply distinct meanings of distance. While the hamming dissimilarity reflects time point specific probabilities of transition between two pathways, distance in terms of the number of common subsequences is exclusively based on common occurrence and precedence of states within sequences, disregarding any notion of timing (see section 5.2).

If the timing of transitions within sequences is 'uniform and universal' (Brückner and Mayer 2005), specific transitions will be experienced at the same age by large parts of the population. This is reflected in high time point specific transition probabilities that will sum up to low hamming distances (see 5.2.2). Distances based on the maximization of common subsequences reflect to what extent 'states and the sequences in which they occur are universal' (Brückner and Mayer 2005) across populations. Distance will be zero for sequences that consist of the same states in the

Table 6.3: Standardization

state space	**country specific**			**common**		
	West DE	**UK**	**%diff**	**West DE**	**UK**	**%diff**
modified hamming						
Mean	239.6	325.5	**35.8%**	239.2	325.7	**36.2%**
Std deviation	124.4	86.6		124.3	102.1	
Min	0	0		0	0	
Max	388	388		387.9	387.6	
# of common subseq						
Mean	.507	.790	**55.8%**	.504	.698	**38.5%**
Std deviation	.127	.081		.126	.104	
Min	.376	.670		.375	.556	
Max	.895	.987		.633	.445	

Note: percentage differences are calculated with reference to Germany.

same order, regardless of their timing. All persons who experience a transition process 'full-time employment - unemployment - old age pension' are considered maximally similar.[7] For both measures high distance indicates low standardization and vice versa. Again standardization is calculated for the country specific and common state space. Between country differences are expressed as the percentage difference taking Germany as the reference point (table 6.3).

In both country samples the maximum possible hamming distance is 388 comprised of the maximum time point specific distance of 4 multiplied by the number of time points under observation (4*97 months, see section 5.2.2). The maximum possible distance denotes that the probability of transition between two pathways was zero at all times. The distances are sample specific and absolute values largely depend on the number of time points under observation. The hamming measure is remarkably stable across state space specifications. Distances are consistently higher by 36 percent in the United Kingdom compared to Germany.

The differences in precedence related standardization, indicated by distances max-

[7]By maximizing the number of common subsequences, and not the number of exactly matching subsequences, we additionally take into account the precedence of two states even if they are interrupted by intermediary states (Elzinga and Liefbroer 2007). Maximizing the number of common subsequences thus places the highest emphasis on pure occurrence and precedence relationships across sequences.

imizing the number of common subsequences, is not as stable across state space specifications (lower part of table 6.3). The percentage difference between mean distance in the two countries is 55.8 percent for the country specific state space and 38.5 percent for the common state space. For both indicators of standardization we find the same trend: pathways to old age pension are more standardized in Germany. Even though the hamming measure and the maximization of number of common subsequences reflect very different concepts of distance, we arrive at a similar cross-country percentage difference of around 36-39 percent, holding state space constant.[8]

The results support *hypothesis* 2 that pathways to old age pension in Germany are more standardized, both in terms of timing and precedence of states within sequences. In line with our expectations, the higher turbulence of pathways to old age pension in the United Kingdom is associated with lower intra cohort standardization compared to pathways in Germany.

6.3 Prevalent pathways to old age pension

Beyond quantitative summary measures of sequence structure, as turbulence and standardization, pathways to old age pension reflect qualitative transition patterns. In order to identify prevalent pathways to old age pension, we apply ward clustering to the distances derived with sequence analysis. Beyond the assertion of between group differences in sequence properties presented in the previous section, sequence analysis is a powerful descriptive and exploratory tool in the tradition of algorithmic modeling (see chapter 5). The value added for the analysis of pathways to old age pension lies in the identification of transitory patterns and regularities in non-standard transition processes.

Given that the substantive results for standardization and differentiation are stable across state space specifications, the cluster analysis is based on country specific state

[8]The similarity in the percentage difference for the two distance measures raises questions, whether they are really picking up distinct sequence characteristics. When looking at the way they were derived (section 5.2.1, 5.2.2), it is unquestionable that they capture different sequence characteristics. When entered as the basis for clustering, they produce very different groupings, thus validating that they really reflect distinct sequence characteristics (results available from author).

space. Since differences in country specific relevance of primary income sources are substantively meaningful, the resulting distances reflect real cross-country differences. Moreover, the objective is not to derive quantitatively comparable summary measures of sequence properties, but to identify qualitatively meaningful pathways to old age pension in the comparison countries. This justifies to base the cluster analysis on sequence distances obtained with the country specific state space.

Clustering is based on the hamming distance, emphasizing the timing within sequences. Distances derived from the maximization of common subsequences regard pathways with a seamless transition from full-time employment to old age pension as maximally similar, regardless of when the transition took place. This is not sensible in an analysis of pathways to old age pension, because timing is central to eligibility and determines subsequent pension level. The maximization of common subsequences is in a sense a stylized sequence characteristic useful to analytically discriminate between distinct sequence properties. Due to the abstraction of the theoretically crucial notion of timing, it is not a good measure of choice for the identification of prevalent meaningful pathways to old age pension.[9]

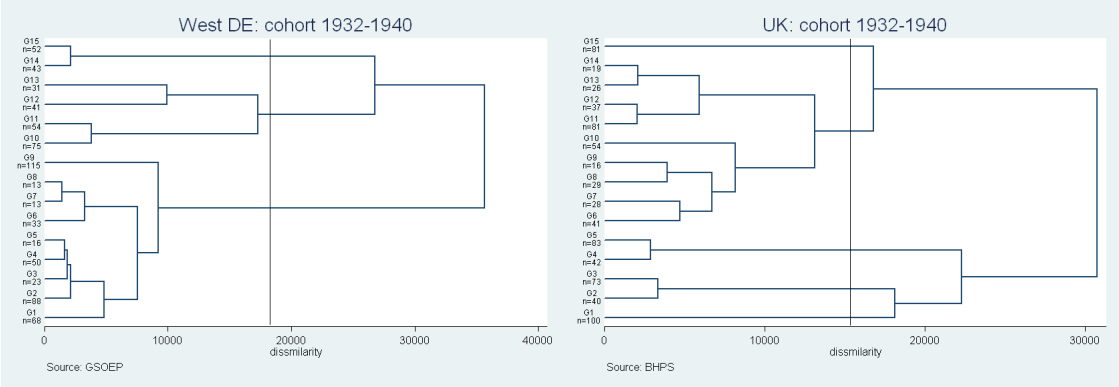
6.3.1 Cluster analysis and the validation of distinct pathways

Figure 6.4 shows cluster dendograms for a maximum of 15 clusters in each country. The dissimilarity calculated with ward clustering displayed on the x-axis, is a relative sample specific measure. It indicates how much additional dissimilarity one has to allow for the combination of subgroups. Dendograms are a visual indicator for the standardization of pathways. A division into few internally similar and externally dissimilar groups is indicative of high standardization.

Because dissimilarity is sample specific, we examine the division of subgroups at 50 percent of maximum dissimilarity indicated by the vertical line. The comparison of Germany and the United Kingdom shows a clear picture. In the United Kingdom there are five rather heterogeneous groups indicated by the five horizontal lines of

[9]The hamming distances return theoretically far more convincing groupings compared to the maximization of common subsequences. The cluster groupings based on the maximization of common subsequences are available from the author.

Figure 6.4: Cluster dendograms based on hamming dissimilarity



the dendogram at 50 percent of maximum dissimilarity. These five groups divide into equally heterogeneous subgroups. In the German sample we find only three groups indicated by the three horizontal lines at 50 percent of maximum dissimilarity. They divide into one particularly homogeneous group at the top of the dendogram, and two likewise homogeneous subgroups.[10] In Germany there are few clusters that are externally distinct, but internally homogeneous. In the United Kingdom we find no clear structure and pathways generally display high dissimilarity to each other. The cluster dendograms additionally support higher standardization of pathways in Germany.

Initial Optimal Matching applications were criticized as a way of arbitrarily 'fishing for patterns' (Wu 2000), lacking standards for validation. In exploratory sequence analysis, modes of ascertainment primarily refer to validation of cluster solutions based on sequence distances. A particular problem is the specification of appropriate cluster stopping rules. Most commonly applied cluster stopping rules are not readily transferable to clustering based on sequence distances, because they do not take into account the sequential nature of the data (Brzinsky-Fay 2007).[11]

A data based and sample specific, thus essentially 'algorithmic modeling' approach, is the comparison of within and between cluster distances, first proposed in

[10]The first group at the top of the dendogram is coined by no own income, the second group by old age pension from age 61, and the third group by longer employment, self-employment and widow pension.

[11]Most cluster stopping rules require the specification of several variables on which the clustering was based. Following sequence analysis this makes no sense, because clustering is solely based on sequence distances and not a set of variables.

connection to sequence analysis by Abbott and Hrycak (1990). The principle of contrasting within to between cluster distances goes back to the Calinsky and Harabasz cluster stopping rule (1974). The strength of exploratory sequence analysis is to uncover general patterns and pick up strong signals in the data, rather than nuanced differences. Thus, within cluster distances should be substantially lower than between cluster distances, if there really are clear patterns in the data.

Lacking conventions about an acceptable ratio of within to between cluster distances, Aisenbrey and Fasang (2007) propose that mean within cluster distance should be at least half of mean between cluster distance in order to indicate truly distinct groups. A large relative decrease of the mean within to between cluster distance ratio indicates preferable cluster solutions. This cluster stopping rule does not provide a 'one and only' best cluster solution. It is a data based guide line about which cluster solutions maximize the trade-off between accuracy and general pattern identification. The within to between cluster distance ratios, and their relative decrease when allow-

Table 6.4: Mean within and between cluster distance ratios

	West DE		**UK**	
Cluster nr.	mean w/mean b	$\Delta w/b$	mean w/mean b	$\Delta w/b$
2	.585		.790	
3	.473	.112	.788	.002
4	.409	.064	.791	-.003
5	.398	.011	.711	.080
6	.429	-.031	.629	.082
7	**.319**	**.110**	**.526**	**.103**
8	.302	.017	**.479**	**.047**
9	.281	.021	.457	.022
10	.261	.020	.438	.019
11	.234	.027	.429	.009
12	.227	.007	.431	-.002
13	.202	.025	.423	.008
14	.194	.008	.418	.005
15	.186	.008	.405	.013

ing for additional clusters are displayed in table 6.4.[12] In the United Kingdom the ratio of within to between cluster distance is higher for all cluster solutions, reflecting higher within cluster heterogeneity.

For Germany the relative decrease is largest in the step from a six to seven cluster solution with .110. Mean within cluster distances are roughly one third of mean between cluster distances (.319), well below the minimum requirement of .5. For the United Kingdom, the relative decrease of the within to between cluster distance ratio suggests a seven or eight cluster solution. The relative decrease is largest in the step from a six to seven cluster solution with .103, but the decrease of .047 in the step from a seven to eight cluster solution is still considerable. The ratio falls below the minimum standard of .5 with the step from a seven to eight cluster solution. Therefore, the eight cluster solution is accepted as the best grouping. For both countries, the relative decrease when allowing for additional clusters is marginal. Allowing for additional clusters would rather hinder the identification of general patterns, than contribute to the accuracy of the patterns identified.

Another indication for lower standardization in the United Kingdom is given by the within/between cluster standard deviations of distances. In the United Kingdom the within cluster standard deviation of distances is higher than the between cluster standard deviation in all cluster solutions (see appendix table 6.7). In contrast, for Germany the within cluster standard deviation of distances turns lower than the between cluster standard deviation with the step from a four to five cluster solution.

6.3.2 Patterns of sequential equivalence

Clusters of sequentially equivalent pathways reflect social structures shaped by life course policies. The corollaries of prevalent pathways to old age pension in terms of gender, education, health, and income shed light on the inequalities underlying these structures. Are they amplified or attenuated throughout the transition process? After a description of the qualitative patterns of pathways to old age pension we provide a

[12] The implemented Calinsky Harabasz cluster stopping option in stata requires the specification of variables the clustering was based on. In order to avoid this, the within/between cluster distances were manually calculated.

brief analysis of changing income distributions across pathways.

Prevalent pathways for Germany and the United Kingdom are shown in figure 6.5 and 6.6. The German pathways divide into three major groups, also visible in the dendogram (figure 6.4). The first three clusters in figure 6.5 constitute a group coined by varying temporal patterns from full-time employment to old age pension. One of them shows a high prevalence of either transitory or more stable preceding unemployment - the micro level outcome of the *'59er' regulation* (see chapter 2). The second group, the next two clusters in figure 6.5, consist of pathways that are characterized by non-standard employment, either part-time or self-employment. The third group is given by two clusters in which employment plays virtually no role, displayed at the bottom of figure 6.5. One is characterized by no own income followed by late old age pension entrance. In the other, widow pension dominates as the primary source of income between age 58 and 66. For Germany the pathways of non-standard employment and no employment mark social groups often excluded from models on retirement conceptualized as labor force exit.

In the United Kingdom three out of eight pathways (top three in figure 6.6) mark temporal variations of employment and occupational pensions. In the second pathway, occupational pensions function as a bridge between employment, and combined state and occupational pensions. The clusters coined by occupational pensions are more homogeneous compared to the five remaining groups.

We find a disability pathway, and non-standard employment pathways of part-time or self-employment. Analogous to Germany, there are two pathways in which employment is of marginal importance. One is characterized by state pensions (NI retirement) as the primary income source. The other is dominated by income support and pensions from the spouses previous employer. For the United Kingdom the pathways coined by non-standard employment, no own income, spouses pensions, and various forms of 'muddling through' are typically excluded from retirement research.

In the German cohort we do not find a 'residual cluster', frequently appearing in sequence analysis applications. Residual clusters consist of all sequences that do not fit into any other meaningful group, but are not actually similar to each other.

Figure 6.5: Seven pathways, West DE

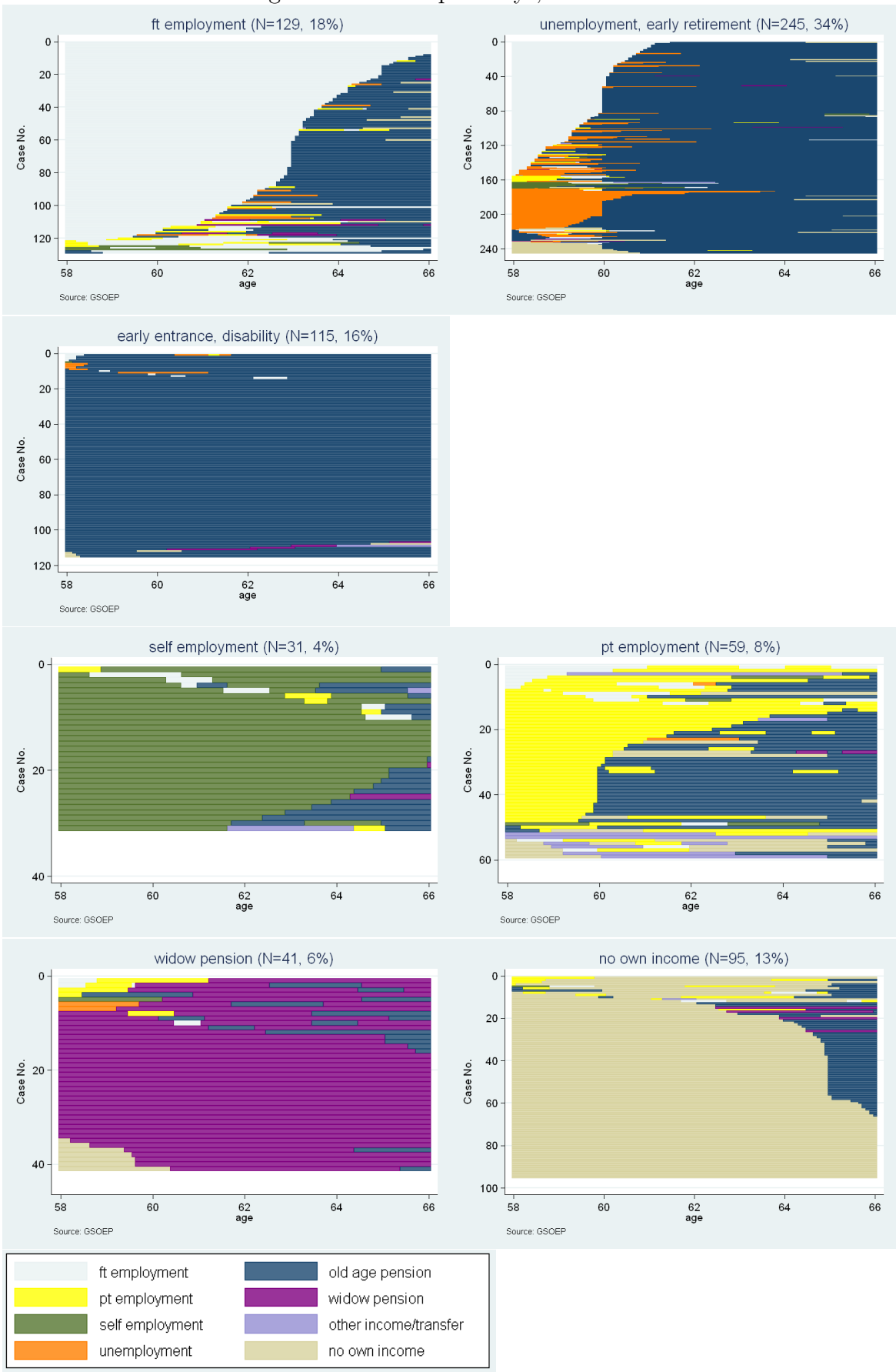


Figure 6.6: Eight pathways, UK

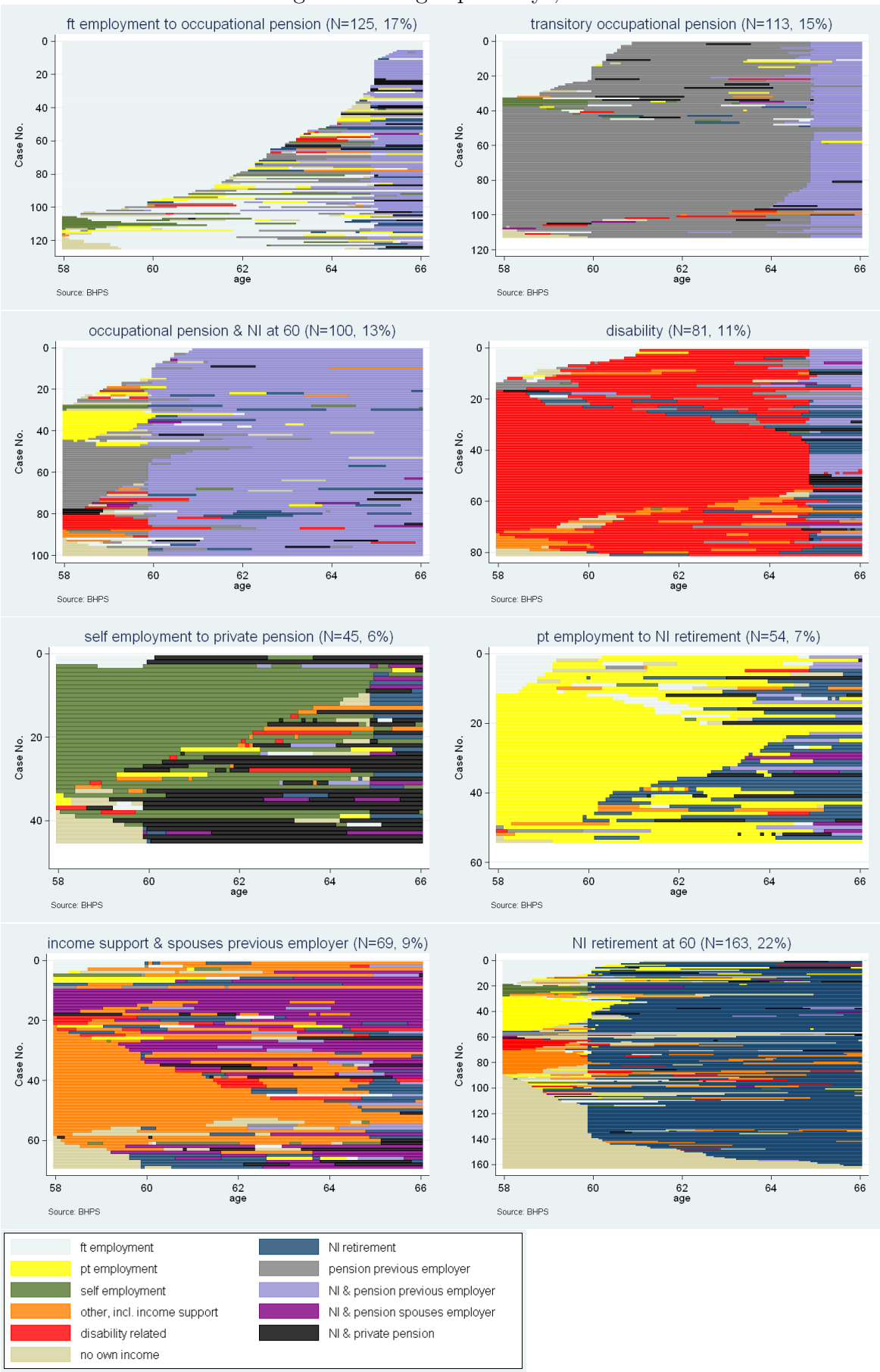
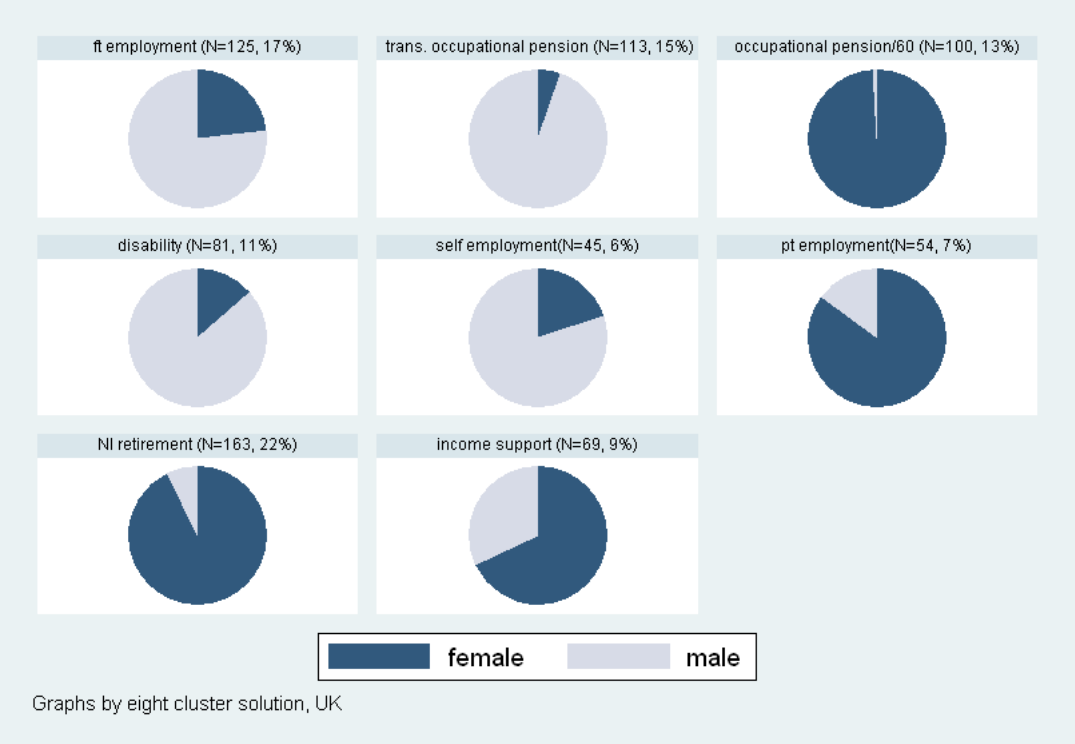


Figure 6.7: Pathways by gender, West DE

The absence of a residual cluster further supports high standardization of pathways in Germany. In the United Kingdom several groups show heterogeneous trajectories with fuzzy transitions. The cluster *income support, spouses previous employer pension* at the bottom of figure 6.6 is particularly heterogeneous, but there is no classical residual cluster, supporting a generally high structuration of pathways in the United Kingdom as well. The most frequent pathway in Germany is the *unemployment, early retirement* group with 34 percent. In the United Kingdom the *NI retirement at age 60* pathway is most prevalent with 22 percent.

Subsequently, the patterns are briefly discussed as 'cross national pairs' of similar qualitative transition patterns. In both countries we find a traditional pathway, transitory early entrance pathways, disability and non-standard employment pathways, as well as pathways coined by no income from employment. We examine related socio-demographic distributions: gender, education, subjective health, and income (figures 6.7-6.13). Mean personal and household income are expressed in national currencies, net value, and fixed at 2000 prices. They combine the sum of income from all simulta-

Figure 6.8: Pathways by gender, UK

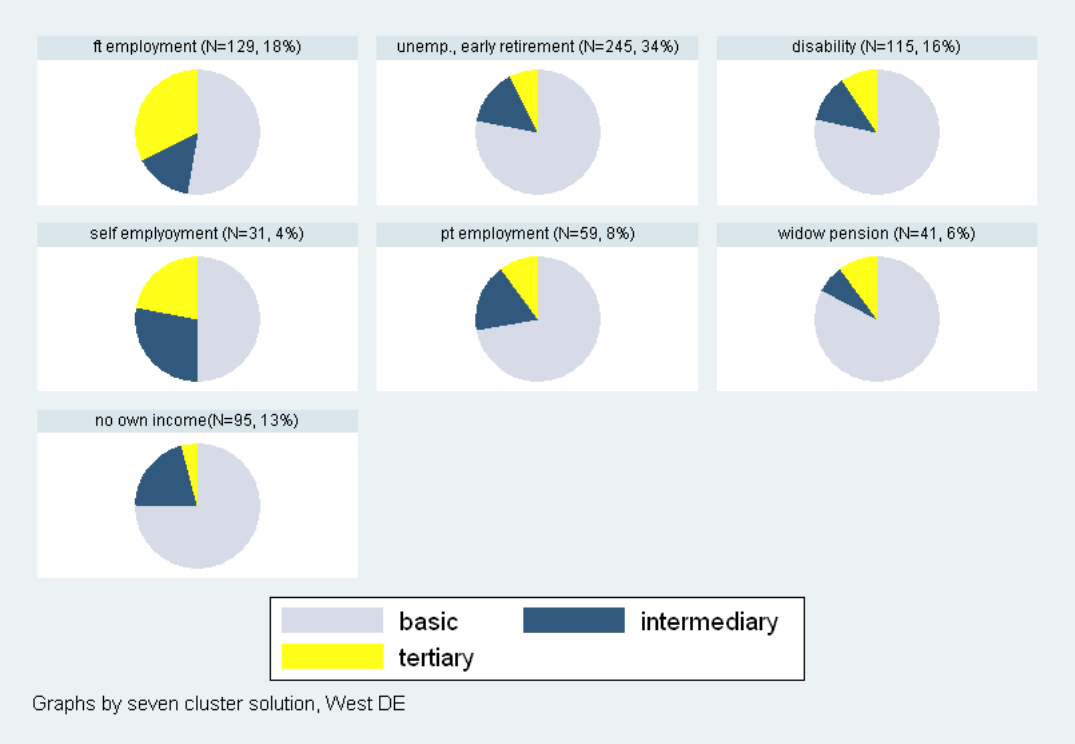


neous income sources. Household income is standardized to the level of single person households with the modified OECD equivalence scale (see appendix to this chapter).

Traditional pathways

In both countries one cluster reflects the 'ideal' traditional pathway intended in the national pension systems. They are displayed at the top left of figure 6.5 and 6.6. A first notable result is that this 'ideal' traditional pathway is only represented by 18 percent of the sample in Germany and 17 percent in the United Kingdom, a very low fraction of the cohort. In Germany this pathway shows the longest full-time employment until age 63 or beyond, followed by a mostly seamless transition to old age pension. In the United Kingdom the traditional pathway is coined by late full-time employment to combined state and occupational pensions. Private pensions indicated by the areas shaded in black are prevalent after age 65 as well. There are some intermediary phases of transitory occupational pensions, or transitory part-time and self-employment in the United Kingdom.

Figure 6.9: Pathways by education, West DE

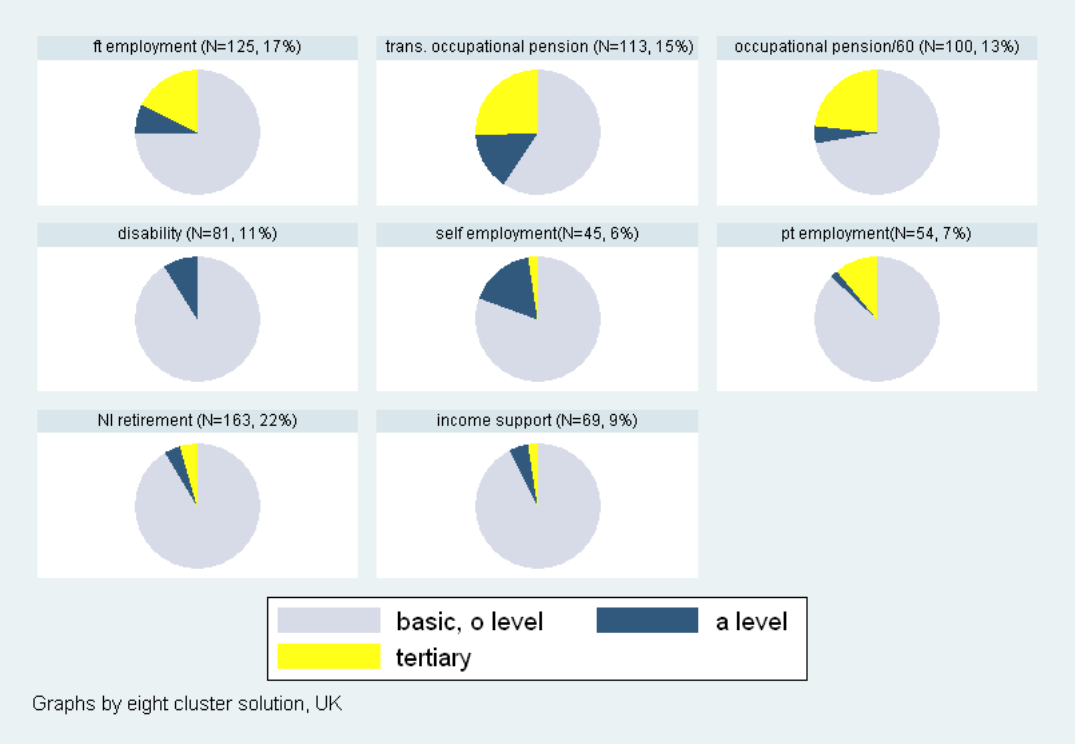


In both countries the traditional pathway goes along with male gender and high subjective health (figure 6.7, 6.8, and 6.13). In Germany this is accompanied by the highest educational level compared to all other pathways (figure 6.9). In the United Kingdom only the cluster named *transitory occupational pension pathway* displays a higher proportion of tertiary education (figure 6.10). It does not come as a surprise that they show the highest mean personal and household income in the respective country comparisons (figures 6.11 and 6.12).

Transitory early entrance pathways

The German *unemployment, early retirement pathway* consists of 34 percent of the sample, roughly twice the size as the traditional pathway, demonstrating the dominance of early pension entrance options for the study cohort in Germany. The cross national pair in the British sample, the *transitory occupational pension pathway* represents only 15 percent. For Germany this cluster includes persons who enter old age pension at age 60, either in a direct transition from employment to old age pension in

Figure 6.10: Pathways by education, UK



line with firm level early retirement incentives, or via unemployment enabled by the *'59er' regulation*. A side effect of the *'59er' regulation* was that firms often laid off workers as many months as they would receive unemployment benefits before entering old age pension at age 60. In the literature, this is referred to as a coalition between the state and firms to promote the externalization of older workers (e.g. Maltby et al. 2004). A slight drop in mean personal income during the unemployment phase disappears in the household equivalence income trajectories, affirming high financial continuity throughout this pathway (figure 6.11 and 6.12). This micro outcome of the *'59er' regulation* shows how harmonized active risk management and pension policies smoothen the retirement transition process. The active life course relevant risk management policy given with the *'59er' regulation* fosters subsequent standardization of pension entrance timing at age 60.

The transitory early entrance pathways in the comparison countries both mark an early labor force exit route, shaped by active life course policies in Germany and by passive life course policies in the United Kingdom. The *transitory occupational*

pension pathway in the United Kingdom also displays high continuity and a clear age structure with standardized entrance to combined state and occupational pensions at age 65.

The transitory pattern between employment and state pensions is common to both pathways, but they differ markedly in socio-demographic characteristics. The *transitory occupational pension pathway* shows the highest proportion of tertiary education, high personal and household income, and is 95 percent male. In contrast, in the German *unemployment, early retirement pathway*, gender is more equally distributed, education is low, and personal and household income range in the middle. Personal and household equivalence income of the *transitory occupational pension pathway* are lower during the transitory phase of occupational pensions compared to the traditional pathway. But age 65 marks a steep increase of personal and household equivalence income to the highest pension level in the British sample. In sum, in Germany the *unemployment, early retirement pathway* reflects socially acceptable externalization of low to medium educated older workers, cushioned by active risk management policies. In the United Kingdom the *transitory occupational pension pathway* marks above average education, and high financial security combined with the ability to realize individualized early retirement. This suggests that the weak institutional context in the United Kingdom not only accentuates individual differences, but also increases the degree of individual choice in the retirement transition process for the upper strata in society. The higher prevalence of the transitory early entrance pathway in Germany reflects the institutionalization of early retirement through numerous early entrance options that did not exist for the study cohort in the United Kingdom (see chapter 2).

The high proportion of men in the British *transitory occupational pension pathway* is related to gender differences in state pension age of 65 for men and 60 for women for the study cohort. We find a female equivalent of transitory occupational pensions included in the next British pathway, *occupational and state pensions at age 60.* This pathway consist of 13 percent of the British sample. It includes mostly women who entered combined state and occupational pensions at age 60 from various destination

Figure 6.11: Pathways by personal income

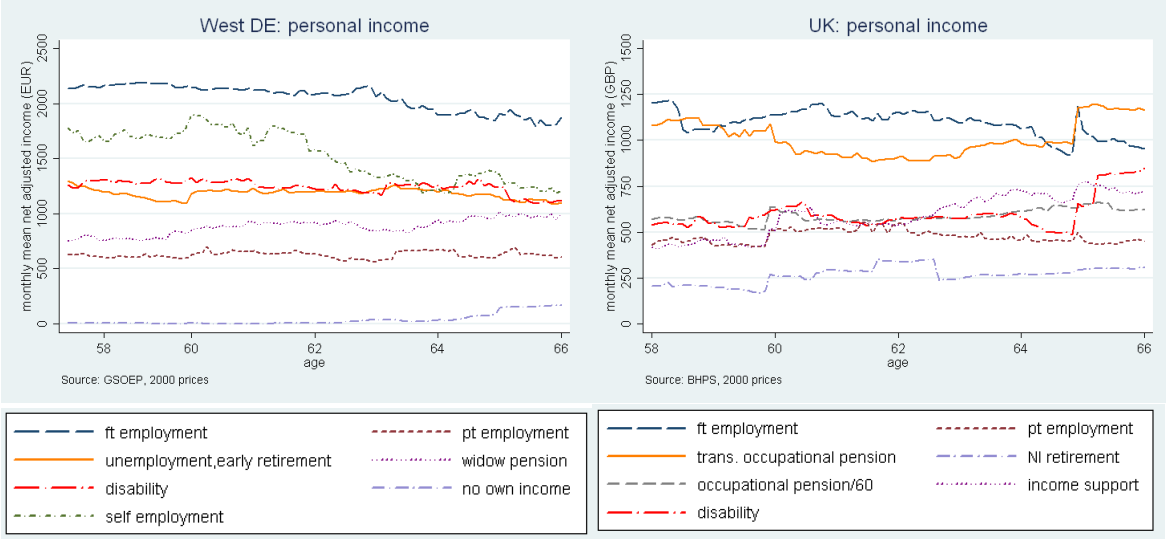
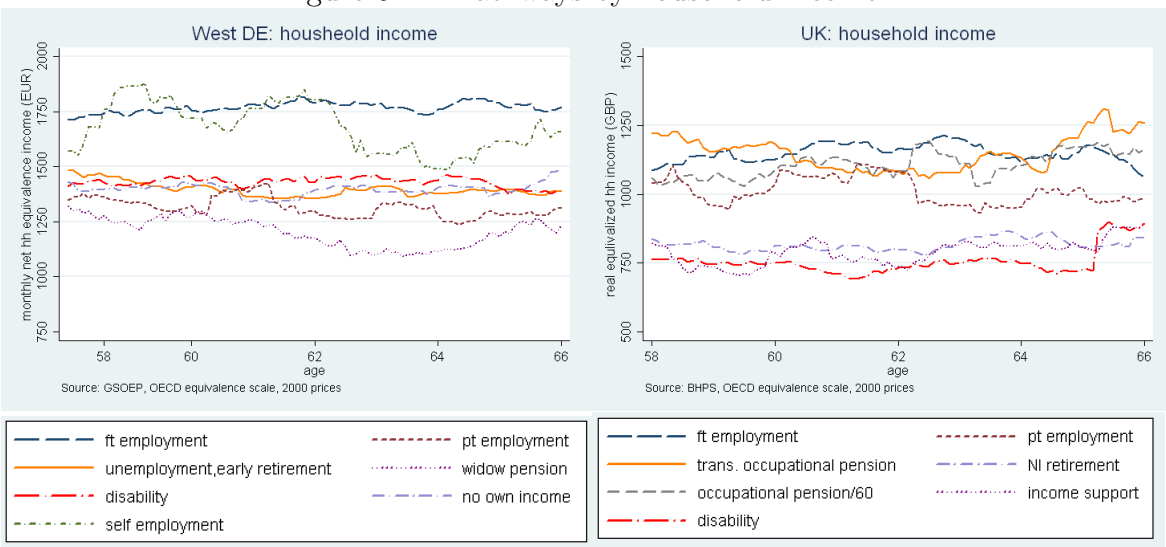


Figure 6.12: Pathways by household income

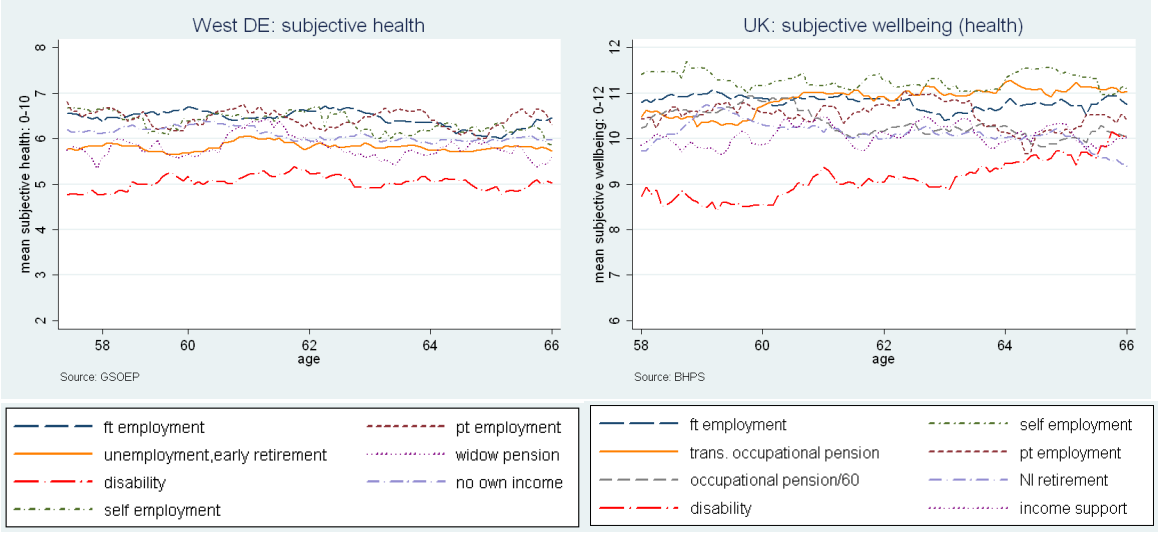


states: full and part-time employment, disability, or occupational pensions. Personal income is relatively low, but mean household equivalence income is on a high level compared to the other pathways. After entrance to combined state and occupational pensions continuity of this pathway is high with very few interruptions by intermediary states.

Disability and poor health pathways

The third German cluster, *early entrance, disability* includes persons who receive

Figure 6.13: Pathways by subjective health



pensions from a very early age on, mostly before age 58. Even though income from disability and old age pensions cannot be separated in the GSOEP, the consistently lower subjective health rating compared to all other clusters (figure 6.13), strongly suggests this group as the cross national equivalent of the British *disability pathway*. Eligibility to normal old age pension at age 58 is only available under very specific conditions, if not for health related reasons in Germany. Consequently, this pathway is institutionally almost impossible if not related to an incapacity to work.

The two *disability pathways* show consistently lower subjective health (figure 6.13) compared to all other clusters, supporting that they mark similar groups. 16 percent of the German sample and 11 percent of the British sample experience the disability pathway. Mean subjective health increases with entrance to old age pension at age 65 for the British pathway. They both show relatively low education, particularly in the United Kingdom, and are predominantly male. Disability is a viable early exit route for lower educated men in both comparison countries. The *disability pathways* reflect the accumulation of inequalities in terms of higher health risks for the lower educated over the life course.

Non-standard employment pathways

In both countries we find a *self-employment* and a *part-time employment pathway*. In

Germany the self-employment cluster comprises 4 percent of the sample, in the United Kingdom the percentage is slightly higher at 6 percent. The part-time employment cluster is represented by 8 percent of the German sample and 7 percent of the British sample. Despite pronounced differences in labor market structures and life course policies, the gendered nature of non-standard employment in pathways to old age pension is stable across countries. The self-employment clusters are predominantly male, the part-time employment pathways are predominantly female.

Beyond this structural similarity, the *part-time* and *self-employment pathways* show marked difference across countries. The self-employment pattern in Germany is characterized by self-employment until age 63 or 65, with a small group still working at age 66. Entrance to old age pension is seamless without intermediary states. In contrast, in the United Kingdom entrance to old age pension for the self employed is fuzzy with high age variation and frequent intermediary states. Private pensions are prevalent. In the BHPS the income trajectories for the *self-employment pathway* cannot be reliably asserted, because the proportion of missing values is too high (50 percent missing). In Germany, income variation across time is particularly high for this pathway. Personal income notably detoriates over time, but this is only partly reflected in a weaker decline of household equivalence income (figures 6.11 and 6.12).

The German *part-time employment pathway* is highly standardized, with mostly seamless entrance to old age pension at age 60, enabled by the *woman's pension* (see chapter 2). In contrast, in the United Kingdom female part-time employment is prevalent beyond the female state pension age of 60. State pensions are the dominant type of old age pension, occupational and private pensions play virtually no role. Transitions to state pensions are fuzzy and temporary. Reliance on state pensions is interrupted by recurrent phases of part-time employment as the primary source of income. The ability to identify this form of recurrent pattern is one of the unique strengths of sequence analysis.

Both *part-time employment pathways* show a comparatively high proportion of tertiary education, but low personal income. In Germany, mean household equivalence income for this pathway is at the lower end, supporting that female part-time

employment is motivated by financial needs of the household. In contrast, mean household equivalence income is in the upper range in the United Kingdom, suggesting that part-time employment is not only motivated by financial needs, but possibly a preference for joint labor force exit with a partner still employed.

Non-employment pathways

In the remaining pathways, employment plays no role as a primary source of own income. There are two non-employment groups in each country that again relate to each other in approximate cross national pairs. The first group (bottom left in figure 6.5 and 6.6) is dominated by pensions derived through a spouse, in form of state widow pensions in Germany and pensions from a spouse's previous employer in the United Kingdom. In Germany this pathway consists of 6 percent of the sample in the United Kingdom of 9 percent. The second group (bottom right in figure 6.5 and 6.6) is coined by no own income, followed by state pensions at the state pension age for women, 65 in Germany and 60 in the United Kingdom. The percentage of the sample in the *no own income to state pension pathway* is higher with 22 percent in the United Kingdom compared to 9 percent in Germany.

These pathways are close to 100 percent female, with the exception of the British *income support, spouse's employer pension pathway* that is only 68 percent female (figure 6.8). This is a highly gendered pattern, considering that we determined the clusters exclusively from the sequential equivalence of pathways to old age pension. Despite general similarities, the female pathways to old age pension vary substantially across counties.

The *widow pension pathway* in Germany is highly continuous. In contrast, the *income support, spouses employer pension pathway* is the most discontinuous pattern in the British sample. In Germany active life course policies generate a continuous stable pathway of state widow pensions. In the United Kingdom passive life course policies generate a highly discontinuous type of pathway characterized by 'muddling through' various primary income sources. Intermediary and more stable phases of reliance on means tested, flat-rate state transfers are prevalent. Education in these

groups is low, and they both show the lowest mean household income in the respective country comparison. In terms of mean personal income, however, they are not at the bottom of the country distributions. The *no own income, state pension pathways* display lower mean personal income.

The *no own income, state pension pathways* are coined by state pension entrance at state pension age preceded by no own income. In the United Kingdom part-time employment occurs for a small proportion of this group before entering state pensions. A subgroup of the German *no own income, state pension pathway* remains without an independent source of income until age of 66, possibly due to contracting out of the pension system for the marriage refund before 1967 (see chapter 2). Those who enter state pension must have been employed at some point, or accumulated sufficient contribution free childcare entitlements to be eligible for a public old age pension (see chapter 2). In both countries this pathway goes along with the lowest mean personal income. Recurrent reliance on income support is prevalent in the British pathway, while in the German counterpart mean own income is zero until age 65. The household plays an important role in the protection from poverty for these pathways, particularly in Germany. In Germany mean household equivalence income is in the upper middle range for the *no own income, state pension pathway.* In the United Kingdom, household equivalence income is equally higher compared to personal income, but not at a comparable level to the German cross national pair.

The *part-time employment*, and *no own income, state pension pathways* in Germany shed light on a polarization of late and early female pension entrance (e.g. Hank 2004). They suggest that early female entrance is enabled by late life labor force participation, even if only on a part-time level. In contrast, late female entrance is preceded by a long phase of no own income, amounting to insufficient accumulation of entitlements for earlier old age pension entrance. Perhaps, these two pathways mark the differential retirement transition process for women who re-entered the labor market after child birth (part-time employment pathway), and those who did not re-enter after child birth (no own income pathway). This argument will be further addressed in chapter 7.

Summary of results

The prevalent pathways to old age pension identified in Germany and the United Kingdom reflect social structures generated by national institutions. The results can be summarized as follows. The qualitative transition patterns illustrated by cluster specific sequence index plots visualize the higher turbulence and lower standardization of pathways in the United Kingdom. Prevalent pathways could be related to each other as approximate 'cross national pairs' (overview in table 6.5).

Despite institutional differences, *gender* distributions across British and German cross national pairs are similar (figure 6.7 and 6.8). In both countries the traditional institutionally intended pathways are male dominated, reflecting the normative modeling of welfare institutions on the work centered normal life course of a male breadwinner. The *transitory unemployment/occupational pension pathways*, the *disability*, and the *self-employment pathways* are equally predominantly male. In contrast, the *part-time*, *widowhood*, and *no own income pathways* are female dominated, reflecting the secondary role of employment for women in the male breadwinner context, in which the study cohort's working lives evolved. In the United Kingdom we also find a female *occupational pension pathway* with the highest mean personal and household equivalence income compared to the other predominantly female pathways, indicating a relatively higher labor market integration of a small fraction of women in this cohort in the United Kingdom. Our findings suggest that women are entering typically male pathways to old age pension with increasing labor market attachment, but the precarious female pathways coined by widowhood, no own income, and means-tested benefits remain almost exclusively female. Gender equality in pathways to old age pension for subsequent cohorts may depend on the emergence of new types of pathways, beyond a higher representation of women in typically male pathways.

The *traditional pension pathway* stands out as highly *educated* in the German sample, followed by the self-employment and the early retirement group (figure 6.9). In the United Kingdom the three occupational pension pathways go along with high education, in particular the *transitory occupational pension pathway*. The latter re-

Table 6.5: Overview: prevalent pathways, West and UK

	West DE			**UK**		
pathway	cluster name	%	% female	cluster name	%	% female
traditional	ft employment	18%	17%	ft employment/occupational pension	17%	23%
transitory early entrance	unemployment/early retirement	34%	41%	transitory occupational pension	15%	5%
				occupational pension, NI at 60	13%	99%
disability	early entrance disability	16%	41%	disability	11%	14%
non-standard employment	self-employment	4%	29%	self-employment to private pension	6%	20%
	pt employment	8%	85%	pt employment to NI retirement	7%	85%
non-employment	widow pension	6%	100%	income support & spouses previous employer pension	9%	68%
	no own income	13%	98%	NI retirement at age 60	22%	93%

flects the option for the highly educated to realize preferences for early retirement based on high financial security beyond labor income.

With the exception of the *disability pathways*, mean *subjective health* remains stable on a relatively similar level across pathways (figure 6.13). The high education, high income pathways report the highest subjective health in both countries. In Germany, the *part-time employment pathway* also goes along with high average subjective health.

The *traditional pathway* in Germany has both the highest mean personal and household equivalence *income* (figures 6.11 and 6.12). In Germany mean personal income trajectories show a converging tendency across time, in line with the leveling hypothesis suggesting redistributive effects of progressive old age pensions. Mean household equivalence income evens the distribution of personal income, reflecting the normative modeling of German social policies on the principle of subsidiarity. The low personal income situation of the female *no own income pathway* is compensated by household income in the middle range. This normative modeling on subsidiarity in the nuclear family has adverse effects for single person households, visible in the low household income of the *widow pension pathway.*

In the United Kingdom the *traditional pathway* provides the highest personal income, followed by the *transitory occupational pension pathway.* The difference between age 60 and 65 reflects the financial penalties of early exit via occupational pensions. The household equivalence income trajectories show a clear divide between two groups: three pathways coined by occupational pensions and the *part-time employment pathway* at the upper end, and the four remaining pathways at the lower end. This is the micro level outcome of the dual system of market based and state pensions, fostered by passive life course policies.

The pathways are informative to what extent pension entrance appears as a choice situation involving several behavioral alternatives, or rather occurs as a mere shift in benefit categories or 'welfare classes' (Leisering 2003). Arguably, persons who were employed before entering old age pension face a greater degree of choice on the timing of pension entrance compared to persons who enter old age pension from no own

income or other welfare transfers. Taken together old age pension entrance is a shift in benefit categories for the *disability pathways*, the *widowhood pathways*, the *no own income pathways*, and for persons who enter from unemployment in Germany. This applies to roughly 40 percent of the British sample and 50 percent of the German sample. Moreover, we can conclude that a higher percentage of women experience pension entrance as a shift in welfare classes, rather than a situation of several realistically available options for pension entrance timing.

6.4 Income inequality across pathways

The mean income trajectories across pathways to old age pension presented in the previous section are informative about general tendencies in income distributions. However, very different distributional shapes may hide behind means. Because inequality is a property of distributions, inequality analysis should focus on full distributional analysis (Handcock and Morris 1999). In addition to full distributional analysis, summary measures of distributions provide simple and precise information in distributional comparison across populations or time.

We assumed that the higher standardization of pathways to old age pension in Germany will go along with lower intra cohort inequality compared to the United Kingdom. Earnings related pensions will stabilize inequalities across time, because earlier positions in the social structure determine later ones through the intertemporal redistribution of income over the life course. Active life course policies will entail a stronger vertical redistributive element and the proportion of income drawn from pensions, or state transfers should be negatively related to income inequality. Consequently, we assumed that inequality will be stable, or moderately decline across pathways to old age pension in Germany (*Hyp 3a*), but accentuate across pathways in the United Kingdom (*Hyp 3b*).

The divergence of mean personal and household equivalence income, particularly prevalent for female pathways (figure 6.11 and 6.12), pointed towards the central redistributive function of the household during pathways to old age pension. In

Germany, the household primarily has a redistributive function protecting women from low income during pathways to old age pension. In the United Kingdom, the household on the contrary seems to accentuate income inequality in a dual structure of high and low income households, depending on access to occupational and private pensions. We distinguish personal and household equivalence income based on the OECD equivalence scale (see appendix to this chapter). Personal income includes the sum of net income from all forms of employment, state transfers and old age pensions. Again, all income figures are fixed at 2000 prices and expressed in national currencies, if not indicated otherwise.

We proceed by adopting the relative distribution framework (Handcock and Morris 1999) for the comparison of personal and household income within the age bracket of pathways to old age pension. This is informative about the relation between standardization and overall income distributions. Subsequently, we present Gini coefficients of personal and household income by age, in order to assess, whether inequality is mitigated or reinforced during pathways to old age pension.

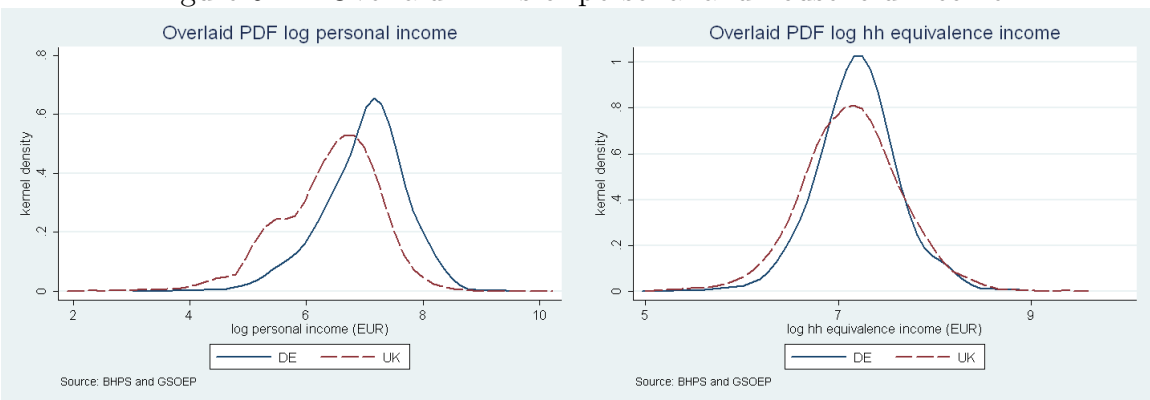
Relative income distributions

The emergence of exploratory data analysis (Tukey 1977) entailed a movement towards non-parametric and distribution oriented analysis in the tradition of the algorithmic modeling culture. Relative distribution methods stem from this tradition. They follow the same line of thought underlying the algorithmic modeling culture (Breiman 2001a, see chapter 5), in emphasizing non-parametric exploratory data analysis and the central role of graphical displays to convey information from data. The relative distribution is a transformation from the data of two distributions into a single distribution that enables strongly scale invariant comparisons of distributions (Handcock and Morris 1999). Scale invariance is a particularly desirable property in cross national comparisons. In the analysis of inequality, the full information contained in distributions, particularly in the tails of distributions, cannot be conveyed equally efficiently by distributional summary measures (Handcock and Morris 1999).

The relative distribution framework is fully non-parametric, requiring minimal as-

sumptions about individual distributions, or their relationship to each other (Handcock and Morris 1999). The rescaling of one distribution to another maps the original units of both distributions to a rank measure, usually between 0 and 1. This mitigates the influence of outliers, because outliers in the reference or comparison distribution are not necessarily outliers in the relative distribution. Before turning to relative distributions, we examine overlaid probability density functions (PDF) of personal and household equivalence income for the comparison countries (figure 6.14). Incomes are

Figure 6.14: Overlaid PDFs of personal and household income



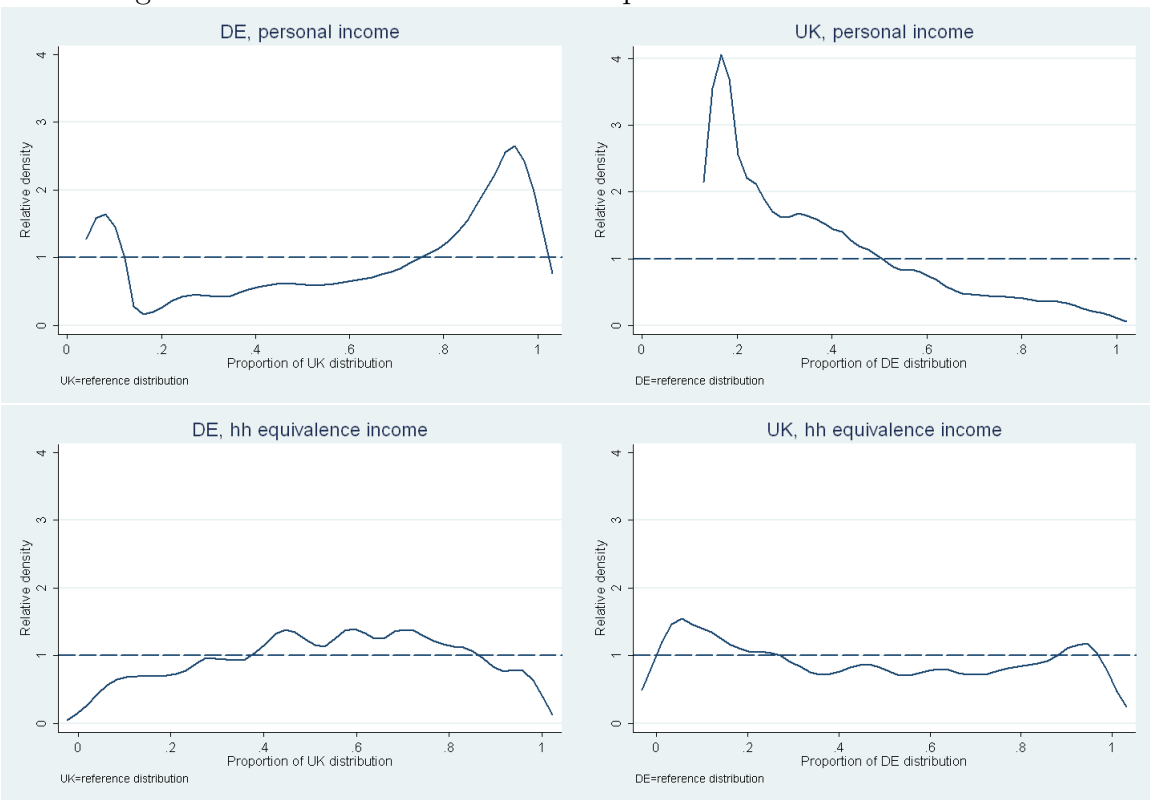
expressed as logs in EUR. This is a good way to deal with outliers in the upper tail of the distribution, but also automatically excludes zero incomes, since the logarithm is not defined for values ≤ 0.

Distributional differences consist of two basic components: location and shape shifts. For both personal and household income we see a shape shift between Germany and the United Kingdom. The distribution of personal income in the United Kingdom shows an additional peak at the lower end and its location is shifted to the left. In contrast, personal income in Germany approximates a normal distribution. The distribution of household equivalence income in the United Kingdom is slightly flatter with a less pronounced shift to the left.

These graphs only tell half of the story, since zero incomes are excluded. Relative distributions including zero incomes are presented in figure 6.15. They are based on real incomes in EUR, since outliers in the upper tail of the distribution are dealt with in the relative distribution framework as described above. We plot the British

distribution relative to the German distribution of personal and household equivalence income and vice versa. The dashed horizontal line at the relative density of

Figure 6.15: Relative distributions of personal and household income



1, displayed on the y-axis, indicates the form the relative distribution would take, if the two distributions were identical. The x-axis denotes quantiles of the reference distribution. In quantiles in which the relative distribution is above one, there are more comparison observations than reference observations. A monotone decline or increase of the relative distribution indicates location shifts of two otherwise similar distributions. In contrast, U-shaped relative distributions indicate shape shifts between distributions (see Handcock and Morris 1999: 42)

In the top left graph of figure 6.15, the German distribution of personal income is the comparison distribution. The British personal income distribution constitutes the reference distribution. In the first quantile, the relative distribution is above one, indicating that more German observations are at the very bottom of the distribution compared to British observations. This peak reflects the high proportion of zero incomes most notable in the female *no own income/state pension pathway* in the Ger-

man sample (figure 6.5). Then the relative distribution declines below one, indicating that more British observations are concentrated in the lower middle quantiles of the German distribution. At the very top quantile there are more German observations again. This graph indicates that the distribution of personal income is more unequal in Germany when including zero incomes, with a higher concentration at the upper and lower tails compared to the British distribution of personal income. The top right graph in figure 6.15 shows the mirror image, the British distribution of personal income relative to the German one. Personal income in the United Kingdom is highly concentrated in the second quantile of the German distribution.[13]

The relative distributions of personal income show two things: cross-country differences in personal income are due to both a location and a shape shift, and there are two country specific peaks at the lower ends of the distribution. For Germany, we find a peak in the lowest quantile of the British distribution, while in the United Kingdom we find a peak at the second and third quantile of the German distribution. While in Germany zero personal income is more prevalent, low personal income is more frequent in the United Kingdom.

Consequently, when excluding zero incomes we largely understate personal income inequality in Germany. The U-shape of the German distribution relative to the British, in fact indicates higher inequality of personal income across pathways to old age pension in Germany. The assumption that high standardization goes along with lower income inequality is not supported on the level of personal income.

The relative distributions of household equivalence income show a different picture (bottom of figure 6.15). In line with our assumptions, the relative distributions indicate a shape shift with a higher polarization of household equivalence income at the upper and lower tail, and thus higher inequality in the United Kingdom. The higher inequality of personal income in Germany is compensated by household equivalence income to a larger extent than in the United Kingdom, supporting a particularly strong redistributive function of households in Germany.

Although we cannot causally relate standardization and inequality to each other in

[13]The relative distribution is undefined for the first quantile, related to the high proportion of zero personal income across pathways to old age pension in Germany.

a statistical sense with only two comparison countries, our findings support that the standardization of pathways to retirement goes along with lower household inequality. But they also emphasize the necessity of a differentiated assessment which substantive patterns are standardized by social policies. At this point we can conclude that:

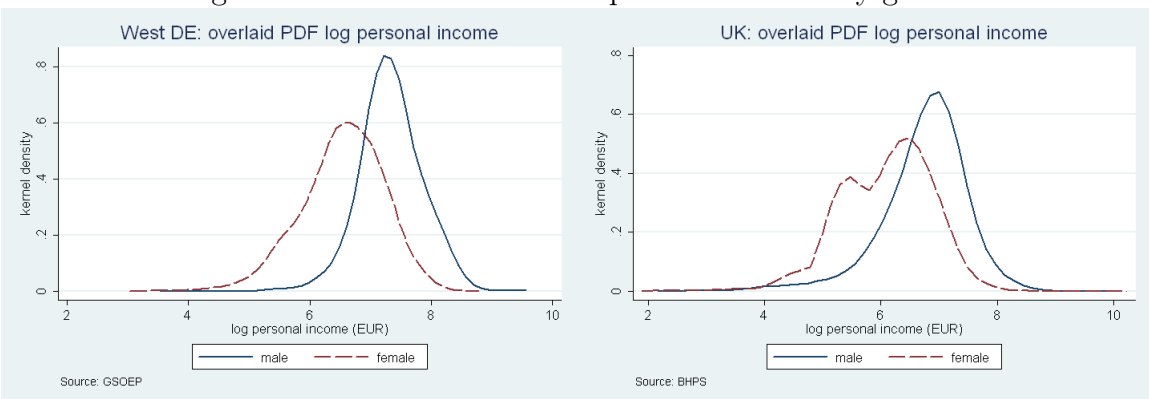
1. High standardization of a male breadwinner division across pathways to old age pension entails high personal income inequality, but low inequality on the household level across pathways.

2. Low standardization of a male breadwinner division across pathways to old age pension goes along with moderate inequality of personal income, but high inequality of household equivalence income.

Due to the gendered division of prevalent pathways to old age pension and the differential impact of household structures on men and women, we subsequently decompose personal income distributions by gender. We only focus on personal income, because most gender differences are diminished in household equivalence income. Figure 6.16 shows the overlaid PDFs of log personal income by gender, excluding zero incomes.

In Germany, the PDF of women's log income is shifted to the left compared to mens, and the shape is flatter, but otherwise similarly bell shaped. In contrast, in

Figure 6.16: Overlaid PDFs of personal income by gender



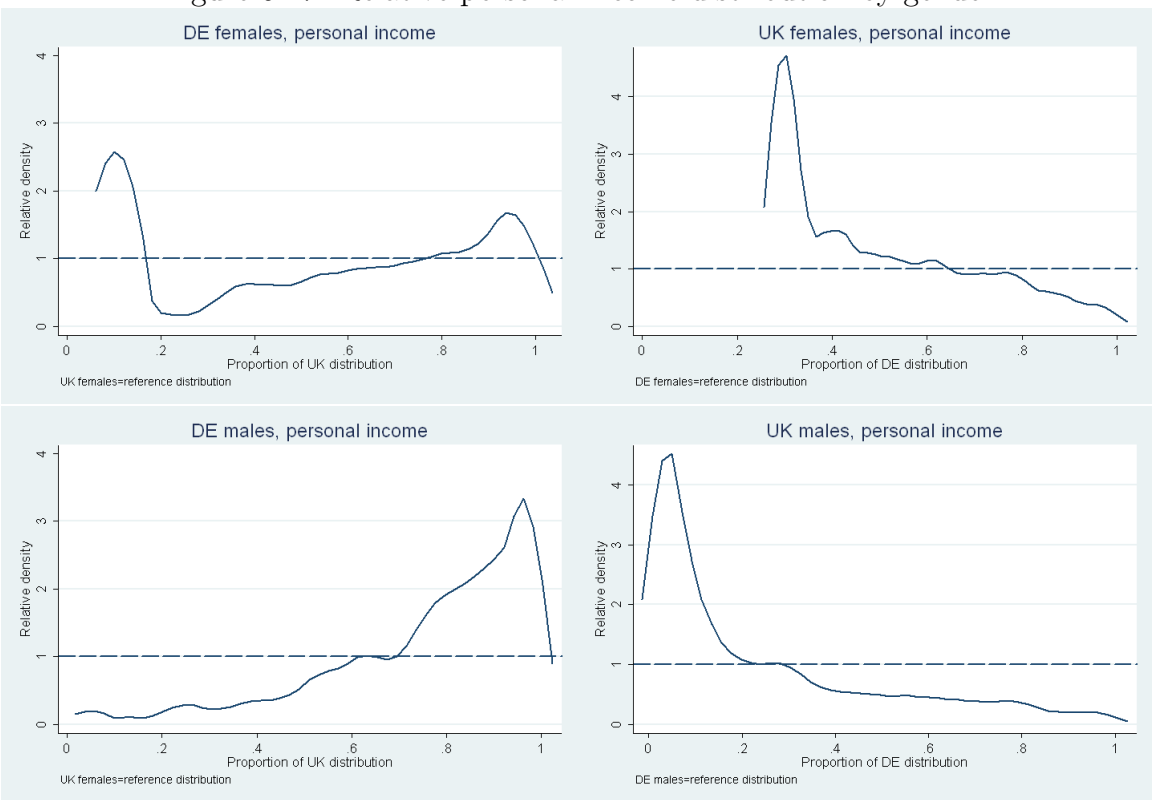
the United Kingdom the PDF of log female income is shifted to the left and shows a bimodal rather than an approximate normal distribution. The PDF of log personal income for men is similar in shape to the German distribution. Thus we find a

pronounced shape and location shift for women compared to men in both countries but with country specific outcomes.

We compare the relative income distributions by gender, including zero incomes in figure 6.17. The distribution of personal income of women in the United Kingdom is displayed relative to the distribution of women's personal income in Germany and vice versa. The equivalent for men is shown in the bottom graphs of figure 6.17.

The skewed relative distribution in the comparison of men indicates a location shift towards lower personal income for men in the United Kingdom. The female distributions vary in location and shape. In the German sample, a higher proportion of women has personal income in the upper and bottom quantiles of the British distribution. This reflects the polarization between women who have an independent source of income across pathways to old age pension and those who do not. In

Figure 6.17: Relative personal income distribution by gender



the United Kingdom, we find a concentration of women's personal income in a steep reversed U-shaped relative distribution in the second and third quantile of the German distribution. This indicates a higher concentration of women in the low personal

income range compared to women in Germany.

In sum, women account for the cross-country differences. The cross-country shape shifts of personal income, indicated by U-shaped relative distributions, is restricted to women in the two comparison countries. Personal income across pathways to old age pension is more unequally distributed for women in Germany compared to women in the United Kingdom. Personal income of men, on the other hand, is only shifted in location.[14] Within country inequality of personal income for men is similar.

Women who have an independent source of income show a more similar income distribution to men in Germany (see PDFs figure 6.16). In contrast, in the British sample the bimodal personal income distribution of women fundamentally differs from the bell shaped distribution of personal income for men.

We find a polarization of female pathways to old age pension and associated personal income in both countries, but in different ways. For women in Germany, the question is whether they have an independent source of income or not. In the United Kingdom it is a question of the level of income obtained. Within country inequality for women in Germany is higher compared to women in the United Kingdom, while within country inequality is approximately equal for men in both countries.

Summary measures of inequality across time

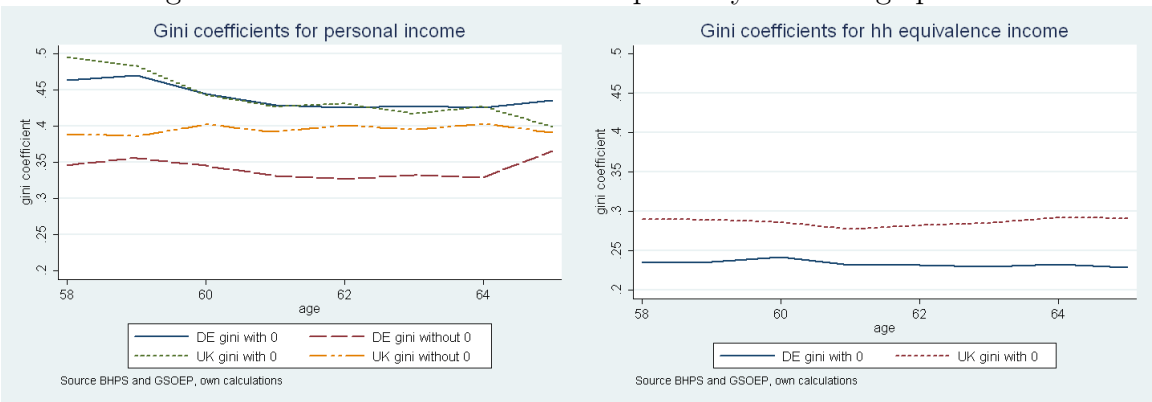
In this section we examine changes in inequality across pathways to old age pension over time using summary measures of inequality. The Gini coefficient is a measure of statistical dispersion that represents distributional patterns associated with inequality (Cowell 2000). It has desirable properties for the comparison of inequality across countries and time. It is not affected by changes in the unit of measurement, currency in this case, allowing the researcher to circumvent issues of inflation and purchasing power. Its ratio is defined between 0 and 1, with high values indicating more unequal distributions.

Changes in Gini coefficients for personal and household equivalence income by age

[14] This location shift should be regarded with some caution considering that GBP were transformed to EUR. They size of the location shift may not precisely reflect national purchasing power parities. The general tendency nevertheless should hold.

enable us to assess, whether inequalities were reinforced, maintained, or attenuated throughout pathways to old age pension as addressed in the hypotheses of cumulative advantage, status maintenance and status leveling (Mayer et al. 1999, O'Rand and Henretta 1999, DiPrete and Eirich 2006). With Gini coefficients we cannot assess status maintenance, status leveling, or cumulative advantage on the individual level. However, since status maintenance implies stable population level inequality, sta-

Figure 6.18: Gini coefficients across pathways to old age pension



tus leveling implies decreasing population level inequality, and cumulative advantage implies increasing population level inequality, Gini coefficients are nonetheless informative on the attenuation or accentuation of intra cohort inequality across pathways to old age pension.

Figure 6.18 shows Gini coefficients across pathways to old age pension for personal and household equivalence income. They are calculated based on national currencies. For personal income we calculated the Gini coefficients separately, including and excluding zero incomes. As expressed in the relative distribution plots (figure 6.15), particularly in Germany this is a central distinction. When zero incomes are included, Gini coefficients of personal income are similar across countries on a high level. However, when excluding zero incomes, the distribution of personal income is consistently lower in Germany.

The comparison of Gini coefficients for household equivalence income with Gini coefficients for personal income, again highlights the central redistributive role of the household. On the household level inequality is far lower in both countries, and con-

sistently lower in Germany compared to the United Kingdom. The redistributive and protective effect of the household is stronger in Germany. This implies considerable financial risks for economically weaker divorced spouses across pathways to old age pensions, if not compensated through pension sharing upon divorce.

Across time, the inequalities indicated by the Gini coefficients are remarkably stable. There is some movement of the Gini coefficients of personal income. Most notably, Gini coefficients including zero incomes decline across pathways to old age pension as more persons who had no independent income at the beginning of pathways reach state pension age and enter old age pension, albeit on a low level (see prevalent pathways in section 6.3). But these trends are fully flattened out in household equivalence income.

This supports the central role of status maintenance across life courses in line with previous findings (Mayer et al. 1999) for Germany, but also for the United Kingdom. Life course sensitive schemes, as earnings related pensions, transmit the same degree of population level inequality that persisted at the beginning of pathways throughout pathways to old age pension in both countries. Contrary to our expectations we do not find an acceleration of either personal, nor household income on the population level across pathways to old age pension in the United Kingdom. Passive life course sensitive policies in the United Kingdom generate overall higher inequality on the household level, but not on the level of personal income.

6.5 Summary and concluding remarks

We proposed the concept of *pathways to old age pension* for a comprehensive cross national cohort comparison of retirement transition processes in Germany and the United Kingdom. *Pathways to old age pension* have several advantages for cross national comparisons of retirement processes over existing concepts emphasizing the process character of retirement, i.e. *pathways to retirement* (Kohli et al. 1991) and *midcourse* (Moen 2003). They establish a conceptual macro-micro link following individual trajectories through income sources defined by macro level institutions.

Further, we can avoid the exclusion of population subgroups that do not experience predefined one-time transitions by setting the temporal boundaries of pathways as the opportunity window for old age pension entrance given in national pension systems. This enabled the inclusion of people not employed in later life and the identification of regularities in non-standard transition processes, crucial for the understanding of gender differences in pensions (Shuey and O'Rand 2004). Further, we could narrow the prevalent gap between theoretical retirement research emphasizing the process character of retirement and empirical retirement research focusing on one-time transitions.

Based on the central role of age graded and functional eligibility in old age pensions and state transfers, we argued that temporal and precedence related sequence properties of pathways will be most sensitive to institutional variations. Presuming that distinct sequence properties only amount to substantively meaningful patterns in combination with each other, we argued that turbulence (Elzinga 2006b) and standardization (Brückner and Mayer 2005) are good summary concepts of sequence properties on the intra and inter personal level.

We placed the analysis in the conceptual framework of differential life course sociology (Mayer 2005). To derive hypotheses on the turbulence and standardization of pathways, we discussed the political economy of the life course emphasizing labor markets (e.g. Mayer 1997, Ebbinghaus 2006, Buchholz 2006), life course effects of social policies (Leisering 2003, Guillemard 2000), and the relationship between institutions and individual differences (Caspi and Moffitt 1993).

We hypothesized that in the United Kingdom low mutual trust between individuals the state and employers, a market induced employment maintenance regime, and predominantly passive risk management and pension policies will lead to higher turbulence (*Hyp 1*), and lower standardization (*Hyp 2*) of pathways to old age pension compared to Germany. We argued that the institutional complexity fostered by passive life course policies will additionally accentuate the impact of individual differences on pathways to old age pension, thus amplifying turbulence (Caspi and Moffitt 1993). Further, higher turbulence will go along with lower standardization, if

intra personal variability indicated by high turbulence is relatively unregulated.

In line with *hypotheses* 1 and 2, the comparative sequence analyses support that pathways to old age pension for the study cohort are more standardized and less turbulent in Germany. Sequence analysis enabled us to empirically access turbulence and standardization as what they are theoretically conceptualized as - properties of trajectories. Our results emphasize the importance of viewing distinct sequence characteristics in combination with each other to arrive at theoretically meaningful concepts of variation in life course patterns (Brückner and Mayer 2005).

The distinction between temporal and precedence related components in turbulence and standardization enhanced our understanding of cross national differences in pathways to old age pension. Using bootstrap methods (Efron and Tibshirani 1993), we derived confidence intervals to assure the statistical significance of cross-country differences in turbulence. Cross-country difference in turbulence was lower when including duration variation compared to the isolated impact of the number of distinct subsequences. Thus, a substantial part of the higher variation across British pathways to old age pension is only transitory within overall quite stable trajectories. We can conclude that pathways in the United Kingdom are characterized by short term frictions, rather than ongoing discontinuity that would indicate the emergence of the retirement transition process as a new life stage. The standardization of pathways in Germany was higher, both in terms of the timing of transitions and the precedence of states within sequences, affirming that several criteria for overall higher standardization are met.

Subsequently, we applied cluster analysis to sequence distances derived with the dynamic hamming dissimilarity measure (Lesnard 2006), emphasizing the theoretically crucial notion of timing in retirement transition processes. We identified prevalent pathways to old age pension that reflect social structures shaped by national institutions. Country specific prevalent pathways could be related to each other as cross national pairs.

In both countries, the pathways characterized by male gender, high education, and high physical well-being are associated with high income. This suggests stable

intra cohort inequalities (O'Rand and Henretta 1999). In Germany, pathways are highly standardized according to a male bread winner division. The household has a major protective function for women, granted by the male bread winner. A side effect of this is the relatively weak economic position of widows. The state does not fully compensate for missing nuclear family protection, reflecting the principle of subsidiarity constitutive for the German welfare state. The standardization of a male bread winner division across pathways to old age pension in Germany goes along with lower inequality on the household level compared to the United Kingdom. Inequality of personal income however, is high in both countries with an even higher concentration in the extreme tails of the distribution in Germany, visible in the relative distributions.

In the United Kingdom, the entitlement to occupational pensions of at least one household member marks a clear divide between financially advantaged and less advantaged households across pathways to old age pension. A higher proportion of women has an independent source of income, and personal income inequality among women is lower compared to women in Germany. Nevertheless, women in the United Kingdom are concentrated in the lower income quantiles, visible in the bimodal distribution of female personal income. Those entitled to occupational pensions fare well, whereas we find several female risk groups 'muddling through' income support, phases of no own income, spouses pensions or a low state pension. Inequality indicated by the Gini coefficient is stable across pathways to old age pension in both countries, supporting the status maintenance hypothesis.

In this chapter we approached retirement as a process to clarify, how national institutions shaped the pathways to old age pension experienced by the study cohort, how pathways were structured and how they relate to income inequalities. We found strongly gendered patterns of pathways to old age pension as the outcome of gendered life courses in both countries. In the next chapter we aim to gain a better understanding of the emergence of these gendered patterns over the life course. The holistic sequence perspective emphasized that we cannot only look at characteristics of the last work place for answers. Relevant selections happen earlier in the life course, as

demonstrated by pathways that do not start with employment at the beginning of the opportunity window for old age pension entrance. This brings family biographies to the fore, because family responsibilities are the primary reason for women of the study cohort not to be gainfully employed. In the subsequent chapter we examine how divorce and childcare interruptions affect the central transition in pathways to old age pension - the timing of pension entrance.

6.6 Data appendix chapter 6

Data preparation and missing data

Missing months of birth were randomly distributed to maintain as many cases on monthly level as possible in both data sets.

GSOEP

The analysis is based on sample A, the original West German sample of the GSOEP. Detailed income information for each month is available in the GSOEP until 1994. After 1994 only the number of months per year that income from a certain source was received is available, not in which particular month it was obtained. Information on the amount of income received is available across all waves. We approximated the monthly sequences of main income sources after 1994 in the following way. If the number of months of income from a certain source received is twelve, it is straightforward: each month of a year is set as received income from that particular source.

If income from a particular source was received for less than twelve months in a given year, but income from the same source was received for twelve months in an adjacent year (either the previous or the subsequent year), we placed the number of months received income from this source adjacent to the year in which this type of income was received for twelve months. If income from this source was received for twelve months in both adjacent years, it was randomly attached to the previous or the subsequent year.

That leaves us with income from a particular source that was only received for a few months in a given year, but not for twelve months in an adjacent year. We first distributed these remaining months to the months for which there was no other income information available yet, if such phases occurred. If this was not the case, remaining months of income from a particular source were randomly distributed across the year in one continuous time period.

Old age pension receipt of less than twelve months in a year was always placed at the end of the year and the subsequent time periods were filled in with old age pension receipt. This is legitimate since it is technically impossible to loose entitlement to

old age pension in Germany, once entered the system. If people continue working, their old age pensions may be reduced, but not ceased. The rules according to which the imprecise income information after 1994 was distributed across years can be summarized as follows. The chronological order of applying the rules is important:

1. if income from source x was received for 12 month in year y, set every month of year y as received income from x

2. if income from source x was received for < 12 months in year y, but income from source x was received for 12 months in an adjacent year (y_{t-1} or y_{t+1}), append the number of months received income from x in y to the adjacent year in which income from x was received for 12 months

3. if income from source x was received for < 12 months in year y, and income from x was received for 12 months in y_{t-1} and y_{t+1}, randomly append the number of months x was received in y to either y_{t-1} or y_{t+1}

4. if income from x was received for < 12 months in y, but not for 12 month in y_{t-1} or y_{t+1}, and there are remaining time spans of no income source information in y, fill in the time spans for which no other income source information is available with the number of months income from x was received

5. if income from x was received for < 12 months in y, but not for 12 month in y_{t-1} or y_{t+1} and there are NO remaining time spans of no income source information in y, randomly distribute the number of months income from x was received as an additional source of income

Cases for which income information for at least 85 of 97 months in total is available are included in the analysis. For the remaining missing time periods, a maximum of twelve months in a row, we continued the last information available. There are 1605 persons born between 1932 and 1940 in sample A, the original West German sample of 1984, who ever participated in the GSOEP in the 22 waves between 1984 and 2005. After excluding persons with more than twelve months of non participation (based on ?netto variable) we remain with 715 usable cases. Persons who were born late in

the year of 1940 have some missing months at the end of the sequences, in their 65th year of age. These missing months are treated by forward filling of the last available information, which is old age pension in nearly all cases.

In addition to typical sources of bias in panel data (see Spiess and Kroh 2006), such as initially non representative distribution of the population, and differential panel attrition, additional bias may result from this reconstruction of income source trajectories. However, beyond usual problems of panel data, errors resulting from the reconstruction of income sources after 1994 are arguably less distortive, since all income sequences are treated in the same way. However, income sequences with a higher number of distinct states and more frequent transitions are likely to suffer more from imprecisions in the exact timing. When interpreting the results, this temporal imprecision, particularly for more complex sequences as well as the likely under representation of persons with weak health and early death should be kept in mind.

BHPS

For the BHPS exact monthly income information is available across all waves, therefore the procedure described above for the GSOEP is not necessary. In total there are 2697 cases born between 1932 and 1940 who ever participated in the BHPS in 15 waves between 1991 and 2006. Of these 2697 cases 55.9 percent only participated in 6 or less waves, which is to few considering that the full age bracket 58-66 requires eight years of observation. The persons who only participated for less than 7 waves are excluded based on the ?ivfio variable. 1189 cases remain.

Depending on exact month of birth some persons born at the tails of the cohort 1932 to 1940 lack a few observations up to 10 months at the end or the beginning of the 97 month period between age 58 and 66. The reason for this is that data collection of the BHPS takes place in fall and thus each wave spans parts of two calendar years from August to September the next year. The missing information at the end and beginning of the relevant age bracket are filled in by backward and forward filling of the last or next observed income source information.

We allow for 1 year of non participation that can be approximated with the last

observed income information, cases with missing information above one year between the age of 58 and 66 are dropped. We keep all cases that participated between the age of 58 and 66 for at least 85 months. This leaves 750 cases of 72750 person periods (750*97), of a nearly balanced panel (98.94 person periods have full interview).

Information about income from state transfers and pensions was obtained from the ?income files, information about income from employment was obtained from the newpan file.

State space specification in the British sample

Private pensions and pensions from the spouses previous employer are only considered in combination with NI retirement, even if they occur as the only primary income source. Considering that 91 percent of those receiving a private pension also receive NI retirement and 70 percent of those receiving a pension from their spouse's previous employer simultaneously receive NI retirement, separating them into distinct states would hinder general pattern search, due to low case numbers in the respective states. The category income support comprises various forms of marginal state transfers, including job seekers allowance.

In contrast to the GSOEP, receiving no own income is not recorded as a separate category in the BHPS. Therefore, we coded time periods in which persons participated in the survey, but reported not receiving income form any of the named sources, as receiving no own income. We may overestimate receiving no own income, since some of the time points we code as receiving no own income may be item non-response to the income questionnaire. However, there is no other way to allow for a state of receiving no own income and it is a crucial information for our analyses. Therefore we chose this second best alternative to allow for a state of receiving no own income.

Do-files for all data preparation and analyses are available from the author.

Bootstrap confidence intervals

We calculate bootstrap confidence intervals based on two methods, the standard nor-

mal percentile method assuming a Gaussian distribution, and the bias corrected and accelerated method (BCa) that is more general and robust (Efron and Tibshirani 1993). By including an acceleration constant $\hat{a}$ that refers to the rate of change of the standard errors of the variance around the true parameter value, the BCa method corrects for biases arising if not all standard errors are constant, as assumed in the standard normal approximation (Efron and Tibshirani 1993: 186pp.). Advantages of the bias corrected accelerated method are that the BCa intervals are second order accurate (its errors in matching go to zero at rate $1/n$ in terms of sample size n), and it is transformation respecting. However, the results obtained with the two methods vary little in our application.

Table 6.6: Confidence intervals bootstrap sampling (common state space)

	lower bound	**upper bound**	**size**	**centrality**
Ignoring duration				
Germany 90% CI around 2.25				
Std. normal theory	2.1823	2.3117	.1294	.0000
Bias-corrected accelerated	2.1856	2.3170	.1313	-.0657
UK 90% CI around 3.26				
Std. normal theory	3.1487	3.3614	.2127	.0000
Bias-corrected accelerated	3.1545	3.3669	.2124	-.0530
Including duration				
Germany 90% CI around 4.03				
Std. normal theory	3.8831	4.1734	.2903	.0000
Bias-Corrected Accelerated	3.8834	4.1732	.2898	-.0007
UK 90% CI around 5.28				
Std. normal theory	5.1113	5.4460	.3347	.0000
Bias-corrected accelerated	5.1045	5.4398	.3353	.0385

Additional information to the analysis of income distributions

The variables labnet and labgro in the GSOEP are generated variables reflecting net and gross wage in EUR including imputations for missing values (see Frick and Grabka 2005 for imputation details). The information on state transfers was collected in DM until 2002 and then in EUR. This means that the retrospective income calendar in

the GSOEP conducted in 2002 referring to 2001 was the first wave (wave s) to collect income information in EUR. Prior information was transformed to EUR and all analyses were calculated on EUR basis. All income figures are corrected by the national consumer price indices (CPI) fixed at 2000 prices. To make incomes comparable among households of different sizes, equivalence scales are used to standardize household income to the level of a single person household. We use the modified OECD equivalence scale, which takes the combined value of 1 for the head of household, 0.5 for each additional household member older than 14 years and 0.3 for children under 14 (see Böheim and Jenkins 2006 for details).

I would like to acknowledge the persons whose software enabled the analysis of this chapter:
Turbulence and standardization were calculated using Cees Elzinga's CSA and CHESA software. Sequence index plots were produced with the stata module sqom.ado by Ulrich Kohler, Christian Brzinsky-Fay, and Magdalena Luniak. The modified Hamming dissimilarities were calculated using Laurent Lesnard's seqcomp.plugin for stata. The relative distribution graphs were produced using Ben Jann's stata package relrank.ado.

Table 6.7: Full within and between cluster distance ratios

		West DE				**UK**			
Cluster nr.	dist.	mean	std	w/ b	Δ	mean	std	w/ b	Δ
overall		239.4	124.4			325.72	86.6		
2	w	178.1	129.0			287.9	102.7		
	b	304.2	77.9	.585		364.2	38.5	.790	
3	w	147.3	112.9			281.1	108.7		
	b	311.5	76.1	.473	.112	356.7	46.8	.788	.002
4	w	128.5	97.2			279.2	113.1		
	b	314.2	75.2	.409	.064	352.9	49.1	.791	-.003
5	w	125.4	93.7			251.5	117.2		
	b	314.7	75.2	.398	.011	353.7	47.9	.711	.080
6	w	120.8	99.5			218.8	119.7		
	b	281.3	103.6	.429	-.031	347.9	56.7	.629	.082
7	w	88.9	70.1			183.3	106.3		
	b	278.0	104.4	.319	.110	348.4	56.2	.526	.103
8	w	81.2	75.1			167.0	94.4		
	b	268.9	108.5	.302	.017	348.6	56.1	.479	.047
9	w	74.9	73.0			158.7	91.4		
	b	266.5	109.4	.281	.021	347.2	57.9	.457	.022
10	w	69.8	65.0			151.9	85.3		
	b	266.5	109.3	.261	.020	347.1	57.9	.438	.019
11	w	60.9	65.3			149.2	82.9		
	b	260.8	112.0	.234	.027	347.1	57.9	.429	.009
12	w	58.7	65.8			148.8	85.3		
	b	259.1	112.9	.227	.007	344.9	61.5	.431	-.002
13	w	52.3	61.2			145.0	87.3		
	b	258.5	112.9	.202	.025	342.6	64.6	.423	.008
14	w	50.1	60.8			143.2	86.4		
	b	257.9	113.0	.194	.008	342.3	64.8	.418	.005
15	w	48.1	56.2			138.8	81.8		
	b	258.0	113.0	.186	.008	342.7	64.2	.405	.013

Chapter 7

Results: the timing of pension entrance

After the analysis of holistic pathways to old age pension, we now turn to the central transition in pathways to old age pension - the timing of pension entrance. In chapter 4 we placed the analysis within the framework of rational choice theory. We made the auxiliary behavioral assumption that individuals will generally enter old age pension as early as possible given their resources and restrictions. We further assumed that divorce and childcare interruptions alter pension entitlement positions and thus options for pension entrance. The expected changes in the entitlement situation through divorce and childcare interruptions were elaborated in descriptive country specific bridge assumptions, highlighting the historic specificity of the 'logic of the situation' in the decision of pension entrance for the study cohort.

In a difference in similarities design we follow the comparative logic of holding the male breadwinner context across the study cohorts working lives constant at maximally different pension systems in effect for this cohort. With regard to the impact of divorce on pension entrance we distinguish between the introduction of *default* pension sharing in 1976 in Germany, and the introduction of *optional* pension sharing in 1973 in the United Kingdom. Concerning the impact of childcare interruptions on women's pension entrance we contrast the *retrospective* introduction of care credits that affected all cohort members equally in 1986 in Germany to the *prospective* in-

troduction of care credits only for care periods after 1978 in the United Kingdom. Further possibilities to accumulate pension entitlements in typical female carer's employment profiles coined by part-time work and discontinuity are better in Germany than in the United Kingdom (see chapter 2).

The chapter is structured as follows. We begin with a description of the samples and the construction and distribution of the dependent variable, the hazard of entering old age pension. Subsequently, we present descriptive findings on the central independent variables, the family biography and employment history over the life course. The hypotheses specified in chapter 4 are tested in discrete time logistic regression models. First, all analyses are conducted separately for women and men. Subsequently, we merge the gender samples to calculate gender interaction effects. To address ambiguities in the conceptualization of retirement, we conclude with a comparison of the results obtained with pension entrance to results obtained with self-report retirement as the dependent variable for the German sample.

7.1 Data and sample

Analogous to the sequence analysis the event history analyses are based on the GSOEP and the BHPS data. We merged the prospective monthly income information for the construction of the dependent variable 'pension entrance' with the retrospective biography information on fertility, marital, and employment histories. This allows us to combine information over the entire life course beginning from age 15 with exact monthly income information on the timing of pension entrance.[1] In some respects, data requirements for event history analyses are lower than for sequence analysis. For the sequence analysis it was necessary to reconstruct full income source sequences over 7 years. For the event history analysis all cases that experience an unambiguous transition to old age pension in the observation period can contribute

[1] In both the BHPS and the GSOEP the biography data is recorded on a yearly not a monthly basis. We artificially extend the yearly biography information to months in order to match the monthly information available in the prospective panel waves. All variables from the prospective panel waves, except the ongoing time variables and the time constant variables are assigned missing values in the artificially expanded period between age 15 and the first observation in a prospective panel wave.

information to the models on the timing of pension entrance.

We focus on slightly different birth cohorts in the sequence analysis and the event history analysis. In the sequence analysis we faced a trade-off of including another birth cohort or allowing for an additional year of age in pathways to old age pension. We therefore dropped the birth cohorts 1930 and 1931 and filled in the last few months of pathways to old age pension for the birth cohort 1940 that are missing since the observation period ended in 2005. For the analysis of pension entrance timing we ensure that all persons are included until their 66th birthday to unambiguously identify the transition to old age pension at the age of 65. Income information is reported for the previous year in each wave of the GSOEP and the BHPS, i.e. the wave of 2005 includes income information for 2004. Since the last observation year is 2005 we can ensure that all persons reached their 66th birthday within the observation period for the cohorts born until 1939. Therefore, the analyses in this chapter is based on persons born 1930-1939.

7.1.1 Dependent variables

We specify the first instance of entering an old age related pension as the primary income source as the dependent variable. In section 1.1 we argued that existing research (e.g. O'Rand and Landerman 1984) on the impact of family processes on retirement is mostly flawed by conceptualizing retirement as labor force exit. Depending on the research question at hand, labor force exit may be a problematic measure of retirement, due to the exclusion of persons not employed in later life. By focusing on the timing of pension entrance as the dependent variable we can include persons not employed in later life. This enables a more comprehensive assessment of pension outcomes following divorce and childcare interruptions.

Another retirement measure frequently used is self-report retirement (e.g. Drobnic 2002, Hank 2004). A problem with self-report measures of retirement is ambiguity about how individuals subjectively classify themselves as retired. Assumably, ambiguity about subjective classifications of the retirement transition will be greatest for persons who do not experience a seamless transition from full-time employment to

old age pension. In these situations reporting the socially accepted retirement age, reflected in state pension ages may be a dominant strategy. Women who spent all or at least the second half of their working lives as housewives may report being retired as soon as their husbands retire, following the rationale of defining all household members status via the household heads status. It is particularly unclear at which time point persons who experience gaps between full-time employment and pension entrance are going classify themselves as retired. Social desirability is also likely to play a role. For example being in early retirement may 'sound better' than being in transitory unemployment at age 60.

In sum, we specify pension entrance timing as the dependent variable for three reasons: (2) it enables the inclusion of persons not employed in later life, (2) it avoids the ambiguity of self-report retirement measures, and (3) enhances conceptual and empirical coherence with our above analysis of pathways to old age pension, since pension entrance is the central transition within pathways to old age pension.

Sample Germany

The event history models for Germany are also based on sample A, the original West German sample of the GSOEP. In total 1670 persons born 1930-1939 participated in sample A, 852 men and 818 women.[2] Only persons who participated in the biography

Table 7.1: Sample cohort 1930-1939, West DE

	men	women
ever in Sample A	852	818
bio info available	600	598
left censored	73	68
at risk	527	530
right censored	162	208
failures	365	322

questionnaires can be included in the analysis since the central independent variables are derived from the retrospective information on the employment, marital, and fer-

[2]We merged the biography information separately for a male and a female file by expanding the person month data by the difference of month between age 15 and the first observed age in the prospective panel waves.

tility history. The data is set up in person month format (one row for each person per month) beginning with age 15, when the biography information starts. The last row for each person is demarcated by either entering old age pension, reaching age 66 and not having entered old age pension yet, or the last valid income information. Analysis time is set as age in months since age 15. For example a person who remains in the sample until age 66 has 611 person months, thus 611 rows in the data set.

Table 7.1 provides an overview of case numbers for the German samples. Of all persons born 1930-1939 who participated in sample A, biography information is available for 600 men and 598 women. Right censored cases are kept in the sample, since they contribute information to the survival rate, the denominator of the hazard rate and can be meaningful as competing risks (Box-Steffensmeier and Jones 2004). Left censored observations are excluded, because they contribute no information to the hazard rate. This applies to 73 cases in the male sample and 68 observations in the female sample. The left censored cases include persons who already were in old age pension on their first observation of the income information.[3] We remain with 527 men at risk of whom 365 experience entrance to old age pension within the observation period. Consequently, 162 cases in the male sample are right censored. Of 530 women at risk of entering old age pension, 322 experience this transition before their 66th birthday. 208 cases in the female sample are right censored, i.e. we have information on an income source other than old age pension at some point but no information on their pension entrance. This can be the case, because persons dropped out of the sample before entering old age pension or did not enter old age pension until age 66.

Table 7.2 shows the primary income source at the last observation and the last income source before entering old age pension for the German samples. Among men 69 percent enter old age pension within the observation window. The proportion of women who enter old age pension is lower at 61 percent. The most frequent reason for right censoring is earlier drop out or unavailability of income information (29

[3]In the German sample left censoring primarily refers to persons who entered disability pension before age 50, since receiving income from an old age pension is recorded in the same category as income from a disability pension.

Table 7.2: Income source before and at last observation, West DE

	men		**women**	
income source at last observation	%	N	%	N
drop out before age 66	29.03	153	27.36	145
full-time employment	0.57	3	0.19	1
self-employment	1.14	6	0.57	3
widow pension	-	-	5.85	31
no own income	-	-	5.28	28
old age pension	69.26	365	60.75	322
total	100.00	527	100.00	530
income source before pension entrance	%	N	%	N
full-time employment	63.01	230	31.37	101
part-time employment	5.48	20	15.84	51
self-employment	6.58	24	1.55	5
unemployment benefit	23.56	86	10.25	33
widow pension	-	-	6.52	21
other income/transfer	0.82	3	1.86	6
no own income	0.55	2	32.61	105
total	100.00	365	100.00	322

percent for men, 27 percent for women). Prolonged employment as a reason for right censoring at age 66 is negligible applying to only 9 men and 4 women. For women, widow pension and no own income at age 66 are relevant reasons for right censoring, in line with the patterns of pathways to old age pension found in chapter 6. Women who receive no own income by age 66 may either have contribution periods below the minimum of five years or opted for the 'marriage refund' by contracting out of the state pension system upon marriage before 1967 (see chapter 2).

The lower part of table 7.2 shows the last primary income source before entering old age pension for persons who experienced this transition in the observation period. The high prevalence of gaps between employment and old age pension visualized in the sequence index plots in figure 6.5, are reflected in the the relatively low percentage of 63 percent of men and 31 percent of women who enter old age pension seamlessly from full-time employment. Another 33 percent of women enter old age pension from having no own income. Among men 24 percent enter old age pension following unemployment, underlining the importance of unemployment as an institutionalized bridge to old age pension particularly for men in the study cohort. Part-time employment

Figure 7.1: Survival curve and hazard rate, men West DE

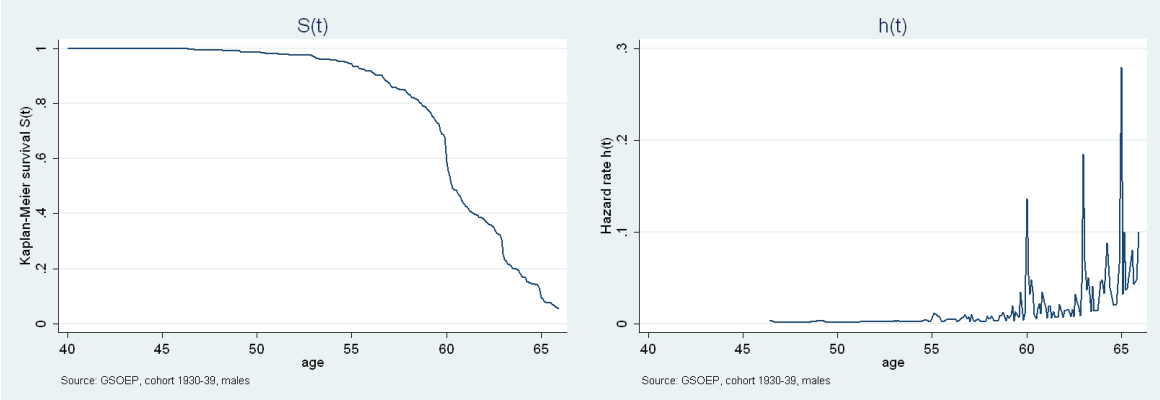
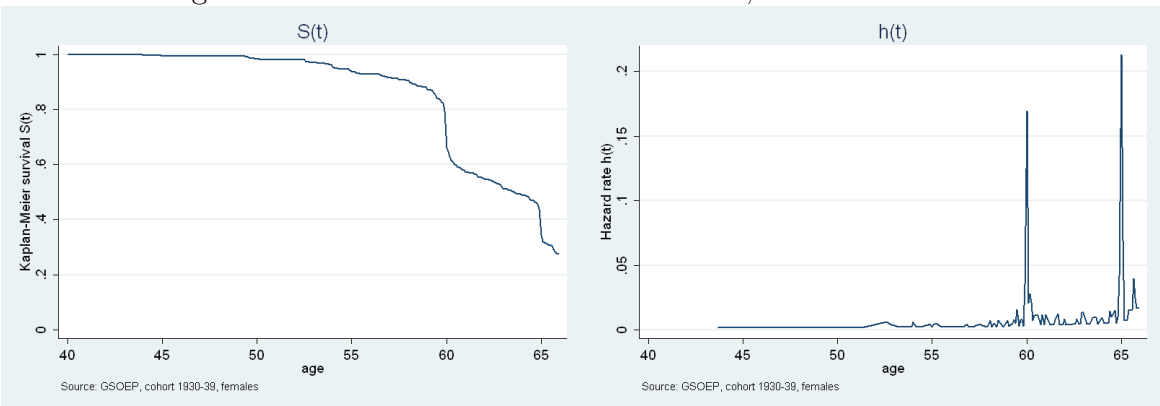


Figure 7.2: Survival curve and hazard rate, women West DE



before entering old age pension is three times as frequent for women compared to men with 16 percent.

The hazard of entering old age pension, Germany

Figures 7.1 and 7.2 show the dependent variable, the hazard rate $h(t) = f(t)/S(t)$, and the survival curve $S(t)$ of entering old age pension. The survival curve $S(t)$ is depicted as the Kaplan Meier survival function on the right side of figures 7.1 and 7.2. The left graph presents an unsmoothed version of the hazard rate.

The hazard of entering old age pension for men is dominated by three peaks at age 60, 63, and 65. These peaks reflect the early entrance option for the unemployed at age 60, the early entrance option at age 63 for the long time insured (35 years), and the state pension age of 65. A clustering of firm level early retirement arrangements around age 60 and 63 assumably contributes to the first two peaks. Even though

the hazard of entering old age pension is highest at the state pension age of 65, the proportion of men who 'survive' by not entering old age pension until age 65 is very low as can be seen from the survival curve $S(t)$. The steep hazard at age 65 simply indicates that the hazard of entering old age pension is very high for men who have not entered old age pension yet at this point.

For women (figure 7.2) the hazard of entering old age pension is dominated by only two peaks at age 60 and 65, indicating a polarization of early and late female pension entrance timing in Germany that became visible in the *part-time pathway* and the *no own income pathway* in the sequence analysis. These peaks are related to the early entrance option following unemployment and the *woman's pension* at age 60, and the state pension age of 65. Women who experienced unemployment in their fifties and women who worked for 15 years in total of which ten were after age 40 can enter at age 60. Entrance at age 63 based on long contribution periods is evidently irrelevant for women of the study cohort.

Entrance to old age pension at state pension age of 65 is more prevalent among women than men. From the sequence analysis we know that this refers to women who had long gaps of no own income before entering state pension at age 65. The German pension system generates clear temporal patterns of pension entrance, clustering at only few age markers: 60, 63, and 65. Pension regulations are tailored at typical male and female life courses with the *woman's pension* or the early entrance option for the long time insured that is relevant for men. They produce a bimodal hazard of pension entrance for women and a multi modal hazard with three peaks for men.

Sample United Kingdom

The construction of the dependent variable is more complicated for the United Kingdom, because we distinguish between two competing risks: relying exclusively on state pensions or entering state pensions combined with occupational and/or private pensions. Outcome 1 is given by entrance to state pensions only. That is, National Insurance retirement including Basic State Pensions and SERPS, the state earnings

related pension scheme.[4] Outcome 2 includes state pensions combined with occupational or private pensions that were *independently* accumulated through employment or savings.

An additional possibility is to receive state pensions combined with a derived pension from a spouses former employer. This is classified as outcome 1. Derived benefits from a spouses former employer are practically only applicable for women. Because derived benefits are unrelated to a woman's own employment history and fully dependent on her relationship status (Ginn 2003), we consider them more similar to receiving state pensions alone compared to independently accumulated occupational or private pensions. It is possible to experience entrance to state pension and entrance to occupational or private pensions successively. We only take into account the transition to independent occupational or private pensions in this case, giving precedence to the importance of access to pension types in the United Kingdom. Analogous to the sequence analysis, the event history models for the United Kingdom are based on the original BHPS sample including information on England, Wales, and Scotland in annual panel waves since 1991 (Taylor et al. 2007).

Table 7.3 provides an overview of case numbers for the British samples. In total

Table 7.3: Sample cohort 1930-1939, UK

	men	women
ever in original BHPS sample	739	769
bio info available	420	482
left censored	62	73
at risk	358	409
right censored	34	20
state pensions	68	239
occupational/private pensions	256	150
total failures	324	389

1508 persons born 1930-1939 ever participated in the original BHPS sample, 739 men and 769 women. Of the 739 men born 1930-1939 who participated in the original BHPS sample, biography information on both the marital and employment history

[4]Unfortunately it is not possible to distinguish between BSP and SERPS benefits in the BHPS data.

is available for 420 cases.[5] In the male sample 62 cases are left censored, leaving 358 persons at risk of entering old age pension, of which 34 are right censored. 0nly 68 men enter state pensions only. 256 men enter state pensions combined with independent occupational or private pensions.

Retrospective biography information is available for 482 out of 769 women, of which 73 cases are left censored. We remain with 409 women who are at risk of experiencing pension entrance within the observation period, of which 20 are right censored. In total 389 females experience entrance to old age pension. 239 enter state pensions only and 150 women enter state pensions combined with independent occupational or private pensions. This reflects the unequal coverage of men and women with occupational and private pensions in the United Kingdom.

Table 7.4 presents the income source at the last observation for the right censored cases, and the last primary income source before entering state pensions and occupational or private pensions separately. Equal to Germany, employment beyond age 66 is negligible as the primary income source for right censored cases in the British samples (upper part of table 7.4).

For women entering state pensions is most frequently preceded by no own income with 43 percent. 21 percent enter state pensions from part-time employment, another 21 percent rely on other transfer income including income support, on which persons rely in case of unemployment. For men entering state pensions is also frequently preceded by no own income with 37 percent, followed by 32 percent in disability related transfers, and 21 percent in other state transfers including income support.[6]

These numbers indicate that entrance to state pensions only, is primarily a shift from one benefit category to another and thus largely determined by institutional regulations that generate 'welfare classes' (Leisering 2003) demarcated by age markers,

[5]The state 'single' is not recorded in the marital biography file, but in the prospective panel waves there is information on whether respondents were ever married. We therefore assigned the persons never married the status 'single' over the entire marital biography and retained them in the file, even though marital biography information is not available for them in the biography file. Also the time from age 15 until the first marriage was filled with the state single for all persons.

[6]Possibly we are overestimating the occurrence of no own income. Lacking a separate category for receiving no own income we classified all persons who participated in the BHPS at a certain time point, but did not report receiving income from any of the available categories as receiving no own income (see appendix chapter 6).

Table 7.4: Income source before and at last observation, UK

	men		**women**	
income source at last observation	%	N	%	N
drop out before age 66	6.15	22	2.20	9
full-time employment	1.40	5	0.49	2
part-time employment	0.84	3	0.73	3
disability related	0.28	1	-	-
other, inc. income support	0.56	2	0.73	3
no own income	0.28	1	0.73	3
state pensions	18.99	68	58.44	239
occupational/private pensions	71.51	256	36.67	150
total	100.00	358	100.00	409
income source before state pensions	%	N	%	N
full-time employment	7.35	5	6.28	15
self-employment	1.47	1	0.42	1
part-time employment	1.47	1	21.34	51
disability related	32.35	22	8.37	20
other, incl. income support	20.59	14	20.50	49
no own income	36.76	25	43.10	103
total	100.00	68	100.00	239
income source before occ./priv. pensions	%	N	%	N
full-time employment	43.75	112	18.00	27
self-employment	1.56	4	1.33	2
part-time employment	3.91	10	10.00	15
NI retirement	3.91	10	13.33	20
NI retirement & spouses emp.	-	-	4.67	7
disability related	18.36	47	7.33	11
other, incl. income support	3.13	8	6.67	10
no own income	25.39	65	38.67	58
total	100.00	256	100.00	150

such as state pension age.

The situation is quite different for entrance to state pensions combined with occupational or private pensions. As noted above we only take into account the transition to occupational or private pensions if persons experience them successively. For men full-time employment is the most frequent preceding income source before entering occupational or private pensions with 44 percent. Among women 18 percent enter occupational or private pensions directly from full-time employment, another 13 percent enter from part-time employment. 13 percent of women enter occupational or private pensions after entering state pensions. Nevertheless, no own income remains the most common preceding income source also before entering occupational or private pensions for women.

The differences in the preceding income source before entering state pensions and occupational or private pensions is informative on the degree of choice people face for pension entrance timing. Entrance to state pensions is largely a shift from one benefit category to another. Entrance to occupational or private pensions is predominantly preceded by full-time or part-time employment, which will arguably provide greater choice on the timing of entering occupational or private pensions. Access to occupational and private pension entitlements accumulated over the life course then determine the degree of choice individuals face in the timing of pension entrance.

The hazard of entering old age pension, United Kingdom

Figure 7.3 and 7.4 shows the survival curve $S(t)$ and the hazard rate $h(t)$ of entering state pensions only (outcome 1) and occupational or private pensions (outcome 2) for men and women in the United Kingdom. The flatter survival curve of entering occupational or private pensions indicates higher temporal flexibility of pension entrance for men, who have access to independent supplementary pensions, as expected from the high prevalence of full-time employment preceding entrance to occupational or private pensions. All men who enter state pensions only enter at the state pension age of 65.

For women in the United Kingdom the hazard of entering state pensions strongly

Figure 7.3: Survival curve and hazard rate, men UK

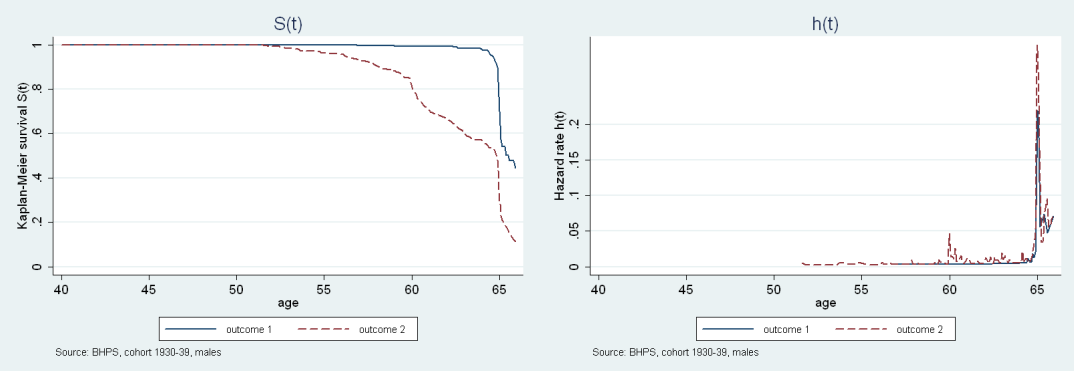
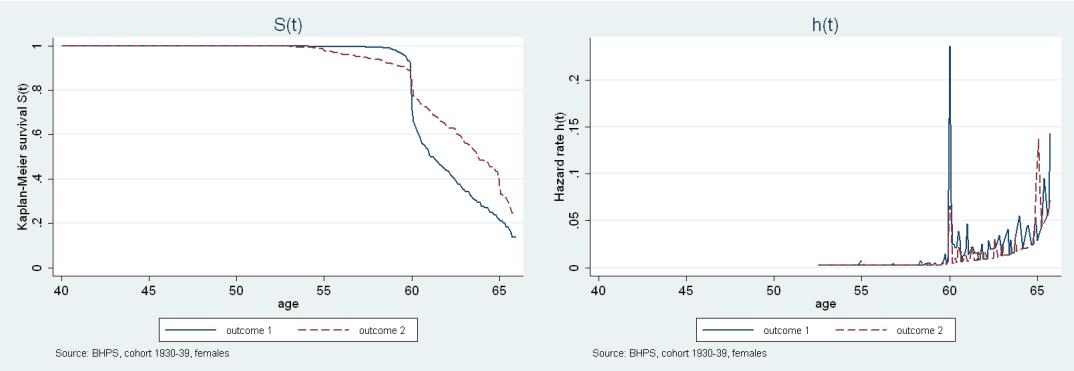


Figure 7.4: Survival curve and hazard rate, women UK



peaks at age 60, the state pension age for women. However, the flatter tail of the survival curve for entering state pensions indicates that a substantial proportion of women enter state pensions as their primary income source after official state pension age. The female part-time employment pathway to old age pension found in chapter 6 suggests that the flatter tail of the survival curve for entering state pensions only reflects women who prolong part-time employment beyond state pension age.

For women we also find a flatter survival curve of entering occupational and private pensions compared to state pensions, pointing towards a higher temporal flexibility of pension entrance for women who have access to independent supplementary pensions. We find a clear shape around age 60 for both risks, which is steeper for state pensions and flatter for occupational or private pensions. While women enter occupational or private pension mostly after the state pension age of 60, men generally enter occupational or private pensions before state pension age of 65. As visualized with the sequence index plots in chapter 6, occupational pensions are an important early

retirement route for men, while women tend to enter only after official state pension age.

The greater temporal flexibility of entrance to outcome 2 for men and women points to an important additional dimension of stratification in the British pension system. A general focus on the better financial position of persons who have access to occupational and private pensions (Department for Work and Pensions 2004, 2007) overlooks flexibility in pension entrance timing as an additional asset in the retirement transition process available to those who accumulated independent supplementary pensions over the life course.

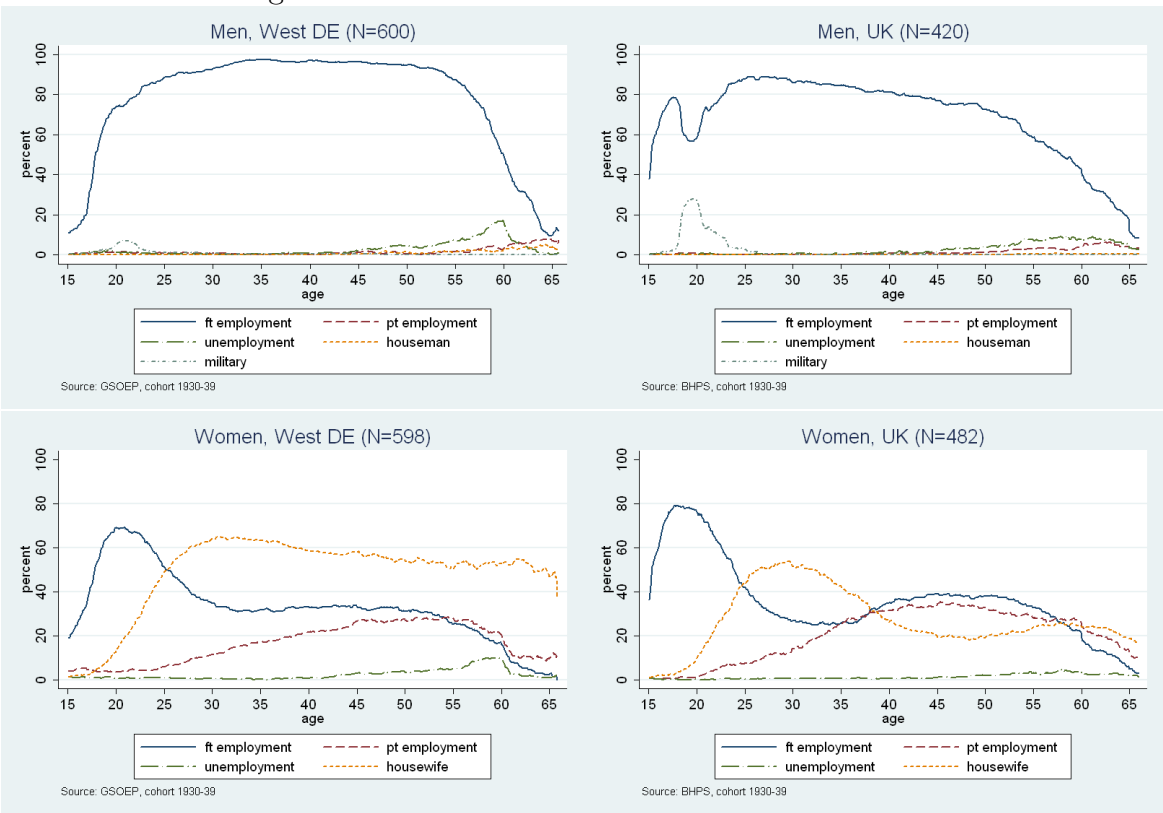
7.1.2 Employment, marital status, and fertility over the life course

In this section we examine the central independent variables reconstructed from the retrospective biography information: employment status, marital status, and fertility over the life course. Subsequently, we estimate the probability of women to be employed several years after child birth and the probability of men and women to be employed one year after divorce in the comparison countries. For this part of the analysis we include all cases with valid biography information, also the left censored cases excluded in the construction of the dependent variables.

Employment history

Figure 7.5 shows the labor force status of men and women in the study cohort between age 15 until age 66. Men are displayed in the two top graphs of figure 7.5, women in the two bottom graphs. In Germany the working lives of men born between 1930 and 1939 are coined by universal full-time employment until about age 60. Unemployment gradually increases starting from age 55 and peaks at age 59 with roughly 20 percent of men in unemployment. Part-time employment equally increases before age 65, likely reflecting partial and gradual retirement regulations. These findings demonstrate the importance of transitory unemployment and partial or pre-retirement regulations for men of the study cohort in Germany.

Figure 7.5: Labor force status over the life course



In the United Kingdom the working lives of men of the study cohort are also dominated by full-time employment. In contrast to Germany, for this cohort military service plays a major role around age 20 in the United Kingdom. Roughly 30 percent of men were in military service around their twenties in the 1950s in the post World War II period. Both unemployment and part-time work increase for men in the British sample beginning from age 50 accompanied by a simultaneous decline of full-time employment. In contrast to Germany, where we find a clear unemployment hump around age 60, unemployment among men in the United Kingdom increases gradually beyond age 50. This likely reflects the vulnerability of older workers related to structural changes during the 1990s (Blossfeld et al. 2006, Golsch et al. 2006), rather than an institutionalized unemployment pathway as the *'59er' regulation* in Germany.[7]

[7]This increase in unemployment is not as strongly reflected in the income source trajectories of men in the United Kingdom, because they often rely on income support or other transfers not explicitly related to unemployment, since unemployment benefits are marginal in the United Kingdom.

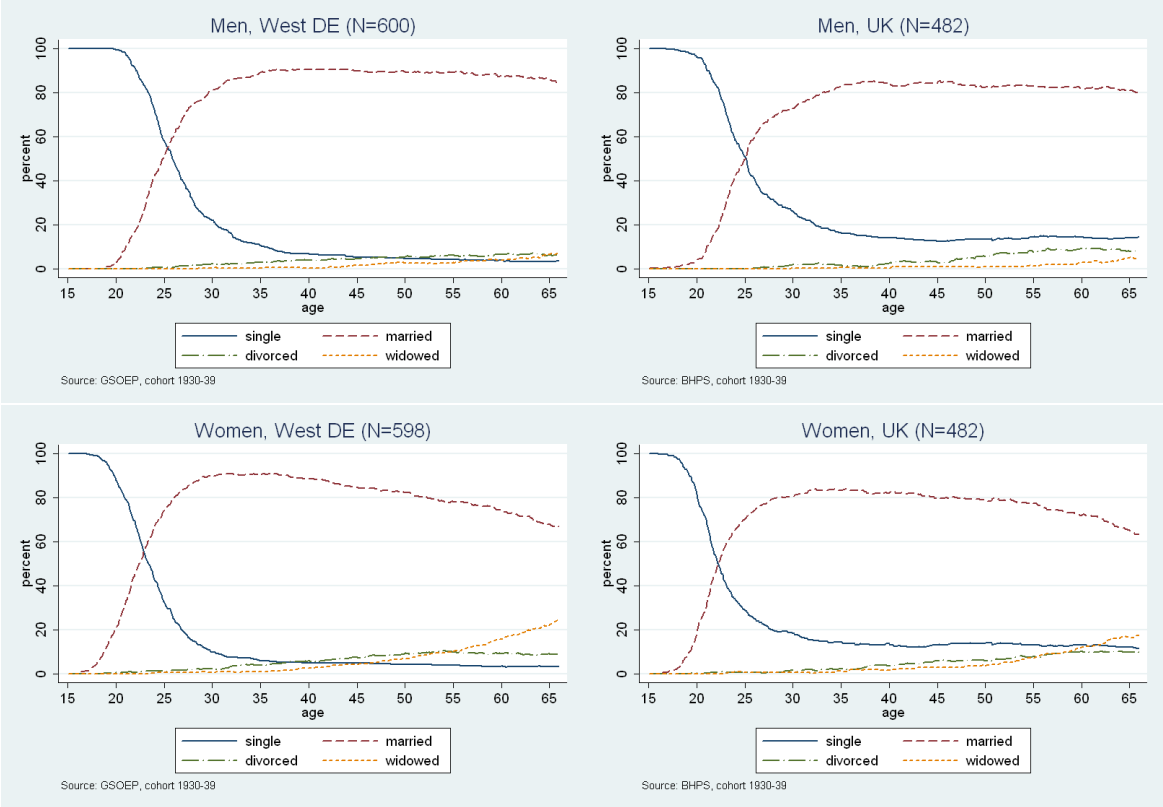
For women in Germany and the United Kingdom the prevalence of full-time employment is highest around age 20. The proportion full-time employed steeply decreases between age 20 and 30, with the onset of fertility (figure 7.7). In both countries full-time homemaking for women peaks in their late twenties and early thirties. While full-time homemaking remains on a high level for women in Germany, it decreases around age 40 accompanied by a higher increase of part-time and full-time work for British women. In line with previous research, we find that part-time employment plays an important role for women in Germany (Stegmann and Mika 2007), and even more so in the United Kingdom (Ginn 2003, Blossfeld and Hakim 1997). The increase of female part-time work in midlife reflects a general increased of female part-time work in the comparison countries beginning with the economic upswing following World War II in the late 1950s (Blossfeld and Rohwer 1997, Burchell et al. 1997), when the study cohort was in their early twenties.

For women in both countries unemployment is practically non existent until midlife. From age 55 onwards, the proportion of women unemployed is higher in Germany, attributable to the *'59er' regulation*. Despite this difference, the proportion of women in various labor force positions is similar in Germany and the United Kingdom. In both countries part-time employment and full-time homemaking increase with a decrease in full-time employment as child bearing sets in.

Marital history

Marital status over the life course remains stable for a large majority of women and men in both countries (figure 7.6). In Germany 90 percent of men and women were married by age 30. In the United Kingdom the proportion ever married is lower at slightly above 80 percent for men and women. The proportion divorced steadily increases from age 35 onwards for men and women in both countries, but remains below 20 percent by age 66. Widowhood affects around 10 percent of women in Germany and the United Kingdom by age 50, and nearly 20 percent from age 60 onwards. Widowhood increases only for women at this age, assumably due to women's higher life

Figure 7.6: Marital status over the life course



expectancy, and because they usually are a few years younger than their husbands.[8]

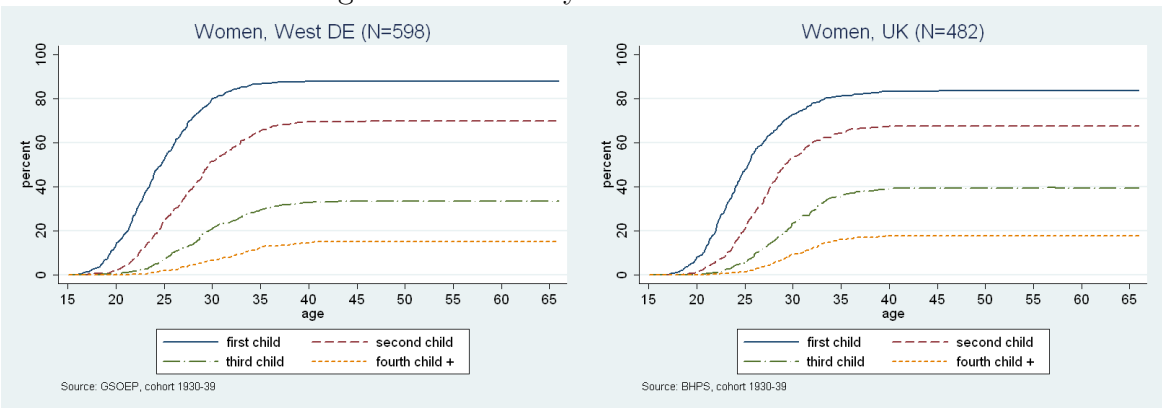
Fertility

Figure 7.7 shows the prevalence of 1 to 4+ children for women in the study cohort. In Germany 87 percent of women give birth to their first child by age 35. For 70 percent a second child follows eventually, while only 35 percent have a third child and below 20 percent have 4 or more children. This distribution reflects the dominant model of the two child family during the post World War II economic boom in the 1950s and 1960s in West Germany (Niehuss 2001, Stegmann and Mika 2007). About 13 percent of women remain childless in Germany.

In the United Kingdom the prevalence of childlessness is slightly higher with 16 percent and the two child family is less dominant. Instead the prevalence of three or more children is higher compared to Germany. 60 percent have a second child,

[8]Cohort specific official statistics on marriage rates were unavailable for Germany and the United Kingdom.

Figure 7.7: Fertility over the life course



almost 40 percent a third child, and slightly below 20 percent give birth to four or more children.

The average number of children is 2.15 for women in the German sample and 2.18 for women in the British sample. These averages reflect the cumulative cohort fertility for the study cohort, the average number of children women of the study cohort had over their life course. According to register data from the Federal Statistical Office Germany, the cumulative cohort fertility for women born between the mid 1930s to 1940 in West Germany was between 2.0 and 2.1 (Statistisches Bundesamt 2007: 18), supporting that the GSOEP data represent the actual cumulative cohort fertility for the study cohort quite well.

In the United Kingdom official estimates of the cumulative cohort fertility for the study cohort are slightly higher than the average of 2.18 we find in the BHPS data. Official estimates arrive at an average of 2.25 children for the women born 1930 and 2.2 for women born 1940, but a higher average of 2.4 for the cohorts born in the mid 1930s in the United Kingdom (Chamberlain and Smallwood 2005: 23). Therefore, it must be kept in mind that the cumulative cohort fertility may be slightly higher than represented in the study sample for the United Kingdom. According to data from the Office for National Statistics, childlessness was 13 percent for women born 1930, 12 percent for women born 1935, and 11 percent for women born 1940 (Chamberlain and Baljit 2005: 80). This suggests that childlessness is slightly over represented for

our study cohort with 16 percent in the BHPS.[9]

The impact of motherhood on subsequent employment

To gain a better understanding of employment consequences of fertility for women we examine their probability to be employed several years after child birth. If employment patterns are similarly affected by child birth in the male breadwinner societies in Germany and the United Kingdom, we can attribute differential pension entrance timing following fertility to direct effects of pension regulations on care credits and possibilities to accumulate pension benefits in typical female carer's employment profiles.

Table 7.5 shows the results of a series of logistic regression models on the probability to be employed part-time or full-time 1-14 years after giving birth to a child. The analyses are based on the person month data including all women for whom information is available in the retrospective biography files on the employment and fertility history, i.e. before excluding left censored cases on the timing of pension entrance. The dependent variables are lagged variables of being employed 1-14 years later. They are displayed in rows rather than columns, contrary to the usual regression display, to avoid a large number of columns that would be inconvenient to illustrate.

Two independent variables are included: birth of a new child and education in years. 'Child born' takes the value 1 for 12 months in the year in which a new child was born, and 0 otherwise. Each new child birth is treated the same, regardless whether it was the first or last child. The effects are presented as marginal effects reflecting the change in the probability to be employed, if the dummy variable child born changes from 0 to 1, and the probability change for an additional year of education. Standard errors are held constant across person ids in order to account for intra person variability. Full tables including case numbers and Pseudo R2 are displayed

[9]This may be due to an under representation of non-employed females in the first waves of the BHPS compared to information in the General Household Survey for the United Kingdom (Lynn 2006: 132). By wave four of the original BHPS the proportion of non employed females was very similar to the General Household Survey and British census data (Lynn 2006: 133). Further, the estimates by Chamberlain and Smallwood include migrants which are underrepresented in the BHPS (Lynn 2006). Since migrants tend to have higher fertility rates this may contribute to the difference.

Table 7.5: Probability to be employed after child birth, women West DE and UK

West DE[a]					**UK**				
	full-time		part-time			full-time		part-time	
	child born	education	child born	education		child born	education	child born	education
years					years				
1	-.081***	.016**	-.089***	-.003	1	-.298**	.006	-.131***	-.008
2	-.101***	.018**	-.082***	-.003	2	-.279***	.011	-.114***	-.008
3	-.115***	.020***	-.067***	-.002	3	-.264***	.014+	-.101***	-.008
4	-.105***	.022***	-.055***	-.002	4	-.264***	.017*	-.076***	-.008
5	-.099***	.023***	-.043***	-.002	5	-.217***	.019*	-.043**	-.008
6	-.086***	.024***	-.033***	-.002	6	-.177***	.021*	-.013	-.008
7	-.074***	.025***	-.024***	-.002	7	-.154***	.021*	.007	-.008
8	-.071***	.026***	-.013	-.001	8	-.128***	.021*	.039*	-.008
9	-.053***	.026***	-.003	-.001	9	-.104***	.020*	.060**	-.009
10	-.034*	.026***	.014	-.001	10	-.074***	.019*	.065***	-.009
11	-.017	.026***	.016	-.001	11	-.045**	.018+	.074***	-.009
12	-.000	.026***	.025**	-.001	12	-.029	.018+	.085***	-.009
13	.008	.025***	.032***	-.000	13	-.009	.017+	.093***	-.009
14	.021	.025***	.038***	-.001	14	.012	.017+	.102***	-.009

[a]Note: marginal effects, robust standard errors, + $p < .10$, *$p < .05$, **$p < .01$ ***$p < .001$

in tables 7.16 and 7.17 in the data appendix to this chapter.

For German women the probability to be full-time employed is significantly lower until 10 years after child birth, when children usually enter secondary schooling (table 7.5). In the United Kingdom we find a significant negative probability to be full-time employed after child birth until 11 years after child birth, one year longer compared to Germany. In both countries the probability to be part-time employed is negative in the first years after child birth but eventually turns positive, indicating the return to part-time work after child birth as a prevalent pattern for women in both countries.

A marked cross-country difference exists in the timing of return to part-time work. In Germany the probability to be part-time employed remains negative until 8 years after child birth and turns positive only 12 years after child birth. In the United Kingdom the shift to a positive probability of being part-time employed happens notably earlier. It is only negative until 6 years after child birth and turns positive 8 years after child birth. This is in line with the graphical illustration of labor force status over women's life courses displayed in figure 7.5 that showed a higher prevalence of part-time employment in midlife for women in the United Kingdom.

High education increases the probability to be full-time employed after child birth in both countries, albeit the effect is more pronounced in Germany. This could be related to the higher importance of educational credentials in the certification based labor market in Germany. High education shows a consistent negative but insignificant effect on the probability to be part-time employed after child birth in both countries.

In sum, the probability of female re-employment after child birth is similar in Germany and the United Kingdom. This supports the validity of our comparative approach that relies on the assumption that women's working lives were subject to similar dynamics in the male breadwinner societies they evolved in. This assumption is crucial in order to justifiably attribute differences in the subsequent models on the impact of childcare interruptions on pension entrance to differences in the national pension systems that differentially reward similar work life patterns in the comparison countries. For both countries the findings above forcefully illustrate the career

Table 7.6: Probability to be employed after divorce, West DE and UK

	West DE		UK	
Women	ft employed	pt employed	ft employed	pt employed
divorced in t-1	.196+	.002	.211**	-.033
education (years)	.010***	.000	.018***	-.001
age (months)	-.001***	-.000**	-.000***	-.000***
ft employment t-1	.871***	-.019***	.872***	-.063***
pt employment t-1	-.046***	.859***	-.018	.869***
person months	357004	357004	286310	286310
cases	596	596	478	478
Chi2	8956.145	6687.208	10857.282	5947.339
$Prob > Chi2$	.000	.000	.000	.000
Pseudo R2	.71	.68	.70	.71
Men	ft employed	pt employed	ft employed	pt employed
divorced in t-1	.061+	-.002	-.117+	-.001
education (years)	.004***	.000	.002	.000
age (months)	-.001***	.000*	-.001***	.000***
ft employment t-1	.925***	-.005***	.889***	-.002*
pt employment t-1	.026	.511***	-.005	.716***
Chi2	6058.863	1544.706	4731.930	1362.263
person months	357004	357004	249759	249759
cases	596	596	417	417
Chi2	8956.145	6687.208	10857.282	5947.339
$Prob > Chi2$	.000	.000	.000	.000
Pseudo R2	.71	.44	.69	.68

Marginal effects, robust standard errors, + $p < .10$, *$p < .05$, **$p < .01$ ***$p < .001$

penalties women of the study cohort faced in male bread winner societies in which external childcare was reserved to a minority of high income couples.

The pension consequences of female part-time employment in the comparison countries are of particular interest. While in the United Kingdom part-time employment after child birth was more prevalent and set in sooner, possibilities to accumulate pension entitlements through part-time employment were on average better in Germany (see also chapter 2).

The impact of divorce on subsequent employment

We subsequently examine the impact of divorce on the probability to be full-time or part-time employed one year later (table 7.6). Divorced $t-1$, full-time employment

$t-1$ and part-time employed $t-1$ are lagged variables on being divorced and employed one year earlier. We ran logistic regression analyses on the person month data set implementing robust standard errors by person id. The results are expressed as marginal effects. The results for women are displayed in the upper part of table 7.6, the result for men in the lower part.

For women we find a positive impact on full-time employment one year after divorce with a marginal effect around .20 for both countries. It is only significant on the 10 percent level in Germany. We find no effect of divorce on being part-time employed one year later. This supports that divorce altered female employment histories in a similar way in the comparison countries, by increasing the probability of full-time employment but not part-time employment. Remaining cross-country differences are different options to accumulate pension entitlements through employment. This primarily refers to better possibilities to accumulate pension entitlements through part-time employment in Germany, and the higher importance of occupational and private pensions with restricted access in the United Kingdom.

For men we find a country specific impact of divorce on subsequent employment. Divorce increases the probability to be full-time employed in Germany, but decreases the probability to be full-time employed one year later in the United Kingdom. This is in line with the assumption that divorce after pension sharing induces a desire to compensate for lost pension entitlements through prolonged employment in Germany, due loss aversion. This would suggest that pension sharing delays men's pension entrance timing in Germany, due to a prolongation of employment, rather than inhibiting options to enter earlier through downgraded entitlements, if we find the hypothesized negative effect of divorce on pension entrance timing for men in Germany.

7.2 Modeling pension entrance

Before presenting the models on pension entrance timing, we briefly outline our modeling strategy.

Modeling strategy

All models are specified as discrete time logistic regression models (Allison 1982). For Germany we specify simple discrete time logistic models. For the competing risks in the United Kingdom we chose a discrete time multinomial regression model. In the following we outline the reasons for choosing the discrete time specification over other alternatives.

Most event history models assume that survival time is continuous (see e.g. Blossfeld et al. 2007). There are two basic reasons, why the stochastic process under study does not occur in continuous time. First, although the underlying process may occur in continuous time, the data are not provided in that form. Survival times may be grouped or banded into discrete intervals of time, e.g. months or years. This is also referred to as interval censoring. Second, the underlying transition process may be *intrinsically discrete*, e.g. graduation only happens once each year.

In our case the data is provided in discrete format on a monthly basis. We cannot identify the exact day at which persons entered old age pension. Further, pension entrance assumably will cluster at the end of pay periods, as months or weeks, and thus can be assumed intrinsically discrete. Therefore, a discrete time conceptualization is substantially convincing for the analysis of pension entrance and fits the format of the BHPS and GSOEP data. Since the discrete time intervals are fairly small, they closely resemble a continuous time specification.

We chose a discrete time logistic specification over continuous parametric event history models and the semi parametric Cox model for several reasons. Common parametric models as the Weibull and log-normal/log-logistic models returned a poor fit when tested in the generalized gamma model. This is of little surprise considering the multi modal shapes of the hazard rates presented in figures 7.1, 7.2, 7.3, and 7.4, which are not well captured by standard parameterizations. Parametric models generally come with a number of caveats in social science applications. Theory is rarely sufficiently precise to allow an exact specification of the functional form of the hazard[10] and parametric models will estimate the hazard as if it had the assumed

[10]One reason for this is that most social theory does not deal with the relationship between duration dependence and the event, but with the impact of covariates on the event (Box-Steffensmeier

form even if this is not the case (Box-Steffensmeier and Jones 2004). Therefore, the non parametric Cox model is proposed as more appropriate for many social science applications.

The Cox model (Cox 1972) is often referred to as a semi-parametric model, since the hazard is parameterized in terms of a set of covariates, but the particular distributional form of the hazard is not parameterized. The crucial assumption of the Cox model is that the hazards for different values of an explanatory variable are proportional, meaning they have the same shape and are only separated by a fixed proportion. In order to obtain parameter estimates, the Cox model is based on the non parametric method of partial likelihood estimation, instead of the maximum likelihood method used in parametric models. The partial likelihood method rests on the assumption that the intervals between successive failure times contribute no information about the relationship between covariates and the hazard rate (Box-Steffensmeier and Jones 2004). This is necessarily the case, because the baseline hazard is not parameterized. The hazard is assumed to have an arbitrary form and could be zero in the intervals with no failures. Therefore, ordered failure times, rather than the interval between failure times, contribute information to the partial likelihood.

For our application a Cox model proved unsatisfactory for several reasons. First, the proportional hazard assumption was violated on a number of central independent variables. Second, due to the high occurrence of tied failure times at age 60, 63 and 65, the precision of the partial likelihood estimates in the Cox model was suboptimal. Partial likelihood estimation generally has a hard time with heavily tie laden data, because it estimates the hazard based on ordered observed failures (Box-Steffensmeier and Jones 2004). At time points at which multiple failures occur simultaneously, partial likelihood estimation cannot determine how many cases are still at risk and thus the estimates become less precise. There are several methods to deal with tied failures in the Cox model that mitigate this problem.[11] Nevertheless, a clustering of failure times around certain age markers as strong as in pension entrance remains

and Jones 2004).

[11] The most common are the so called Breslow method, Efron method, averaged likelihood method and exact discrete method. The latter two are more precise but quickly become very computationally intensive.

problematic.

The reason why neither parametric specifications, nor the Cox model are readily applicable to pension entrance timing can be seen in the high clustering of failure times around specific age markers. Standard parametric specifications do not provide good representations of multi modal hazards and the partial likelihood estimates loose precision in heavily tie laden data. Tied failure times are prevalent in data on retirement timing, because retirement tends to cluster around specific age markers, regardless whether conceptualized as labor force exit or pension entrance. Therefore, a discrete time logistic models seems the best alternative.[12]

Discrete time logistic regression

Discrete time models assume that time is discrete and not continuous. The data has to be set up in person month format in which information for each person is cut off after the first event occurrence. In single risk discrete time logistic models coefficients indicate a change in the timing of event occurrence. A positive coefficient indicates earlier entrance, a negative coefficient later entrance. The discrete time method can estimate several outcomes as competing risks simultaneously in a multinomial logit model (Allison 1982). This generally implies that individuals can only experience one of the competing risks.[13] In discrete time competing risk models the interpretation of the coefficients is less straightforward (Jenkins 2005: 110). In competing risk models, the coefficients not only contain information on the timing of the competing events, but also on the conditional or unconditional probability of entering a particular outcome.

Translated to our application this means that a positive coefficient on occupational or private pensions in the British sample indicates both that entrance to these pension types occurs earlier and that the probability of entering occupational or private pensions and not state pensions only is higher. Matters are even more complicated, because an increase in a variable with a positive coefficient for one outcome does not

[12]The substantive results were very similar in the parametric models and the Cox models, supporting the robustness of our findings (results available from author).

[13]It is in principle possible to allow for repeated events in the discrete time framework. This however, comes at a great increase of complexity.

necessarily indicate an increase in the probability of that outcome, as the probability of another outcome may increase by even more (Jenkins 2005: 111).

With regard to our application, this interpretation of the coefficients in the competing risk model as probabilities to experience one outcome over another has some desirable implications. The institutional analysis in chapter 2 suggested differential access to pension types as the major dimension of stratification in the British pension system, as opposed to variation in the timing of pension entrance in Germany. The graphical presentation of the hazard rates for the United Kingdom (figures 7.3 and 7.4) showed that the timing of entrance to both outcomes is clustered around age 60 for women and age 65 for men. The main difference between the hazard of entering state pensions only and occupational or private pensions was a flatter hazard for occupational or private pensions, indicating greater temporal flexibility of entering this outcome. The fact that the hazard clusters around equal gender specific age markers for both pension types suggests that coefficients primarily indicate probabilities to enter either state pensions only or occupational or private pensions, rather than containing information on the timing of entrance. We can therefore assume that we primarily capture the access to different pension types with the multinomial competing risk model for the United Kingdom.

While this is desirable in terms of country specificity for the British analysis in our case oriented design, the specification of a single risk model in Germany and a competing risk model in the United Kingdom creates ambiguity in the cross national comparability of results. After estimating country specific models for the country specific outcomes separately by gender, we therefore calculate integrated models in which we merge the country samples and specify single risk models on the timing of pension entrance regardless of pension type for both countries.

A problem in discrete time models is that they assume independence of time point specific observations per person (Allison 1982). To mitigate this problem we implement robust standard errors by person id that hold standard errors per person constant across person months. With up to 611 rows per person in the person month set up of the data this is crucial to account for within person interdependence of

observations. Observations in the person month data file are taken into account until they enter old age pension or are right censored. For all persons only the first month of receiving old age pension remains in the data set. Right censored cases are cut off after their last valid income information.

7.2.1 Divorce and pension entrance of men

The models on the impact of divorce on pension entrance timing proceed in several steps. We begin with the models for men.

Independent variables

In the *first step* time enters the model as linear age and in form of three dummy variables to account for typical pension entrance peaks at age 60, 63, and 65 in Germany. For the United Kingdom we can only include age 65 as a dummy for a typical pension entrance peak, because entrance to state pensions only occurs only after age 65 (see figure 7.3). The coefficients for age 60 and 63 cannot be specified, because entrance to state pensions does not occur for men at these age markers. In the *second step* we control for initial human capital accumulation through formal education in years. In the *third step* we include the predictors on union dissolution we are theoretically interested in. We distinguish between a divorce before and after the introduction of default pension sharing in 1976 in Germany and optional pension sharing in 1973 in the United Kingdom. Never having been divorced is the reference category. Never having been married and widowhood enter the models as additional indicators of the marital history, to separate the impact of divorce from other forms of 'non-marriage'. In the *fourth step* we control for total labor force participation with three time varying indicators that sum up accumulated full-time and part-time employment and the total duration of unemployment experienced so far at each time point. To account for financial incentives for pension entrance we include the difference between pre- and post pension income. In the *fifths step* we control for known predictors of retirement timing: subjective health and whether a partner is in old age pension at the time of pension entrance. For Germany we include whether a partner is in old age pen-

sion, for the United Kingdom whether a partner is still working for data availability reasons.

Characteristics of the last job, e.g. occupation and sector are not included, because this would lead to a systematic exclusion of persons with long gaps between the last job and entering old age pension. The information on characteristics of the last job is not retrospectively reported in the GSOEP and the BHPS and would have to be reconstructed from the annual panel waves. As a consequence it would be missing for persons who had long gaps between employment and pension entrance.[14] This primarily affects women but also men. In Germany gaps before pension entrance mainly occur for men who enter old age pension after unemployment. In the United Kingdom men who enter old age pension after receiving disability related transfers would likely be excluded (see prevalent pathways in chapter 6).

As the previous employment history enters our models as control variables, not predictors we are theoretically interested, we assume that initial education, the total amount of unemployment, full-time, and part-time employment, and the difference between pre- and post pension income provide sufficient proxy variables to capture relevant aspects of the employment history. Following the objective of parsimony in model specification (Ockham's razor), the cost of including information on the last job seems too high due to the selective availability of this information.

An overview of the distribution of all independent variables is given in the data appendix to this chapter in tables 7.18 and 7.19. We hold case numbers constant across all model steps to ensure that effect changes are not related to differential sample composition.

Men, Germany

Table 7.7 shows the results of the discrete time logistic model for men in Germany. Of 523 men who have observations on all independent variables 362 enter old age pension. The risk of entering old age pension increases with age, and at the pension entrance peaks of age 60, 63 and 65. High education delays entrance to old age

[14]The data sets include generated variables with time independent information on the last job, but missing values for the study sample were above 80 percent, making their inclusion impracticable.

Table 7.7: The timing of pension entrance, men West DE

timing of pension entrance[a]	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
age (months)	.025***	.026***	.026***	.025***	.025***
age60	1.396***	1.402***	1.404***	1.401***	1.431***
age63	.691***	.721***	.726***	.756***	.835***
age65	.592*	.570+	.562+	.632*	.657*
education (years)		-.096***	-.094***	-.068*	-.065*
divorced before/in 1976 (never div.)			.042	-.116	-.314
divorced after 1976			-.349	-.388+	-.311+
never married			.042	-.032	-.183
widowed			.085	-.007	-.000
total ft employment				.001	.001
total pt employment				.002	.003+
total unemployment				.011***	.011***
pre-post pension income				.000+	.000
subjective health					-.214***
partner in old age pension					-.146
cons	-23.026***	-22.196***	-22.214***	-22.374***	-21.138***
person months	276651	276651	276651	276651	276651
subjects at risk	523	523	523	523	523
failures	362	362	362	362	362
Chi2	850.3	805.9	813.1	845.4	844.4
$Prob > Chi2$	.000	.000	.000	.000	.000
aic	3800.5	3784.6	3790.1	3763.8	3684.2
Pseudo R2	.31	.32	.32	.33	.34

[a]Note: robust standard errors by person clusters, + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

pension.

The effects for a divorce before or after the introduction of pension sharing in 1976 point in the hypothesized direction, but are not consistently significant. Only in the last two steps of the model we find a negative effect for divorce after the introduction of pension sharing in 1976 at the 10 percent level. This is in line with *hypothesis 5b* that divorce after 1976 leads to later pension entrance of men. Taken together the results on the impact of divorce on subsequent employment (table 7.6) and divorce on pension entrance timing (table 7.7) suggest that the loss of pension entitlements through pension sharing induces the desire to make up for lost entitlements by prolonging employment, rather than making early entrance unavailable for men. We find no effect for other forms of non-marriage, i.e. never having been married and widowhood.

Total duration of full-time employment shows no significant effect, assumably related to the norm of lifetime employment shown in figure 7.5. The amount of full-time employment is not a major source of variation among men in the study cohort in Germany. The duration of unemployment on the other hand is. We find that the cumulative duration of unemployment over the life course leads to earlier pension entrance of men. Since unemployment primarily occurred after age 55 for this cohort, as visualized in the descriptive analysis in the previous section, this is related to the *'59er' regulation*. Good subjective health delays entrance to old age pension, while a partner in old age pension at the time of pension entrance has no impact. This is in line with findings that men's retirement timing tends to be less affected by their wives retirement than vice versa (Allmendinger 1990, Henretta et al. 1993).[15]

Men, United Kingdom

Table 7.8 and 7.9 show the results of the discrete time multinomial logistic model for the competing risks of entering state pensions only (outcome 1) or state pensions combined with occupational or private pensions (outcome 2). Not entering any form of old age pension until age 66 is the baseline category. Education increases the probability to enter occupational or private pensions.

[15] All correlations among independent variables are below .2, mostly below .1, thus multicollinearity should not distort the results.

Table 7.8: Pension entrance, men UK I

(1) State pensions[a]	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
age (months)	.054***	.054***	.056***	.055***	.055***
age65	3.240***	3.259***	3.326***	3.394***	3.403***
education (years)		.125	.151	.195	.196
divorced before 1973 (never div.)			.415	.443	.420
divorced in/after 1973			.296	.180	.207
never married			1.210**	.915+	.928+
widowed			-1.707	-2.015	-1.951
total ft employment				-.001	-.001
total pt employment				.003	.002
total unemployment				.004+	.004+
pre-post pension income				-.001	-.001
subjective health					.009
spouse working					.092
cons	-47.134***	-48.789***	-50.353***	-49.746***	-49.885***

[a]Note: robust standard errors by person clusters, + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 7.9: Pension entrance, men UK continued II

(2) Occupational/private pensions[a]	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
age age (months)	.023***	.024***	.024***	.023***	.024***
age65	2.684***	2.775***	2.769***	2.803***	2.819***
education (years)		.325***	.317***	.321***	.319***
divorced before 1973 (never div.)			-.133	-.139	-.215
divorced in/after 1973			-.087	.084	.150
never married			-.247	.009	.088
widowed			.282	.481	.566+
total ft employment				.002***	.002***
total pt employment				-.007	-.009
total unemployment				-.005	-.005
pre-post pension income				.000*	.000**
subjective health					.003
spouse working					.359*
cons	-21.902***	-25.616***	-25.479***	-26.170***	-26.481***
person months	182674	182674	182674	182674	182674
subjects at risk	335	335	335	335	335
state pensions	68	68	68	68	68
occupational/private pensions	241	241	241	241	241
Chi2	784.2	748.7	776.0	778.7	831.0
$Prob > Chi2$	.000	.000	.000	.000	.000
aic	3033.6	3000.4	3005.5	2982.3	2984.2
Pseudo R2	.38	.39	.39	.40	.40

[a]Note: robust standard errors by person clusters, + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

In line with *hypothesis 5d* neither divorce before, nor after the introduction of optional pension sharing in 1973 has a significant impact on pension entrance. In contrast to Germany, the direction of the coefficients for divorce are positive for entering state pensions only and inconsistent for entrance to occupational or private pensions. Since pension entitlements are not lost in pension sharing there is no need to delay pension entrance to make up for lost pension entitlements. Options to enter either state pensions or occupational and private pensions are accumulated over the life course and divorce does not change pension entitlements in the short term through pension sharing. Men who were never married have a higher probability to enter state pensions only. This possibly reflects the accumulation of risks of men with weak labor force attachment who have lower chances on the marriage market.

The total duration of unemployment increases the probability to enter state pensions only. During unemployment men naturally do not have the possibility to accumulate occupational pension entitlements and are unlikely to have the financial capacity to invest in a private pension plan. The total duration of full-time employment increases the probability to enter occupational or private pensions, as full-time employment is usually related to access to occupational pensions.

A high difference between pre- and post pension income, indicating that earnings before pension entrance were substantially higher than pension income, increases the probability to enter occupational or private pensions. Since we do not include assets and wealth as sources of post pension income, this assumably reflects the higher probability of men with high earnings in their last job to enter occupational or private pensions. The probability to enter occupational or private pensions is further increased by a working spouse, possibly indicating a higher prevalence of dual earner couples among persons who have access to these pension types. We find a positive coefficient of subjective health on state pensions only and a negative coefficient on occupational or private pensions, but they are not significant.[16]

We can conclude that divorce after the introduction of pension sharing has the

[16]Multicollinearity was highest among the age variables with .5 between age 60 and age 65. Otherwise correlations among independent variables were below .1, making it safe to assume that the estimates are not distorted by multicollinearity.

hypothesized negative impact on pension entrance timing of men in Germany, albeit the significance at the 10 percent level is not persuasive. Our results nevertheless support that pension sharing introduced as a default inclines the economically stronger spouse to enter old age pension later. We argue that the mechanism behind this effect is loss aversion that induces a desire to compensate for lost pension entitlements through prolonged employment and a delay of pension entrance. The same regulation introduced as an option in the United Kingdom has no impact on either entrance to state pensions, not entrance to state pensions combined with occupational or private pensions.

7.2.2 Divorce, childcare, and pension entrance of women

The models for women presented in this section include additional variables on childcare interruptions. We proceed in slightly different steps elaborated in the following.

Independent variables

In a *first step* we enter the variables on time analogous to the models for men, and a time varying fertility dummy that turns 1 when a women gives birth to her first child and enters motherhood. We treat childlessness as a time varying state instead of a constant attribute, as prospective mothers spent parts of their lives as childless women. In the *second step* we include education equal to the models for men. In the *third step* we control for union dissolution analogous to the models above, distinguishing between a divorce before and after the introduction of pension sharing in 1976 in Germany and 1973 in the United Kingdom. Also analogous to the models on men we include never having been married and widowhood as additional variables on the marital history. In the *fourth step* we include predictors that summarize different patterns of childcare interruptions. We distinguish between the following categories:

1. *Preclude/end:* mothers who never worked or did not return after child birth

2. *Interrupt, return part-time:* women who re-entered part-time employment after child rearing

3. *Interrupt, return full-time:* women who re-entered full-time employment after child rearing

4. *Double burden:* women who were employed continuously (excluding short periods of maternity leave) and combined the double burden of child rearing and employment.

Childless women make up the reference category.[17] In this step we additionally include a variable summarizing the duration of care periods before and after the prospective introduction of care credits in 1978 in the British models. The variable is calculated as the total duration of family care periods in which a women had a child under the age of 16, since care credits to Basic State Pension were awarded for care of children under age 16 after 1978. In the *fifths step* we control for total labor force participation in form of total full-time and part-time employment and the total duration of unemployment experienced over the life course. This is important to ensure that the fertility related employment patterns have an independent effect besides the total amount of employment over the life course. Analogous to the models for the male samples we include the difference between pre- and post pension income, subjective health and whether a partner is in old age pension or still working as additional controls.

Women, Germany

The results for women in Germany are shown in table 7.10. The risk of entering old age pension increases with age. The polarization of female pension entrance timing between age 60 and 65, also visible in the hazard rate in figure 7.2, is reflected in the positive coefficients for age 60 and 65. We find a significant negative impact for age 63, supporting that entrance the early entrance option at 63 based on long contribution periods (see chapter 2) is irrelevant for women in the study cohort. From the pathways to old age pension identified with sequence analysis, we know that later pension entrance at age 65 is mostly preceded by no own income, while early pension

[17] Delay of labor force entrance only occurred seldom and thus could not be treated as an independent category.

entrance at age 60 is prevalent after part-time employment.

In line with *hypothesis 6a*, motherhood significantly delays entrance to old age pension, suggesting that motherhood hampers the ability to accumulate sufficient entitlements to enter old age pension early. We find no effect for education, possibly because the study cohort experienced the transition to adulthood during the post World War II period between 1945-1955. The educational infrastructure had largely broken down and women were temporarily pulled into the labor market due to the lack of men capable to work (Niehuss 2001). As a consequence education is generally low among women in this cohort.

Divorce before and after 1976 has a positive impact on pension entrance timing in the third step of the model, but only divorce after 1976 has a significant positive impact in the final step of the model, when controlling for employment histories. This is in line with *hypothesis 5a* that divorce after 1976 leads to earlier pension entrance of women in Germany, because they profit from default pension sharing. The positive impact of divorce before 1976 in the third step of the model is assumably related to an increase in full-time employment following divorce (table 7.6) that enables pension entrance at age 60 with the *woman's pension* option. This is supported by the fact that the positive impact of a divorce before 1976 turns insignificant as soon as employment related factors are controlled for. Taken together the results suggest that pension sharing and an increase in full-time employment following divorce, particularly rewarded with the *woman's pension* at age 60, combine to enable earlier pension entrance of divorced women in Germany.

We find a negative impact of never having been married only in the last step of the model at the 10 percent significance level. Widowhood leads to later pension entrance. This likely reflects that widowed women have a lower prevalence of ever entering old age pension as the primary income source, because they are more likely to rely on a widow pension as the main source of income in old age. Further, pension entrance may primarily be a shift from one benefit category to another from widow pension to old age pension at state pension age of 65 for widows.

Table 7.10: The timing of pension entrance, women West DE

timing of pension entrance[a]	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
age (months)	.020***	.020***	.021***	.023***	.023***
age60	1.957***	1.957***	1.963***	1.995***	2.032***
age63	-.712*	-.712*	-.700*	-.648*	-.507
age65	1.148***	1.148***	1.173***	1.302***	1.681***
child born	-.578**	-.575**	-.596**	-.638	-.932***
education (years)		.004	-.014	-.024	-.026
divorced before/in 1976 (never div.)			.543*	.156	.113
divorced after 1976			.599**	.246	.493*
never married			.039	.042	-.550+
widowed			-.495*	-.793***	-1.091***
no return (no child)				-.724	.469
return pt				.338	.734*
return ft				.376	.637+
double burden				1.109*	.975**
total ft employment					.004***
total pt employment					.004***
total unemployment					.006*
pre-post pension income					.001***
subjective health					-.203***
partner in old age pension					.375*
cons	-19.792***	-19.834***	-20.135***	-21.296***	-21.964***
person months	291685	291685	291685	291685	291685
subjects at risk	527	527	527	527	527
failures	319	319	319	319	319
Chi2	860.9	860.9	848.9	808.9	706.7
$Prob > Chi2$	.000	.000	.000	.000	.000
aic	3557.9	3559.7	3541.8	3457.9	3255.7
Pseudo R2	.29	.29	.30	.31	.36

[a]Note: robust standard errors by person clusters, + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

The results on fertility related employment interruptions are illuminating with regard to the polarization of female pension entrance timing in Germany. While having a child generally delays entrance to old age pension, we find a consistent strong positive effect for mothers who worked continuously besides having children (*hypotheses 6d*). In the last step of the model we also find a positive effect for mothers who returned to both full-time and part-time employment after child rearing (*hypotheses 6b* and *6c*). This suggests that mothers with continuous or interrupted employment careers enter old age pension early at age 60, while mothers who never worked or did not return after child rearing enter old age pension at the state pension age of 65 due to a lack of entitlements for early entrance. This effect remains stable when controlling for the total amount of labor force participation, ensuring that it is related to specific fertility related employment patterns and not merely differences in the total amount of employment.

Both total accumulated full-time and part-time employment foster early entrance, supporting that part-time and full-time employment enable independent entitlement accumulation of women in Germany. This is attributable to relatively good possibilities to accumulate pension entitlements in part-time work and the womans' pension that disproportionately rewarded also part-time employment after age 40.

Good subjective health delays pension entrance. A partner in old age pension leads to earlier pension entrance, while we found no impact of a partner in old age pension for men in Germany. This supports a higher sensitivity of women's retirement to their spouses retirement characteristics, while men's retirement remains largely unaffected by their wives retirement.[18]

Women, United Kingdom

The results for the discrete time multinomial logit model for women in the British sample are presented in tables 7.11 and 7.12. Not entering any form of old age pension until age 66 is the baseline category, with the competing risks of state pensions only,

[18]The highest correlation among independent variables is found between child born and age with .51 and the time dependent variables cumulative full-time employment and part-time employment also correlate at .3 and .4 with age. Almost all other correlations among independent variables are below .1.

or state pensions combined with occupational or private pensions. For both outcomes we find a positive effect of linear age and age 60 as could be expected from the shape of the hazard rates. Time dependence of entering state pensions and occupational or private pensions is similar, except for the greater temporal flexibility of entering occupational or private pensions shown in figure 7.4. High education significantly decreases the probability of rely on state pension only, and increases the probability to have access to independent occupational or private pensions. This reflects the better access of highly educated women to occupational pensions and their higher financial capacity to invest in a private pension plan (Ginn 2003).

We find no consistent significant difference between a divorce before or after the introduction of *optional* pension sharing in 1973 on either outcome. A significant negative impact of divorce before 1973 on entrance to state pensions on the 10 percent level turns insignificant when controlling for employment related factors. This may be related to the limited ability of women divorced early in their life course to engage in employment, if they are still responsible for childcare after divorce. We also find a negative impact of divorce on entrance to occupational or private pensions at the 10 percent significance level for a divorce after 1973 in the last step of the model. This suggests that women tend to work longer and delay entrance to old age pension following divorce. Arguably this is motivated by a desire to compensate for a weaker economic position after divorce in the absence of pension sharing. Taken together we find only weak support for *hypothesis 5c* that divorce leads to later pension entrance of women in the United Kingdom. Nevertheless, there is a pronounced cross-country difference in contrast to the positive impact of divorce given default pension sharing on female pension entrance timing in Germany.

In contrast to Germany, never having been married significantly increases entrance to state pensions and occupational or private pensions. Never having been married increases women's odds to enter any type of pension earlier, suggesting a general 'pension penalty on marriage'. This is assumably related to barriers to independent entitlement accumulation for married women of the study cohort in the United Kingdom (see chapter 2), most prominently the *half-test* and the *married woman's*

Table 7.11: Pension entrance, women UK I

(1) State pensions[a]	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
age (months)	.043***	.043***	.044***	.045***	.045***
age60	2.434***	2.409***	2.452***	2.449***	2.467***
age63	-.350	-.347	-.362	-.362	-.368
age65	-.480	-.450	-.372	-.372	-.390
child born	-.561*	-.606*	-.216	-.826	-.685
education (years)		-.160**	-.149**	-.147*	-.127*
divorced before 1973 (never div.)			-.597+	-.470	-.369
divorced in/after 1973			-.083	-.078	-.041
never married			1.213**	1.186**	1.112**
widowed			.129	.286	.410
end				.746+	.527
return pt				.660+	.527
return ft				.049	.055
double burden				.614	.218
care before 1978				-.001	-.001
care after 1978				.005+	.005+
total ft employment					-.001+
total pt employment					-.000
total unemployment					.007***
pre-post pension income					-.001
subjective health					-.006
spouse working					.267
cons	-35.756***	-34.550***	-35.932***	-36.496***	-36.622***

[a]Note: robust standard errors by person clusters, + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 7.12: Pension entrance, women UK continued II

(2) Occupational/private pensions[a]	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
age (months)	.029***	.029***	.029***	.030***	.029***
age60	1.683***	1.703***	1.724***	1.718***	1.709***
age63	.237	.224	.219	.209	.233
age65	1.109**	1.056**	1.161**	1.194**	1.189**
child born	-.411	-.376	-.044	-.111	-.104
education (years)		.144*	.177**	.194**	.189**
divorced before 1973 (never div.)			.161	.030	.072
divorced in/after 1973			-.383	-.420	-.543+
never married			.968*	1.036*	1.081*
widowed			-.384	-.428	-.376
end				.364	.903
return pt				.289	.517
return ft				.295	.163
double burden				.722	1.076+
care before 1978				-.002	-.001
care after 1978				-.011+	-.009+
total ft employment					.003***
total pt employment					-.000
total unemployment					-.014*
pre-post pension income					.000
subjective health					.002
spouse working					.167
cons	-25.927***	-27.154***	-28.332***	-28.697***	-29.339***
person month	199748	199748	199748	199748	199748
persons at risk	381	381	381	381	381
state pension	227	227	227	227	227
occupational/private pension	139	139	139	139	139
Chi2	981.8	1014.5	988.3	991.3	1097.6
$Prob > Chi2$	.000	.000	.000	.000	.000
aic	3757.7	3746.7	3738.6	3736.5	3714.7
Pseudo R2	.36	.36	.37	.37	.38

[a]Note: robust standard errors by person clusters, + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

exemption. The life courses of women of the study cohort evolved in strong male breadwinner societies in both countries with marriage as the dominant model (Lewis and Ostner 1994). The strong male breadwinner enforcement in pensions particularly until the mid 1970s in the British pension system apparently entailed higher pension penalties on marriage for women compared to the moderate enforcement of the male breadwinner model in pensions in Germany (Meyer and Pfau-Effinger 2006, Ginn 2003). The pension penalty on marriage for women of the study cohort in the United Kingdom is persistent irrespective of fertility and employment histories, since it remains stable across all steps of the model.

We find no effect of motherhood on either outcome. The impact of fertility related employment patterns disappears when controlling for total labor force participation with the exception a higher probability of mothers who worked continuously to enter occupational or private pensions. Contrary to *hypothesis 7b* mothers who return to part-time employment after child rearing do not have a higher probability to enter state pensions only. This suggests that part-time work frequently does not even accumulate state pension entitlements and is arguably related to the fact that women frequently work several part-time jobs of which each is below the lower earnings limit. In this case they do not accumulate state pension entitlements, even if taken together they earn above the lower earnings limit for state pension benefit accrual. Contrary to *hypothesis 7c*, a return to full-time employment after child rearing does not suffice to enhance entrance to occupational or private pensions. Apparently, employment interruptions hamper access to occupational and private pensions even if women return to full-time employment afterwards. This implies substantial penalties on employment discontinuity in occupational and private pensions. In line with *hypothesis 7d*, we find a positive impact on entrance to occupational and private pensions only for women who took the double burden of continuous employment and child rearing.

Our results provide some support that the introduction of prospective care credits with the Home Responsibilities Protection (HRP) in 1978 affected women's pension entrance. Care periods for children under 16 after 1978 have an expected positive effect on entrance to state pensions at the 10 percent significance level. Care credits

after 1978 have a negative impact on entrance to occupational or private pensions at the 10 percent level. Taken together this suggests that the prospective introduction of care credits in 1978 slightly increased the availability of state pensions for women with care periods after 1978. At the same time a pit fall of this regulation becomes evident: the acknowledgment of care periods in state pension does not mitigate female carer's limited access to occupational and private pensions. According to projections (Ginn 2003) state pensions will on average provide pension levels below the threshold for means tested benefits. This questions the value of this regulation as it is not likely to change female carer's reliance on means tested benefits in old age. The results rather underline the necessity to improve female carer's access to occupational and private pensions, which remained unaffected by the introduction of HRP.

The total amount of full-time employment decreases the probability to rely on state pensions only and strongly increases the probability to enter independent supplementary pensions. In contrast to Germany, accumulated part-time employment has no effect on women's pension entrance timing to either outcome in the United Kingdom. This reflects the exclusion of part-timers from occupational pensions in the United Kingdom (Blossfeld and Hakim 1997, O'Reilly and Fagan 1998) and suggests that female part-time employment often was below the lower earnings limit and did not accumulate state pension entitlements either.

The total duration of unemployment increases entrance to state pension and decreases the likelihood of entering occupational or private pensions, equal to the findings for men in the United Kingdom. Persons who are not in employment cannot accumulate entitlements to an occupational pension and lack the financial capacity to invest in a private pension plan. This demonstrates that not only childcare interruptions, but also other types of employment interruptions as unemployment are penalized with limited access to occupational and private pensions in the United Kingdom. Further, the pension consequences of unemployment are not mitigated through special arrangements as the *'59er' regulation* in Germany.[19]

[19]Multicollinearity is highest between the total amount of full-time employment and age (.53), the total amount of part-time employment and age (.52) and the time dependent variable child born and age (.51). Otherwise multicollinearity among independent variables is below .3 in all cases, mostly below .1.

The models so far focused on gender and country specific effects. Our findings on the impact of default and optional pension sharing upon divorce point in the hypothesized direction. Divorce under the condition of default pension sharing in Germany leads to earlier pension entrance of women and later pension entrance of men. Divorce under the condition of optional pension sharing in the United Kingdom shows opposite signs by gender, later pension entrance for women and earlier pension entrance for men that are only weakly significant.

With regard to childcare interruptions we found that motherhood generally delays pension entrance in Germany but return to any type of employment after child rearing, including part-time employment, leads to earlier pension entrance. We attribute these effects to the *woman's pension* and better possibilities to accumulate pension entitlements through part-time work in Germany.

In the United Kingdom we found a general pension penalty on marriage, attributable to the strong barriers to independent entitlement accumulation of married women with the *half-test* and the *married woman's exemption* until 1975. Part-time employment has no effect on pension entrance timing and only continuous employment besides child rearing increases the probability to enter occupational and private pensions. With regard to the period effect of the prospective introduction of care credits we found that care periods after 1978 increase the probability to enter state pensions, but decrease entrance to occupational or private pensions. We conclude that this regulation does little to improve women's pension position, since female carers who rely on state pensions are likely below the threshold for means-tested benefits in old age (Ginn 2003).

The country and gender specific models were useful to illuminate gender and country specific dynamics also of the control variables. For example education delays pension entrance of men but has no effect on pension entrance timing of women in Germany. In the United Kingdom education increases the probability to enter occupational or private pensions for both men and women. This underlines that pension entrance is highly gender and country specific, justifying the analysis of separate

samples by country and gender.

Nevertheless, the sample specific models are vulnerable to several errors and the specification of country specific dependent variables hampers comparability of results. We will discuss potential errors and specify integrated models on the timing of entrance to any type of pension with interaction effects on the impact of divorce by gender in the following section.

7.2.3 Overview and interactions

The absence of a significant effect of divorce after pension sharing for the United Kingdom in the gender and country specific models is not sufficient to conclude that there really is no effect. Because significance levels depend on sample size, the impact of divorce may become significant in the British sample with increasing sample size. We therefore risk committing a type two error of assuming that there is no effect even though there is one. Moreover, the country samples may represent different proportions of the national populations leading to incomparability of significance levels across countries.[20]

One possibility to adjust for this is to weight the country samples by actual population size. This would require an accurate assessment of the cohort specific population that survived until the observation period. An alternative is to calculate country specific gender*divorce interaction effects. An opposite direction of interaction effects in the country samples, i.e. a positive effect of divorce after pension sharing for women and a negative effect for men in Germany as opposed to a negative effect of divorce after pension sharing for women and a positive effect for men in the United Kingdom, can provide more firm support of our hypotheses of a different impact of default and

[20] According to the British National Office for Statistics in 1995 the population of the United Kingdom was 58,612000 and the population of the former Federal Republic of Germany was 66,715000 (Office for National Statistics 2000: 42). This is a ratio of 1:1.138. Our samples include 720 persons at risk in the United Kingdom and 1050 at risk in Germany, representing a ratio of 1:1.45, suggesting that a larger part of the German population is represented. As a consequence estimates will more likely be significant for the German sample. The population proportion is only a relatively rough estimate since we would ideally take into account the cohort specific population size in the observation period, which is not readily available.

Table 7.13: The timing of pension entrance after divorce, gender interactions by country

	WEST DE			UK		
Timing of pension entrance[a]	**Step 1**	**Step 2**	**Step 3**	**Step 1**	**Step 2**	**Step 3**
age (months)	.023***	.023***	.022***	.031***	.032***	.032***
age60	1.668***	1.670***	1.668***	1.829***	1.839***	1.835***
age63	.208	.205	.338+	-.367*	-.367*	-.366*
age65	.886***	.899***	1.268***	2.166***	2.172***	2.178***
education (years)	-.054**	-.056**	-.024	.076+	.082*	.077+
male gender	.966***	.906***	-.054	-.841***	-.891***	-1.028***
divorce before pension sharing	.677**	.646**	.273	-.449	-.443	-.449
divorce after pension sharing	.703**	.604*	**.397+**	-.477	-.476	**-.495+**
divorce before*male	-.627	-.588	-.220	.434	.460	.466
divorce after*male	-1.041***	-.948**	**-.601***	.381	.401	**.475**
never married		.287	-.016		.443**	.463**
widowed		-.377*	-.886***		-.188	-.184
total ft employment			.004***			.001+
total pt employment			.005***			.000
total unemployment			.007***			.001
pre-post pension income			.000*			.000*
subjective health			-.198***			-.002
partner in pension/working			.143			-.024
cons	-21.896***	-21.896***	-21.030***	-28.063***	-28.342***	-28.352***
person months	568336	568336	568336	397315	397315	397315
subjects at risk	1050	1050	1050	720	720	720
failures	678	678	678	681	681	681
Chi2	1647.1	1662.7	1483.7	1371.5	1349.7	1393.3
$Prob > Chi2$	.000	.000	.000	.000	.000	.000
aic	7388.1	7383.7	7019.4	6174.7	6170.6	6173.0
Pseudo R2	.30	.30	.34	.38	.39	.39

[a]Note: robust standard errors by person clusters, + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

optional pension sharing on pension entrance timing.[21]

To approximate the true impact of default and optional pension sharing on pension entrance timing of men and women in Germany and the United Kingdom we merged the gender samples and calculated interaction effects for the impact of divorce before and after the introduction of pension sharing by gender for each country. Table 7.13 presents discrete time logistic models on the timing of pension entrance including interaction effects by gender. The competing risks for the United Kingdom are combined to the single risk of entrance to any type of pension. This renders the dependent variable more comparable across countries and allows an unambiguous interpretation of the coefficients in terms of the timing of pension entrance. They are calculated separately for Germany, displayed on the left side of table 7.13, and the United Kingdom, displayed on the right hand side. The country samples include men and women. The stepwise procedure is reduced to three steps, since we are only interested in the gender interactions with divorce before and after the introduction of default and optional pension sharing.

For Germany the hypothesized gender interaction, that divorce after the introduction of default pension sharing leads to earlier entrance of women but later entrance of men is consistently supported through all steps of the model. Divorce after the introduction of pension sharing leads to significantly earlier pension entrance but the interaction between male gender and a divorce after 1976 is negative and significant, also after controlling for employment histories (*hypotheses 5a* and *5b*).

For the United Kingdom the interactions consistently point in the opposite direction compared to Germany. The only significant effect for the divorce variables is a negative impact of divorce after 1973 for women at the 10 percent level (*hypothesis 5b*). This is in line with the assumption that divorced women delay pension entrance to compensate for a weaker economic position. We still are at risk of committing a type 2 error, assuming that there is no effect when there really is one, because the effects may eventually become significant with increasing sample size. But we can assert that the gender divorce interaction is different in the United Kingdom. If there

[21]Power analysis would be an alternative strategy to avoid a type 2 error (Cohen 1977).

is any effect, women enter old age pension later following divorce, while men enter earlier.

Based on the results presented in table 7.13 we can state that in Germany women enter old age pension earlier after the introduction of default pension sharing and men later, which is not evident for the United Kingdom. This is in line with our hypothesis that default pension sharing upon divorce changes the restrictions on pension entrance such that women enter earlier and men later in male breadwinner societies.

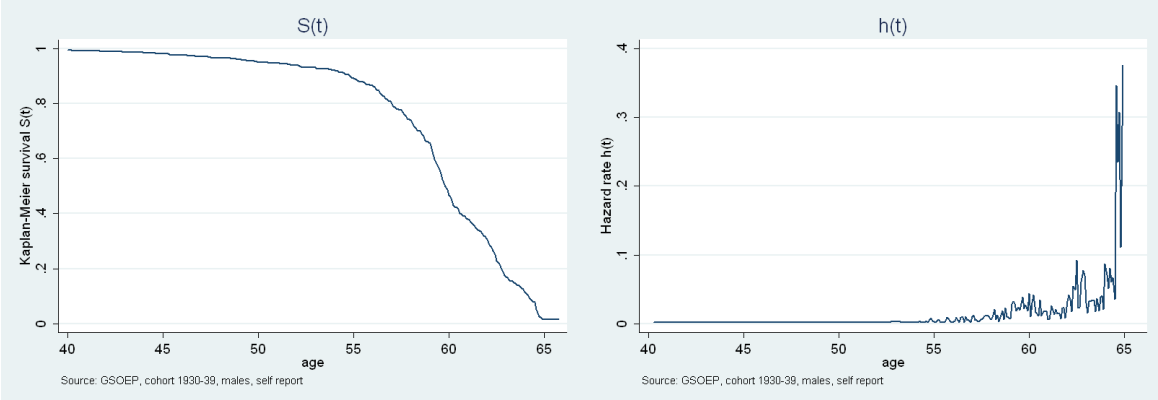
7.3 Pension entrance vs. self-report retirement

A recurring topic throughout the thesis are ambiguities related to different conceptualization of retirement, as holistic pathways to old age pension, pension entrance, labor force exit, or self-report retirement. To shed light on implications of different retirement measures we contrast the results obtained for Germany with pension entrance as the dependent variable with results obtained in the same models using self-report retirement as the dependent variable. The self-report retirement measure is only reported on a yearly basis, while pension entrance was given on a monthly basis in the GSOEP.

Men, Germany

Of the 600 men born 1930-1939, 424 enter self-report retirement, 19 are left censored and 157 are right censored. Figure 7.8 shows the components of the hazard rate for men based on the self-report retirement measure. It is remarkably similar to the hazard rate of pension entrance displayed in figure 7.1, with the decisive difference that the hazard of entering self-report retirement is far less precise, particularly around the age marker of 60 and 63. These two peaks in the hazard are lost in the imprecision of the yearly time intervals and the ambiguity of self-report. Arguably around age 60 following unemployment and firm level early retirement regulations, it is particularly difficult to subjectively classify when one is retired. People will frequently find themselves in a situation in which they have retired from the labor market and are

Figure 7.8: Components of hazard rate self-report retirement, men West DE



in transitory unemployment or partial retirement. In partial retirement they may no longer work but still receive a paycheck from their employer (Altersteilzeit) and have not entered old age pension yet (see chapter 2). Nevertheless, the basic shape of the survival curve remains similar for pension entrance based on the monthly income information and self-report retirement (figure 7.1 and 7.8).

Table 7.14 presents the results of the same model for men as in the previous section with self-report retirement as the dependent variable. The substantive results largely remain stable but we find some differences as well. In contrast to the model on pension entrance timing, the dummy variable for age 65 is excluded from the model on self-report retirement due to over determination. We only find a negative impact of age 63. This means that the coefficients on the typical retirement peaks in the model on self-report retirement entail misleading implications on the time dependency of the process found for pension entrance timing.

The substantive results on the impact of the explanatory variables remains unchanged. High education delays self-report retirement of men. Divorce after the introduction of default pension sharing in 1976 leads to later self-report retirement at the 10 percent significance level as well, and we find a positive impact of unemployment on self-report retirement.

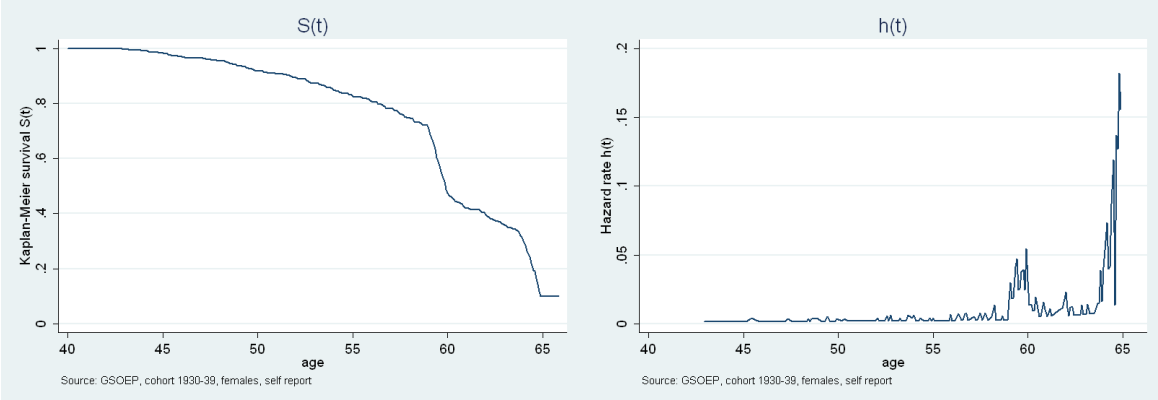
Overall the results in table 7.14 support the robustness of our substantive findings on the negative impact of divorce on men's retirement timing under the condition of default pension sharing. Moreover, they support the viability of using self-report

Table 7.14: The timing of self-report retirement, men West DE

Self-report retirement[a]	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
age (month)	.032***	.033***	.033***	.032***	.032***
age60	-.112	-.112	-.109	-.103	-.070
age63	-1.017***	-.985***	-.992***	-.981***	-.963***
education (years)		-.095***	-.090***	-.078***	-.063**
divorce before 1976 (never div.)			.114	.005	-.242
divorce after 1976			-.287	-.346+	-.420+
never married			.246	.213	.228
widowed			.212	.210	.278
total ft employment				.000	.001
total pt employment				.003	.004*
total unemployment				.006***	.006***
pre-post pension income				-.000	-.000
subjective health					-.170***
partner in old age pension					-.301*
cons	-27.195***	-26.487***	-26.562***	-26.620***	-25.602***
person months	285577	285577	285577	285577	285577
subjects at risk	548	548	548	548	548
failures	393	393	393	393	393
Chi2	803.0	746.7	748.4	785.3	821.9
$Prob > Chi2$	.000	.000	.000	.000	.000
aic	4123.7	4105.6	4110.1	4100.5	4045.5
Pseudo R2	.31	.31	.31	.32	.33

[a]Note: robust standard errors by person clusters, + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 7.9: Components of hazard rate self-report retirement, women West DE



retirement as an approximation of actual pension entrance timing, particularly considering the non trivial effort of reconstructing pension entrance based on the monthly income information of the GSOEP.

We argued that self-report retirement may be particularly ambiguous for persons who do not experience a seamless transition from employment to old age pension. This is supported by the fuzziness of the self-report retirement measure for men around age 60 and age 63 likely capturing ambiguities around transitory unemployment and firm level early retirement arrangements. If this is the case we would expect stronger deviations between pension entrance and self-report retirement for women who tend to experience longer gaps between employment and old age pension entrance as became visible in chapter 6 (figure 6.5).

Women, Germany

Of the 598 women born 1930-1939, 417 enter self-report retirement, 12 are left censored and 169 are right censored. A first notable result is that more women of the study cohort subjectively classify themselves as being in retirement than report entering old age pension as their main income source (N=322, see table 7.1). This may be related to a tendency of women who live on a widow pension or receive no own income at age 66 to classify themselves as retired.

Figure 7.9 presents the components of the hazard rate for entrance to self-report retirement for women. Similar to the differences in the hazard rates of the two

retirement measures for men, the hazard of entering self-report retirement for women deviates most from the hazard of pension entrance around age 60. In addition, a notably higher proportion of women report being retired before age 60 compared to the pension entrance measure. The basic shapes of the survival curves for the two measures remains similar with a drop around age 60 and age 65.

To what extent these deviations matter for substantive results obtained with the measures can be seen in the model for women taking self-report retirement as the dependent variable (table 7.15). Again the dummy for age 65 is excluded from the model due to over determination. Also, we do not find the positive effect for age 60 as in the model on pension entrance timing, only a negative effect for age 63. We can conclude that for both men and women the self-report retirement measure may lead to different conclusions about the time dependency of the process compared to pension entrance timing.

In contrast to the model on men, the results for the self-report measure for women do not unambiguously support our substantive hypotheses on the impact of divorce on pension entrance timing given default pension sharing. In step three and four of the model divorce before and after the introduction of pension sharing lead to earlier pension entrance but once controlling for labor market participation both divorce indicators become insignificant. This supports that results between actual pension entrance and self-report retirement deviates more for women compared to men, because their retirement transition processes involve less clear transitions between labor force exit and old age pension entrance.

For childcare interruptions the results are somewhat different, but suggest the same substantive interpretation as obtained with the pension entrance measure. In step four of the model we find identical effects that motherhood generally delays self-report retirement, but return to full-time or part-time employment as well as continuous employment throughout child rearing lead to earlier self-report retirement. In step five the negative impact of motherhood turns insignificant and we find a negative impact for women whose employment career ended with child rearing. Nevertheless, the substantive relationship between return to the labor market after child birth re-

Table 7.15: The timing of self-report retirement, women West DE

Self-report retirement[a]	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
age in months since 1900	.026***	.026***	.028***	.029***	.030***
age60	-.173	-.172	-.189	-.145	-.118
age63	-1.191***	-1.193***	-1.221***	-1.265***	-1.189***
child born	-.384**	-.414**	-.590***	-1.231***	-.229
education (years)		-.028	-.013	-.018	.012
divorce before 1976 (never div.)			.708***	.668**	.224
divorce after 1976			.517**	.529**	.215
never married			.144	.172	-.393+
widowed			3.338***	3.511***	3.720***
end				-.077	-1.110*
return pt				.588***	-.271
return ft				.850**	-.234
double burden				1.208***	.086
total ft employment					.003***
total pt employment					.004***
total unemployment					.015***
pre-post pension income					.000*
subjective health					-.108***
partner in old age pension					-.207
cons	-22.823***	-22.522***	-23.877***	-24.788***	-25.805***
person months	287581	287581	287581	287581	287581
subjects at risk	543	543	543	543	543
failures	375	375	375	375	375
Chi2	544.9	547.8	437.2	520.1	577.9
$Prob > Chi2$	.000	.000	.000	.000	.000
aic	4227.4	4228.4	3930.0	3899.8	3749.6
Pseudo R2	.26	.26	.32	.32	.35

[a]Note: robust standard errors by person clusters, + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

mains the same: mothers who do not re-enter employment after child-birth enter retirement later.

Moreover, it seems that self-report retirement more closely resembles pension entrance than labor force exit. This is consequential for the interpretation of results. For example in an analyses of the GSOEP data for West Germany, Hank (2004) finds a negative effect of motherhood on entrance to self-report retirement. He concludes that mothers prolong employment at the end of working life to make up for childcare interruptions. Quite the contrary, our findings based on pension entrance and a visualization of pathways with sequence analysis suggest that mothers enter old age pension later, because they have insufficient entitlements to enter earlier, if they did not return to stable employment after child rearing.

7.4 Summary and concluding remarks

In this chapter we addressed how divorce and childcare interruptions affect the timing of pension entrance for women and men born 1930 and 1939 in Germany and the United Kingdom. In order to avoid the exclusion of part of the relevant population we focused on pension entrance timing rather than the timing of labor force exit as the dependent variable.

We found that divorce after the introduction of default pension sharing leads to earlier pension entrance of women and later pension entrance of men in Germany. We assume that this is related to direct effects of pension sharing that alters entitlement position in the short term upon divorce. Taken together with the impact of divorce on subsequent employment, our findings indicate that men enter later in favor of prolonged employment to compensate the loss of pension entitlements through pension sharing. Women in Germany, on the other hand, enter earlier, because they profit from pension sharing.

In contrast, in the United Kingdom the impact of divorce on pension entrance under the condition of optional pension sharing showed few significant effects. Moreover, the gender interaction with divorce pointed in the opposite direction compared

to Germany: women rather enter old age pension later following divorce, while divorced men show a tendency to enter earlier. We argued that divorced women enter later in favor of prolonged employment to compensate for a weaker economic position following divorce, since they did not benefit from pension sharing.

With regard to the impact of childcare interruptions on women's pension entrance our results contribute to the understanding of the polarization of female pension entrance timing between age 60 and 65 in Germany. In line with our expectations motherhood generally delayed entrance to old age pension related to a lower entitlement position of mothers. However, mothers who remained continuously employed and mothers who returned to either part-time or full-time employment after child rearing interruptions entered old age pensions earlier, which we attribute to relatively good possibilities to accumulate pension entitlements through part-time work and the *woman's pension* option at age 60.

In the United Kingdom we found a general pension penalty on marriage, attributable to the strong barriers to independent entitlement accumulation of married women with the *half-test* and the *married woman's exemption* until 1975 (see chapter 2). Part-time employment has no effect on women's pension entrance and only continuous employment besides child rearing increases the probability to enter occupational and private pensions. With regard to the period effect of the prospective introduction of care credits we found that care periods after 1978 increase entrance to state pensions but decrease the probability to enter occupational or private pensions. We conclude that this regulation does little to improve women's pension position, since female carers who rely on state pensions are likely to be below the threshold for means-tested benefits in old age (Ginn 2003). Instead, female carer's access to occupational and private pensions has to be improved to mitigate pension penalties on childcare, as long as state pensions remain on or below subsistence level.

Some caveats with regard to the results have to be noted. Focusing on only one cohort we cannot clearly separate the period effect of changing marriage laws on pension sharing from an age effect regarding the impact of divorce. Possibly for women in Germany, divorce later in the life course leads to earlier pension entrance but

divorce early in the life course does not. Our interpretation as a direct effect through the introduction of pension sharing is backed up by theory and plausible, but we cannot rule out the alternative explanation of a life course effect in a statistical sense. This will only be separable by supplementing the analysis with results for younger cohorts. Nevertheless, the comparison with the United Kingdom is informative in this respect. Since pension sharing was implemented about the same time, yet as a seldom used option, a life course effect should have appeared in both countries.

An alternative explanation for the later pension entrance of men following divorce in Germany would be that the value of leisure when receiving an old age pension is lower without a spouse, inclining divorced men to prolong employment. This effect however, would have been expected stable across countries as well, which was not the case.

Going back to our rational choice framework, our findings underline the powerful impact of structural restrictions in pension entrance resulting from divorce and child-care interruptions in specific institutional contexts. Our hypotheses derived from a reconstruction of the country specific 'logic of the situation' were largely supported. A necessary next step is to refine possibly heterogeneous behavioral strategies among different population groups taking into account the impact of institutional restrictions we found in this chapter.

7.5 Data appendix chapter 7

GSOEP

Income information was treated according to the same rules as described in the data appendix to chapter 6.

BHPS

In order to reconstruct the employment history information from the BHPS the file xlempe including information from several original sources of life time employment history information in the BHPS was used (Halpin 2000): BLIFEMST updated with information from wJOBHISt and wINDRESP. While another file, newpan contains the richest data and the least recall error (ibid.), xlempe is more detailed on job history status, by distinguishing between full-time, part-time and self-employment.

Tables 7.16 and 7.17 show full tables including case numbers and R-squares for women's probability to be employed after child birth.

In this section we discuss the insights gained, show up limitations, and point out policy conclusions and avenues for future research. We begin by resuming the comparative logic and the theoretical rationales that guided the analyses. Subsequently, we provide a summary of the results and relate them to each other. Besides the substantive questions above, we pursued a methodological interest to explore the complementary value of recent advances in sequence analysis to event history methods, traditionally employed in quantitative life course research. We sum up insights gained with both methods and critically discuss the added value of sequence analysis. The discussion closes with a non-technical summary of policy implications, limitations of the analysis, and an outlook on future research.

Table 7.16: Probability to be employed after child birth, full table women West DE

West DE[a]	(N=596)								
full-time	child born	education	R2	person months	**part-time**	child born	education	R2	person months
years					years				
1	-.081***	.016**	.004	357004	1	-.089***	-.003	.003	357004
2	-.101***	.018**	.006	349852	2	-.082***	-.003	.003	349852
3	-.115***	.020***	.007	342700	3	-.067***	-.002	.001	342700
4	-.105***	.022***	.008	335548	4	-.055***	-.002	.001	335548
5	-.099***	.023***	.009	328396	5	-.043***	-.002	.001	328396
6	-.086***	.024***	.010	321244	6	-.033***	-.002	.0005	321244
7	-.074***	.025***	.011	314092	7	-.024**	-.002	.0003	314092
8	-.071***	.026***	.012	306840	8	-.013	-.001	.0001	306940
9	-.053***	.026***	.012	299788	9	-.003	-.001	.0000	299788
10	-.034*	.026***	.012	292636	10	.014	-.001	.0001	292636
11	-.017	.026***	.012	285484	11	.016	-.001	.0001	285484
12	-.000	.026***	.012	278332	12	.025*	-.001	.0002	278332
13	.008	.025***	.012	271180	13	.032**	-.000	.0004	271180
14	.021	.025***	.012	264028	14	.038***	-.001	.0005	264028

[a]Note: marginal effects, robust standard errors, + $p < .10$, *$p < .05$, **$p < .01$ ***$p < .001$

Table 7.17: Probability to be employed after child birth, full table women UK

UK[a]	(N=478)								
full-time	child born	education	R2	person months	**part-time**	child born	education	R2	person months
years					years				
1	-.298**	.006	.0089	286310	1	-.131***	-.008	.0034	286310
2	-.279***	.011	.0084	280574	2	-.114***	-.008	.0026	280574
3	-.264***	.014+	.0083	274838	3	-.101***	-.008	.0021	274838
4	-.264***	.017*	.0081	269102	4	-.076***	-.008	.0014	269102
5	-.217***	.019*	.0074	263366	5	-.043**	-.008	.0008	263366
6	-.177***	.021*	.0062	257630	6	-.013	-.008	.0006	257630
7	-.154***	.021*	.0057	251894	7	.007	-.008	.0006	251894
8	-.128***	.021*	.0049	246158	8	.039*	-.008	.0008	246158
9	-.104***	.020*	.0040	240422	9	.060**	-.009	.0011	240422
10	-.074***	.019*	.0032	234686	10	.065***	-.009	.0012	234686
11	-.045**	.018+	.0026	228950	11	.074***	-.009	.0014	228950
12	-.029	.018+	.0023	223214	12	.085***	-.009	.0016	223214
13	-.009	.017+	.0021	217478	13	.093***	-.009	.0018	217478
14	.012	.017+	.0020	211742	14	.102***	-.009	.0020	211742

[a]Note: marginal effects, robust standard errors, + $p < .10$, *$p < .05$, **$p < .01$ ***$p < .001$

Table 7.18: Independent variables, men West DE and UK

Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
West DE				
education (years)	11.5	2.4	8.5	18
total ft employment (months)	212.5	153.7	0	609
total pt employment (months)	2.4	16.3	0	372
total unemployment (months)	3.0	12.9	0	198
pre-post pension income (EUR)	312.5	632.8	0	7954.7
subjective health (0-10)	7.9	2.0	0	10
UK				
education (years)	9.2	1.2	6	13
total ft employment (months)	221.3	154.8	0	610
total pt employment (months)	1.1	10.5	0	244
total unemployment (months)	3.3	17.7	0	441
pre-post pension income (GBP)	121.2	380.8	0	3952.6
subjective health (0-36)	10.6	5.2	0	35

	West DE		**UK**	
	person months	%	person months	%
divorced before 1976/1973	21,535	7.73	12,063	5.90
divorced after 1976/1973	18,268	6.55	33,496	16.39
never married	10,923	3.92	14,546	7.12
widowed	1,907	0.68	1,322	0.65
partner in old age pension	28,633	10.27	-	-
spouse working	-	-	73,085	35.77

Table 7.19: Independent variables, women West DE and UK

Variable	Mean	Std. Dev.	Min	Max
West DE				
education (years)	10.5	1.9	7	18
total ft employment (months)	109.4	107.6	0	571
total pt employment (months)	31.0	68.4	0	455
total unemployment (months)	2.5	13.3	0	276
pre-post pension income (EUR)	113.6	314.5	0	2791.7
subjective health (0-10)	7.8	2.0	0	10
UK				
education (years)	9.3	1.2	4	14
total ft employment (months)	119.2	98.0	0	582
total pt employment (months)	45.1	79.3	0	495
total unemployment (months)	1.4	11.4	0	258
pre-post pension income (GBP)	74.2	194.8	0	1621.8
subjective health (0-36)	11.3	5.3	0	36

	West DE		**UK**	
	person months	%	person months	%
child born	205,230	70.11		
divorced before 1976/1973	28,539	9.75	13,975	6.20
divorced after 1976/1973	20,732	7.08	30,437	13.51
never married	10,327	3.53	13,913	6.18
widowed	12,915	4.41	5,983	2.66
partner in old age pension	292,737	24.89	-	-
spouse working	-	-	77,868	34.57
no children	33,834	11.56	31,967	14.19
no return/preclude	87,520	29.90	30,355	13.48
return part-time	80,240	27.41	97,263	43.18
return full-time	54,653	18.67	51,922	23.05
double burden	36,490	12.47	11,542	5.12

Chapter 8

Discussion and outlook

In this thesis we approached retirement outcomes of gendered life courses from two perspectives. First, we proposed the concept of pathways to old age pension to emphasize that retirement is a process that does not always occur as a one-time work to old age pension transition. By analysing country- and gender-specific pathways to old age pension, our analysis also included individuals (particularly women) who do not experience such traditional, one-time transitions. Second, we highlighted that retirement follows not only a working life, but also a particular family biography, particularly relevant in the emergence of gender inequalities. Specifically, we considered how divorce and childcare interruptions affect pension entrance.

We used a case-oriented difference in similarities design (Tilly 1984, Ragin 1987) to compare the retirement experiences of the cohort bron 1930-1940 in Germany and the United Kingdom. By comparing these two countries, we were able to analyze the differential effects of two maximally different pension systems (Ginn et al. 2007) while holding a male breadwinner context constant across the study cohort's working lives (Lewis and Ostner 1994, Pfau-Effinger 2005): a generous, nearly universal state pension system in Germany compared to a highly differentiated pension system in which state pensions provide only subsistence income in the United Kingdom. We clarified the institutional regulations in effect for the study cohort in Germany and the United Kingdom and emphasized the historic specificity of the process under study, its location in time and space.

Thus, our design approximated a quasi-experimental design (Shadish et al. 2002) with national differences in pensions as the 'treatments'. Because divorce and childcare interruptions cannot be randomly assigned to treatment and control groups our historically specific comparison is particularly valuable.

Generally, we investigated how the German system, a generous, nearly universal state pension system, and the British system, which provides only subsistence income structure individuals' pathways to old age pension. In our investigation of how family biographies affect pension entrance, we were interested in how pension regulations mediate the impact of divorce and childcare interruptions on pension entrance timing. Specifically, we investigated the affect of the following three institutional differences:

1. default pension sharing upon divorce in Germany since 1976 versus optional pension sharing in the United Kingdom since 1973

2. easier accumulation of pension entitlements through part-time work in Germany compared to the United Kingdom

3. the retrospective introduction of care credits in Germany versus the prospective introduction of care credits in state pensions in 1978 in the United Kingdom

   We developed two sets of hypotheses. The first set concerned typical pathways to old age pension within the conceptual framework of differential life course sociology (Mayer 2005). Specifically, we investigated the degree of standardization (Brckner and Mayer 2005) and turbulence (Elzinga 2006b) in pathways to old age pension and associated patterns of income inequality in both countries. Based on theories on the institutionalization of the life course (Mayer 2005, Leisering 2003), including political ecpnpmy approaches that emphasize labor market structures (Mayer 1997, Ebbinghaus 2006, Buchholz et al.2006), life course effects of social policies (Leisering 2003, Rein and Schmähl 2004, Guillemard 2000), and the relationship between individual differences and institutional structures (Caspi and Moffitt 1993), we hypothesized that pathways to old age pension would be less turbulent and more standardized in Germany compared to the United Kingdom. We investigated three hypotheses regard-

ing inequality: status maintenance, cumulative advantage, and status levelling (Mayer et al. 1999, O'Rand and Henretta 1999, Dannefer 2003, DiPrete and Eirich 2006). Table 8.1 summarizes this first set of hypotheses and the results of our analyses.

The second set of hypotheses concerned the effects of divorce and childcare interruptions on pension entrance timing. We adopted the model building approach within the rational choice framework (Coleman 1990, Diekmann and Voss 2004) by focusing on structural constraints to pension entrance, postulating and not testing an auxiliary behavioral assumption. We assumed that people revert to simple behavioral rules due to the high complexity of the pension entrance decision (Heiner 1983, Aaron 1999, Kahneman 2003). Namely, we argued that most individuals will enter old age pension as early as their resources and restrictions allow. Within this framework, divorce and childcare interruptions alter the timing of pension entrance by affecting individuals' pension entitlements and their entrance options.

Pension sharing regulations and the employment opportunities available to mothers affect how divorce and childcare interruptions alter retirement transitions. Based on descriptive bridge assumptions (Eser 1996, Lüdemann and Kelle 1998), we hypothesized that default pension sharing in Germany would lead divorced women to enter pension earlier but divorced men later. In the United Kingdom, where pension sharing is an infrequently used option, we predicted that divorce would delay women's pension entrance but would have no notable effect on men's pension entrance. Concerning childcare interruptions, we expected motherhood to delay pension entrance for German women due to insufficient pension entitlements, but that returning to part-time and full-time employment after childrearing would lead to earlier pension entrance due to the *women's pension* option at age 60. In the United Kingdom, we expected that only a return to full-time employment and continuous employment during childrearing would increase the probability of mothers to enter an occupational or private pension. We discussed implications of family theories for the research

questions with the conclusion that they are informative on joint spousal retirement but provide little guidance about the impact of divorce and childcare interruptions on pension entrance. However, they point to selectivities with regard to the persons likely to experience a divorce and have children. Table 8.2 summarizes our hypotheses and results concerning the effects of divorce and childcare interruptions.

Our analysis highlighted that national pension systems can differentiate on country specific outcomes. For the study cohort the German pension system primarily differentiated in terms of the timing of pension entrance, while the British pension system primarily stratified in terms of access to different pension types. This suggests the necessity to focus on country specific outcomes to grasp the substantive cross-country variation in life course consequences for retirement. The greater temporal flexibility in pension entrance for persons who have access to independent occupational pensions in the United Kingdom is an often overlooked additional dimension on which persons with access to these pension types are advantaged beyond the higher pension income they provide.

Typical Pathways to old age pension In an exploratory analysis, we identified qualitative patterns of typical pathways to old age pension experienced by the study cohort in Germany and in the United Kingdom. One of our most striking findings was that less than 20Our study also revealed interesting gender differences in both countries. Men tended to experience more institutionalised pathways, such as bridge unemployment in Germany (Kohli et al. 1991). In contrast, women's pathways were driven by the 'institution of the family' (Allmendinger et al. 1993), as opposed to state institutions. We found that women predominantly experienced one of three non-standard pathways to old age pension: part-time employment, means tested benefits and lack of independent income, with each pathway implying financial dependence on household resources. Women transitioning to old age pension without independent income were especially prevalent in Germany. As a consequence, women are more affected by their family status (e.g., divorce and widowhood). In both countries, female

pathways to old age pensions were marked by a shift between 'welfare classes' from one benefit category to another more often than male pathways. This has the paradoxical implication that although pension policies are largely directed at male breadwinners, state pension ages more directly affect women's pension entrance. Early entrance routes such as occupational pensions, firm-level arrangements and generous unemployment benefits give men more flexibility. Once again, our analysis highlights that retirement research concerning labor force exit transitions overlooks the majority of women (see also Allmendinger et al. 1993), and therefore underestimate the true extent of gender inequality. In terms of benefits, we generally found that women's pathways to old age pension provided less income than typical men's pathways. Women with access to occupational pensions in the United Kingdom were an exception to this rule. While the distribution of personal income across pathways to old age pension for men was similar in both countries, distribution differed markedly for women. In Germany, we found a polarization between women with no income and women with relatively high income, corresponding with women who fully rely on a male breadwinner's pension and those women with access to state pensions. In the United Kingdom, we found a similar polarization between women with low income and women with relatively high income, corresponding with women who only have access to state-pensions and women who have access to occupational and private pensions. This finding illustrates that how women's family and work biographies interact with national pension systems.

Standardization and turbulence We hypothesized that pathways to old age pension would be less turbulent and more standardized in Germany than in the United Kingdom (*Hypotheses* 1 and 2). This was supported by our results: active pension policies and an employment exit regime in Germany fostered standardization and low turbulence of pathways to old age pension of the study cohort. In comparison, passive pension policies entailing a higher institutional differentiation of pension provision and an employment maintenance regime in the United Kingdom generated lower levels of standardization and higher levels

of turbulence across pathways to old age pension.We believe the 'weak' institutional context in the United Kingdom amplifies the influence of individual preferences and differential abilities, relative to the 'strong' institutional context in Germany. More generally, these results demonstrate that despite the general 'destandardization' of the retirement transition process observed over the past two decades (Han and Moen 1999, Kohli and Rein 1991, Guillemard 2000), national institutions produce significant cross-country differences. We distinguished between turbulence with and without duration variation (Elzinga 2006) and found that the higher turbulence across pathways to old age pension in the United Kingdom is largely due to short-term frictions, rather than ongoing discontinuity. This suggests that pathways to old age pensions in the United Kingdom are marked by short-term disruptions of various income sources rather than ongoing discontinuity that would suggest the emergence of retirement as a new life stage in itsself.

Hypotheses 1 and 2 on turbulence and standardization of pathways to old age pension were supported. Active pension policies and an employment exit regime in Germany fostered standardization and low turbulence of pathways to old age pension of the study cohort. Passive pension policies that entail a higher institutional differentiation of pension provision and an employment maintenance regime in the United Kingdom generated higher levels of turbulence and lower levels of standardization between pathways.

We assume that this effect is amplified by the higher salience of individual differences in preferences and abilities in the 'weak' institutional context given in the United Kingdom compared to the 'strong' institutional context given in Germany. These results demonstrate that besides the proclaimed 'destandardization' of the retirement transition process over the past two decades (Han and Moen 1999, Kohli and Rein 1991, Guillemard 2000), significant cross-country differences remain that can be linked to specific national institutions.

We compared levels of standardization across countries not changing levels of standardization over time. Standardization, de-standardization, and re-

standardization of pathways may take place at different pace in different countries. The closer link between national institutions and levels of standardization achieved in the comparison of Germany and the United Kingdom is informative with regard to levels of standardization that can be expected in the future following recent pension reforms.

As pension institutions in Germany are converging to the British model as recent reforms introduce a higher institutional differentiation of pension provision with an increased relevance of occupational and private pensions, the patterns for Germany can be expected to converge to the patterns of pathways to old age pension found in the United Kingdom. Arguably pathways in Germany will be particularly de-standardized in a transitional phase in which complex transitional arrangements of old and new pension regulations are in effect for different cohorts, but re-standardize in new qualitative patterns similar to those found in the United Kingdom once the reforms take full effect.

The distinction of turbulence with and without duration variation (Elzinga 2006) showed that the higher turbulence across pathways to old age pension in the United Kingdom is largely due to short term frictions, rather than ongoing discontinuity. This supports that in the United Kingdom pathways to old age pension are not emerging as a new life stage in itself, but rather mark a transition process coined by short term disruptions of reliance on various income sources. Similar frictions can be expected in Germany as recent reforms take effect that phase out institutionalized early entrance routes through partial and pre-retirement or unemployment (Ginn et al. 2007). As demonstrated with the transitory occupational pension pathways in the United Kingdom, occupational pensions can function as a substitute of state financed transition routes, e.g. via unemployment.

An emergence of higher turbulence of pathways to old age pension will also depend on the enhancement of older workers labor market mobility and re-employment chances of unemployed older workers that foster moves in and out of employment (Blossfeld et al. 2006). If the highly structured institutionalized

pension entrance routes in Germany are not replaced by firm level arrangements that function as substitutes, variability across individual pathways to old age pensions is bound to increase for successive cohorts in Germany. To the extent that this increased variability reflects labor market mobility and second career chances of older employees fostered by employment maintenance strategies, higher variability is desirable from a social policy point of view. If increased variability rather reflects 'muddling through' various precarious income sources, old age poverty will increase and welfare expenses will remain comparatively high in form of means tested benefits. This brings the qualitative patterns of old age pension, besides the quantitative assessment of sequence properties of pathways to old age pension to the fore.

Summary of results

Our findings generally underline the power of institutional structures in shaping gendered retirement transition processes and the pension consequences of divorce and childcare interruptions. Tables 8.1 and 8.2 show a summary of the hypotheses and the results.

In an exploratory analysis we identified qualitative patterns of 'typical' pathways to old age pension experienced by the study cohort in Germany and the United Kingdom. Despite the large differences in pension institutions, typical

Table 8.1: Summary of results on pathways to old age pension

Hyp	dependent variable	DE	UK
1	turbulence	low (√)	high (√)
2	standardization	high (√)	low (√)
3a/b	inequality of personal income over time	stable (√)	increasing (-)
4	inequality of household income	low (√)	high (√)

pathways could be related to each other in approximate cross national pairs that showed similar socio-demographic characteristics reflecting inequality by gender, education, income and health. A striking finding is that the 'traditional pathway' intended by the national pension systems with seamless transitions

from full-time employment to old age pension at state pension age are only experienced by less than 20 percent of the study cohort in both countries. In Germany institutionalized early entrance routes account for another 35 percent of the study cohort, while transitory occupational pensions were experienced by 18 percent in the United Kingdom. This brings to the fore that much of the debate around retirement policy refers to fairly small parts of the population, and early entrance routes occur more frequently than seamless transitions from employment to old age pension at state pension age. The remaining cohort members experienced rather individualized non-standard pathways to old age pension. For the predominantly female pathways these non-standard pathways came along with financial dependence on household resources, particularly in Germany.

The highly gendered nature of pathways to old age pension became evident in several clusters close to a 100 percent female, derived solely from sequential equivalence of pathways in both countries. Institutionalized pathways as bridge unemployment in Germany (Kohli et al. 1991) primarily institutionalized retirement transition processes experienced by men. Pathways to old age pension experienced by women are coined by part-time employment, means tested benefits and no own income in both countries, implying financial dependence on household resources. The pathways of these women are coined by the 'institution of the family' (Allmendinger et al. 1993). As a consequence women are more vulnerable to changes in their family status, e.g. through divorce or widowhood.

Female pathways consistently show lower mean income compared to typical male pathways, with the exception of women who have access to occupational pensions in the United Kingdom. Pension entrance as a shift between 'welfare classes' from one benefit category to another is markedly more prevalent for women in both comparison countries. This has the paradoxical implication that although pension policies are largely directed at life time male breadwinner careers, women's pension entrance is to a greater extent fully regulated by in-

stitutionalized state pension ages, while men face more flexibility through early entrance routes via occupational pensions, firm level arrangements and generous unemployment benefits. Our analysis highlights that a large majority of the female population, the three non-standard female pathways found in each country, are usually overlooked in retirement research focusing on labor force exit transitions (see also Allmendinger et al. 1993). These studies will therefore understate the true extent of gender inequality. The female population usually excluded is however, not one homogeneous group, but experiences distinct country specific patterns coined by part-time work, means tested benefits, widow pensions and financial dependence.

An examination of income inequalities across pathways (*hyp 3a/b, 4*) supported the hypothesis of status maintenance across pathways for Germany and the United Kingdom. Since we use summary measures of inequality we cannot assert status maintenance on the individual level. However, the competing hypotheses of cumulative advantage and status leveling imply increasing or decreasing inequality on the population level, which we did not find. Overall the analysis of personal inequality over time supports that inequality within the study cohort was maintained over pathways to old age pension. This is in line with our expectations for Germany, due to the strong intertemporal redistribution of the German pension system (Leisering 2003). For the United Kingdom we cannot assert the expectation that inequality increases. Rather the access to occupational and private pensions seems to anchor inequality early on and carries it forward over pathways to old age pension.

Inequality of personal income across pathways to old age pension is similar in the comparison countries, when including zero incomes of female homemakers in Germany. On the household level inequality is lower compared to personal inequality in both countries and lower in Germany compared to the United Kingdom. This highlights the importance of the household in mitigating income inequality particularly Germany through generous male breadwinner pensions that are designed to provide for dependent females without explicit derived

benefits for spouses as in the United Kingdom.

While the distribution of personal income across pathways to old age pension for men is similar across countries, for women they differ markedly. In Germany we found a polarization of women with no income and relatively high income. In the United Kingdom personal income of women is polarized between relatively low and high income. In Germany this reflects women with access to state pensions vs. women who fully rely on a male breadwinner's pension and have no independent income. In the United Kingdom the polarization between relatively low and high income reflects access to state pensions only, compared to women who have access to occupational or private pensions. These country specific distributions of women's personal income are the outcome of women's family life histories in interaction with the national pension systems.

The erosion of the male breadwinner context taking place in both countries since the 1970s, at a slightly faster pace in the United Kingdom (Meyer and Pfau-Effinger 2006), poses country specific challenges to the national pension system. Especially in Germany, where high male breadwinner pensions are designed to care for dependent spouses, we can expect a polarization into high income dual earner couples and low incomes couples, similar to the distribution already prevalent in the United Kingdom. Redistribution from male breadwinners to dependent wives will decline as lower gender inequality may come at the cost of higher inequality between high and low income couples intensified by assortative mating (Esping-Andersen 2008).

The second empirical chapter examined the timing of pension entrance in response to divorce and childcare interruptions. Pension sharing upon divorce emerged as a central factor for the impact of divorce on pension entrance timing, in line with *hypotheses 5a-d* (see table 8.2). Under default pension sharing as given in Germany after 1976, divorced women entered old age pension earlier and divorced men later. We argued that earlier entrance of women is enabled by an improved entitlement position having received half their husbands accu-

Table 8.2: Summary of results on pension entrance

hyp	dependent variable	predictor	subgroup	DE	UK
5a/c	pension	divorce after	women	+ (√)	- (√)
5b/d	entrance timing	pension sharing	men	- (√)	? (+ n.s)
6a-d	pension	motherhood	women	- (√)	
	entrance timing	return part-time		+ (√)	
		return full-time		+ (√)	
		continuous employment		+ (√)	
7a-d	P(occ./priv. pensions)	motherhood	women		- (- n.s.)
		return part-time			- (+ n.s.)
		return full-time			+ (+ n.s.)
		continuous employment			+ (√)

mulated entitlements in pension sharing. Men enter later, because they seek to compensate for lost entitlements through prolonged employment. This is supported by an additional analysis suggesting that the probability to be full-time employed increases for men after a divorce in Germany.

Under optional pension sharing in the United Kingdom there is no persuasive impact of divorce on pension entrance timing. Opposite to Germany divorced women tend to enter old age pension later, while divorced men rather enter earlier. We argue that this is attributable to indirect effects of divorce on pension entrance through changed employment participation. Considering that divorce is one of the primary reasons for female poverty (Uunk 2004), divorced women in the United Kingdom may be forced to prolong employment and delay pension entrance for economic reasons since they did not profit from pension sharing.

Nevertheless, we cannot fully rule out alternative explanations for the gender and country specific effects, due to our quasi experimental setting. Alternative explanations would be a lower value of leisure without a spouse inclining men in Germany and women in the United Kingdom to work longer and thus enter old age pension later. Then however, we would have expected to find the same effect for women in Germany and men in the United Kingdom, which was not the case. Cross-country differences in the stigmatization and cultural meaning of divorce

may also contribute to the effects. Due to the strong male breadwinner context across the working lives of the study cohort in both countries, these factors can be assumed reasonably stable and thus cannot account for the cross-country variation we found. In line with our hypotheses, the explanation that pension sharing directly changes options for pension entrance and enables women in male breadwinner societies to enter early, but includes men to enter later provides the most consistent account of the observed cross-country differences of pension entrance timing in response to divorce.

Compared to the analysis on divorce, the analysis of childcare interruptions and pension entrance timing is complicated by a higher interrelation of relevant components, as care credits, options to accumulate entitlements through part-time work, and specific pension regulations for women. These include the *woman's pension* option at age 60 in Germany and barriers to married women's entitlement accumulation in the United Kingdom. In line with *hypotheses 6* for Germany we found that return to part-time and full-time employment after child rearing leads to earlier pension entrance (table 8.2). We attribute these effects to the *woman's pension* option that disproportionately rewards female employment after age 40, combined with better possibilities to accumulate pension entitlements through part-time work compared to the United Kingdom. Mothers who do not re-enter employment after child rearing enter old age pension later at state pension age (65), because they have insufficient entitlements to enter earlier and are not eligible to the *woman's pension*.

The results on childcare interruptions were less conclusive for the United Kingdom (*hypotheses 7*). Instead we found a pension penalty on marriage in general that we attribute to the strong barriers to independent entitlement accumulation of married women with the *half-test* and the *married woman's exemption* until 1975. A return to part-time employment after child rearing showed no effect, reflecting the limited options to accumulate pension entitlements to state and occupational or private pensions through part-time work. Only continuous employment besides child rearing increases women's probability to enter occu-

pational or private pensions, a return to full-time employment is not sufficient.

The prospective introduction of care credits to state pensions in 1978 increased the probability to enter state pensions for women with care periods after 1978. At the same time the duration of care periods after 1978 decreased the probability to enter occupational or private pensions. We can conclude that this regulation does little to improve women's pension position, since female carers who rely on state pensions are likely below the threshold for means-tested benefits in old age (Ginn 2003). As a consequence improved access to state pensions alone cannot mitigate female carer's pension penalties. This brings the improvement of access to occupational and private pensions for female carer's to the fore.

In sum the analysis of childcare interruptions and pension entrance timing suggests the advancement of women's return to employment after child rearing for the top of the political agenda in Germany. In the United Kingdom primarily the options to accumulate pension entitlements through part-time work and barriers to occupational and private pensions need to be mitigated to counter gender inequality in pensions resulting from childcare interruptions.

What was the added value of sequence analysis?

The results obtained with sequence and event history analysis both underline the power of institutions in shaping retirement transition processes and pension entrance timing. In the following, we critically discuss the added value of applying sequence analysis.

The added value of sequence analysis has to be understood from its background in the algorithmic modeling tradition (Breiman 2001) that highlights the advantage of approaching data without distributional assumptions, providing rich descriptions, and the power of visual representations to convey information about social processes (Tukey 1977). In this sense, sequence analysis is a valuable exploratory method to additionally exploit increasingly available longitudinal data.

A strong point of sequence analysis in our application is the possibility to narrow the gap between empirical and theoretical retirement research. Sequence analysis enabled us to implement the theoretical conceptualization of retirement as a process of sequentially linked states empirically, treating sequences as units of analysis with certain properties assumed to vary with macro institutions. We formulated a clear concept of the sequence we are theoretically interested and derived specific hypotheses from theories on the institutionalization of the life course. This relates to the concept of construct validity based on the logical and empirical relationship among constructs (Babbie 1979). Since we found the sequence structures we theoretically expected we can conclude that construct validity is given.

In applications where there is no reason to expect clear patterns and case numbers are small, pattern search may indeed resemble 'fishing for patterns' (Wu 2001). A cluster stopping rule as the relative improvement rule would have identified and rejected this. In our application we provided a rigid and clear criterion to determine the correct number of clusters with the relative improvement rule and ensured that the clusters provide a minimum standard of discrimination between groups at half of within to between cluster distances.

Arguably one of the greatest weaknesses in our application of sequence analysis to pathways to old age pension and sequence analysis in its current stage, is that policy conclusions are not straightforward. We are only beginning to understand structures of life course processes holistically. While technical advancements have been rapid, the implications of the results is less clear. We found precise answers to the questions we asked: the degree of standardization and turbulence across pathways to old age pension and prevalent pathways that reflect social structures over time. A combination with rigid cluster stopping rules and bootstrap methods was helpful to avoid 'fishing for patterns' and ascertain the results. The next question is what can we infer from different degrees of standardization and turbulence in pathways to old age pension? Are standardization and turbulence a good or a bad thing? Do they indicate a higher

degree of individual choice or precarious instability? How can we assess this? As sequence analysis is foremost a descriptive tool, both in an exploratory and a confirmatory sense, the step from description to implication remains a core challenge that requires further theory development.

The development of sequence methods have made a large step forward in answering questions about the structure of trajectories and the analytical separation of different properties of sequences (Brückner and Mayer 2005). We have come closer to answer the questions whether standardization and differentiation are actually taking place in different contexts, but are less sure about what they mean. This, however is foremost an analytical, substantial, and theoretical, rather than a methodological question.

Further methodological development of sequence analysis requires more research on what can be inferred from sequence properties. Possibilities would be to link average sequence summary indicators to subjective well-being or other outcomes. Current limitations to the insights gained with sequence analysis may not be a flaw of sequence analysis as a technical tool, but rather our lack of knowledge about the correlates of sequence characteristics. As any other method sequence analysis is dependent upon strong theoretical guidance. Further technical developments and theory on sequences and sequence structures have to cross fertilize each other to establish sequence analysis as an enduring and indispensable component of the methodological toolbox in the social sciences in general and in life course research in particular.

In event history analyses it is usually far more clear whether a late or early transition is a good or a bad thing, whether we want a process to be of long duration or not. The complexity of sequence characteristics makes this second step of inferring meaning from sequence properties more difficult. In addition to the blockbuster application Andrew Abbott noted as a requirement for the breakthrough of sequence analysis (Abbott 2000: 75), the policy relevance of sequence results and guidelines for a normative evaluation of sequence characteristics will be important to convince a broader audience of its usefulness.

Sequence properties only amount to a meaning in combination with each other (Brückner and Mayer 2005) - it is exactly this meaning that we have to put more effort in understanding.

This, however, does not diminish the value of the sequence analysis approach in visualizing processes over time as is possible with sequence index plots. They are easily accessible and contain rich information on how social processes evolve over time. Event history analyses do not assert causal relationships in a strict sense, but derive a causality claim from the dynamic reconstruction of temporal processes (Blossfeld 1996). Sequence analysis can be illuminating in this sense as well.

Table 8.3 summarizes the core substantial results obtained with sequence and event history analysis in this thesis. They can be summarized in two simple but telling sentences. The list of results obtained with event history analysis is longer and they imply more immediate suggestions for policy intervention. The list of results gained with sequence analysis include findings that cannot be obtained with any other method, are new to the literature, and as such highlight 'thinking sequentially' as a still under explored but promising field of research that can realign theory and empirical research on life course questions.

A final note should be made on the complementary potential of sequence analysis and event history analysis. Rooted in different research traditions and directed at different concepts, the trajectory vs. the transition, they are not complementary as methods for the same questions on a *concrete level*. Sequence analysis is not conducive to examine the impact of divorce or childcare interruptions on the timing of pension entrance. Event history analysis cannot grasp the structure of pathways to old age pensions in a holistic and comprehensive way. The two methodological approaches rather are complementary with regard to research questions on a more *general level*. In our case this relates to the question of how gender disparities over the life course translate into gendered retirement transition processes. Sequence analysis revealed qualitative gender specific pathways to old age pension, while event history analysis showed up

Table 8.3: Comparison of results from sequence and event history analysis

sequence analysis	event history analysis
• pathways to old age pension are more turbulent in the United Kingdom compared to Germany, but the higher turbulence reflects short terms frictions in overall stable trajectories not ongoing discontinuity • pathways are less standardized in the United Kingdom compared to Germany both in terms of timing and order of states • prevalent pathways in both countries can be related to each other in approximate cross-national pairs. In both countries, pension entrance is a shift from one benefit category or having no independent income particularly for women	• default pension sharing upon divorce leads to earlier pension entrance of women and later pension entrance of men in male breadwinner societies • optional pension sharing had no persuasive effect, but points in the opposite direction: women enter later and men enter earlier • mothers in Germany generally enter old age pension later compared to childless women, but mothers who returned to any form of employment, including part-time work enter earlier • in the United Kingdom women face a pension penalty on marriage in general related to the barriers to independent entitlement accumulation of females based on marriage • mothers who were continuously employed have a higher probability to enter occupational pensions in the United Kingdom, return to part-time or full-time employment are not sufficient

how specific family life events contribute to variations in the central transition within pathways to old age pension, the pension entrance transition. In our application sequence and event history analysis were complementary in enhancing our understanding of the powerful impact of national institutions in the emergence of gender inequalities in retirement processes as the outcome of gendered life courses.

Implications for the German and British old age pension system

In this section we provide a non-technical summary of the core results and emphasize implications for the German and British pension system. Four core implications relate to (1) possible strategies to narrow gaps between employment and old age pension entrance, (2) the current and future role of pension sharing upon divorce, (3) strategies to mitigate pension penalties on childcare interruptions of women, (4) the importance of modes of policy implementation for the impact of family provisions in pensions.

(1) Strategies to narrow gaps between employment and old age pension: the sequence analysis powerfully demonstrated that seamless transitions from employment to pension entrance are an exception rather than the norm in both comparison countries. There are very different types of gaps - no own income, unemployment, disability, muddling through marginal employment and income support. In order to simultaneously foster continuous retirement transition processes and unburden social security systems these gaps have to be narrowed.

Different types of gaps offer varying potential for intervention and call for different strategies to narrow them. In order to derive successful strategies it is important to understand the different types of gaps and their temporal structure. Transitory occupational pensions are neither costly for the state, nor precarious for individuals and thus do not call for policy intervention. Gaps related to disability can arguably only be narrowed by increasing public health and disability prevention, or by fostering career shifts toward jobs people with

minor disabilities are capable of doing. Disability pathways, however, may also be used as a bridge by people who are not actually disabled, but manage to fulfill eligibility requirements. As alternative pathways, e.g. via unemployment are closed in Germany, disability pathways may become more frequent as a substitute, if eligibility rules fail to correctly discriminate between those truly uncapable of work and those unable or unwilling to continue work. Gaps via unemployment, no own income or 'muddling through' various income sources and reliance on state support burden social security systems and are precarious for individuals. Therefore, they require the most policy attention. They primarily affect women and people with low education.

Gaps can in principle be narrowed from two directions, relating to push factors out of the labor market and pull factors into old age pension: prolonged employment and earlier pension entrance. Earlier pension entrance is not a viable strategy, because it endangers both the financial sustainability of pension systems and the productive participation of older workers in the labor market, particularly in light of rising life expectancies. This leaves the prolongation of employment as the obvious strategy to narrow gaps between employment and pension entrance. Increasing the official state pension age, as will soon take effect in Germany (from 65 to age 67) and for women in the United Kingdom (from 60 to 65), will only prolong gaps if not accompanied by measures to prolong employment. Rather than simply augmenting state pension age, the actual challenge is to close existing gaps and foster longer employment of older workers.

The prevalence of different types of gaps is gendered as a result of gendered life courses. As a consequence gender specific policies are needed. Our findings suggest that policies to narrow gaps between employment and old age pension entrance of women have to set in at earlier life course phases, at the crucial re-entry to the labor market after child rearing. For men a prolongation of employment in later life is promising to narrow existing gaps. For women the challenge is to achieve higher rates of stable re-entrance to the labor market

after child birth, otherwise they cannot be reached by measures to prolong employment of older workers in general. We can conclude that measures to narrow gaps between employment and old age pension entrance have to be targeted at different life course stages for men and women to be effective.

In addition to prolonging employment another possibility to unburden pension systems and at the same time prevent precarious discontinuous pathways to old age pension for individuals, is to increase the prevalence of transitory occupational pensions. Transitory occupational pension pathways simply shift the coverage of risk from the state and individuals or families to employers. However, this may endanger competitive capacities of companies and will not be easy to implement politically. Even if occupational pensions take a more prominent role, coverage of risk can be quite easily shifted back to individual employees through the type of pension plan offered by the company, e.g. through defined contribution rather than defined benefit plans as has been increasingly the case in the United Kingdom (Ginn 2003), and also in the United States (Shuey and O'Rand 2004).

Strategies to prolong employment of older workers may require to not only to address how older workers have to change to remain employable, but also how jobs and work environments can be adapted to enable longer employment participation. As strategies to prolong employment of older workers reach limits, which is certainly far from being the case, creative thinking about other forms of productive and fulfilling gaps is needed. Possibly viable routes could be subsidized volunteering and social engagement between employment and pension entrance, or an establishment of 'second career' options by identifying and creating jobs that can be targeted at older workers.

(2) The current and future role of pension sharing upon divorce: pension sharing upon divorce does not only change pension levels, but also the timing of pension entrance in a gender specific way. Regulations on pension sharing upon divorce are of particular relevance, if pension entitlements are on average very

unequally distributed among spouses. Pension sharing is going to lose relevance for successive cohorts, as marriage is increasingly less relevant as a reason to give up employment. Nevertheless, for the cohorts born in the 1940s and 1950s the importance of pension consequences of divorce can be expected to increase. As divorce rates increase in the near future regulations on pension sharing will affect a larger part of the population, and life courses of these cohorts are still coined by a relatively traditional division of labor. For later cohorts pension entitlements will be more equally distributed among spouses, due to higher female labor force participation and thus will be less gendered compared to the study cohort.

An increasing detachment of fertility and marriage (Ginn 2003), with rising birth rates out of wed-lock calls for an abolition of derived benefits based on marriage in favor of improved recognition of care periods in pensions. If marriage is no longer a reason to give up employment pension sharing and derived benefits for married spouses become obsolete bringing an increased recognition of childcare compensation in pensions to the fore, leading to core implication 3, strategies to mitigate pension penalties on childcare.

(3) Strategies to mitigate pension penalties on childcare interruptions of women: pension penalties for childcare can be changed in several ways. First, by regulations that directly connect childcare to entitlement positions, as care credits in pensions. Second, by altering the amount of employment through which women accumulate independent entitlements. Third, by improving pension benefits for part-time and discontinuous work. This implies that to the extent that general career penalties on child rearing are mitigated, pension penalties are automatically reduced.

Since the male breadwinner structure in effect for the study cohort is eroding in Germany and the United Kingdom, childcare interruptions will take a different meaning for pension outcomes in the future. Successive cohorts of women will be higher qualified and have more stable labor force attachment over their life

courses. Yet as long as the household division of labor is not equalized, career penalties on childcare create gendered life courses that carry over to gendered pathways to old age pension. Care credits that are only awarded to women who give up employment set wrong incentives, since they encourage to leave the labor market and make re-entry after interruptions difficult. Thus a central component of the solution to mitigate pension penalties on childcare interruptions has to be to mitigate female carer's general career penalties and achieve a more equal gendered division of labor in the household. This can be achieved by incentivizing re-entrance to the labor market after child rearing and through better pension compensation for types of employment that are compatible with (part-time) child rearing. Our findings support that in Germany incentivizing re-entrance to employment after child rearing is of prime importance. In the United Kingdom better pension compensation of employment that is compatible with child rearing, i.e. possibilities to accumulate pension entitlements through part-time work and better access to occupational and private pensions is of prime importance. If this is not achieved the mere amount of female carer's employment will not mitigate pension penalties on childcare interruptions.

(4) The importance of modes of policy implementation: our findings support that not only the type of family provision in pensions, but also the way it is implemented is consequential. Our comparison of the impact of default and optional pension sharing on pension entrance suggests that family provisions in pensions are only effective if introduced as defaults. If they have to be actively claimed they have little effect. This is arguably attributable to the high complexity of pension regulations and the large time lags between benefit accumulation and benefit receipt.

Large time lags and complexity involved in the decision situation of pension entrance, particularly if relevant decision have to be made in times of emotional trauma and stress as induced by divorce, make it impossible for policies to rely on individual rationality in the strict sense to guide decision making and

arrive at social optimal outcomes (Aaron 1999). This suggests that whether regulations are introduced as defaults or options, i.e. framed as gains or losses, may be more important than the magnitude of financial incentives for certain behavior. As a consequence more effort should be put in designing modes of implementation in addition to the substantive content of policy regulations (Schmid 1996).

An ongoing normative point of debate is whether paternalistic institutions as mandatory pension systems are necessary to provide adequate pension provision, or if freedom of choice in the tradition of liberalism should be a political priority. A middle ground is to specify participation in pension systems as defaults from which individuals still have the option to actively renounce. Individuals would still have the freedom to contract out, but in line with other research our findings suggest that participation rates would be higher fostering better pension coverage (see e.g. Madrian and Shea 2001).

Limitations and future research

Our analysis is subject to several limitations, some arise from the data, others are conceptual. Limitations from the data include that pension types could not be further distinguished in both countries. In Germany the separation of disability and occupational pensions, even though the later likely do not play a major role as a primary income source alone, would be useful to investigate the role of disability pensions and the simultaneous occurrence of occupational and state pensions. In the United Kingdom a distinction between Basic State Pensions (BSPs) and State Earnings Related Pensions (SERPS) would be desirable, particularly since women will be more likely to rely on BSP alone. We could thus not grasp this dimension of gender inequality, the differentiation within state pensions, in our analysis of pathways to old age pension.

Concerning conceptual limitation, the behavioral assumptions underlying our rational choice framework are debatable. The assumption that people generally enter as early as possible is relatively crude, but was useful to derive testable

hypotheses on the impact of structural constraints on pension entrance resulting from divorce and childcare interruptions. From the perspective of theory development on the relationship between family biographies and retirement, our analysis supported that structural constraints matter. The next necessary step to arrive at a basic theoretical framework is to examine how these structural constraints interact with possibly divers behavioral strategies. This can be realized by testing several behavioral assumptions for different subgroups of the population against each other in both countries. The analysis of diverging behavioral strategies of high and low skilled individuals are arguably the most important next step. Qualitative research on individual retirement preferences following events as divorce would be equally useful to gain a better understanding of individual preferences.

We cannot unambiguously attribute the effects found for divorce to direct effects of pension sharing. We carefully discussed alternative explanations and came to the conclusion that the explanation via direct effects that change pension entrance options in response to divorce in a country specific way are the most plausible account of the observed effects. It still remains an approximation in a quasi experimental setting without randomization. In future research it would be useful to account for selective probabilities to experience divorce or childcare interruptions in a two stage model in which the selectivity on the predictors, the 'treatment variables', would be taken into account explicitly. A possibility may be an integration of counter factual techniques in the event history framework, similar to the approach taken in G-estimation (e.g. Robins et al. 1992).

A recurring topic in this thesis is the importance to be precise about the dependent variable retirement. 'Retirement' is a fuzzy concept that requires exact definition in any analysis. Different definitions refer to different populations, leading to selective exclusions that have to be taken into account in the choice of an appropriate conceptualization of retirement for the research question at hand. For the analysis of retirement consequences of family biographies, labor force exit is a problematic outcome in societies in which labor force partici-

pation rates and family responsibilities are unequally distributed between men and women.

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