Gender inequalities in health at older ages

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A longitudinal and comparative investigation across European countries

Damiano Uccheddu

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CHAPTER 1

Introduction

CHAPTER 1

1. Introduction

1.1. Research Problem and Background

Gender inequalities in health have been the topic of much research in the past decades (Rieker, Bird, and Lang 2010) and reducing them is one of the main objectives of active and healthy ageing research and policy (Foster and Walker 2013; Grundy 2006; Manandhar et al. 2018; OECD 2017; Östlin 2002). Several studies have shown that in virtually all societies women live longer than men, yet systematically report higher rates of morbidity, disability, and healthcare utilization (Case and Paxson 2005; Crimmins, Kim, and Solé-Auró 2011; Crimmins et al. 2011; Crimmins and Saito 2001; Dahlin and Härkönen 2013; Read and Gorman 2010; Springer, Hankivsky, and Bates 2012; Verbrugge 1989). Aside from biological characteristics, several other factors may underpin gender inequalities in health. Gender-specific disparities in terms of social and employment-related (dis-) advantages and economic resources may contribute to widening the gender gaps in physical and mental health throughout the life course (Bird and Rieker 1999, 2008; Delaruelle, Buffel, and Bracke 2018; Denton and Walters 1999; Oksuzyan, Gumà, and Doblhammer 2018; Read and Gorman 2010; Rieker et al. 2010; Roxo, Bambra, and Perelman 2020). Despite mounting evidence regarding the role of various social and economic factors in explaining gender inequalities in health, important questions remain unanswered including how inequality in later life health is related to gender inequalities in the work and family spheres (Doblhammer and Gumà 2018; Hank and Steinbach 2018).

This dissertation builds on the idea that life course events interact with gender to determine health outcomes. The aim is to investigate whether, and to what extent, men and women are the subject of different health outcomes after experiencing a specific life course event or series of events. To achieve this goal, I adopted a multifaceted approach towards gender inequalities in health to shed more light on the mechanisms linking gender to health status in later life. In so doing, I examined several aspects of the phenomenon from different perspectives – and across different European countries – by looking at a very specific set of mechanisms that relate to gender inequalities in social and economic resources, family relationships, and care responsibilities.

1.2. Theoretical considerations

1.2.1. Gender inequalities in health: possible underlying mechanisms

Interdisciplinary health research highlights several explanations for health differences between men and women. Most earlier studies on this topic suggest that gender inequalities in health may stem from three main causes (Bird and Rieker 1999; Gordon and Hubbard 2019; Oksuzyan et al. 2018; Read and Gorman 2010): (1) biological gender differences (*e.g.,* hormone production, sex differences in the burden of chronic diseases, etc.) (Case and Paxson 2005; Gordon and Hubbard 2019); (2) gender differences in health reporting (Benyamini, Leventhal, and Leventhal 2000; Idler 2003; Oksuzyan et al. 2019); and (3) gender differences in social determinants of health. This last reason is the focus of this dissertation and it is explained in more detail below in this subsection.

Previous research has stressed how gender differences in health are influenced by inequalities in the distribution of social determinants of health (Dahlin and Härkönen 2013; Denton, Prus, and

Walters 2004; Zajacova, Huzurbazar, and Todd 2017). Social determinants of health are defined by the World Health Organization (WHO) as "the conditions in which people are born, grow, live, work, and age" (CSDH 2008:1), which include education, money, power, social connections, and other social factors (CSDH 2008). A wider set of social, political, and economic macro-level factors – which operates at global, national, and local levels – shapes these circumstances (CSDH 2008).

The most extensive research on gender inequalities in health focuses on the unequal allocation of social and economic resources between men and women. Much of it concerns how socioeconomic status (SES) may fundamentally cause unequal health outcomes for men and women (Denton and Walters 1999; Huisman, Kunst, and Mackenbach 2003; Lahelma et al. 2002; McDonough and Walters 2001; Östlin 2002). To explain women's worse health status, researchers emphasize their overrepresentation in groups with lower SES and their lesser control over SES resources as compared to men. The underlying idea is that SES embodies an array of "flexible resources" (Phelan, Link, and Tehranifar 2010) – such as knowledge, money, power, prestige, or time – that can be used to cope with stressful life events or to avoid and deal with illnesses, minimizing their negative consequences on health (Link and Phelan 1995). Therefore, women's relative lower SES may expose them to conditions that can be detrimental to health, or impede their access to health-related resources (McDonough and Walters 2001; Östlin 2002; Read and Gorman 2010; Rieker and Bird 2000; Ross and Bird 1994). This scholarship provides valuable findings and clarifies how the unequal distribution of SES resources interacts with gender and physical or mental health.

Next to socioeconomic resources, other specific aspects of the social organization of men's and women's lives and relations contribute to gender inequalities in health in later life. Social roles, role-related activities, and differences in social or economic burdens of family responsibilities are considered another central explanation (Bird and Rieker 1999; Read and Gorman 2010). For example, the unequal allocation of unpaid family work (*e.g.,* childrearing, caregiving, household work, etc.) or the double burden of paid work and unpaid family work can be regarded as fundamental social determinants of health (Link and Phelan 1995; Phelan et al. 2010). Contrary to SES, which arises because of gender-based inequalities in education and the labour market, this mechanism regards inequalities in the gender division of family responsibilities (Bird and Rieker 2008; Link and Phelan 1995). A consequence of these inequalities is the increased exposure to stress for women, as compared to men, which in turn has negative health effects (Pinquart and Sörensen 2003; M. Pinquart and Sörensen 2006; Schulz and Martire 2004; Zarit, Reever, and Bach-Peterson 1980).

1.2.2. Life course perspective and social stress theory

To investigate the above-mentioned mechanisms – i.e., the unequal allocation of socioeconomic resources and family responsibilities between men and women – this dissertation is guided by two general frameworks: the life course perspective (Pearlin 2010; Pearlin et al. 1981; Pearlin and Skaff 1996) and the theories of social stress (e.g. Pearlin et al. 1981). The life course perspective is a theoretical approach that can be used to understand the later years of life as the consequence of early-life choices, opportunities, and constraints (Elder 1994). "Life course" can be defined as the combination of "interlocking trajectories or pathways across the life span that are marked by sequences of events and social transitions" (Elder and O'Rand 1995:453) and, more specifically, "a sequence of socially defined events and roles that the individual enacts over time" (Giele and Elder

1998:22). According to this perspective, later-life health is influenced and determined by how life trajectories develop and intertwine with family responsibilities at a younger age. Therefore, a person's past work and family experiences become written into the physiology and pathology of their body by a literal "embodiment" of social inequalities in men's and women's bodies (Blane 2006; DiPrete and Eirich 2006; Willson, Shuey, and Elder 2007). In addition, the life course is typically gendered, as men and women have systematically different biographical paths and pacing, crucial life events, and linked lives that might shape health inequality (Moen 2001). For example, if women are intensively providing care to family members in need during particular life course stages and yielding fewer positive outcomes from caregiving (Lin, Fee, and Wu 2012), this may be a source of health disadvantage relative to men of similar ages.

Theories of social stress, such as the Pearlin's stress-process model (Pearlin 2010; Pearlin et al. 1981; Pearlin and Skaff 1996), conceptualize stress as the result of excessive life demands combined with insufficient resources capable of addressing such demands. Within this framework, work and family life can be understood to be domains that may bring individual rewards (*e.g.,* more socio-economic or health-related resources) but also stress and strain. These stressors may in turn result in negative well-being outcomes (Pearlin et al. 1981, 2005). Unpaid family caregiving, divorce, or involuntary job loss are typical examples of family- and work-related stressors which impact physical and mental health conditions later in life (Pearlin et al. 1990, 2005; Martin Pinquart and Sörensen 2006). These processes are linked with detrimental consequences for health outcomes, including both physical and mental health (Shockley and Allen 2013), particularly for women (Lundberg and Frankenhaeuser 1999; Matud 2004).

Next to the conceptual integration of the life course perspective with the theories of social stress, this dissertation emphasizes the importance of the heuristic principle of "linked lives" – i.e., the recognition that individuals' lives are embedded in social relationships with nearest others and influenced by them, especially across generations by bonds of kinship (Elder 1994, 1995; Settersten 2005). This suggests that the life courses of one family member might influence the well-being of another family generation by reverberating through the ties of a family network (Elder 1994), and more so for women (Moen 2001).

1.2.3. Institutional context

Life course theory suggests that micro-level individual choices and behaviours are socially structured by the institutional context in which individuals are embedded (Bernardi, Huinink, and Settersten 2019, 2020; Kohli 2019; Mayer 2019). Institutions, such as the welfare state, play an important role in shaping public health (Bambra 2016; Beckfield et al. 2015) and in addressing the fundamental causes of health inequality (Freese and Lutfey 2011; Link and Phelan 2010; Phelan and Link 2013; Raphael and Bryant 2015). The social organization of the welfare state is a major force that influences the association between social conditions, life course events of social nature, and statuses – such as gender (Harder and Sumerau 2018; Link and Phelan 1995a) – on the one side, and health, illness, and healing on the other side (Beckfield et al. 2015; Freese and Lutfey 2011; Link and Phelan 2010; Phelan and Link 2013). Comparative health research has been largely interested in classifying welfare states into regime clusters (for a review, see Bambra 2007b). Esping-Andersen (1990) elaborated an empirical typology composed of three welfare regimes, each characterised

by a specific configuration between state, market and family in offering varying levels of welfare provision: the *social-democratic* regime (encompassing, universal, equalising, and comparatively generous benefits; for example, Denmark, Norway, and Sweden), the *liberal* regime (minimal provision of welfare, heavy reliance on the private sector, modest benefits, strict entitlement criteria, and usually means-tested and stigmatised recipient; for example, United Kingdom and the United States), and the *conservative* regime (a status differentiating welfare, with a high role for employers, and a marginal role of the market) (Esping-Andersen 1990).

Esping-Andersen's three worlds' typology is based on three dimensions: de-commodification, social stratification, and integration/interaction between the state, the market, and the family in the allocation, provision, and (re)distribution of social and economic resources vital to protect against social risks (*e.g.,* unemployment, disability, sickness, and old age) (Esping-Andersen 1990, 1999). The first dimension, *de-commodification*, refers to "the degree to which individuals, or families, can uphold a socially acceptable standard of living independently of market participation" (Esping-Andersen 1990:37). The second dimension, *social stratification*, refers to the role of the welfare state in shaping the class and social order. As suggested by Esping-Andersen, "[t]he welfare state is not just a mechanism that intervenes in, and possibly corrects, the structure of inequality; it is, in its own right, a system of stratification. It is an active force in the ordering of social relations" (Esping-Andersen 1990:23). The third dimension regards the *integration/interaction* of the three main inequality-shaping institutions: the state, the market, and the family (Esping-Andersen 1990, 1999, 2005). These three risk-managing institutions constitute the "welfare triad" – i.e., the main sources of allocation, provision, and (re)distribution of welfare within societies – and they operate concurrently in managing social risks (Esping-Andersen 1999).

What characterizes distinct institutional contexts (i.e., welfare regimes) are (*i*) the different ways in which the risk is managed among the three institutions, and (*ii*) the interplay among them. This means that in each welfare regime one of the three institutions (state, market and family) plays a major role in the risk management and the allocation, provision, and (re)distribution of welfare. The state is the institution that exerts the main role in the social-democratic regime, the market represents the major force in the liberal regime, while the family is the chief institution in the conservative regime. Nonetheless, in each welfare regime, the three institutions operate simultaneously and the activity of one of them unavoidably affects also the others. What makes each welfare regime peculiar is the primary institution that plays the major role in these activities, and the way the three institutions are interconnected.

The role of the welfare state is important to population health and gender equality in health in terms of how the state interacts with the family (DiPrete 2002), and thereby reducing the specific welfare burden on women (Bambra 2007a; Esping-Andersen 1999; Korpi 2000). Esping-Andersen's (1999) concept of de-familialization is particularly relevant for this dissertation. De-familialization refers to the extent to which the welfare state permits individual entitlements to a socially acceptable standard of living *independent of family relationships*. While high levels of de-familialization (and decommodification) are characteristic in Social Democratic welfare states, women in Conservative countries (especially Southern European countries) are strongly dependent on family. In this dissertation, I make use of gender stratification concepts, specifically de-familialization

(Bambra 2004, 2007a; Esping-Andersen 1999; Korpi 2000), in combination with others like the decommodification of labour and healthcare.

Another central aspect of welfare state regime theory is devoted to countries' approaches to the care of dependent individuals (Esping-Andersen 1990; Kaschowitz and Brandt 2017). On the one hand, state and family might complement each other in the provision of care to dependent individuals (e.g., children, frail adults, etc.). On the other hand, there might be an inverse relationship between formal service provision and informal family care (state and family can substitute for each other) (Kohli 1999; Künemund and Rein 1999). The complementarity between family and state can be seen as a specific form of division of labour in terms of "specialization" (Brandt 2013:46; Kaschowitz and Brandt 2017) and it is expected to be more prevalent in social democratic welfare states, where "family members are [...] enabled to give additional support to their relatives if, when and in which form they like to" (Brandt 2013:30). This pattern is expected to be inverted in less generous welfare states (*e.g.,* liberal or conservative), in which women are compelled to supply more intense forms of informal care and support (Bonsang 2007; Brandt 2013; Kaschowitz and Brandt 2017). Therefore, different levels of welfare provisions and different combinations of social risk management among the state, the market, and the family might influence the extent to which women can participate in the labour market. In turn, this influences the need to rely on (female) family members for caregiving, with consequences for women's health conditions.

1.3. Research questions addressed in this book

The main aim of this dissertation is to provide a more in-depth picture of the complex relationships between gender and health in later life. To achieve this goal, this dissertation elaborates on four specific sets of research questions.

First, this dissertation focuses on gender differences based on the social determinants of health that are of a socioeconomic nature. In doing so, I adopt a multidimensional approach towards socioeconomic status (SES) to examine to what extent the differential impact of three measures of SES (namely education, income, and wealth) on the health of women and men varies across different macro-level contexts. The main research question is:

- How does the impact of SES on health after midlife vary among women and men depending on the socioeconomic context in which individuals are embedded (i.e., welfare cluster)? (*Chapter 2*)

Second, to better understand how family responsibilities have an impact on later life health, I adopt a life course perspective. In doing so, I analyse how whole *early-life* family and work trajectories are associated with health in later life. I address the following research questions:

- To what extent are specific work-family life courses associated with different levels of objective physical health in later life? (*Chapter 3*)
- Which work-family life course is the most important predictor of objective physical health for men? And which one for women? (*Chapter 3*)

- To what extent do the associations between work-family life courses and objective physical health in later life vary across institutional contexts? (*Chapter 3*)

Third, another important aspect of the link between gender and health is related to stressful demographic transitions experienced during *adulthood*. To investigate the role of these events, I examined the intergenerational consequences of marital disruptions, which are relatively rarely explored. Extending the life course perspective to other family generations (Elder 1994, cf. "linked lives" 1995; Settersten 2005), I assessed the influence that adult children's union dissolution can have on the health of their older parents. The research question arises of how fathers and mothers respond to the divorce of adult sons or daughters in terms of health.

- How does adult children's union dissolution affect the health conditions of an older parent? (*Chapter 4*)
- Does the impact of adult children's divorce on parental health differ between fathers and mothers? (*Chapter 4*)
- Does the gender of the child play a role? (*Chapter 4*)

Fourth, it is important to better understand whether and how family responsibilities *in later life* might play a role in unravelling the nexus gender-health. Spousal caregiving offers a unique opportunity for investigating how gender shapes the impact of care responsibilities on health in later life. Therefore, I investigate the following research questions:

- Do the transitions into the role of spousal caregiving have the same effect on individual health as the transitions out of the role of spousal caregiving (in the opposite direction)? (*Chapter 5*)
- Does the impact of the transition into and out of caregiving on health in later life differ between women and men? (*Chapter 5*)
- If so, does the specific welfare state arrangement play a role? (*Chapter 5*)

Overall, answering these questions is important because it helps to shed more light on whether the gendered impact of family responsibilities on health is static or dynamic along the caregiving trajectory.

1.4. Data and analytic strategy

1.4.1. Data sources

In this dissertation, I make use of individual-level panel data from both survey and administrative sources. First, I analyse data from the Survey of Health, Ageing and Retirement in Europe (SHARE) (Börsch-Supan et al. 2013). Second, I exploit a data linkage between the Dutch component of SHARE with unique administrative longitudinal data hosted by Statistics Netherlands (CBS), that is the System of Social-statistical Datasets (SSD) (Bakker, van Rooijen, and van Toor 2014).

SHARE is a multidisciplinary, cross-national, and longitudinal panel dataset containing detailed individual-level information on objective and subjective health, socioeconomic status, and family structure of European adults aged 50 or older. SHARE covers the 27 European Union (EU) member states plus Switzerland and Israel. The data collection is based on computer-assisted personal interviewing and the sampling strategies varied by country. Detailed information about the entire SHARE project is available at www.share-project.org. To date, SHARE has collected five prospective panel waves of current circumstances (waves 1, 2, 4, 5, and 6) and two retrospective life histories surveys as part of the "SHARELIFE" project (waves 3 and 7).

The second data source I use is the System of Social-statistical Datasets (SSD) (Bakker et al. 2014). The SSD is a combination of various administrative micro datasets, among which are the population, housing, and tax registers. The SSD covers the entire population of the Netherlands and contains detailed and complete individual-level data on family histories (e.g., the occurrence and timing of cohabitations and separations, leaving and returning to the parental home, etc.), education, work histories, and healthcare use. In addition, using data from the SSD, it will be possible to identify the place of residence of both parents and children and calculate different measures of intergenerational geographic distance. Dutch SHARE respondents, who gave consent, are then linked to their children's registry data from the SSD. Table 1 contains the datasets used in the empirical chapters.

Table 1. Dataset used in the empirical chapters

Dataset	Reference	Years of data collection	Chapters
SHARE, Wave 1	Börsch-Supan et al. (2013)	2004-2005	Chapters 2, 3, 4, and 5
SHARE, Wave 2	Börsch-Supan et al. (2013)	2006-2007	Chapters 2, 3, 4, and 5
SHARE, Wave 3 (SHARELIFE)	Brugiavini et al. (2019)	2008-2009 (2010 for Ireland)	Chapter 3
SHARE, Wave 4	Börsch-Supan et al. (2013)	2011-2012	Chapters 2, 3, 4, 5
SHARE, Wave 5	Börsch-Supan et al. (2013)	2013	Chapters 2, 3, 4, 5
SHARE, Wave 6	Börsch-Supan et al. (2013)	2015	Chapters 2, 3, 5
SHARE, Wave 7 (SHARELIFE)	Brugiavini et al. (2019)	2017	Chapter 3
SSD	Bakker et al., (2014)	1995-2018	Chapter 4

Note: SHARE: Survey of Health, Ageing and Retirement in Europe; SSD: System of Social-statistical Datasets.

SHARE and the SSD have three major advantages. First, they contain repeated information on the same unit of analysis (i.e., the individual) in several points over time. This hierarchical structure of the data – where multiple observations over time are nested within the same unit of analysis (i.e., a prospective panel design) – makes it possible to assess *changes* over time, related to the same individual, as well as to provide precise information on the sequence of events. This has considerable advantages for causal analysis, especially when dealing with unobserved time-constant heterogeneity.

Second, the two sources of data are exceptionally well suited for life course research. On the one hand, SHARE has been enriched through a long retrospective (waves 3 and 7), aimed at giving an account of the entire life history of fertility, employment, and partnership of the respondents until the time of the interview. On the other hand, the SSD is longitudinal and contains micro-level information on the family histories of each SHARE respondents' child. For this reason, it opens the possibility to extend the life course perspective to other family generations. In Europe, there are no surveys that collect complete and detailed information on the life course histories of all the children of a given respondent. What was still missing in the literature, was a data linkage between different sources of data that can enable the incorporation of detailed life-course histories of children (that are never recorded in surveys) with detailed information on the subjective and objective measures of physical and mental health of their parents (that are often not recorded in administrative data).

Third, SHARE was purposefully designed to provide comparable multidisciplinary data from representative samples of European populations living in 29 countries. Considering the vast cross-national differences in social stratification and welfare state institutions of European countries, SHARE allows extending the analysis of gender and health beyond a single-country to a cross-national comparative perspective. This is essential to advance the understanding of how later-life health inequalities emerge, and under which institutional conditions they can be expected to change. Table 2 shows the countries under analysis in each chapter of the dissertation.

Table 2. Countries under analysis in each chapter.

Country	Chapter 2	Chapter 3	Chapter 4	Chapter 5
Austria	√	√		√
Belgium	√	√		√
Bulgaria		√		
Croatia		√		
Cyprus		√		
Czech Republic		√		√
Denmark	√	√		√
Estonia		√		√
Finland		√		
France	√	√		√
Germany	√	√		√
Greece		√		√
Hungary		√		
Ireland		√		
Italy	√	√		√
Latvia		√		
Lithuania		√		
Luxembourg		√		√

(continued)

Table 2. Continued.

Country	Chapter 2	Chapter 3	Chapter 4	Chapter 5
Malta		√		
Netherlands		√	√	√
Poland		√		√
Portugal		√		√
Romania		√		
Slovakia		√		
Slovenia		√		√
Spain	√	√		√
Sweden	√	√		√
Switzerland	√	√		√

Note: Chapters 2, 3, 4, and 5 use data from the Survey of Health, Ageing and Retirement in Europe (SHARE) project; Chapter 4 is based on a data linkage between the Dutch component of SHARE with administrative data from the System of Social-statistical Datasets (SSD).

1.4.2. Outcome variables

The main measure used in this dissertation is the Frailty Index (Romero-Ortuno and Kenny 2012), which is an accessible and sensitive age-independent indicator of accumulation of health deficits in multidimensional health domains (Kulminski et al. 2006, 2007; Mitnitski et al. 2002; Rockwood and Mitnitski 2007). Frailty is a broad concept increasingly used to describe the condition of older people being vulnerable to adverse health outcomes (De Witte et al. 2017). This condition involves a progression from robustness to general health decline in a dynamic (i.e., preventable or delayable) and relatively reversible process (De Witte et al. 2017). The interest in the concept of frailty lies in postponing the decline in health, quality of life, and psychological well-being of older adults to improve their chances of living a long and healthy life (Romero-Ortuno et al. 2010). For this reason, it might be possible to conceptualize frailty as an antonym for successful ageing, or at least as a transition phase between successful ageing and disability (Cesari et al. 2016; Clegg et al. 2013). While commonly associated with advanced age, frailty can be measured across the entire life course (Markle-Reid and Browne 2003; Rockwood and Song 2011) and it can be clearly distinguished from disability and comorbidity (Fried et al. 2001; Gobbens et al. 2010).

The Frailty Index adopted in this dissertation combines physical frailty markers such as weight loss (body mass index deficit, diminution in the desire for food, etc.) and grip strength, with other factors such as cognition (impaired orientation to date), mood (sadness or depression, lack of enjoyment, etc.), and limitations in (instrumental) activities of daily living (Romero-Ortuno and Kenny 2012).

Frailty is also subject of a fast-growing research area, especially in gerontology and geriatric medicine, focusing on its causes, risk factors and outcomes (Fried, Walston, and Ferrucci 2009; Gobbens et al. 2010), but it is more of a newcomer to social research (Ahmed, Mandel, and Fain 2007). Frailty among older adults is recognised as a major challenge for European countries (Euro-

pean Commission 2014) and the sustainability of health and social care systems in general (Cesari et al. 2016). However, the majority of studies on frailty have been conducted outside Europe and there is a relative lack of studies in the European context (Romero-Ortuno and Kenny 2012). Theou and colleagues (2015) estimated that the frailty prevalence in Europe ranged from 12.7 to 28.2% among people 75 and older. Unlike merely subjective health measures commonly used in the literature on gender inequalities in health, the Frailty Index is an important concept for all those who plan and provide care for older adults, since it is appropriate to identify those who need geriatric interventions (Schuurmans et al. 2004) and for improving sex-sensitive forecasts of risks of adverse health outcomes among older adults (Kulminski et al. 2006, 2007; Mitnitski et al. 2002).

Next to the Frailty Index, this dissertation employs a measure of objective physical health (Chapters 3 and 4) and a measure of mental health (Chapter 4). As a measure of physical health, Chapters 3 and 4 adopt an objective measure of muscle strength and overall physical health assessed by a dynamometer (i.e., grip strength) (Andersen-Ranberg et al. 2009; Wahrendorf et al. 2020). Grip strength has become a widely accepted objective measure of general physical health with an independent explanatory power (Hank et al. 2009; Rijk et al. 2016) and it is a strong predictor of physical vulnerability and mortality at older ages (Andersen-Ranberg et al. 2009; Hank et al. 2009; Jürges 2007; Rijk et al. 2016). As a measure of mental health, Chapter 4 uses depressive feelings, measured through the EURO-D depression scale. This measure is based on 12 items – i.e., depression, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness – and ranges from 0 to 12 (Ploubidis and Grundy 2009; Prince et al. 1999). By employing these measures of health as an outcome, this dissertation aims at reaching a wider agreement about the impact of social factors on different dimension of men's and women's health in later life.

1.4.3. Analytic strategy

The analytical strategy of this dissertation is based on longitudinal data[1], mainly from the Survey of Health, Ageing and Retirement in Europe (SHARE). The strategy consisted of two broad approaches. First, I adopt a transition-centred approach based on (fixed-effects) panel regression models to focus on each individual (or family) critical life course event. Chapter 2 investigates the impact of education and changes in income or wealth on changes in subsequent health conditions. It does so by applying hybrid (between-within) regression models as a specific way of addressing the issue of unobserved heterogeneity (i.e., variables omitted from the models) (Allison 2009; Bell, Fairbrother, and Jones 2019; Bell and Jones 2015; Schunck and Perales 2017). In Chapter 4 I analysed the data at the level of parent-child dyads and employed a panel fixed-effects framework as well. The parent-child dyad is statistically the most powerful unit because both children can experience life course transitions and these will then count as separate (although nested) events. Similarly, Chapter

1 I use the term "longitudinal" exclusively with reference to repeated observations on the same units of analysis (i.e., the individual). In Chapter the information is enriched through a long retrospective of the events, aimed at documenting the entire life course taken by the SHARE respondents up to the moment of the survey.

5 examines the asymmetric associations between caregiving transitions and health using a novel approach based on fixed-effects regression models (Allison 2019).

Second, I employ a holistic approach to examine life course trajectories as a whole. Chapter 3 considers men's and women's entire trajectories and combinations of both family and employment domains by using a refined sequence analysis technique. More specifically, I identify life course types of women and men born between 1908-1967 using Lesnard's dynamic Hamming algorithm (Lesnard 2010). This approach allows to more precisely focus on the process (timing) and the interaction/interdependence of the two life domains over a key phase of men's and women's adulthood (Aisenbrey and Fasang 2010; Lesnard 2010).

1.5. Overview of the four empirical chapters

The four empirical contributions in this dissertation were written as standalone journal articles, having their own introduction, statistical technique, results, discussion, and conclusion. For this reason, they can be read independently. Since all studies are based on SHARE data, there is some overlap in the methodological sections. Chapters 2 and 5 have already been published in the *European Sociological Review* and *Social Science & Medicine* respectively. Chapters 3 and 4 are under peer-review in other international scientific journals.

Chapter 2 examines the interrelationships between SES, gender, and frailty. Chapter 3 focuses on the links between work-family life courses and physical health in later life. Chapter 4 investigates how a child's divorce influences parents' health in later life. Chapter 5 analyses the influence of the transitions into and out of the spousal caregiving role on individual frailty. Chapter 6 concludes this dissertation with a discussion of the main findings and some suggestions for future research.

Table 3 provides an overview of the empirical studies in this dissertation. For each empirical contribution, the table shows the authors, the dependent and independent variables, the data, and the number of countries under analysis, the methods adopted, and a summary of the conclusions.

Table 3. Overview of the four empirical chapters.

Chapter	Co-authors	Dependent variables	Independent variables	Data	Countries
Ch. 2	Damiano Uccheddu, Anne H. Gauthier, Nardi Steverink, and Tom Emery	Frailty Index	Socioeconomic status (education, income, and wealth)	SHARE (2004–2015)	9 European countries
Ch. 3	Damiano Uccheddu, Anne H. Gauthier, Tom Emery, and Nardi Steverink	Grip Strength	Early-life work and family life courses	SHARE (2004–2017), SHARELIFE (retrospective)	28 European countries
Ch. 4	Damiano Uccheddu, Ruben van Gaalen	Depression, Frailty Index, Grip Strength	Children's marital union dissolution	SHARE (2004–2013)	The Netherlands
Ch. 5	Damiano Uccheddu, Anne H. Gauthier, Nardi Steverink, and Tom Emery	Frailty Index	Spousal Caregiving	SHARE (2004–2015)	17 European countries

	Methods	Conclusion
	Hybrid (between-within) regression	Considering between-effects estimates, our results show that the positive impact of education and wealth on health is stronger for women living in countries where the welfare arrangements are less decommodifying and de-familializing. No such interaction is found for income and fixed-effects estimates.
	Sequence analysis, cluster analysis, multivariable linear regression	For men, weak labour market attachment and very late age at entry to fatherhood are associated with weaker grip strength. For women, life courses characterized by either weak labour market attachment in combination with having many children (i.e., three or more) or experiences of employment drop-out after childrearing are detrimental for health at older ages. In addition, the study highlights how later-life health is framed by the welfare context in which gendered work and family responsibilities unfold across individual life courses from early adulthood to midlife.
	Time distributed fixed-effects regression	Parents' health conditions worsen as one of their children experienced marital dissolution. In addition, we found anticipation effects of children's separation on parental health. Among parents, no striking gender differences emerged from this study. The marital dissolution of a son exerts a stronger burden on parental psychological distress than that of a daughter.
	Asymmetric fixed-effects regression	The transitions into caregiving have a detrimental effect on health. On the contrary, the transitions out of caregiving have in most cases no beneficial consequences on health. Most importantly, we found evidence supporting differential effects of caregiving transitions by gender and welfare arrangement: the transitions out of caregiving are associated with better health conditions only for Southern and Eastern European women.

CHAPTER 2

Gender and Socioeconomic Inequalities in Health at Older Ages Across Different European Welfare Clusters[1]

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1 A slightly different version of this chapter has been published as: Uccheddu, Damiano, Anne H. Gauthier, Nardi Steverink, and Tom Emery. 'Gender and Socioeconomic Inequalities in Health at Older Ages Across Different European Welfare Clusters: Evidence from SHARE Data, 2004–2015'. *European Sociological Review* 35, no. 3 (2019): 346–62. https://doi.org/10.1093/esr/jcz007.

CHAPTER 2

2.1. Abstract

This study takes a comparative approach to assess whether the association between socioeconomic status (SES) and health in later life differs by gender in a sample of individuals aged 50 and above living in nine European countries (Austria, Belgium, Denmark, France, Germany, Italy, Spain, Sweden, and Switzerland). We apply linear hybrid (between-within) regression models using panel data (50,459 observations from 13,955 respondents) from five waves of the Survey of Health, Ageing and Retirement in Europe (SHARE) between the years 2004–2015. SES measures included education, income, and wealth. A 40- item Frailty Index (FI) of accumulated deficits, an important indicator of health in older populations, was used as the dependent variable. Considering between-effects estimates, our results show that the positive impact of education and wealth on health is stronger for women living in countries where the welfare arrangements are less de-commodifying and de-familializing. No such interaction is found for income and fixed-effects estimates. This study could advance the understanding of gender inequalities in health. Also, such findings can guide future policies devoted to reducing gender and socioeconomic inequalities in health in later life.

2.2. Introduction

Reducing gender inequalities in health is recognised as a crucial goal of active and healthy ageing research and policy (Foster and Walker 2013). Against the backdrop of steady growth in life expectancy in Europe, there has been limited improvement in terms of healthy life years at older ages, with women systematically reporting higher rates of morbidity, disability, and healthcare utilisation than men, even though they live longer (Case and Paxson 2005; Crimmins et al. 2011; Read and Gorman 2010; Verbrugge 1989).

Health differences between women and men are the result of the combination of both biological and social factors (Bird and Rieker 1999; Read and Gorman 2010) and are widely recognised as attributable to differences in socioeconomic status (SES) (Östlin 2002; Read and Gorman 2010; Verbrugge 1989). The interaction between gender and SES is deeply associated with health (Östlin 2002). Socioeconomic resources – considered as "fundamental causes" of individual health (Link and Phelan 1995) – structure over the life course the likelihood of women's and men's differential exposure and vulnerability to disease, their access to health-related resources, as well as the differential consequences of poor health (Macintyre and Hunt 1997; Östlin 2002). For example, gender-specific socioeconomic disparities in terms of education, labour market participation, financial independence, and family responsibilities may contribute to widening the gender gaps in physical and mental health throughout the life span (Bird and Rieker 2008; Delaruelle et al. 2018; Denton and Walters 1999; Rieker et al. 2010). At the same time, the welfare state can play an important role in redistributing socioeconomic resources which are important to health, and thus contributing to lowering gender and socioeconomic inequalities in health (Bambra 2007a; Esping-Andersen 1999; Korpi 2000).

Gender inequalities in health are not static across the life span and differ by specific disease outcome (Mirowsky 1996; Read and Gorman 2010). On the one hand, some studies have found that women's disadvantage in health tends to diminish with advancing age (Case and Deaton 2005; McCullough and Laurenceau 2004; Read and Gorman 2011) up until the point at which – among adults in their 60s and older – women report better self-reported health than men (Zajacova et al.

2017). On the other hand, others have found that gender inequalities in mental health and wellbeing tend to increase as individuals age, and are highest among the oldest adults (McDonough and Strohschein 2003; Pinquart and Sörensen 2001). Moreover, men may be more likely to engage in more health risk behaviours than women (such as alcohol and drug use, abuse, and dependence) that adversely affect their health and risk of premature mortality (Bird and Rieker 2008; Case and Paxson 2005; Read and Gorman 2010; Rieker et al. 2010). Conversely, women may be more likely to suffer from nonfatal and chronic debilitating disorders (*e.g.,* arthritis and disability) that do not necessarily result in their death but do negatively impact their wellbeing later in life (Case and Paxson 2005; Read and Gorman 2010). Moreover, gender inequalities in health vary considerably cross-nationally, suggesting that the gender gaps in health are affected by country-specific characteristics (Bambra et al. 2009; Borrell et al. 2014; Crimmins et al. 2011; Delaruelle et al. 2018; Högberg 2018).

While the extent of gender-based health inequalities, and the social determinants underlying them, are well documented (Bird and Rieker 2008; Rieker et al. 2010), there has been little research on the extent to which the differential impact of SES on the health of women and men varies across different macro-level contexts (Bambra et al. 2009; Gkiouleka et al. 2018; Östlin 2002; Read and Gorman 2010). The knowledge gap is even greater when considering older women and men, despite their high use of healthcare services and the importance of health to support independence in later life.

Although some research has examined cross-national differences in the degree and patterning of gender inequalities in health among different socioeconomic groups (Bambra et al. 2009; Lahelma et al. 2002; Lahelma and Arber 1994; Rahkonen et al. 2000), the large majority of the literature has mostly been cross-sectional and focused on the adult population as a whole. The intersections and trajectories of SES, gender, and health in later life, therefore, remain unclear. Furthermore, the association between SES and health by gender shows mixed results depending on the SES indicator considered, the health outcome under examination, as well as other factors (such as political, economic, social, and cultural) (Macintyre and Hunt 1997; Mackenbach et al. 2008; Östlin 2002).

The associations between SES and health may be confounded by unobserved factors (Kröger, Pakpahan, and Hoffmann 2015). Unobserved permanent personal characteristics (*e.g.,* biological factors, personality traits, intellectual abilities, or childhood conditions) that differ between individuals and that may be associated with both SES and health can be one source of confounding. Fixed-effects and "hybrid" (between-within) models have been identified as a specific way of addressing the impact of these unobserved individual factors (*i.e.,* omitted variables) (Allison 2009; Bell et al. 2019; Bell and Jones 2015; Schunck 2013). Additionally, the different patterning in the intersections between gender and SES depending on the health outcome analysed points out the need to understand the complexity and multidimensionality of health in later life with a gender-sensitive approach (Macintyre, Hunt, and Sweeting 1996; Östlin 2002).

In middle and old ages, women have more chronic conditions, greater levels of depression, disability, and morbidity than men (Case and Paxson 2005; Crimmins et al. 2011; Read and Gorman 2010). The accumulation of these deficits in multidimensional health domains can be measured by a "Frailty Index" (Rockwood and Mitnitski 2007). The Frailty Index is a count of health deficits, reflecting the proportion of potential deficits affecting a given person, and indicating the likelihood that frailty is present. This measure provides a more complete picture of older adults' overall health, and it is consistently found to be a strong predictor of adverse health outcomes, including

the subsequent mortality (Fried et al. 2001; Romero-Ortuno and Kenny 2012). Moreover, frailty is an important concept for all those who plan and provide care for older adults, since it is appropriate to identify those who need geriatric interventions (Schuurmans et al. 2004).

This study addresses the shortcomings of the previous literature by investigating whether the association between three different measures of SES (education, income, and wealth) and frailty after midlife (age 50 years to baseline) vary according to gender across nine European countries with different macro-level characteristics. Thereby, we combine micro and macro determinants of health, showing how multiple dimensions of socioeconomic resources are of different importance for the health of women and men living in different contexts. Most importantly, this article aims at integrating and extending the previous literature overcoming some of its methodological limitations, specifically by applying a longitudinal design, controlling for time-constant unobserved heterogeneity at the individual level, and addressing the problem of selective panel attrition. The comparative approach, the modelling of longitudinal data, and the inclusion of frailty as a health outcome represent the key contributions of this study.

2.3. Gender inequalities in health: possible underlying mechanisms

2.3.1. Micro-level: gender, SES, and health

Research has, so far, highlighted several explanations for gender differences in health, typically referring to a set of biological, psychosocial, behavioural, and social factors that can impact the health of women and men in different ways (Read and Gorman 2010; Verbrugge 1989). Among them, SES is widely recognised as the most important determinant of gender differences in health (Denton and Walters 1999; Huisman et al. 2003; Lahelma et al. 2002; McDonough and Walters 2001; Östlin 2002). The idea, underlying the fact that individuals with higher SES are more likely than their lower SES counterparts to enjoy better health, is that SES embodies an array of "flexible resources" (Phelan et al. 2010) – such as knowledge, money, power, or prestige – that can be used by individuals to avoid or deal with illnesses, minimizing their negative consequences on health, and to better cope with stressful life events (Link and Phelan 1995). Hence, women's relative lower SES places greater limits on their access to health-related resources, leading to a reduction in their health (McDonough and Walters 2001; Östlin 2002; Read and Gorman 2010; Rieker and Bird 2000; Ross and Bird 1994). The gender-specific socialization explanations are worth mentioning because the social organization of men's and women's lives and relations may affect their exposure and vulnerability to specific risks and health behaviours (*e.g.,* excessive alcohol consumption) through differences in employment patterns, social roles or role-related activities, or to differences in their social and economic burdens (Bird and Rieker 1999; Read and Gorman 2011).

However, it is still unclear to what extent SES has the same differential impact on the health of women and men in later life. On the one hand, the large majority of the existing evidence is from single-country cross-sectional analyses that did not find any interactive association between gender and SES with health at older ages (Connolly, O'Reilly, and Rosato 2010; Damian et al. 1999; Knurowski et al. 2004; Sulander et al. 2009). The same results were found in studies based on national longitudinal studies from England (McMunn, Nazroo, and Breeze 2008; Melzer et al. 2000), Spain (Orfila et al. 2006), and Sweden (Parker et al. 2013). On the other hand, the associ-

ation between SES and health was found to be stronger in older men than in older women in one study from Spain (Regidor et al. 1999). In contrast, a stronger association between SES and health in older women was reported in one cross-sectional study from Spain (Lasheras et al. 2001) and in one follow-up study from the UK (Grundy and Holt 2000). Other studies reported mixed results depending on the SES indicator and the health outcome considered (Enroth et al. 2013; Grundy and Sloggett 2003; McDonough and Walters 2001; Prus and Gee 2003; Rueda and Artazcoz 2009; Rueda, Artazcoz, and Navarro 2008; Torres, Rizzo, and Wong 2016).

2.3.2. Macro-level: socioeconomic context, gender, and health

The related question – and our focus – asks how or in what ways SES affects the health of older women and men differently across countries. A variety of comparative studies analysing the association between SES and health across European countries showed mixed results in the interaction between SES and gender. One cross-sectional study comparing 17 Western European countries did not find any difference between genders in the association of education with self-reported health (Bambra, Netuveli, and Eikemo 2010). Another cross-sectional, cross-national study showed no clear pattern by gender in the relationship between education and self-reported health (von dem Knesebeck, Verde, and Dragano 2006). Similarly, cross-sectional associations between SES and self-reported health varied by gender but in different directions among the countries and European regions studied in other works (Dalstra et al. 2006; Huijts, Eikemo, and Skalická 2010; Lahelma et al. 2002; Lahelma and Arber 1994; Rahkonen et al. 2000; Rueda 2012). The same cross-sectional fluctuations in gender and SES interactions depending on the country were also reported in a study of 11 European countries (Huisman et al. 2003) and one using data from 13 European countries (Bambra et al. 2009).

One of the theories that has been suggested to explain the differential gender gap in health across countries is the "constrained choice" theory (Bird and Rieker 2008). According to it, the differences in health between women and men can be due to macro-level opportunities and constraints that directly and indirectly shape health-related individual priorities and choices. This suggests that the systematic differences in health conditions between women and men across countries may be explained by the interaction between the state, the market, and the family in welfare provision (Esping-Andersen 1990). The role of the welfare state is important to population health and gender equality in health in terms of how the state interacts with the family (DiPrete 2002), and thereby reducing the specific welfare burden on women (Bambra 2007a; Esping-Andersen 1999; Korpi 2000). Women's SES is related to the extent to which the welfare state facilitates female autonomy and economic independence from the family (Bambra 2007a; Orloff 1996).

Useful here is to combine gender stratification concepts, specifically defamilisation, with others like the decommodification of labour and healthcare. Defamilisation refers to the extent to which the welfare state permits individual entitlements to a socially acceptable standard of living independent of family relationships (Bambra 2004, 2007a; Esping-Andersen 1999; Korpi 2000). In contrast, decommodification refers to the degree to which the welfare state frees individuals from market dependence for a socially acceptable standard of living (Bambra 2005a, 2005b, 2007b; Esping-Andersen 1990). While high levels of defamilisation (and decommodification) are characteristic in Northern European countries, women in Southern European countries are strongly dependent on family. Consequently, we would expect a lower gender gap in health in social democratic welfare

states and a higher gender gap in health in familistic ones (Borrell et al. 2014; Romero-Ortuno, Fouweather, and Jagger 2014).

Therefore, this study will analyse the association between SES and health after midlife and the extent to which this varies by gender in different European contexts. This is done in a set of three European welfare clusters, that is Northern Europe (Denmark and Sweden), Western Europe (Austria, Belgium, France, Germany, and Switzerland), and Southern Europe (Italy and Spain). We classified the nine European countries into these three generic welfare clusters because they roughly represent different geographical regions and welfare state regimes, and because this operationalisation is also consistent with various social theories. Comparisons of health inequalities are based on the Frailty Index (Romero-Ortuno and Kenny 2012) and made across three structural variables (educational level, income, and wealth) suitable to investigate the SES of older adults (Grundy and Holt 2001; Lahelma et al. 2004). Thus, this study will examine whether the varying amount of SES changes within the three welfare clusters corresponds to differentiated changes in the magnitude of health inequalities between women and men. The research question is 'does the impact of SES on health after midlife vary among women and men depending on the welfare cluster?'

As explained above, a core element of our theoretical expectations is that if the welfare state decommodifies labour (Esping-Andersen 1990) as well as health (Bambra 2005a, 2005b, 2007b), then there should be a weaker association between SES and health – for both women and men – living in highly decommodifying welfare states (Denmark and Sweden). Since these latter countries are also characterised by higher levels of defamilisation (Bambra 2004, 2007a), we hypothesise that *compared with men, SES is expected to be weakly associated with health changes for women living in countries with high defamilisation and decommodification* (Denmark and Sweden). By contrast, always comparing with men, we expect SES to have a stronger impact on health changes for women living in the Southern European countries (Italy and Spain), due to their lowest levels of defamilisation and less generous levels of welfare provision as compared to other European countries.

2.4. Method

2.4.1. Data and sample

We use individual-level panel data from the Survey of Health, Ageing and Retirement in Europe (SHARE).[1] SHARE is a multidisciplinary, cross-national and longitudinal research project focusing

1 This paper uses data from SHARE Waves 1, 2, 3, 4, 5 and 6 (DOIs: 10.6103/SHARE.w1.611, 10.6103/SHARE.w2.611, 10.6103/SHARE.w3.611, 10.6103/SHARE.w4.611, 10.6103/SHARE.w5.611, 10.6103/SHARE.w6.611), see Börsch-Supan et al. (2013) for methodological details. The SHARE data collection has been primarily funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812) and FP7 (SHARE-PREP: N°211909, SHARE-LEAP: N°227822, SHARE M4: N°261982). Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see www.share-project.org).

on adults aged 50 or older living in residential households (Börsch-Supan et al. 2013). The survey includes detailed information about demographics, family structure, SES, and health. SHARE data collection is based on computer-assisted personal interviewing (CAPI). Sampling strategies varied by country. Detailed information about the entire SHARE project is available at www.share-project.org.

This study uses data from the first (2004-2005), second (2006-2007), fourth (2011-2012), fifth (2013), and sixth (2015) wave of SHARE. The retrospective third wave of SHARE (SHARELIFE), carried out in 2008-2009, was excluded from the analyses as it focuses only on the respondents' life histories and because the questionnaire and variables are very different from the core data. However, we used information from the third wave to identify respondents who exited the panel (*i.e.,* respondent's death year).

The analytical sample includes data from nine European countries (Austria, Belgium, Denmark, France, Germany, Italy, Spain, Sweden, Switzerland) and consisted of 13,955 respondents (50,459 observations) of age 50 and older, who were present in the first wave of SHARE. Since the health outcome of interest was a change in frailty levels, we restricted the sample to any individual participating in at least two waves. The overall response rate at baseline was 61.8%, ranging from 37.6% (Switzerland) to 73.6% (France) (De Luca and Peracchi 2005). Out of the 21,407 respondents in the first wave of SHARE, 19,078 (89.1%) provided valid information for the variables used in this study, and 13,955 of them (65.2%) participated in at least one follow-up measurement. In total, these respondents provided 50,459 observations across five waves of SHARE ($n_{2004/2005}$=13,955, $n_{2006/2007}$=12,157, $n_{2011/2012}$=8,896, n_{2013}=8,137, and n_{2015}=7,314), which is an average of 3.6 observations per person. Of the initial respondents, 18.4% (3,939) died within 11 years of follow-up after the first interview. Additional detailed information on survey participation, response rates, panel retention, and sample design of the SHARE survey is available elsewhere (Bergmann, Kneip, et al. 2019; De Luca and Peracchi 2005). Table 4 reports the characteristics of the analytical sample.

Table 4. Descriptive statistics of variables in the analyses

	Whole Sample	Men	Women
	(N = 50,459)	(N = 23,382)	(N = 27,077)
	% (Mean)	% (Mean)	% (Mean)
Age[a]	(67.93)	(67.97)	(67.90)
Gender			
Male	46.34		
Female	53.66		
Frailty Index (FI)[a]	(0.12)	(0.11)	(0.14)
Education			
Low	47.11	42.53	51.07
Medium	31.36	33.35	29.64
High	21.53	24.13	19.29

(continued)

Table 4. Continued

	Whole Sample (N = 50,459) % (Mean)	Men (N = 23,382) % (Mean)	Women (N = 27,077) % (Mean)
Income			
1st quartile	25.05	21.61	28.02
2nd quartile	25.00	24.25	25.65
3rd quartile	25.00	25.92	24.20
4th quartile	24.95	28.21	22.13
Wealth			
1st quartile	25.05	22.74	27.04
2nd quartile	24.99	25.38	24.66
3rd quartile	25.02	25.60	24.52
4th quartile	24.94	26.29	23.78
Marital Status			
Married	72.31	81.07	64.75
Never Married	5.47	5.56	5.40
Divorced	7.33	6.21	8.30
Widowed	14.88	7.17	21.54
Number of Children			
Childless	9.73	10.04	9.46
1	17.39	16.62	18.06
2	37.75	38.43	37.16
3+	35.13	34.91	35.33
Wave			
[1] 2004-05	27.66	27.71	27.61
[2] 2006-07	24.09	24.40	23.83
[4] 2011-12	17.63	17.57	17.68
[5] 2013	16.13	16.04	16.20
[6] 2015	14.49	14.28	14.68
Welfare cluster			
Southern Europe			
Italy	12.12	11.85	12.35
Spain	10.08	9.70	10.40
Western Europe			
Austria	6.59	6.21	6.91
Germany	9.98	10.23	9.76
France	12.76	12.09	13.34
Switzerland	4.93	4.93	4.93

(continued)

Table 4. Continued

	Whole Sample	Men	Women
	(N = 50,459)	(N = 23,382)	(N = 27,077)
	% (Mean)	% (Mean)	% (Mean)
Belgium	19.51	20.12	18.98
Northern Europe			
Denmark	8.98	9.32	8.69
Sweden	15.05	15.55	14.63

Note: Unless otherwise indicated, values are reported in percentages. Unweighted pooled dataset (Individual-Year, N = 50,459).
Source: SHARE data, years 2004-2015 (own estimates)
[a] Continuous variable: mean (in brackets).

2.4.2. Dependent variable: Frailty Index

For a dependent variable, we use a 40-item Frailty Index (FI) of accumulated deficits, constructed in accordance with standard procedures (Romero-Ortuno and Kenny 2012; Searle et al. 2008). Frailty is considered a comprehensive concept and measure of health at older ages and it is highly predictive of subsequent adverse health outcomes (Fried et al. 2001; Romero-Ortuno and Kenny 2012). Current deficits used to construct the dependent variable are measured at each wave of SHARE and include objective health markers (grip strength), weight loss (body mass index deficit), functional impairments in personal and instrumental activities of daily living, self-reported health and comorbidities, mood (sadness or depression, lack of enjoyment, etc.), limitations in cognition (impaired orientation to date: day, month, year, and day of the week, etc.), and other measures (see Appendix, Table A1). Each individual's deficit points were summed and divided by the total number of deficits evaluated (in our case 40) to obtain a FI with a theoretical range from 0 (no deficits present) to 1 (all deficits present). For example, a respondent with five deficits would have a FI value of 0.125 (5/40). Higher values indicated a greater number of health problems and hence greater frailty. The reliability coefficient, Cronbach's alpha, for the 40 items, is 0.861, which is commonly considered adequate to sum the items to a scale. The distribution of the FI approximately showed a gamma distribution. Missing values for each item were negligible: except for grip strength (8.58% of missing), all items showed less than 4% missing values. Full information on the FI deficit variables and cut-off points are reported in Table A1 in the Appendix.

2.4.3. Independent variables

Gender and SES are the key explanatory variables. SES is operationalised using three indicators, namely education, income, and wealth. Education is based on the international classification ISCED-97 and refers to the respondent's highest level of education. We classified education as low (ISCED 0, 1 and 2), medium (ISCED 3 and 4), and high (ISCED 5 and 6). This variable is collected only in the baseline interview and contained 1.83% missing cases. Country and wave-specific quartiles of income and wealth were estimated at the household level and adjusted for family size (by dividing the variables by the square root of household size). Income and wealth were calculated based on an average of the five imputations provided in SHARE, which compensate for

non-response. These two measures were assessed in each wave of the survey and refer, by survey design, to the year preceding the measurement of the dependent variable (*i.e.,* the reference period ranges from time $t - 1$ and ^{t}).

Control variables include age, age-squared, age-cubed (to allow for nonlinear relations), current marital status (four categories: married[2]; never married; divorced; widowed), current number of children (childless, 1, 2, 3+), SHARE waves, and country of residence. SHARE collected information on marital status and the number of children in each wave of the study. We added these two control variables into the models due to their associations with SES and health (Delaruelle et al. 2018; Grundy and Holt 2000; Grundy and Sloggett 2003; Lahelma et al. 2002; Lersch, Jacob, and Hank 2017; Ross and Bird 1994). For all the control variables, missing values were below 2%.

2.4.4. Classification of countries

Assuming relative homogeneity of the key features of their socioeconomic institutions and policies (Maître, Nolan, and Whelan 2005), we classified the nine European countries into three generic welfare clusters, which roughly represent different welfare state regimes and geographical regions (Avendano, Jürges, and Mackenbach 2009):

Northern Europe (Denmark and Sweden). Following the Esping-Andersen (1990, 1999) and other typologies (e.g., Ferrera 1996), these two countries are classified as social democratic welfare states. The welfare policies of Denmark and Sweden, characterised by a universalistic approach to social rights, show high levels of defamilisation (Bambra 2004, 2007a). In addition, they promote gender equality both on the labour market and in the care responsibilities, actively supporting dual-earner household arrangements (Korpi 2000), in particular in families with young children (Gauthier 2002).

Southern Europe (Italy and Spain). These countries have been classified as a distinct welfare state regime (Eikemo et al. 2008; Ferrera 1996) because of their specificities: they are characterized by a sub-protective and more fragmented system of welfare provision with a higher reliance on family support as a form of welfare provision compared to other European countries (Bambra 2007b). The state support to families is extremely limited and women are encouraged to take up the family and care responsibilities (Bambra 2007a, 2007b).

Western Europe (Austria, Belgium, France, Germany, and Switzerland). These countries are classified differently according to the typology applied. They belong to the Bismarckian cluster in the Ferrera (1996) typology, but some of them are recognised as conservative by others (Arts and Gelissen 2002). Generally, these countries represent a different regime than the Southern or Northern (Esping-Andersen 1990, 1999), although there is not yet full agreement and some of them may share common characteristics with countries belonging to other welfare state regimes.

2.4.5. Analytic Strategy

Statistical analysis is conducted using linear hybrid models (Allison 2009; Bell et al. 2019; Bell and Jones 2015) and it aims at evaluating the associations between SES and frailty separately for

2 Respondents are considered "married" if they reported: (a) being married and living with the spouse; (b) being married but living separated from the spouse; (c) having a registered partnership.

each welfare cluster and gender. In doing so, we follow the procedure described by Schunck (2013). Hybrid models are random-effects models that allow for separate within-cluster effects (*i.e.,* fixed-effects estimates) and between-cluster effects (Bell et al. 2019). Hence, like fixed-effects methods, hybrid models can control for time-constant unobserved individual heterogeneity (Allison 2009; Bell et al. 2019; Bell and Jones 2015; Schunck 2013). The great advantage of this approach is that it permits the inclusion of time-invariant variables (*e.g.,* gender) in a fixed-effects framework. Before clustering the countries, we fitted separate hybrid models by country to check the similarity between the single country estimates[3].

Since a low level of education can lead to a low income and, consequently, to a low wealth, which in turn affect negatively health status (Lahelma et al. 2004), we estimated three models for each country and gender: the first contains only education and all the basic control variables, the second adds dummies for each income quartile, and the third adds dummies for each wealth quartile. The first model allows us to estimate the total effect of education on frailty (Model 1), while the second and third models estimate respectively the total effect of income (Model 2, net of education) and wealth (Model 3, net of education and income). Moreover, the modifying effect of gender on the SES-frailty association was evaluated by including a product term between gender and each SES measure in separate regression models for all older adults combined[4].

In epidemiological literature, researchers have stressed that measuring effects on the additive scale is most appropriate for assessing the public health relevance of an exposure (Knol and VanderWeele 2012). Contrary to multiplicative models (*e.g.,* Poisson or log-linear models), modelling the Frailty Index in linear hybrid models allow us to measure effect modification on the additive scale.

Changes in the Frailty Index can be related to different types of attrition, including gender-specific health-related non-response or selective mortality by gender. To adjust for sample loss due to attrition we estimated the regression models using inverse probability weighting (IPW). To calculate the weights, we have estimated a series of logistic regression models for response versus non-response in wave t as a function of independent variables (X_{t-1}) in a previous wave $t-1$, conditional on having participated in wave $t-1$ (Tchetgen et al. 2012; Wooldridge 2002). The variables included in the models to calculate the inverse probability weights were the Frailty Index, gender, age, education, income, wealth, marital status, number of children, and country of residence. For each observation, we computed the inverse of the predicted probabilities from these models ($1/\hat{p}_t$) and then used them to weight each observation in the multivariate analysis. The use of IPW as method to adjust for attrition gives more weight to those individuals with key demographic, socioeconomic, and health factors leading to a high probability of dropping out of the panel.

Since the violation of the homoscedasticity assumption may be present when the dependent variable of linear regression models is not symmetric, we computed robust standard errors to relax the assumption of the absence of heteroscedasticity. All analyses are performed using Stata 15.1.

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3 For details, see the online Supplementary Material in the European Sociological Review. To substantiate our findings, we also applied linear random-effects models (results available upon request).

4 Following the indications provided by Schunck (2013), we estimated the interactions separately for the within and between-effects.

2.5. Results

Figures from Figure 1 to Figure 3 present the estimates from multivariate hybrid models which investigated – separately for welfare clusters and gender – associations between SES and frailty, controlling for time-constant unobserved heterogeneity at the individual level (full model estimates in tabular form are shown in Table A2 in the Appendix). The upper panel of the figures reports the within-effects (i.e., longitudinal) estimates, thus only considering variance within individuals. The lower panel presents the between-individual (i.e., cross-sectional) estimates. Filled circles represent the estimates obtained when controlling for socio-demographic variables and level of education (Model 1), while hollow rhombuses refer to estimates from models that also include quartiles of income (Model 2) and filled squares refer to estimates from models that add quartiles of wealth (Model 3). When interpreting the results from the regression analyses, it is important to note that the variation for the FI and SES measures is mainly driven by between-individual variance. However, there is also enough within variance to justify a fixed-effect approach (Table 5 and Table 6).

The main results are as follows. In all the three welfare clusters there is a statistically significant and clear educational gradient in frailty for both genders (Figures Figure 1 to Figure 3, Model 1). In line with our expectations, the educational gradient appears to be strongest for women living in Southern European countries, less strong in Western European countries, and smallest in Northern European countries. In the case of Southern Europe (Figure 1, Model 1), for example, a woman's FI is lower by 0.056 points if she belongs to the highest level of education instead of the lowest one (95% CIs: -0.071, -0.040; $p<0.001$). This means that lower-educated Southern European women report at least two more deficits than higher-educated women in the 40-item Frailty Index. Including additional controls for quartiles of income (Figures Figure 1 to Figure 3, Model 2) reduces the magnitude of the educational coefficients, but does not alter the overall pattern. However, in this case, the total effect of income appears to be the smallest for both men and women living in Southern European countries. Moreover, once relying solely on within-individual variance, the longitudinal association between income and frailty is not statistically significant ($p>0.05$).

Model 3 (Figures Figure 1 to Figure 3) adds quartiles of wealth to Model 2. Considering the between variance, the results show a clear wealth gradient in frailty, which appears to be less steep for men living in Southern European countries and for both women and men living in the Scandinavian countries. Similarly to income (Model 2), when relying exclusively on within-individual variance, the longitudinal association between wealth and frailty is not statistically significant ($p>0.05$). The exception being women living in Western European countries (Figure 2, Model 3), where we find that a woman's FI rises by 0.007 points if she drops from the 3rd quartile of wealth to the 1st quartile (95% CIs: -0.013, -0.002; $p<0.01$). Despite this effect size is negligible, a Wald test confirms this result ($P<0.01$), indicating that wealth has an overall longitudinal impact on the frailty levels of Western European women. It is interesting to note that the level of education has a statistically significant indirect effect, even after controlling for both income and wealth (Figures Figure 1 to Figure 3, Model 3).

Table 5. Variance composition for Frailty Index

		Mean	SD	Min	Max
Frailty Index (FI)	Overall	0.124	0.105	0	0.838
	Between		0.096	0	0.733
	Within		0.053	-0.259	0.575

Note: Individual-Year, N = 50,459
Source: SHARE data, years 2004-2015 (own estimates)

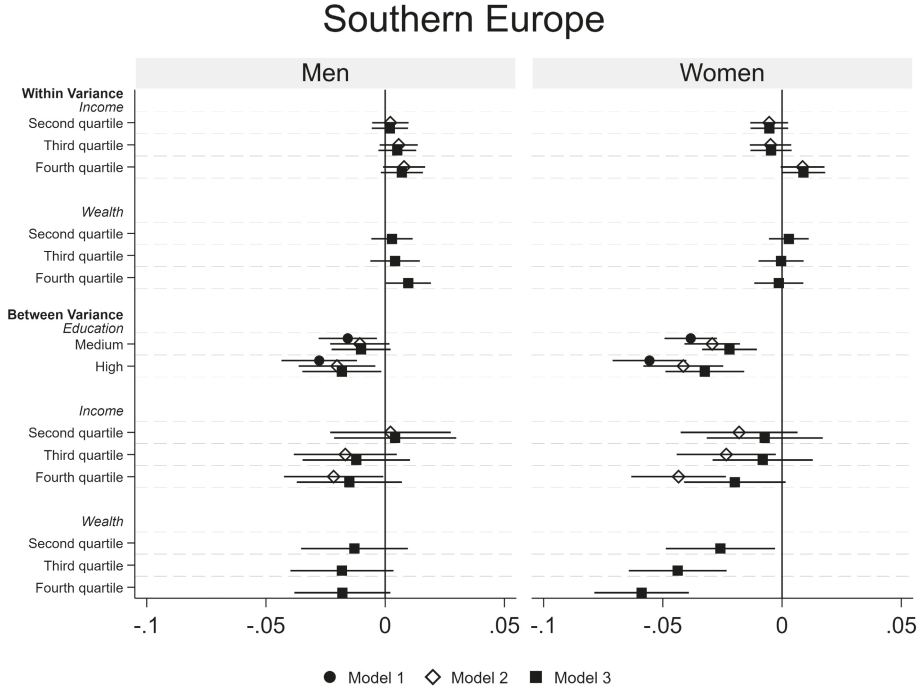
Table 6. Variance composition for the level of education, income, and wealth

Variables	Overall		Between		Within
	N	%	N	%	%
Level of Education					
Low	23771	47.11	6740	48.30	100.00
Medium	15823	31.36	4365	31.28	100.00
High	10865	21.53	2850	20.42	100.00
Total	50459	100.00	13955	100	100.00
Income					
First quartile	12640	25.05	6930	49.66	52.07
Second quartile	12617	25.00	7626	54.65	46.06
Third quartile	12613	25.00	7613	54.55	44.97
Fourth quartile	12589	24.95	6556	46.98	52.02
Total	50459	100.00	28725	205.84	48.58
Wealth					
First quartile	12639	25.05	5806	41.61	63.17
Second quartile	12611	24.99	6980	50.02	49.96
Third quartile	12625	25.02	7086	50.78	48.44
Fourth quartile	12584	24.94	5764	41.30	58.43
Total	50459	100.00	25636	183.7	54.44

Note: Individual-Year, N = 50,459
Source: SHARE data, years 2004-2015 (own estimates)

To substantiate these findings, we evaluated the potential effect modification of gender on the relationships between SES and frailty including gender and SES interaction terms in separate regression models for all older adults combined. Table 7 shows the results from these linear hybrid models, estimated separately for each welfare cluster (see Table A2 in Appendix for full model estimates). Turning to our research question, Table 7 shows that the association between SES and frailty is stronger for women than for men in Southern (education and wealth) and Western European countries (only for education), as indicated by the statistically significant effect modification of gender in those contexts (between-individual estimates). For example, we find that Southern European women are more vulnerable than men to the influence of wealth in terms of frailty: a woman's FI drops by 0.037 points if she belongs to the 4th quartile of wealth instead of the 1st quartile (95% CIs: -0.066, -0.009; p<0.01). The results of Wald tests confirm that the interaction terms are jointly different from zero (p<0.05).

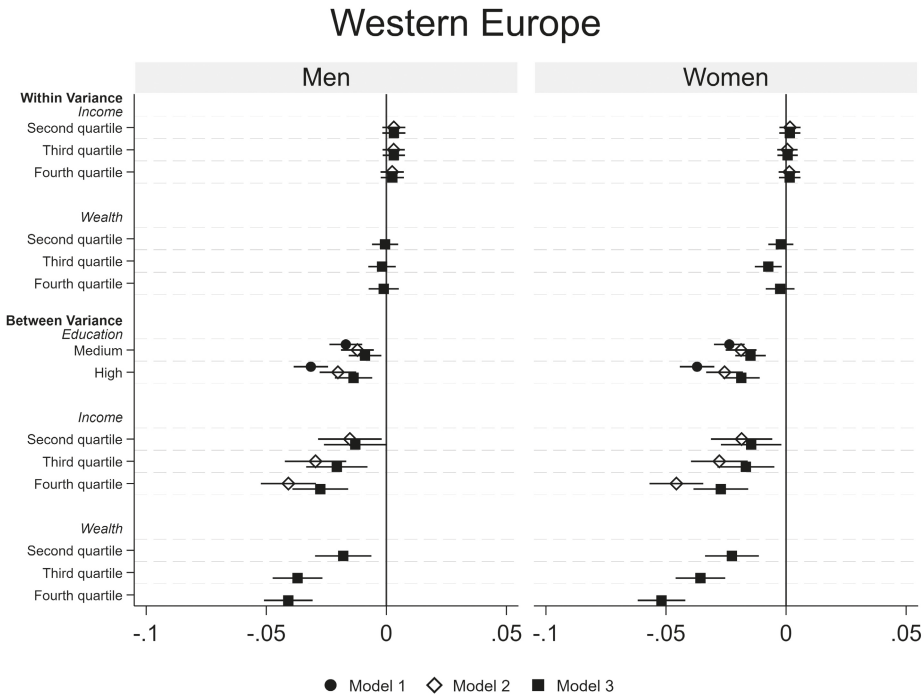
Figure 1. Linear hybrid models predicting frailty, by gender (Southern Europe). Estimates and 95% confidence intervals.



Note: Filled circles indicate estimates from models with level of education and sociodemographic controls only (Model 1); hollow rhombuses refer to models with additional controls for quartiles of income (Model 2); filled squares indicate estimates from models that add quartiles of wealth (Model 3). Models include all the control variables. Complete models are displayed in Table A2 (Appendix).
Source: SHARE data, years 2004-2015 (own estimates).

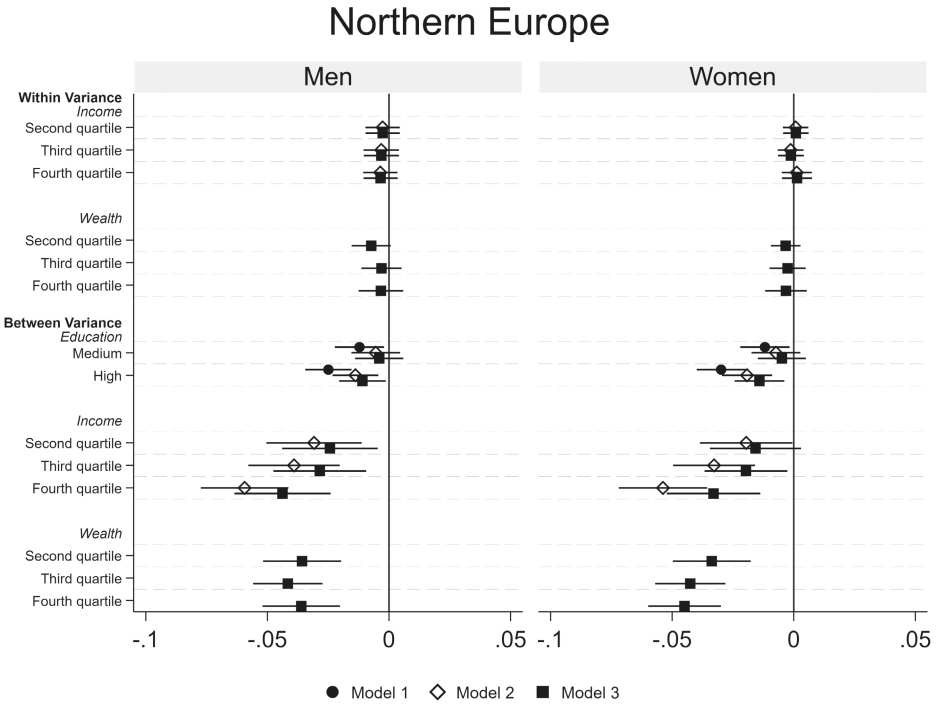
As a robustness check, we estimated a fully interacted hybrid model to examine whether SES-related changes in the FI differed significantly by gender and welfare cluster (results available on request), and then a Wald test on the joint significance of all the interaction terms between welfare cluster, gender and the three measures of SES. The test rejects the null hypothesis of equality of the coefficient for education only ($p<0.001$). Since the time frame (*i.e.,* the sequencing of the independent, control, and dependent variable) may be relevant for the analyses using fixed-effects models (Nyberg et al. 2017), we additionally adopted a more restrictive "time-adjusted" analysis: to overcome possible endogeneity issues, we lagged independent and control variables by one period relative to the dependent variable, which reduced the final sample to 36,504 observations from 13,955 individuals. The results hardly changed after allowing for lagged relationships (results available upon request).

Figure 2. Linear hybrid models predicting frailty, by gender (Western Europe). Estimates and 95% confidence intervals.



Note: Filled circles indicate estimates from models with level of education and sociodemographic controls only (Model 1); hollow rhombuses refer to models with additional controls for quartiles of income (Model 2); filled squares indicate estimates from models that add quartiles of wealth (Model 3). Models include all the control variables. Complete models are displayed in Table A2 (Appendix).
Source: SHARE data, years 2004-2015 (own estimates).

Figure 3. Linear hybrid models predicting frailty, by gender (Northern Europe). Estimates and 95% confidence intervals.



Note: Filled circles indicate estimates from models with level of education and sociodemographic controls only (Model 1); hollow rhombuses refer to models with additional controls for quartiles of income (Model 2); filled squares indicate estimates from models that add quartiles of wealth (Model 3). Models include all the control variables. Complete models are displayed in Table A2 (Appendix).
Source: SHARE data, years 2004-2015 (own estimates).

Table 7. Linear hybrid models predicting frailty, by welfare cluster. Beta coefficient (first column) and 95% confidence intervals (second column).

	Southern		Western		Northern	
	β	95% C.I.	β	95% C.I.	β	95% C.I.
Within Variance						
Income (ref.: 1st quartile)						
2nd quartile	0.002	-0.006,0.009	0.003	-0.002,0.008	-0.003	-0.010,0.004
3rd quartile	0.004	-0.004,0.012	0.003	-0.002,0.008	-0.003	-0.011,0.004
4th quartile	0.006	-0.003,0.015	0.002	-0.002,0.007	-0.003	-0.010,0.004
Wealth (ref.: 1st quartile)						
2nd quartile	0.003	-0.006,0.012	0.000	-0.006,0.005	-0.007	-0.016,0.001
3rd quartile	0.004	-0.006,0.015	-0.001	-0.007,0.004	-0.003	-0.011,0.005
4th quartile	0.010*	0.000,0.019	-0.001	-0.007,0.006	-0.003	-0.012,0.006
*Interaction: Gender * Income*						
Women * 2nd quartile	-0.007	-0.018,0.004	-0.001	-0.008,0.005	0.004	-0.005,0.013
Women * 3rd quartile	-0.009	-0.021,0.003	-0.002	-0.009,0.004	0.002	-0.007,0.011
Women * 4th quartile	0.003	-0.010,0.016	-0.001	-0.007,0.006	0.004	-0.005,0.013
*Interaction: Gender * Wealth*						
Women * 2nd quartile	0.000	-0.012,0.012	-0.002	-0.009,0.006	0.005	-0.006,0.015
Women * 3rd quartile	-0.005	-0.019,0.009	-0.006	-0.014,0.002	0.001	-0.010,0.012
Women * 4th quartile	-0.011	-0.025,0.003	-0.002	-0.011,0.007	0.000	-0.013,0.012
Between Variance						
Level of Education (ref.: Low)						
Medium	-0.005	-0.017,0.008	-0.006	-0.013,0.001	-0.003	-0.013,0.007
High	-0.015	-0.032,0.001	-0.012**	-0.020,-0.004	-0.011*	-0.020,-0.001
Income (ref.: 1st quartile)						
2nd quartile	0.000	-0.026,0.025	-0.015*	-0.027,-0.002	-0.025*	-0.044,-0.006

(continued)

Table 7. Continued.

	Southern		Western		Northern	
	β	95% C.I.	β	95% C.I.	β	95% C.I.
3rd quartile	-0.014	-0.036,0.009	-0.022***	-0.034,-0.009	-0.026**	-0.045,-0.008
4th quartile	-0.012	-0.034,0.010	-0.027***	-0.039,-0.016	-0.040***	-0.059,-0.022
Wealth (ref.: 1st quartile)						
2nd quartile	-0.011	-0.034,0.011	-0.018**	-0.030,-0.007	-0.037***	-0.053,-0.021
3rd quartile	-0.018	-0.040,0.003	-0.037***	-0.047,-0.027	-0.043***	-0.057,-0.029
4th quartile	-0.020	-0.040,0.000	-0.041***	-0.051,-0.031	-0.037***	-0.053,-0.021
*Interaction: Gender * Level of Education*						
Women * Medium	-0.021*	-0.038,-0.005	-0.011*	-0.020,-0.002	-0.002	-0.015,0.011
Women * High	-0.021	-0.044,0.002	-0.008	-0.018,0.003	-0.003	-0.016,0.010
*Interaction: Gender * Income*						
Women * 2nd quartile	-0.005	-0.040,0.030	0.001	-0.017,0.019	0.007	-0.019,0.033
Women * 3rd quartile	0.006	-0.025,0.036	0.006	-0.011,0.023	0.002	-0.022,0.025
Women * 4th quartile	-0.010	-0.040,0.020	0.001	-0.015,0.017	0.002	-0.022,0.025
*Interaction: Gender * Wealth*						
Women * 2nd quartile	-0.014	-0.046,0.017	-0.004	-0.020,0.012	0.004	-0.018,0.027
Women * 3rd quartile	-0.025	-0.055,0.005	0.002	-0.013,0.016	0.002	-0.018,0.023
Women * 4th quartile	-0.037**	-0.066,-0.009	-0.011	-0.025,0.003	-0.007	-0.028,0.015
Gender (ref.: Men)						
Women	0.068***	0.044,0.092	0.021**	0.006,0.035	0.010	-0.011,0.030
AIC	-29642.4		-89741.9		-41275.4	
BIC	-29217.6		-89233.0		-40838.6	
No. of observations	11200		27132		12127	
No. of groups (individuals)	3036		7615		3304	

Note: ref.: reference category. Models include all the control variables. The estimates of the control variables (age, age^2, age^3, marital status, number of children, SHARE waves, and country of residence) are found in Table A3 (Appendix). * p<0.05, ** p<0.01, *** p<0.001
Source: SHARE data, years 2004-2015 (own estimates)

2.6. Discussion and conclusion

In this study, we have analysed how the longitudinal associations between SES and health after midlife differs by gender and the macro-level context in a sample of individuals aged 50 and above living in 9 European countries. Previous literature suggests that some of the complex relationships found between gender and health may be driven by individual socioeconomic factors as well as by the macro-level contexts in which individuals live. Our study makes a significant contribution to the literature on gender inequalities in health in later life by investigating the longitudinal associations between three measures of SES (education, income, and wealth) and frailty, a multidimensional comprehensive concept and measure of health. We tested these associations using comparative cross-national data and estimating "hybrid" (between-within) regression models in different European welfare state clusters (Southern, Western, and Northern).

Considering only the between-individual variance in the hybrid models, our results support the cross-sectional findings that SES, as a predictor of health in later life, does not have the same impact across gender within different socioeconomic contexts. What our results clearly show is that only in Southern (Italy and Spain) and Western European countries (Austria, Belgium, France, Germany, and Switzerland) the impact of education and wealth on health is stronger for women. Conversely, in Northern Europe (Denmark and Sweden) we did not observe any gender difference according to SES. The fixed-effects estimates from the hybrid models show that the intra-individual change in income and wealth does not cause a substantive change in health after midlife. Hence, our results partially corroborate the hypothesis that the longitudinal influence of SES – and, most importantly, the effect modification of gender – on health after age 50 is weaker in countries with high defamilisation and decommodification. This is in line with the previous literature, since frailty-free life expectancy is lower for women than men, but these differences are less marked in Sweden and Denmark (Romero-Ortuno et al. 2014). However, the fixed-effects estimates suggest that income and wealth might have only a limited impact on health after midlife, while models with between-variation components might overestimate the influence of SES on health because they do not control for unobserved (time-constant) heterogeneity at the individual level. Moreover, while statistically significant, the effect sizes of the three measures of SES found in this study are not large.

Several explanations may account for the international variations observed between individuals. On the one hand, at least part of the variation can be ascribed to the more generous, decommodifying welfare state policies of the Scandinavian countries (Esping-Andersen 1990, 1999), since they can protect better against the health effects of low SES (Bambra 2005a). Evidence of this is that there are weaker associations between education and factors subject to welfare state policy interventions (*e.g.,* employment, income, wealth) in the Northern than in Southern or Western European countries (Avendano et al. 2009). Moreover, the more equal distribution of these resources in the Northern European countries, combined with the highest levels of defamilisation (Bambra 2004, 2007a), may have contributed to smaller gender inequalities in health than in the less redistributive and less protective Southern and Western European countries.

On the other hand, we recognise the possibility that other factors, unobserved in our study, can account for these macro-level variations. Cross-national differences in the quality and stratification of the use of healthcare (Van Doorslaer, Masseria, and Koolman 2006) – combined with the fact that women have a higher frequency of healthcare utilisation than men (Bird and Rieker 1999;

Zajacova et al. 2017) – may also account for some of these differences. This study recommends that future studies should more carefully investigate these and other potential pathways.

The study has three noteworthy limitations that should be highlighted for future studies. First, all dimensions of frailty, except for maximum grip strength, are self-reported and may be sensitive to potential bias caused by cross-cultural (Jürges 2007) and gender differences in reporting styles (Zajacova et al. 2017). A possible solution could have been the use of additional information on reporting heterogeneity, examining variation in the evaluation of given health states represented by anchoring vignettes (King et al. 2004). This would have resulted in a more robust analysis, purged from the individual's own health assessment. Unfortunately, the self-administered paper questionnaire containing vignettes has been administered only to a small sample and only in the first two waves of SHARE. Second, results may be affected by cross-national differences in the proportion of institutionalised older adults who are not surveyed in the first wave of SHARE. These two limitations could likely downward-bias the estimates of frailty in Northern European countries and upward-bias them in Southern European countries. Third, the analyses are based on five panel waves and this could limit the within-unit variation in the estimation of the parameters of the fixed-effect (hybrid) models. This may explain why the within-effects estimates were not statistically significant.

Despite the limitations outlined above, this study is, to our knowledge, the first longitudinal cross-national investigation of the magnitude of the relationship between SES and health in relation to gender in a sample of older adults over an 11-year period. This work stresses the important role of SES in maintaining good health at older ages, highlighting how education and wealth have a more powerful impact on health for older women living in the Southern and Western European countries than those living in the Northern European societies. This suggests that de-commodifying and de-familializing welfare arrangements can reduce gender inequalities in health at later ages, especially amongst those from the lowest SES groups.

CHAPTER 3

Gendered Work-Family Life Courses and Later Life Health[1]

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1 A slightly different version of this chapter is under review in an international peer-reviewed journal as: Uccheddu, Damiano, Anne H. Gauthier, Tom Emery, and Nardi Steverink. '*Gendered Work-Family Life Courses and Late-Life Health: A Comparative Analysis from 28 European Countries*', [Under Review].

CHAPTER 3

3.1. Abstract

This study investigates the connection between work-family life courses during the childbearing period (ages 15-49) and health among men and women at older ages (aged 50 or older) in 28 different countries belonging to six European welfare clusters. It does so by using sequence analysis to identify work-family life course types based on data from the Survey of Health, Ageing and Retirement in Europe (SHARE). The dependent variable is grip strength, an objective measure of general physical health. Results from the multivariable linear regression models show that, for men, weak labour market attachment and very late age at entry to fatherhood were associated with weaker grip strength. For women, life courses characterized by either weak labour market attachment in combination with having many children (*i.e.,* three or more) or experiences of employment dropout after childrearing are detrimental for health at older ages. In addition, the study highlights how later-life health is framed by the welfare context in which gendered work and family responsibilities unfold across individual life courses from early adulthood to midlife. These findings make an important contribution to the domain of gender inequalities in health in later life and stress the need to engage more with issues related to the mechanisms linking work and family trajectories to poor health in later life

3.2. Introduction

Paid work and family circumstances are key domains that structure the accumulation of social and economic resources over the life course (Mayer 2009). For example, labour market interruptions during childrearing years, as well as early or late transitions to parenthood, can have large consequences on men's and women's social and economic resources (Dariotis et al. 2011; Evertsson, Grunow, and Aisenbrey 2016; Muller, Hiekel, and Liefbroer 2020). These two domains of life, paid work and family circumstances, may have in turn important long-term consequences on health at older ages. First, employment can benefit health in later life by increasing social capital, pension entitlements, wealth, or enhancing social recognition and support (Di Gessa et al. 2020; Stone et al. 2015). However, adverse employment trajectories or stressful and demanding jobs can be associated with higher risks of poor health conditions later in life (Sabbath et al. 2015; Wahrendorf et al. 2020). Second, parenthood and childrearing might also lead to more social ties and support, and positively affect subsequent health (Keenan and Grundy 2019; Lacey, Stafford, et al. 2016; Sironi 2019). Yet, experiences of teenage parenthood, short and very long birth intervals, and having many children may have adverse long-term implications for parental health (Grundy and Kravdal 2014; Lacey, Kumari, et al. 2017; Sironi, Ploubidis, and Grundy 2020).

Beyond these separate risk factors, *combining* work and family responsibilities may have a positive or negative influence on short- and long-term health. On the one hand, difficulties balancing work and family might lead to increasing levels of stress that in turn may impact later-life health outcomes (Chandola et al. 2004; Fokkema 2002; Gove 1984; Khlat, Sermet, and Le Pape 2000; Lahelma et al. 2002). This is especially true for working mothers, who often face a "double shift" of work upon returning home (Backhans, Lundberg, and Månsdotter 2007; Boye 2011; Månsdotter 2006). On the other hand, combining multiple social roles and responsibilities may improve health through "role enhancement", the process whereby individuals gain more social and economic resources known to be relevant for health or otherwise considered to buffer the adverse effects of stress (Barnett and Hyde 2001; Lahelma et al. 2002; Martikainen 1995; Nordenmark 2004; Sieber 1974). In addition, some of the complex relationships found between work-family life courses and health in later life may vary by gender and might be driven by the institutional contexts in which individuals are embedded (Boye 2011; Worts et al. 2016; Zella and Harper 2018, 2020).

Although there is extensive literature on the associations between the two domains of work and family and health outcomes, research has generated mixed findings on whether combining work and family roles enhances or harms health in later life. While some research finds combining work and family responsibilities might benefit individuals' well-being in the short term (Aassve, Goisis, and Sironi 2012; Frech and Damaske 2012; Nelson et al. 2013; Schnittker 2007; Umberson, Pudrovska, and Reczek 2010), a substantial amount of research suggests it can potentially adversely affect individual stresses and strains (Bass et al. 2009) as well as longer-term health and mortality (Benson et al. 2017; Boye 2011; Gjerdingen et al. 2001; van Hedel et al. 2016; Månsdotter 2006). These contradictions may reflect differences in study design across countries, sample composition, and measures of health employed.

The present study thus aims at clarifying previous findings by analysing longitudinal cross-national and fine-grained data which includes entire early-life work and family trajectories and their properties over an extended period (i.e., from childhood to midlife). In addition, because previous studies mainly rely on subjective assessments of well-being, we look at a more objective and concrete indicator of general health to come to a wider agreement on the impact of work-family combinations on health in later life (Spitzer and Weber 2019). Stress exposure may be related to physical health outcomes, either indirectly (*e.g.,* through behavioural risk factors) or directly through long-term variations in physiological stress responses (Grundy and Read 2015; Juster, McEwen, and Lupien 2010; McCrory et al. 2019). Therefore, it is plausible that objective measures of physical health better capture stress than subjective, self-assessed health outcomes (Grundy and Read 2015; Lacey, Sacker, et al. 2017; McMunn et al. 2016; Spitzer and Weber 2019). Relying on objective indicators of health, which have been overlooked in the past (for an exception see, for example, McMunn et al. 2016), may help to understand whether or not earlier research findings are reproducible for objective measures of physical health (Spitzer and Weber 2019).

The gender differences in these life course events and circumstances are of particular interest. However, even though men are increasingly involved in family life and childcare (Patterson and Margolis 2019), they are regularly excluded from the analyses under the (possibly incorrect) assumption that combining work and family responsibilities matters less for men since traditionally they are not the primary family caregivers (McMunn et al. 2016). Among the few studies considering men as well as women (e.g. Engels et al. 2019; Lacey, Sacker, et al. 2017; Tosi and Grundy 2019), results are consistent in showing that the different combinations of work and childrearing circumstances have gendered consequences on health conditions in later life. Women's working lives are often constrained by family and care responsibilities that arise from parenthood, which limits their possibilities to fully participate in paid employment (Bolin, Lindgren, and Lundborg 2008; Fouarge et al. 2010; Schober 2013). Mothers are generally more likely than fathers to take career breaks or drop out of the labour market, and even when they do work, they are more likely to be working a double shift of employment and unpaid family care (Lacey, Stafford, et al. 2016; McMunn et al. 2006; Worts et al. 2016). The weaker labour market attachment (Lahelma et al. 2002; Schnittker 2007), as well as the double burden of paid work and unpaid family care (Backhans et al., 2007; Boye, 2011; Månsdotter, 2006), might negatively affect women's health and well-being. For example, the negative health impact of combining work and family responsibilities are likely to be stronger for women, who have a disproportionate toll of simultaneous attainment of work and family responsibilities (Moen 2001, 2011; Moen and Spencer 2006). Prolonged periods under these potentially stressful circumstances may therefore promote the development of chronic conditions (Pearlin 2010; Pearlin et al. 1981). Biomedical evidence suggests there are multiple sex-specific pathways whereby stress accumulation along the life course leads to long-term health consequences and increased mortality risks (Juster et al. 2010; McCrory et al. 2019).

The configurations and pathways of employment and parenthood might also vary cross-nationally, due to differences in key aspects of countries' welfare state provisions, such as the characteristics

of the labour market or the institutionalization of family roles (Worts et al. 2016). The division of paid and unpaid work between the state, the market, and the family is institutionally stratified according to the characteristics of the welfare states and their family policies (Orloff 1996). Thus, men and women's different combinations of work and family responsibilities can be expected to vary according to the welfare state institutions (Anxo et al. 2011; Esping-Andersen 1999; Fuwa and Cohen 2007; Gershuny and Sullivan 2003; Korpi 2000; Orloff 1993; Sainsbury 1999), as well as their impact on women and men's health conditions (Adjei, Brand, and Zeeb 2017; Boye 2011; Zella and Harper 2018, 2020). Welfare state characteristics might exert an important role in moderating the negative impact of childrearing trajectories on later-life health (Grundy 2009; Grundy and Foverskov 2016; Keenan and Grundy 2019; Sironi 2019) or other socioeconomic risks (Lundberg et al. 2008). While it is known that there are important differences in the motherhood wage penalty across welfare states (Davies and Pierre 2005; Kleven et al. 2019; de Linde Leonard and Stanley 2020), less is known about whether and how such institutional contexts can shape the links between specific combinations of work and family trajectories and their associations with health in later life for men and women (Zella and Harper 2018, 2020). The present study stresses the need to consider the links between work-family trajectories and health in later life as framed by the context in which men and women are embedded.

In recognition of the interdependence of paid work and childrearing across adulthood – especially for women, but also increasingly for men – this study investigates whether and how the associations between specific early work-family life courses and health in later life vary by gender and between different macro-institutional settings, using data from 28 European countries participating in the retrospective Survey of Health, Ageing and Retirement in Europe (SHARE) waves 3 (2009) and 7 (2017). The present study aims to address the following research questions:

To what extent are specific work-family life courses associated with different levels of objective physical health in later life?

Which work-family life course is the most important predictor of objective physical health for men? And which one is for women?

To what extent do the associations between work-family life courses and objective physical health in later life vary across institutional contexts?

3.3. Analytical framework and empirical evidence

3.3.1. Work-family life courses and associations with health

Stress accumulation is proposed as an important mechanism underlying the associations between work-family life courses and health (Kostiainen et al. 2009; Sironi et al. 2020; Umberson et al. 2010; Wahrendorf et al. 2013, 2020). Chronic stress and related long-term variations in psychobiological stress responses (or states of "allostatic load") may be the factors that promote the onset and progression of long-term health effects and increase morbidity and mortality (Juster et al. 2010; McCrory et al. 2019). This study distinguished among three theoretical approaches to understand

the associations between work-family life courses and health at older ages, respectively based on (a) social stress, (b) role conflict, and (c) role enhancement.

Theories of *social stress*, such as the Pearlin's stress-process model (Pearlin 2010; Pearlin et al. 1981; Pearlin and Skaff 1996), conceptualize stress as the result of excessive life demands combined with insufficient resources capable of addressing such demands (*i.e.,* coping repertoires, social support, and mastery). Within this framework, work and family life can be understood to be domains that may bring individual rewards (*e.g.,* more social and economic resources) but also stress and strain. These stressors may in turn result in negative well-being outcomes such as depression or low mood (Pearlin et al. 1981). Unpaid family caregiving is a typical example of a family stressor that can interact with employment demands to impact physical and mental health conditions later in life (Pearlin et al. 1990; Martin Pinquart and Sörensen 2006). In general, processes originated by work-family stress are linked with detrimental consequences for health outcomes, including both physical and mental health (Shockley and Allen 2013), particularly for women (Lundberg and Frankenhaeuser 1999; Matud 2004). Repeated stressful episodes arising from the timing, intensity, and sequencing of specific work and family events might result in chronic stress, which in turn affects health conditions later on (Pearlin 2010; Pearlin and Skaff 1996). For example, the accumulated stress of repeat childrearing, its substantial economic costs, or the role overload arising from combining employment and family demands can lead to physical "wear and tear" (Townsend et al. 1989) for both men and women (Grundy and Read 2015). Similarly, early fatherhood may indirectly influence health conditions through drop-outs from high school, underemployment, low wealth accumulation at older ages, or other markers of life-course socioeconomic disadvantage (Dariotis et al. 2011). In particular, research shows that parents of young children (*i.e.,* aged 6 or younger) experience the greatest disadvantages in terms of health when combining childrearing with employment (Schnittker 2007).

A second possible mechanism linking the joint influences of paid work and family responsibilities on later age health is *role conflict*. The role conflict theory postulates that the competing demands of paid work and caregiving responsibilities increase the stress levels among employed mothers, with detrimental consequences on their health (Chandola et al. 2004; Fokkema 2002; Gove 1984; Khlat et al. 2000; Lahelma et al. 2002). In other words, combining extensive family and work responsibilities may lead to role overload, work-family conflict, and stress, which in turn can negatively impact mothers' health. Recent studies appear to support this mechanism and highlight how the timing of specific combinations of motherhood and paid work throughout the life course might influence health later in life. Two recent studies suggest that working mothers of young children report worse health than those out of the labour market (Leupp 2017) and than childless women working full-time (Chandola et al. 2019). Similarly, a study using data from the United States found that mortality was lowest for non-working, married, later-mothers (McKetta et al. 2018) and a Swedish study has found the lowest levels of health and wellbeing among women who start early to participate in paid work and had rather late first childbirth (Johansson, Huang, and Lindfors 2007).

The third mechanism is derived from the *role enhancement* theory which argues that multiple roles are beneficial for individuals' health because they promote psychological functioning, providing attachment and social ties outside the family (or work) domain, as well as higher self-esteem and financial independence (Barnett and Hyde 2001; Lahelma et al. 2002; Martikainen 1995; Nordenmark 2004; Sieber 1974). In this case, the positive effects in one domain of life are thought to outweigh the potentially negative ones. Consequently, the combination of different roles might subsequently benefit an individuals' health. For example, adding the worker role might promote mothers' health by generating social and economic security (Kostiainen et al. 2009). For fathers, a stronger involvement in family roles might provide meaning, direction, and guidance in life that in turn positively impact psychological well-being (Nordenmark 2004). Recent comparative studies of European countries support this mechanism by showing that early life combinations of paid employment and domestic duties along the life course have a positive impact on women's later life self-reported health and mental well-being (Zella and Harper 2018, 2020). Studies mostly based on female samples and data from the United Kingdom (UK) and United States (US) show that life courses characterized by early motherhood with long periods out of the labour market are associated with poor health in mid-life (Lacey, Sacker, et al. 2016; McKetta et al. 2018; McMunn et al. 2016; Sabbath et al. 2015) and later life (Tosi and Grundy 2019).

If the expectations of the stress process and the role conflict theory are well-founded, we should expect that combining multiple social roles throughout the life course decreases the levels of individual health at older ages. Based on these theoretical considerations and empirical findings, we can hypothesize that individuals' work-family life courses characterized by having young children in combination with paid work – that is, trajectories of working fathers and mothers who have children early, late, or many children (*i.e.,* three or more) – are associated with lowest levels of individual health in later life compared to childless individuals or parents with fewer children and/or a weaker labour market attachment.

If the expectations of role enhancement theory are well-founded, we should expect that combining multiple social roles throughout the life course increases the levels of individual health at older ages. This can result in the expectation that individuals' work-family life courses characterized by strong labour market attachment in combination with having children – that is, trajectories of fathers and mothers who have stable sequences of employment throughout the life course – are associated with the highest levels of individual health in later life compared to parents with few children or a weaker labour market attachment or compared to childless individuals with strong labour market attachment.

3.3.2. Gender, work-family life courses, and health

The health consequences of combining work and family roles may differ by gender. Gender affects the stress-process in two main ways (Barnett, Biener, and Baruch 1987). First, by determining whether a circumstance or life event will be perceived as stressful. Second, by influencing coping

responses and the health consequences of stress reactions. Women and men are also different in how they respond to stress biologically, psychologically, and physiologically (Juster et al. 2010; Lundberg 2005; Macintyre et al. 1996; Matud 2004; McCrory et al. 2019). For example, since women have traditionally been socialized to assume maternal and homemaker roles, any family-related strain may have a stronger detrimental impact on health for women than for men (Frone 2000). Conversely, since men have been socialized to assume breadwinners roles, work-related strains may have a stronger detrimental impact on health for men than for women (Frone 2000).

The Social Production Function (SPF) theory (Lindenberg 1996, 2013; Steverink 2014; Steverink and Lindenberg 2006) can also help understand how gender influences the relationship between social stress and health in later life. SPF theory considers the health consequences of stress as the result of a lack of fulfilment of basic human social needs. If these basic needs are not met (which generates stress), there will be a lack of conditions necessary for effective individual functioning and well-being, which in turn may impact subsequent health (Deci and Ryan 2000). Especially important in this regard are two basic human social needs: the needs for affection and status.

The need for affection (i.e., the need to be loved, cared for, and to experience interpersonal feelings of emotional closeness) is generally met thanks to close personal relationships. The family is often the primary resource for the fulfilment of this basic social need. Stress resulting from negative experiences within family-related life course events (*e.g.,* constraints due to intensive family caregiving activities) – which may threaten the individual's ability to achieve or maintain good health – is seen in SPF theory as stress related to the need for affection. The need for status (i.e., the need to be recognized because of one's relative social position) is mainly met in social situations such as at work. Work-related achievements, skills, or assets can be seen as the primary source for fulfilment of the need for status. Consequently, stress as a result of negative experiences concerning work-related life course events (*e.g.,* episodes of unemployment or long periods out of the labour market) is considered as stress related to the fulfilment of the need for status.

SPF theory assumes gendered specificities in the possibility for substitution or compensation between different need fulfilments (Steverink et al. 2011; Steverink, Lindenberg, and Ormel 1998). According to the SPF theory, when stress emerges in the domains of status or affection, both men and women will experience negative health and well-being consequences from this. However, women will be more protected from status-related stress than men because they can compensate this "easier" than men with increased affection need fulfilment (Steverink et al. 2011, 1998). This is because women are both more socialized than men to give and receive affection (Maccoby 1990) and also better physiologically advantaged for giving and receiving attachment and connectedness (Taylor, Dickerson, and Klein 2002). On the contrary, men have these advantages for status need fulfilment, in that they seek social connectedness particularly by competing for a good position in a status hierarchy (Baumeister and Sommer 1997). Steverink and colleagues (2011) found that experiencing early-life status-related stress (*e.g.,* deriving from unemployment or other strains related to the labour market) is associated with later-life health consequences for men but not for women. Their findings also indicate no gender differences in the association between affection-related stressors (*i.e.,* strains on personal relationships such as family and spouses) and physical and mental health (Steverink et al. 2011).

Overall, these theoretical reflections and empirical findings suggest that life courses characterized by unstable work patterns (*i.e.,* trajectories with long-accumulated time out of employment) will be less detrimental to the health of women than to men's health. However, life courses characterized by strains in the family domain (*e.g.,* early or late transition to parenthood, a high number of children, very short or very long birth intervals, etc.) will be detrimental to both men's and women's health in later life

3.3.3. Institutional context and work-family life courses

The above-mentioned mechanisms and patterns of associations may differ in their importance and health consequences according to the institutional context in which individuals are embedded. For example, societies differ in the degree to which opportunities and resources are granted for women and men (Bird and Rieker 2008) and consequently, this variation may lead to country differences in gender gaps in health (Hunt and Annandale 1999; Moss 2002; Read and Gorman 2010). In this regard, research points to inequalities arising from family care responsibilities (*e.g.,* housework, care for children and older adults, etc.) – disproportionately shouldered by women – and highlights variations in work and family combinations (Orloff 1996). Welfare state theory (Esping-Andersen 1990, 1999) might provide a useful framework for understanding how the macro-level institutional context may influence the associations between work and family life courses and health in later life. For example, the welfare state can moderate the negative impact of non-employment (Bambra and Eikemo 2009) or childrearing trajectories on later-life health (Grundy 2009; Grundy and Foverskov 2016; Keenan and Grundy 2019; Sironi 2019).

According to the stress-process framework, the availability of formal care options might help reduce intrapsychic strain which leads to stress and ultimately to negative health outcomes (Pearlin et al. 1990). Moreover, specific policies might affect the extent to which it is economically feasible to withdraw from the labour market to provide informal care for family members in need, such as young children (Guo and Gilbert 2007; Pavolini and Ranci 2008; Pfau-Effinger 2005). In countries with high levels of dual-career employment, high levels of family benefits, child care and leave, where the care work is mainly allocated to the state (such as in Social Democratic countries) (Gauthier 2002; Korpi 2000), the negative health consequences of combining work and family life – implied by the role conflict theory – may be reduced because the stronger support for working parents can influence the burden of care and also the stressors that are directly related to the family care activities (Kaschowitz and Brandt 2017). The high level of state support for working parents and the high commitment to gender equality in such countries can buffer the stressors that can arise from the burdens due to fulfilling multiple social roles (*e.g.,* that of a spouse, a parent, or an employee) as conceived by the role conflict theory (Zella and Harper 2018, 2020). In contrast, in the more familistic countries (such as in the Southern and Eastern European countries) – with stronger kinship ties, where economic uncertainty is higher, the availability of formal support to a dual-earner family model is strongly limited, and in which women are primary family caregivers – the combination of work and family responsibilities might exert a bigger toll on women's health at older ages as assumed by the role conflict theory.

Only a very few studies have explicitly investigated how specific work-family life course types may become a real benefit or threat for health at older ages in different macro-institutional settings. Zella and Harper (2018), in an analysis based on female samples and data from 12 European countries, show that the associations between work-family life courses and health are framed by the welfare context in which women live. More specifically, where family policies support combining paid work with family responsibilities, employed mothers are more protected from poor health and depression in later life (Zella and Harper 2018, 2020). Similarly, a study that compares health outcomes for American and British mothers shows that the accumulation of socioeconomic disadvantages is more prominent in the US (a context characterized by very weak social safety nets) than in the UK (McDonough et al. 2015). However, a study that compares the US and European context found only small international differences in the links between cardiovascular risks and work-family life courses of American and European women (van Hedel et al. 2016).

According to these theoretical arguments and empirical findings, we can expect that individuals' work-family life courses characterized by strong labour market attachment in combination with having children – that is, trajectories of fathers and mothers who have stable sequences of employment throughout the life course – are associated with lower levels of individual health in Southern (Cyprus, Greece, Malta, Spain, Italy and Portugal), Baltic (Estonia, Lithuania, and Latvia) and Central and Eastern European (CEE) countries (Czech Republic, Poland, Hungary, Slovenia, Slovakia, Croatia, Bulgaria, and Romania) than in other countries.

3.4. Contribution of the study

The main contribution of the present study is threefold. Firstly, the study adopts a holistic approach that can take into account men's and women's entire trajectories and combinations of both family and work domains by using a refined sequence analysis technique. More specifically, we identify life course types of women and men born 1908-1967 using Lesnard's dynamic Hamming algorithm (Lesnard 2010) on rich retrospective data drawn from the most recent waves of the retrospective Survey of Health, Ageing and Retirement in Europe (SHARE). This approach allows to more precisely focus on the process (timing) and the interaction/interdependence of the two life domains over a key phase of men's and women's adulthood (Aisenbrey and Fasang 2010; Lesnard 2010). This is particularly relevant for the scope of our study because the exact timing of events (*e.g.,* the transitions to parenthood) within sequences is of specific theoretical importance.

Secondly, the study adopts a broader view than previous research, by expanding the research questions to an objective measure of muscle strength and overall physical health assessed by a dynamometer (*i.e.,* grip strength) (Andersen-Ranberg et al. 2009; Wahrendorf et al. 2020). Grip strength has become a widely accepted objective measure of general physical health with an independent explanatory power (Hank et al. 2009; Rijk et al. 2016) and is a strong predictor of physical vulnerability and mortality at older ages (Andersen-Ranberg et al. 2009; Hank et al. 2009; Jürges 2007; Rijk et al. 2016). By looking at this objective measure of health, this study will help to come to a wider agreement about the impact of work-family life courses on the physical dimension of men's and women's health in later life.

Thirdly, the study assesses the impact of early-life combinations of work and family responsibilities on subsequent health by using rich cross-national longitudinal life course data. This permits the identification of patterns of work and family life courses for both men and women among nationally representative samples of older adults living in 28 European countries. This allowed adopting a broader view than previous studies, which mostly focus on single-country analyses (Engels et al. 2019; Zella and Harper 2018). This data allowed us to explicitly analyse the relationship between work-family life courses and health outcomes in later life by combining micro and macro determinants of health, showing how multiple combinations of paid work and childrearing circumstances are of different importance for the health of women and men living in six different European welfare clusters: Social Democratic, Liberal, Conservative, Southern European, Baltic, and Central and Eastern European (CEE). Considering the vast cross-country differences in social stratification and welfare state institutions, extending the analysis beyond a single-country to a cross-national comparative investigation, our study may advance the understanding of how the later-life health effects of combining work and family responsibilities emerge, and under which conditions they can be expected to change. In addition, given the early stage of research on post-socialist welfare states, the inclusion of the Baltic and CEE countries is a specific strength of our study.

3.5. Method

3.5.1. Data and sample

Our analysis is based on data from the Survey of Health, Ageing and Retirement in Europe (SHARE)[1], which is a multidisciplinary cross-national longitudinal survey focused on the collection of microdata on health, socioeconomic status, and family relations of older Europeans (Börsch-Supan et al. 2013). To date, SHARE has collected five panel waves of current living circumstances (including waves 1, 2, 4, 5, and 6) and two retrospective life histories surveys as part of the "SHARELIFE" project (waves 3 and 7). Refreshment samples are drawn regularly to compensate for attrition and to maintain the representation of the younger age cohorts (Bergmann,

1 This paper uses data from the generated Job Episodes Panel (DOI: 10.6103/SHARE.jep.700), see Brugiavini et al. (2019) for methodological details. The Job Episodes Panel release 7.0.0 is based on SHARE Waves 3 and 7 (DOIs: 10.6103/SHARE.w3.700, 10.6103/SHARE.w7.700), see Börsch-Supan et al. (2013) for methodological details. The SHARE data collection has been funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982) and Horizon 2020 (SHARE-DEV3: GA N°676536, SERISS: GA N°654221) and by DG Employment, Social Affairs & Inclusion. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see www.share-project.org).

Kneip, et al. 2019). Detailed information on survey participation, response rates, panel retention, and sample design of the SHARE survey is available elsewhere (Bergmann, Kneip, et al. 2019; De Luca and Peracchi 2005).

To derive complete work and fertility trajectories between ages 15 and 49, we employ data from the so-called SHARELIFE's Job Episodes Panel (Brugiavini et al. 2019) that rearranges information taken from SHARE to create a longitudinal dataset containing the labour market and parenthood status of each respondent throughout her or his life (for methodological details see Bergmann, Scherpenzeel, and Börsch-Supan 2019; Börsch-Supan et al. 2013; Brugiavini et al. 2019; Schröder 2011).

The original SHARE sample consisted of 50,636 cases (43.76% men and 56.24% women) from 28 countries: 14 from the third SHARELIFE wave (Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Poland, Spain, Sweden, and Switzerland) and 14 from the seventh SHARELIFE wave (Bulgaria, Croatia, Cyprus, Estonia, Finland, Hungary, Latvia, Lithuania, Luxembourg, Malta, Portugal, Romania, Slovakia, and Slovenia). This resulted in a total of 1,772,260 observations. Due to the dissimilarity matrix that needs to be created for the sequence analysis as all sequences are compared to one another, sequence analysis requires an enormous computer memory to analyse the data (Brzinsky-Fay, Kohler, and Luniak 2006). For this reason, after trying different sample sizes, a random 55% sample has been drawn (i.e., the maximum sample size possible), consisting of 27,852 individuals (974,820 observations, 44% men and 56% women) with complete employment and fertility histories between ages 15 and 49. We performed the sequence analysis on this sample. After discarding respondents with incomplete information on all the variables (1,585 cases; 6%), the analytic SHARE sample consisted of 26,267 individuals (44% men and 56% women). Table 8 reports the characteristics of the analytical sample.

Table 8. Descriptive characteristics of the study sample (N=26,267).

	Whole Sample			**Men**			**Women**		
	N=26,267			N= 11,441			N=14,826		
	N	% (mean)	(SD)	N	% (mean)	(SD)	N	% (mean)	(SD)
Grip Strength	26.267	(33.16)	12.02	11.441	(42.33)	10.68	14.826	(26.08)	7.27
Age	26.267	(66.22)	9.45	11.441	(66.31)	9.13	14.826	(66.16)	9.69
Gender									
Men	11.441	43.5 6							
Women	14.826	56.44							
Education									
Low	10.326	39.31		4.048	35.38		6.278	42.34	
Medium	10,65 0	40.5 5		4.974	43.48		5.676	38.28	
High	5.291	20.14		2.419	21.14		2.872	19.37	
Income quartiles									
1st quartile	6.787	25.84		2.966	25.92		3.821	25.77	
2nd quartile	6.692	25.4 8		2.911	25.44		3.781	25.5	
3rd quartile	6.467	24.62		2.813	24.59		3.654	24.65	
4th quartile	6.321	24.06		2.751	24.05		3.570	24.08	
Marital status									
Living with a spouse	18.951	72.15		9.472	82.79		9.479	63.93	
Living as a single	7.316	27.8 5		1.969	17.21		5.347	36.07	
Wave									
3	12.393	47.18		5.585	48.82		6.808	45.92	
7	13.874	52.82		5.856	51.18		8.018	54.08	

(continued)

Table 8. Continued.

	Whole Sample			Men			Women		
	N=26,267			N= 11,441			N=14,826		
	N	% (mean)	(SD)	N	% (mean)	(SD)	N	% (mean)	(SD)
Welfare cluster									
Social Democratic	2.952	11.24		1.356	11.85		1.596	10.76	
Liberal	962	3.66		431	3.77		531	3.58	
Conservative	5.118	19.48		2.346	20.51		2.772	18.7	
Southern European	4.699	17.89		2.117	18.5		2.582	17.42	
Baltic	4.167	15.86		1.553	13.57		2.614	17.63	
CEE	8.369	31.86		3.638	31.8		4.731	31.91	
Childhood health:									
General health									
Excellent	9.017	34.33		4.287	37.47		4.730	31.9	
Very good	8.146	31.01		3.529	30.85		4.617	31.14	
Good	6.626	25.23		2.680	23.42		3.946	26.62	
Fair	1.872	7.13		720	6.29		1.152	7.77	
Poor	606	2.31		225	1.97		381	2.57	
Missed school for 1 month	or longer								
No	23.773	90.51		10.410	90.99		13.363	90.13	
Yes	2.494	9.49		1.031	9.01		1.463	9.87	

(continued)

Table 8. Continued.

	Whole Sample			Men			Women		
	N=26,267			N= 11,441			N=14,826		
	N	% (mean)	(SD)	N	% (mean)	(SD)	N	% (mean)	(SD)
Confined to bed or home for 1 month or longer									
No	24.073	91.65		10.545	92.17		13.528	91.25	
Yes	2.194	8.35		896	7.83		1.298	8.75	
In hospital for 1 month or longer									
No	24.765	94.28		10.792	94.33		13.973	94.25	
Yes	1.502	5.72		649	5.67		853	5.75	

Source: Data are from SHARELIFE's Job Episodes Panel, release 7.0.0 (Brugiavini et al. 2019). Own estimates.
Note: Unless otherwise indicated, values are reported in percentages.

3.5.2. Measures

3.5.2.1. Dependent variable: grip strength

This study employs an objective measure (grip strength) of general physical health as the dependent variable. This variable is an indicator of measured general functional performance and is particularly suitable for gender and international comparisons (Andersen-Ranberg et al. 2009; Wu et al. 2017). Grip strength in kilograms was measured using a hand-held dynamometer twice, using both hands (four measurements in total for each respondent, two for each hand). We consider the maximum of the four observations as the relevant value for each respondent (Andersen-Ranberg et al. 2009). A higher score reflects stronger grip strength and hence better health (*variable range: 1-96*).

3.5.2.2. Independent variable: work-family life courses

Work-family life courses serve as our main independent variable. We identify them from annual retrospective information about employment and parenthood status between ages 15 and 49.

Parenthood histories are derived from SHARE participants' answers to questions on parenthood, including the birth year of each child. Having children is coded in a comprehensive way, including biological, step-, and adopted children. The variable identifies the number of children and whether the participant had at least one child aged 6 or younger (the age where children in Europe generally enter school, and where the child-care commitments are most demanding). For each year, there can be five parenthood states: childless; no youngest child under seven years of age; one child under seven years of age; two children, where the youngest child is under seven years of age; three or more children, where the youngest child is under seven years of age.

Employment histories are derived from participants' details on labour market participation including, among others, the starting and ending date of the job. For each year, there can be two states: "employed" and "non-employed" (for any reason).

By combining these two dimensions, we distinguished 10 states: (1) "Working, Childless"; (2) "Not Working, Childless"; (3) "Working, No Children <7"; (4) "Not Working, No Children <7"; (5) "Working, 1 Child <7"; (6) "Not Working, 1 Child <7"; (7) "Working, 2 Children <7"; (8) "Not Working, 2 Children <7"; (9) "Working, 3+ Children <7"; (10) "Not Working, 3+ Children <7". For each SHARE respondent, we construct an individual trajectory specifying work-family state at each age between 15 and 49 years (both included).

3.5.2.3. Classification of countries

This paper accounts for the broader institutional context by distinguishing different European regions according to the type of family welfare regime in those regions (Fasang, Geerdes, and Schömann 2012; Gumà, Solé-Auró, and Arpino 2019; Komp-Leukkunen 2019; Oláh, Kotowska, and Richter 2018). This permits to summarize the general context (*e.g.,* public policies, levels of gender equity, etc.) of European countries in some way. Specifically, we grouped the 28 European countries into six generic clusters according to their type of family welfare regime[2]:

2 Israel is excluded from the analysis, due to ambiguous classification.

- *Social Democratic* (Denmark, Finland, and Sweden). These countries are distinguished by a universalistic approach to social rights, comparatively generous social transfers, a commitment to full employment and income protection, and a strongly interventionist state (Esping-Andersen 1990, 1999; Orloff 1993). Their advanced social services allow women to combine work and childcare more easily than the other welfare states do (Anttonen and Sipilä 1996; Anxo et al. 2011). In addition, they encourage gender equality both on the labour market and in family responsibilities, actively supporting dual-earner household arrangements (Korpi 2000), especially in families with young children (Gauthier 2002).
- *Liberal* (Ireland and Switzerland). The liberal welfare states are distinctive for most English-speaking countries and Switzerland, with the latter and Ireland being part of this study. These countries favour market mechanisms for welfare production and accept the resulting social inequalities (Esping-Andersen 1990). The strong reliance on the market and the low levels of social-insurance provision constraint its citizens to participate in paid work (Esping-Andersen 1990; Mayer 2004). However, those with high incomes or wealth can access a wide range of services, which can allow their partner to withdraw from the labour market. As a result, gender differences in labour market participation and health outcomes are common (Anttonen and Sipilä 1996; Anxo et al. 2011; Corna and Sacker 2013).
- *Conservative* (Austria, Belgium, France, Germany, Luxembourg, and the Netherlands). These countries are characterized by their "status differentiating" welfare packages in which benefits are often earnings-related, managed through the employer, and orientated towards maintaining existing social conditions (*e.g.,* traditional gender roles). The role of the family is especially emphasized and the redistributive impact is minimal. However, the role of the market is marginalized. These countries have low levels of female labour market participation, due to the historic marginalization of female workers and the existence of policies that encourage women to take care of family responsibilities (Esping-Andersen 1990).
- *Southern European* (Cyprus, Greece, Italy, Malta, Portugal, and Spain). These countries have been classified as distinct welfare state regime (Ferrera 1996) because of their sub-protective and more fragmented system of welfare provision and welfare services. Southern European countries are characterized by high reliance on family support as a form of welfare provision compared to other European countries (Bambra 2007b). The state support to families is extremely limited and women are encouraged to take up the family and care responsibilities (Bambra 2007a, 2007b).
- *Central and Eastern European (CEE)* (Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia) and *Baltic* (Estonia, Latvia, and Lithuania). Post-socialist countries are the most underdefined and understudied region in terms of welfare state development and their classification remains controversial (Esping-Andersen 1999; Ferrera 1996). The labour markets of post-socialist countries quickly shifted from closed to open employment systems with the collapse of socialist communism (Deacon 2000; Novak 2004). Unemployment, previously almost non-existent, rapidly increased during the political and economic transition process. With the economic transition, skills acquired under socialism often became less marketable, which has increased career uncertainty (Standing 1996). Despite these general characteristics, the two clusters are relatively heterogeneous with marked

differences between the CEE and the Baltic countries. Overall, the CEE countries tend to have weaker employment protection legislation combined with more open employment relationships than the Baltic countries. In the latter, a stronger segmentation of the labour market is combined with a more stringent employment protection legislation, which is however often only weakly and selectively applied (Cazes and Nesporova 2004; Fasang et al. 2012; Saar, Unt, and Kogan 2008).

3.5.2.4. Other variables

For the analyses of the association between childrearing-work histories and subsequent health outcomes, we controlled for several individual- and household-level factors measured at the time of the interview: respondent's age (range 50-101), marital status (living with a spouse, living as a single), respondent's education, household income and wealth quartiles (country and wave-specific), country of residence, and SHARELIFE wave.

To control for health selection, this paper accounts for some measures of childhood health status: *general health*[3] (six categories: "Excellent"; "Very good"; "Good"; "Fair"; "Poor"; and "Health varied a great deal [spontaneous]"); *missed school for 1 month or longer*[4] (two categories: "yes" and "no"); *confined to bed or home for 1 month or longer*[5] (two categories: "yes" and "no"); and *in hospital for 1 month or longer*[6] (two categories: "yes" and "no").

3.5.3. Statistical analysis

Sequence analysis. Work-family life courses were determined using sequence analysis (Gauthier et al. 2010; Pollock 2007). This tool uses whole work-family life courses as the unit of analysis allowing to investigate the timing, order, and duration of events, providing a more nuanced account of life course experiences, and recognizing work and family as interdependent life domains (Barban and Billari 2012; Gauthier et al. 2010). More practically, the technique compares each sequence to all other sequences in the dataset and measures the (dis)similarity of individuals' biographical sequences (Abbott and Tsay 2000). The particular method of sequence analysis used in this study is Dynamic Hamming (Halpin 2017; Lesnard 2010) which better distinguishes respondents based on the timing of states within the life course than do standard algorithms (Aisenbrey and Fasang 2010; Lesnard 2010). Sequence analysis was conducted separately for men and women.

Cluster Analysis. We used hierarchical cluster analysis to group sequences into different clusters based on Ward's linkage procedure. To determine the most appropriate number of clusters, for both men and women, we compare solutions between 5 and 25 clusters, including frequently used

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3 The exact question wording was: "The next set of questions is about your health during your childhood. By childhood we mean from when you were born up until, and including, when you were age 15. Would you say that your health during your childhood was in general excellent, very good, good, fair, or poor?"

4 The exact question wording was: "Did you ever miss school for a month or more because of a health condition during childhood (that is, from when you were born up to and including age 15)?"

5 The exact question wording was: "(During your childhood, because of a health condition,) were you ever confined to bed or home for one month or more?"

6 The exact question wording was: "(During your childhood, because of a health condition,) were you ever in hospital for one month or more?"

quality measures: Calinski-Harabasz and Duda-Hart stopping rules (Duda, Hart, and Stork 2012; Halpin 2017). We also evaluated each cluster solution in terms of its content validity, and whether a higher cluster solution adds another cluster of theoretical relevance. On this basis, we opted for a 12-cluster solution for men and a 15-cluster solution for women.

Regression analysis. To investigate the relationships between work-family life courses and subsequent later life health, we estimated a series of multivariable regression models to predict which work-family clusters were related to grip strength at the time of the interview. In addition to work-family life courses, the regression models include all the control variables above-mentioned. Additionally, we formally test whether the association between work-family life courses and health varies across welfare clusters, by including interaction terms for work-family life courses and welfare clusters. To ease the interpretation of the interactions, we also present contrasts of marginal effects (*i.e.,* average marginal differences) in graphical form, along with their confidence intervals. Calculations and graphs are based on the SADI package (Halpin 2017) and the SQ package (Brzinsky-Fay et al. 2006) in Stata 16.1.

3.6. Results

3.6.1. Descriptive analyses of work-life combinations

The cluster analysis based on sequence analysis resulted in 12 clusters of work-family life course for men and 15 clusters for women. Figure 4 and Figure 5 present chronograms for each identified cluster of work-family life course respectively for men and women, displaying the proportion of each work-family combination by year between age 15 and 49 years. The distribution and the description of men's and women's work-family life courses are shown in Table 9, while Table 10 shows the distribution of the work-family life course patterns across the six welfare clusters.

Table 9. Sample distributions for work-family life course types and associated description of the sequences (N=26,267).

Men (N=11,441)				Women (N=14,826)			
Work-family life course	**Description (ages 15-49)**	**N**	**%**	**Work-family life course**	**Description (ages 15-49)**	**N**	**%**
'Working, Childless'	Childless men with stable work trajectories.	1,176	10.28	'Working, Childless'	Childless women with stable employment trajectories.	1,275	8.60
'Working, One Child Early'	Continuous employment; one child from early 20 s.	624	5.45	'Not Working, Childless'	Childless women with unstable employment trajectories.	371	2.50
'Working, One Child'	Continuous employment; one child from late 20s.	885	7.74	'Working, One Child'	Continuous employment; one child.	708	4.78
'Working, Two Children Early'	Continuous employment; two children from late teens.	700	6.12	'Working, Two Children Spaced'	Continuous employment; two children (first child from late teens, second child from late 20s)	761	5.13
'Working, Two Children'	Continuous employment; two children (first child from early 20s).	1,703	14.89	'Working, Two Children Early'	Continuous employment; two children (first child from late teens); closely spaced births.	1,033	6.97
'Working, Two Children Later'	Continuous employment; two children (first child from early 20s); spaced births.	1,394	12.18	'Working, Two Children'	Continuous employment; two children (first child from early 20s).	1,585	10.69
'Working, Large Family Early'	Continuous employment; three or more children (first child from early 20s).	657	5.74	'Working, Two Children Later'	Continuous employment; two children (first child from late 20s).	1,356	9.15
'Working, Large Family'	Continuous employment; three or more children (first child from early 20s); spaced births.	1,383	12.09	'Working, Large Family Early'	Continuous employment; three or more children (first child from late teens).	1,144	7.72

(continued)

Table 9. Continued.

Men (N=11,441)				Women (N=14,826)			
Work-family life course	**Description (ages 15-49)**	**N**	**%**	**Work-family life course**	**Description (ages 15-49)**	**N**	**%**
'Working, Large Family Later'	Continuous employment; three or more children (first child from late 20s); spaced births.	527	4.61	'Working, Large Family'	Continuous employment; three or more children (first child from early 20s); spaced births.	815	5.50
'Working, Later Family (from age 25)'	Continuous employment; first child after age 25.	1,595	13.94	'Not Working, Large Family Early'	Mostly non-employed (ages 15-49); three or more children (first child from late teens).	865	5.83
'Working, Later Family (from age 35)'	Continuous employment; first child after age 35.	431	3.77	'Not Working, Large Family'	Mostly non-employed; three or more children (first child from late teens).	814	5.49
'Unstable Work, Family'	Fathers with unstable employment trajectories (i.e. working intermittently).	366	3.20	'Not Working, Large Family Later'	Mostly non-employed; three or more children (first child from late 20s); spaced births.	645	4.35
				'Work Drop-out, Two Children'	Employed throughout childrearing years, with no interruptions until the first birth.	682	4.60
				'Work Drop-out Later, Two Children'	Employed throughout childrearing years, with no interruptions until late 30s.	957	6.45
				'Work Break, Large Family'	Non-employed during childrearing years; return into employment after childrearing.	1,815	12.24

Table 10. Percentage distribution over the work-family life course types, by welfare cluster (column percentages).

	Welfare cluster						
	Social Democratic	Liberal	Conservative	Southern European	Baltic	CEE	Total
Men's work-family life course type							
Working, Childless	11.95	13.92	12.57	11.95	7.73	7.86	10.28
Working, One Child Early	3.83	2.09	5.50	2.41	8.50	6.90	5.45
Working, One Child	5.31	4.18	8.40	6.38	8.95	8.91	7.74
Working, Two Children Early	5.90	2.55	4.13	2.31	8.31	9.18	6.12
Working, Two Children	14.23	8.82	13.04	10.20	15.33	19.57	14.89
Working, Two Children Later	11.50	9.05	12.23	13.84	13.72	11.16	12.18
Working, Large Family Early	5.75	6.26	6.39	4.96	5.34	5.88	5.74
Working, Large Family	15.19	17.40	13.68	13.70	9.79	9.32	12.09
Working, Large Family Later	5.38	8.58	5.03	7.84	2.90	2.42	4.61
Working, Later Family (from age 25)	15.71	18.79	14.11	20.64	11.40	9.79	13.94
Working, Later Family (from age 35)	3.69	5.57	3.28	3.59	3.41	4.15	3.77
Unstable Work, Family	1.55	2.78	1.62	2.17	4.64	4.87	3.20
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N	1,356	431	2,346	2,117	1,553	3,638	11,441

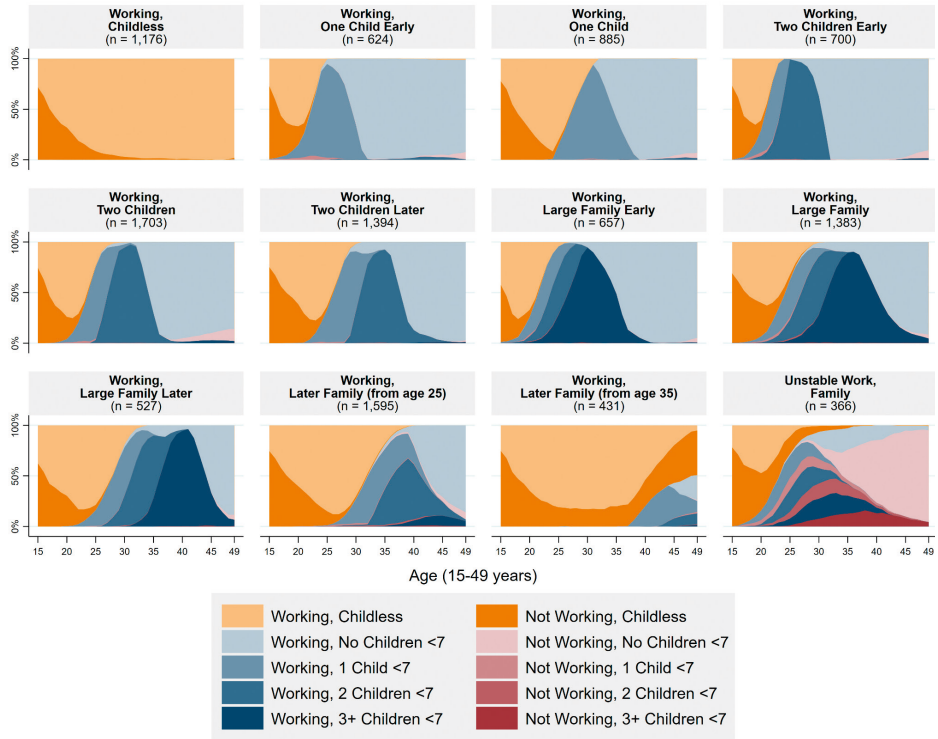
(continued)

Table 10. Continued.

	Welfare cluster						
	Social Democratic	Liberal	Conservative	Southern European	Baltic	CEE	Total
Women's work-family life course type							
Working, Childless	8.83	16.38	10.71	7.05	9.07	7.00	8.60
Not Working, Childless	1.00	2.64	2.53	7.71	0.65	1.16	2.50
Working, One Child	4.14	1.69	3.64	1.74	8.38	5.66	4.78
Working, Two Children Spaced	4.07	0.75	2.71	1.67	8.53	7.42	5.13
Working, Two Children Early	4.51	0.75	2.96	1.74	8.80	12.68	6.97
Working, Two Children	11.59	2.26	6.89	4.42	15.49	14.33	10.69
Working, Two Children Later	14.85	6.97	7.32	6.55	13.96	7.29	9.15
Working, Large Family Early	9.77	5.08	5.56	3.68	10.71	9.13	7.72
Working, Large Family	10.03	6.40	4.33	3.37	7.27	4.73	5.50
Not Working, Large Family Early	2.13	4.52	8.04	11.46	0.69	5.71	5.83
Not Working, Large Family	1.94	14.50	8.44	12.39	0.38	3.00	5.49
Not Working, Large Family Later	0.88	3.58	4.11	14.68	0.65	2.16	4.35
Work Drop-out, Two Children	2.13	12.43	10.06	7.94	1.07	1.48	4.60
Work Drop-out Later, Two Children	3.95	3.95	5.63	4.61	7.12	8.71	6.45
Work Break, Large Family	20.18	18.08	17.06	11.00	7.23	9.53	12.24
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N	1,596	531	2,772	2,582	2,614	4,731	14,826

Source: Data are from SHARELIFE's Job Episodes Panel, release 7.0.0 (Brugiavini et al. 2019). Own estimates.

Figure 4. Clusters of work-family life courses. Chronograms for men (N=11,441).



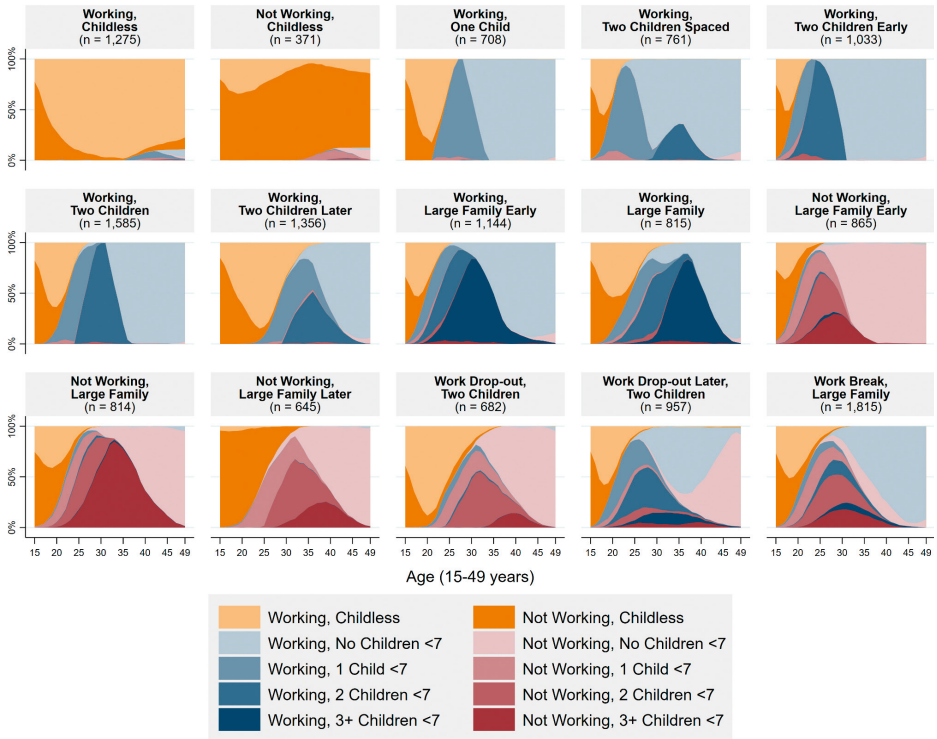
Source: Data are from SHARELIFE's Job Episodes Panel, release 7.0.0 (Brugiavini et al. 2019). Own estimates.

Figure 4 shows, for men, a series of clusters primarily characterized by continuous employment throughout the life course, only differentiated by the timing of fatherhood and entry into the labour market. The only exception to this pattern is the cluster of men with unstable employment trajectories ("Unstable Work, Family"), which is the smallest cluster of the male sample (n=366).

Figure 5 shows that women's work-family life course types are more heterogeneous than those of men. Besides the cluster of childless women with stable work histories ("Working, Childless") which is also present in the male sample, we find childless women continuously out of the labour market (cluster "Not Working, Childless"). This is the smallest cluster of the female sample (n=371). Another cluster ("Working, One Child") includes women with one child and sustained labour market attachment. The cluster "Working, Two Children Spaced" identifies continuously working mothers with two widely spaced births. Another set of two clusters identifies employed women with large families, either having had children before their twenties ("Working, Large Family Early") or later ("Working, Large Family"). Other clusters identify mothers continuously out of the labour market with large families differentiated only by the timing of childbirth. The cluster "Work Drop-out, Two Children" includes women with children who worked with no interruptions until the first birth, then interrupted their work career right after. Another cluster identifies women with

children who worked with little or no interruptions during childrearing but then left employment ("Work Drop-out Later, Two Children"). The final cluster worth mentioning identifies women who left employment when they had children and returned to the labour market after a few years ("Work Break, Large Family").

Figure 5. Clusters of work-family life courses. Chronograms for women (N=14,826).



Source: Data are from SHARELIFE's Job Episodes Panel, release 7.0.0 (Brugiavini et al. 2019). Own estimates.

3.6.2. Associations between work-family life courses and health

3.6.2.1. Men

Table 11 shows the results of multivariable models examining the association between life course types and grip strength (GS) for men (full model estimates are reported in Appendix Table A4). We used the "Work, two children" life course type as the reference category for the main independent variable. As expected, Table 11 shows that fathers with weak labour market attachment (cluster "Unstable Work, Family") have weaker GS in later life as compared to men who did work continuously over the life course. More precisely, GS of employed fathers with two children (reference category) exceed GS of fathers with weak labour market attachment by approximately 2.5 kilograms (β = -2.530; 95% CIs: -3.585, -1.476; $p<0.001$). In addition, working fathers belonging

to the cluster "Working, Later Family (from age 35)" have a weaker GS than those in the reference category (β = -2.608; 95% CIs: -3.609, -1.607; p<0.001). Interestingly, despite the effect sizes are quite contained, the life course types "Working, One Child" and "Working, Large Family" are associated with weaker GS (respectively, β = -0.942; 95% CIs: -1.678, -0.207; p < 0.05; and β = -0.782; 95% CIs: -1.410, -0.154; p<0.05). Finally, it is worth noting a negative association between being childless and GS (β = -1.093; CIs: -1.801, -0.384; p<0.01).

Table 11. Associations between work-family life course type and grip strength in older ages (higher = better): results of linear regression analyses (Men).

	Grip strength (GS)	
	b	95% CIs
Work-family lifecourse type (ref.: Working, Two children)		
Working, Childless	-1.093**	-1.801,-0.384
Working, One Child Early	-0.585	-1.403,0.232
Working, One Child	-0.942*	-1.678,-0.207
Working, Two Children Early	-0.217	-1.047,0.613
Working, Two Children Later	0.198	-0.419,0.814
Working, Large Family Early	-0.169	-0.946,0.608
Working, Large Family	-0.782*	-1.410,-0.154
Working, Large Family Later	-0.466	-1.266,0.334
Working, Later Family (from age 25)	-0.396	-1.011,0.218
Working, Later Family (from age 35)	-2.608***	-3.609,-1.607
Unstable Work, Family	-2.530***	-3.585,-1.476
Constant	81.877***	80.404,83.350
AIC	82525.266	
BIC	82760.305	
r2	0.307	
Observations	11441	

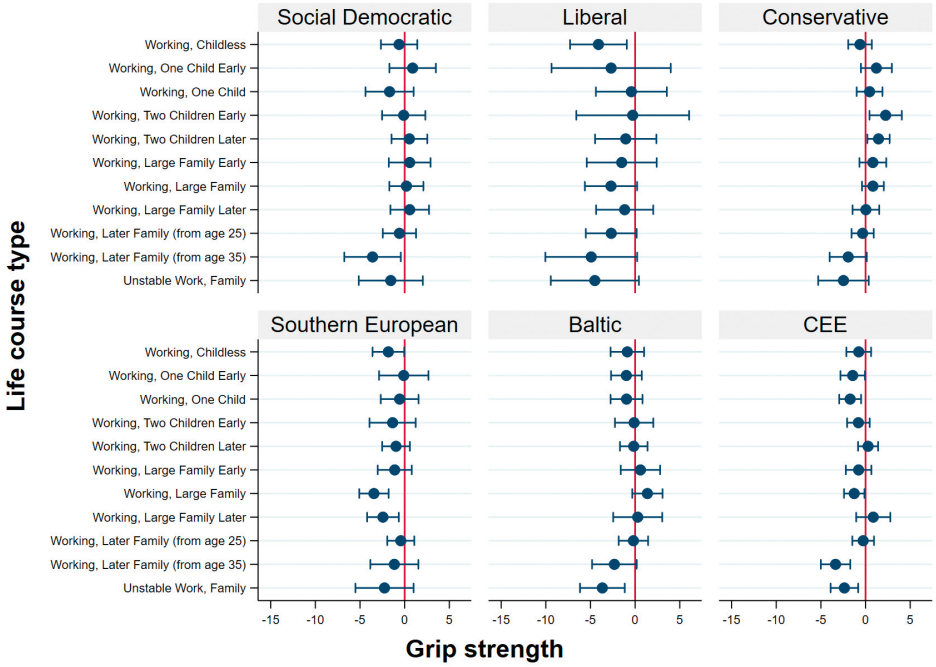
Source: Data are from SHARELIFE's Job Episodes Panel, release 7.0.0 (Brugiavini et al. 2019). Own estimates.
Note: 95% confidence intervals in second column. Models include all the control variables. Full model estimates are reported in Appendix Table A4.
Ref.: reference category; AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion.
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

To investigate whether the associations between work-family life courses and health differed in a statistically significant manner by welfare cluster, we estimated a set of regression models with interaction terms between work-family life courses and welfare clusters. The interaction plots in Figure 6 and Figure 7 report – for each welfare cluster – the contrast of marginal effects, that is, the discrete change between belonging to the reference category "Working, two children" and the other subset of categories of the main independent variable.

Figure 6 presents the point estimates and 95% confidence intervals for the coefficients of life course type on GS for men, by welfare cluster (full model estimates in tabular form are shown in

Appendix Table A6). With some geographical variations, the results from Figure 6 support the findings reported in Table 11. When interacting life course types with each welfare cluster, the contrast of margins shows that the negative association between weak labour market attachment (cluster "Unstable Work, Family") and GS is in the expected direction in all the welfare clusters but statistically significant only in Baltic and CEE countries. Very late age at parenthood (cluster "Working, Later Family [from age 35]") is associated with weak GS in Social Democratic and CEE countries. Compared with the reference category, men living in CEE countries belonging to the "Working, Later Family (from age 35)" cluster have on average 3.36 fewer kilograms in the GS score than those who belong to the reference category (difference = -3.360; 95% CIs: -5.007, -1.713; p<0.001). One other finding worth mentioning is the positive association between higher GS and membership to the clusters "Working, Two Children Early" (difference = 2.250; 95% CIs: 0.441, 4.059; p<0.05) and "Working, Two Children Later" (difference = 1.449; 95% CIs: 0.201, 2.697; p<0.05) in the Conservative welfare cluster.

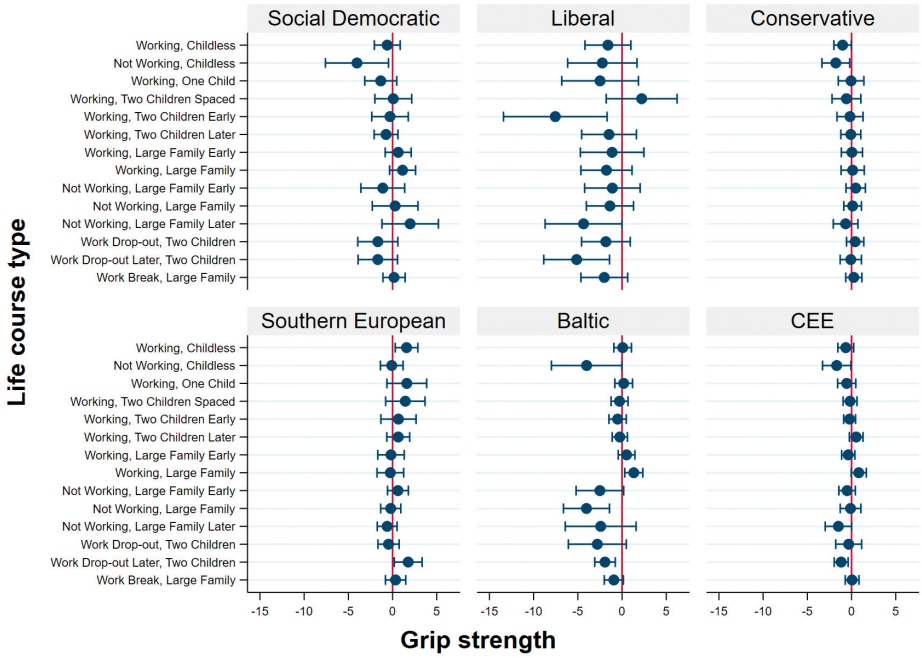
Figure 6. Contrasts of conditional marginal effects for life course type on grip strength (GS) with 95 per cent confidence intervals (men).



Source: Data are from SHARELIFE's Job Episodes Panel, release 7.0.0 (Brugiavini et al. 2019). Own estimates.

Notes: Average marginal differences with respect to life course type "Working, Two Children". Differences in GS are expressed in kilograms. Estimates are based on regression models reported in Appendix Table A6. Positive values of GS indicate better health.

Figure 7. Contrasts of conditional marginal effects for life course type on grip strength (GS) with 95 per cent confidence intervals (women).



Source: Data are from SHARELIFE's Job Episodes Panel, release 7.0.0 (Brugiavini et al. 2019). Own estimates.

Notes: Average marginal differences with respect to life course type "Working, Two Children". Differences in GS are expressed in kilograms. Estimates are based on regression models reported in Appendix Table A7. Positive values of GS indicate better health.

3.6.2.2. Women

Table 12 shows the results of multivariable models predicting GS for women (full model estimates are shown in Appendix Table A5). As is the case for men, we used the "Working, two children" life course type as the reference category. Findings from Table 12 indicate that childless women out of the labour market ("Not working, Childless") have a weaker GS relative to the reference category of employed women with two children (β = -1.413; 95% CIs: -2.140, -0.685; p<0.001). This translates into a difference of about 1.4 kilograms in GS. Similarly, the GS score is negatively associated with being a mother continuously out of the labour market with three or more children (clusters "Not Working, Large Family" and "Not Working, Large Family Later") and being a working mother with little or no employment interruptions during childrearing but with subsequent drop-out from the labour market ("Work Drop-out Later, Two Children"). Another life course negatively associated with GS is that of employed mothers with no work interruptions until the first birth, who then interrupted their work career right after (cluster "Work Drop-out, Two Children") (β = -0.502; 95% CIs: -1.051, 0.048; p<0.10), but the effect size is rather small. A

final finding worth noting refers to the *positive* association between the cluster "Working, Large Family" (mothers with sustained labour market attachment with three or more children) and GS (β = 0.693; 95% CIs: 0.186, 1.200; p<0.01).

Table 12. Associations between work-family life course type and grip strength in older ages (higher = better): results of linear regression analyses (Women).

	Grip strength (GS)	
	b	95% CI
Work-family lifecourse type (ref Working, Two children) Working, Childless	-0.336	-0.801,0.129
Not Working, Childless	-1.413***	-2.140,-0.685
Working, One Child	-0.204	-0.788,0.381
Working, Two Children Spaced	-0.102	-0.635,0.430
Working, Two Children Early	-0.244	-0.732,0.244
Working, Two Children Later	-0.050	-0.493,0.393
Working, Large Family Early	0.052	-0.420,0.523
Working, Large Family	0.693**	0.186,1.200
Not Working, Large Family Early	-0.170	-0.708,0.368
Not Working, Large Family	-0.406	-0.929,0.116
Not Working, Large Family Later	-1.262***	-1.878,-0.647
Work Drop-out, Two Children	-0.502+	-1.051,0.048
Work Drop-out Later, Two Children	-0.919***	-1.447,-0.392
Work Break, Large Family	-0.075	-0.500,0.351
Constant	47.628***	46.601,48.655
AIC	96490.227	
BIC	96756.371	
r2	0.261	
Observations	14826	

Source: Data are from SHARELIFE's Job Episodes Panel, release 7.0.0 (Brugiavini et al. 2019). Own estimates.
Note: 95% confidence intervals in the second column. Models include all the control variables. Full model estimates are reported in Appendix Table A5.
Ref.: reference category; AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion.
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Figure 7 shows the contrast of margins of the interaction terms between life course types and welfare clusters for women (full model estimates in tabular form are shown in Appendix Table A7). Results from Figure 7 indicate that childless women continuously out of the labour market (cluster "Not Working, Childless") have weaker GS in all but the Liberal and Southern European countries. In addition, the association between being childless with strong labour attachment (cluster "Working, Childless") is negatively related with GS in Conservative countries (difference = -1.010; 95% CIs: -1.999, -0.022; p<0.05) and positively associated in Southern European countries (difference = 1.582; 95% CIs: 0.304, 2.861; p<0.05). By and large, combining employment with childrearing is either not statistically associated or positively associated with GS across the different welfare clusters. For example, women belonging to the cluster "Working, Large Family" and living in Baltic (difference = 1.325; 95% CIs: 0.305, 2.345; p<0.05) or CEE countries (difference = 0.817; 95% CIs: -0.035, 1.669; p<0.10) have stronger GS in later life than those in the reference category. However, combining employment with early childrearing (cluster "Working, Two Children Early") is statistically associated with weaker GS for women living in Liberal countries (difference = -7.549; 95% CIs: -13.408 -1.690; p<0.05). Correspondingly, being a mother with sustained periods outside the labour market is either not statistically associated or negatively associated with GS across the welfare clusters under examination. For example, mothers belonging to the life course type "Not Working, Large Family" and living in Baltic countries have about 4 fewer kilograms in GS than those who belong to the reference category (difference = -4.023; 95% CIs: -6.626, -1.420; p<0.01). Similar results are found for women with later histories of childrearing, belonging to the life course type denominated "Not Working, Large Family Later", and living in Liberal (difference = -4.353; 95% CIs: -8.697, -0.008; p<0.05) and CEE countries (difference = -1.488; 95% CIs: -2.979, 0.004; p<0.10). A statistically significant association between a postponed dropout (cluster "Work Dropout Later, Two Children") and GS is found in Southern European, Baltic, and CEE countries. While in the Baltic and CEE countries the association is negative, women living in the Southern European welfare cluster show *stronger* GS than those in the reference category (difference = 1.766; 95% CIs: 0.197, 3.335; p<0.05). Being non-employed mothers during childrearing years who then return into employment (cluster "Work Break, Large Family") is statistically associated with weaker GS only for women living in Baltic countries (difference = -0.929; CIs: -2.008, 0.149; p<0.10).

3.7. Discussion and conclusion

In this study, we used a large set of retrospective information to investigate how specific work-family combinations over the life course influence objective physical health in later life for men and women, and across different institutional contexts (i.e., welfare states). Our study makes a significant contribution to the literature on gender inequalities in health in later life by identifying a series of life course typologies using sequence analysis on rich retrospective data drawn from the Survey of Health, Ageing and Retirement in Europe (SHARE). This study extends the previous literature by testing these associations on an objective measure of general physical health (i.e., grip strength) in six different European welfare state clusters (Social Democratic, Liberal, Conservative, Southern European, Baltic, and Central and Eastern European).

The results show that for men the most important predictor for physical health in later life is a life course characterized by very late age at fatherhood or unstable work, while for women it is more

detrimental for health having either a life course characterized by late motherhood, high number of children, and weak labour market attachment, or an experience of work drop-out after childrearing. This appears to be in line with theories on stress exposure (e.g. Pearlin 2010; Pearlin et al. 1981) and cumulative disadvantages (Bartley and Plewis 2002; McDonough et al. 2015), which suggest that early-life combinations of adversities in family and work domains may increase psychological stress with detrimental consequences on later-life health. These findings also support the idea that work-related strains have a stronger health consequence for men than for women (Frone 2000; Steverink et al. 2011).

Mothers' and fathers' life courses characterized by long or repeated periods out of the labour market are associated with poor health in later life as compared to parents with strong labour market attachment. For both men and women, this result tends to support the role enhancement theory (Barnett and Hyde 2001; Lahelma et al. 2002; Nordenmark 2004) and is in line with the findings from other studies looking at self-reported general health and mental well-being (Tosi and Grundy 2019; Zella and Harper 2018, 2020), biomarkers of metabolic syndrome (McMunn et al. 2016), inflammation and stress (Lacey, Sacker, et al. 2016), and mortality (McKetta et al. 2018; Sabbath et al. 2015). Therefore, these previous findings can be extended to both older men and women and objective measures of general physical health, such as grip strength. Similar to previous studies (e.g. Quashie et al. 2020), the results suggest that childlessness may be associated with better or worse health depending on gender and the institutional contexts under examination. For example, while childlessness has generally shown an adverse effect on women's and men's health, childless women with strong labour market attachment living in the Southern European countries reported better health than mothers with two children who worked continuously throughout the life course.

Other parents' life courses – such as those characterized by a combination of strong labour market attachment with either early or late transitions to parenthood, or high parity (*i.e.,* having 3 or more children) – are indeed associated with poor health in later life. Similarly, our results indicated that short interbirth intervals are associated with worse health outcomes for mothers with strong labour market attachment living in countries with Liberal welfare regime (cf. Grundy and Kravdal 2014). In this case, the results tend to support the role conflict theory for these specific timings of parenthood (Chandola et al. 2004; Fokkema 2002; Gove 1984; Khlat et al. 2000; Lahelma et al. 2002).

In line with recent comparative research that examines the links between life course types and women's well-being (e.g. Zella and Harper 2018, 2020), the study also provides evidence that the institutional context might play an important role in shaping the relationships between life course types and physical health in later life. The results suggest that employment drop-out after childrearing may be associated with worse health in certain institutional contexts (i.e., Liberal, Baltic, and Central and Eastern European countries). More generally, results show that countries that are more inclined to promote combinations of work and family responsibilities can play a role in protecting parents from adverse health effects in old age (Zella and Harper 2018, 2020).

The study has some important limitations that should be considered for future studies. First, this study is based on secondary analysis of employment and family histories and we recognize the problems with the analysis of retrospective data, including memory errors. However, retrospective SHARE data are overall strongly reliable with the information on the time of occurrence of the events, with less than 10% recall errors over all events (Garrouste and Paccagnella 2011). We also

do not consider several other work and family factors which may impact health in later life. For example, union dissolution trajectories might be linked to depression or adverse health conditions at mid-life (Lacey, Sacker, et al. 2016, 2017; McDonough et al. 2015) though not all studies find this for some objective markers of health (McMunn et al. 2016). Similarly, we do not investigate the role of part-time and full-time employment in combination with childrearing. Our research suggests that future studies should investigate these and other properties of family and employment histories. Second, the sample size of some countries under analysis is quite small and this might lead to biased estimates. This might also be the reason why the confidence intervals of some life course types were much broader. In addition, countries participating in the third wave of SHARE (*i.e.,* Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Poland, Spain, Sweden, and Switzerland) might be affected by attrition issues. As SHARE continues with further waves, the potential for more nuanced analyses of family, employment, and health events will increase substantially.

Despite these limitations, our study extends previous research by considering how different combinations of work and family trajectories along the life course are related to objective physical health in six different European welfare contexts, including post-socialist welfare states such as the Baltic and Central and Eastern European countries. One of the main contributions of this study is that it unveils several international patterns of the associations between work-family life courses and physical health in later life. In addition, the study highlights the crucial role of gender in the examination of how work and family conditions early in life directly or indirectly influence subsequent health.

CHAPTER 4

Children's Strains, Parents' Pains? How Adult Children's Union Dissolution Influences Older Parents' Health[1]

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1 A slightly different version of this chapter is under review in an international peer-reviewed journal as: Uccheddu, Damiano, and Ruben van Gaalen. '*Children's Strains, Parents' Pains? How Adult Children's Union Dissolution Influences Older Parents' Physical and Mental Health*', [Under Review].

CHAPTER 4

4.1. Abstract

This study aims at investigating gender differences in the longitudinal association between adult children's union dissolution and older parents' health. Much research has shown that parental union dissolution can negatively affect the wellbeing of their children, even in adulthood. The family life course perspective and theories of social stress also provide strong arguments on how adult children's union dissolution may affect a parent's health status. However, the extent to which parental health changes before and after a child's separation is still barely investigated. Using a combination of panel data (on parents, Survey of Health, Ageing and Retirement in Europe [SHARE]) and Dutch administrative data (on all adult children), we adopted a fixed-effects approach to assess the longitudinal association between children's union dissolution and three different measures of parental health (depression, grip strength, and frailty). Our results indicated that parents' health conditions worsen as one of their children experienced marital dissolution. In addition, we found anticipation effects of children's separation on parental health. Among parents, no striking gender differences emerged from this study. The marital dissolution of a son exerts a stronger burden on parental psychological distress than that of a daughter. This research contributes new findings, expanding the small existing body of literature to both physical and mental health outcomes. In addition, it highlights the importance of focusing on both the period before and after a child's separation as well as gender-related differences for advancing the understanding of the pathways to poor health at older ages.

4.2. Introduction

The health and well-being consequences of union dissolution – the end of marriage or cohabitation through divorce or separation – have been the topic of much research. The results are generally straightforward: parental union dissolution negatively affects the well-being of the ex-partners involved in the divorce (Leopold and Kalmijn 2016; Monden and Uunk 2013), parent-child relationships (Kalmijn 2013, 2016; Kalmijn et al. 2019; Spitze et al. 1994), and also children's health outcomes (Goisis, Özcan, and Van Kerm 2019; Strohschein 2005). There are also well-documented gender differences in the consequences of divorce (Kalmijn 2007; Kalmijn and Monden 2006; Leopold 2018). Less straightforward and less investigated are the intergenerational health consequences of a marital breakup in the opposite direction: how does adult children's union dissolution affect the health status of an older parent? Longitudinal studies based on this research question have predominantly focused on parents' mental well-being and indicate that children's union dissolution may have either no (e.g. Milkie, Bierman, and Schieman 2008) or weak to moderate negative effects on parents' depressive feelings (Kalmijn and de Graaf 2012; Tosi and Albertini 2019). Interestingly, research has generated mixed findings concerning whether the gender composition of parents and children may influence the impact of children's marital break-up on parental health.

This study aims at investigating gender differences in the longitudinal association between adult children's union dissolution and older parents' health. In doing so, we trace the change in three different outcomes covering three health domains: mental health, physical health, and general health. To date, empirical evidence connecting offspring's distressing family events with parental outcomes is not based on longitudinal data – so the causal spectrum cannot be further investigated – and focused mainly on the mental component of health (e.g. Fingerman et al. 2012; Greenfield and Marks 2006; Kalmijn 2016; Pillemer et al. 2017). These studies yield notable insights, but they often remain descriptive because of their cross-sectional character. More recently, a smaller but growing literature has developed on longitudinal methods to disentangle the effects of children's union dissolution from other sources of confounding (Kalmijn and de Graaf 2012; Milkie et al. 2008; Tosi and Albertini 2019). Due to limitations in the research design, in all these studies only information is gathered on the marital (and not cohabiting) history of a subsample of (and not all) adult children (e.g., Tosi and Albertini 2019). To summarize, extant research faces four main challenges.

First, recent longitudinal studies are based on survey data in which respondents do not report on all children and have only limited information on the precise timing of children's union dissolution (e.g. Kalmijn and de Graaf 2012; Tosi and Albertini 2019). Having additional detailed dyadic information – especially referred to a period before union dissolution – on *all* and both married and cohabiting adult children of a parent might significantly advance this line of research (Carr and Springer 2010; Umberson and Thomeer 2020). This enables a dynamic multilevel, even a fixed-effects approach "within" parents (i.e., time points nested within children, nested within parents) to assess more robustly the longitudinal association between children's union dissolution and parental health.

Second, there has been less attention given to children's separation as a process. In particular, generally overlooked within the current literature is the concept of "anticipatory stressors" – i.e., "negative events and strains" that do not (yet) exist as a reality but are considered as having the potential to become so (Pearlin and Bierman 2013:328) – towards the end of the marital relationship

(Pearlin and Bierman 2013). Although the idea of anticipatory health effects of children's divorce on parental health is implied within the current literature (Amato 2000), research that explicitly focuses on fully developing anticipatory health effects is lacking. A stronger focus on anticipatory dyadic-level stressors may bring with it the potential to gain important insight into the mechanisms linking children's dissolutions of de facto partnerships with parental health, the focus of our study.

Third, while some studies found that mothers suffer more – in terms of depressive feelings – from children's union dissolution than fathers (Kalmijn and de Graaf 2012), other studies did not find such gender differential effect (Milkie et al. 2008; Tosi and Albertini 2019), even after distinguishing all the possible parent-child gender constellations (Tosi and Albertini 2019). Explicitly incorporating the emphasis on how gender may condition the links between stressors and health will advance theoretical end empirical research on health inequalities in later life.

Fourth, to the best of our knowledge, previous longitudinal studies have not been focused on dimensions of health other than the mental one. In this domain, while findings from individual studies provide empirical support that children's marital breakup can affect parents' depressive feelings (Kalmijn and de Graaf 2012; Tosi and Albertini 2019), other studies did not find such effect on other dimensions of well-being – such as anger – for either fathers or mothers (e.g. Milkie et al. 2008). Further investigations of different health risks and their associations with family circumstances are likely to improve our understanding of the pathways to poor health at older ages (Liu and Waite 2014; McFarland, Hayward, and Brown 2013). In this study, we argue that the consequences of children's marital breakup on parents' health – and the gender differences therein – may extend into various dimensions of health (i.e., mental, physical, and general health).

Given the shortcomings mentioned, this study aims at extending the literature by investigating gender differences in how children's union dissolution is associated with parents' health in later life. The combination of dyadic panel data from administrative (System of Social-statistical Datasets (SSD) and survey (Survey of Health, Ageing and Retirement in Europe (SHARE)) sources contains complete life course information on *all* SHARE respondents and their children, allowing us to include parents' information on health linked to all children in the family. Contrary to previous research on this topic, this study will look at various measures of physical and mental health to come to a wider agreement about the impact of children's union dissolution on different dimensions of parental health. In addition, we assess the heterogeneity of these effects across parents' and children's gender.

4.3. Theory and hypotheses

4.3.1. Children's union dissolution and associations with parental health

The family life course perspective (Elder, Johnson, and Crosnoe 2003; Pearlin 2010; Pearlin et al. 1981; Pearlin and Skaff 1996) and the theories of social stress (e.g. Pearlin et al. 1981) provide a framework for examining how adult children's union dissolution may affect a parent's health status. According to the life course heuristic principle of "linked lives" (Carr 2018), individuals' lives are embedded in social relationships with nearest others and influenced by them, especially across generations by bonds of kinship (Elder 1994, 1995; Elder et al. 2003; Moen and Hernandez 2009,

2009; Settersten 2005; Suitor et al. 2011). This suggests that when a person in the family system undergoes change, so must all the familial role partners of that person.

Theories of social stress (Pearlin 1989, 2010; Pearlin et al. 1981; Pearlin and Skaff 1996) – which conceptualize stress as the result of excessive life demands combined with insufficient resources capable of addressing such demands – are often used to predict the causes of critical health problems. The emphasis on the concept of "linked lives" has been theoretically integrated with the theories of social stress, such as Pearlin's stress process model (Pearlin 2010; Pearlin et al. 1981; Pearlin and Skaff 1996). Within this framework, when an adult child experiences a stressful life course event (e.g., a divorce), effects of that change may radiate through all familial role partners interlinked to the person. Therefore, the consequences of a child's union dissolution may reverberate into a decline in the health of the older generation (i.e., their parents).

Empirical evidence regarding intergenerational ties suggests that stressful life course events in one generation are associated with stress outcomes across generations of families, including young adults (Fingerman et al. 2012; Kalmijn and de Graaf 2012) and midlife offspring (Bangerter, Zarit, and Fingerman 2016; Gilligan, Suitor, and Pillemer 2013; Pillemer et al. 2017; Suitor et al. 2016). According to the stress-process theory, these stressors may in turn result in negative physical and mental health outcomes for the older generation (Pearlin 2010; Pearlin et al. 1981; Pearlin and Skaff 1996).

There are different social mechanisms through which a child's divorce may directly affect a parent's health status (for a review, see Kalmijn and de Graaf 2012; Tosi and Albertini 2019). First, parents might have some expectations about the ideal marital life course of their children. When these expectations are not met, they can suffer from stress and this might in turn impact negatively their health conditions (*normative mechanism*) (Kalmijn and de Graaf 2012; Pillemer et al. 2012). Second, parents are empathic toward their children and thus they can take their perspective and be concerned about their problems. This means that parents might experience a deterioration in their health when children are undergoing a union dissolution and facing problems in their well-being as well (*altruistic mechanism*) (Knoester 2003). Third, parents may feel responsible for their children's life course choices because they have socialized their children during childhood and adolescence. This means that a child's union dissolution can be seen by the parent as a failure of their parental role and this, in turn, may affect their health conditions (*responsibility mechanism*) (Hagestad 1986). Fourth, health can "spread" across relationships or "spillover" from one family member to another (Umberson and Thomeer 2020). This suggests that the stress associated with divorce can be transmitted within social networks and from children to parents via their social interactions (*social contagion mechanism*) (Umberson and Thomeer 2020; Wethington 2013; Wolf, Raissian, and Grundy 2015).

Guided by the above theoretical arguments and empirical literature, we evaluate the hypothesis that a child's union dissolution is associated with increases in parents' poor health conditions (**Hypothesis 1**).

4.3.2. Divorce as a process. Anticipation and temporary effects.

A life-course perspective on the links between children's union dissolution and parents' health requires attention to time and time-related phenomena, such as anticipation effects (Bernardi et

al. 2019, 2020). The dynamics of marital breakup must be understood from both subjective and interpersonal perspectives: that is, how parents anticipate or project their children's lives looking forward, and how they review, interpret, and evaluate their lives in the present and looking backwards. Therefore, parents' opportunities and constraints might be affected by their children's past biographical experiences (which may be called the "shadows of the past"), their current circumstances, and the anticipation of their future (the "shadows of the future") (Bernardi, Huinink, & Settersten, 2018).

In their work on the stress process, Pearlin and Bierman (2013) noted that anticipatory stressors are likely experienced with greater frequency than currently recognized and thus deserve more attention than they currently receive. Pearlin and Bierman (2013:328) defined anticipatory stressors as "negative events and strains" that "do not exist as realities but are viewed as having the potential to become so". Relatedly, the notion of anticipatory stressors is implicit within the crisis model, as one component of the stress experience (e.g. Amato 2000).

According to the crisis model of divorce (e.g. Amato 2000), the marital breakup is a dynamic process that involves a series of practical changes, each of which involves stress and strains for those who experience it. These stressors include conflict, moving, adjusting to living alone, making new financial arrangements, finding a new partner, and so forth. These stressors might have consequences that also extend to those very close to the divorcees (Fingerman et al. 2012).

The crisis model of divorce has two central features. First, an important principle of the model is that the consequences of union dissolution begin *before* the separation itself (Amato 2000). Therefore, an anticipation effect of children's separation on parental health also applies: since divorce is a process and not an event, the health conditions of parents whose children are getting divorced should start to deteriorate throughout this process. Second, another expectation of the crisis model is that the effects of divorce are temporary. After practical arrangements have been made after divorce and children are adapted to their new routines, they should start to feel better and consequently also their parents. Similarly, the emotional consequences of losing a partner are supposed to be transient (Stroebe, Schut, and Stroebe 2007).

The above considerations result in the following hypotheses regarding children's union dissolution and their associations with parental health. First, we expect that the negative effects of children's divorce on parental health start to manifest in the period preceding the divorce itself (**Hypothesis 2a**). Second, we expect that parental health gradually reverts to pre-divorce levels in the years after divorce (**Hypothesis 2b**).

4.3.3. The role of gender in the associations between children's divorce and parental health

Both the life course perspective and the theories of social stress place fundamental importance on social statuses – such as gender – as conditioning the relationship between stressors emerging from adverse life course events and health outcomes (Bengtson and Allen 1994; Elder 1998; Pearlin 1989, 2010; Pearlin et al. 1981; Pearlin and Skaff 1996; Umberson et al. 2010). In this regard, research has shown the existence of gender differences in psycho-physiological stress responses (Schmaus et al. 2008), coping styles (Matud 2004), and stress-induced negative health outcomes, including cardiovascular disease and depression (Liu and Waite 2014; O'Neil et al. 2018; Piccinelli and

Wilkinson 2000). Similarly, divorce and its consequences for the ex-partners are recognized to be gendered phenomena (Kalmijn 2007; Kalmijn and Monden 2006; Leopold 2018). Since women's bonds as mothers, daughters, sisters, and grandmothers tie families (Rossi and Rossi 1990), we should expect children's (and especially daughters') life-course events to have a larger impact on the lives of mothers than on fathers.

Several theoretical considerations suggest somewhat stronger effects of children's divorce on a mother's health. First, although some recent literature suggests that the proportion of men assuming important roles within the family sphere (e.g., childcare) is increasing (Nomaguchi and Milkie 2020; Patterson and Margolis 2019; Sharma, Chakrabarti, and Grover 2016), the bonds between mothers and children are expected to be stronger than the bonds between fathers and children (Rossi and Rossi 1990). Mothers traditionally invest more resources in family relationships, are more engaged in their children's lives (Rossi and Rossi 1990), and most often take on a leading role in kinkeeping (Kalmijn 2007; Rosenthal 1985). Following their child's birth, parents (women especially) become more traditional in their gender-related attitudes and behaviours (Ferriman, Lubinski, and Benbow 2009; Katz-Wise, Priess, and Hyde 2010) and this might strengthen the mother's involvement in the upbringing of their children. Traditional gender beliefs and role expectations of other individuals towards mothers often reflect these assumptions in everyday social interactions (Ridgeway and Correll 2004). This suggests that the above-mentioned normative mechanism (Kalmijn and de Graaf 2012; Pillemer et al. 2012) might be more dominant for mothers than for fathers, as they may regard their child's union dissolution more as a personal failure than fathers, resulting in more stress deriving from their feelings of shame and guilt.

Second, physical household labour remains the focus of most research on gender differences in family responsibilities, but researchers have also drawn attention to "hidden" or "invisible" forms of labour, such as kinkeeping (Kalmijn 2007; Rosenthal 1985) and cognitive and emotional labour (Daminger 2019; Daniels 1987; Devault 1999). Using a convenience sample of 35 couples with young children, Daminger (2019) found that cognitive labour – referring to mental activities such as anticipating the needs of family members, identifying options for meeting those needs, deciding among the options, and monitoring the results – was disproportionally shouldered by mothers. Similarly, psychosocial literature suggests that women are far more likely than men to feel what another feels (i.e., they are more emphatic) (O'Brien et al. 2013; Rueckert and Naybar 2008; Singer et al. 2006). These considerations suggest that if the above-mentioned "altruistic" mechanism is at work (Kalmijn and de Graaf 2012; Knoester 2003; Tosi and Albertini 2019), this might be more dominant for mothers than for fathers, with more detrimental health consequences of children's union dissolution for mothers.

However, some recent literature suggests that fathers might experience a similar decline in health and well-being due to children's separation as mothers. Nomaguchi and Milkie (2020) indicate that gender differences in how parenting is experienced are narrowing. For example, men report that experiencing fatherhood makes them reorient their worldviews, values and priorities, relationships, and perceptions of work and family responsibilities (Daly, Ashbourne, and Brown 2013). Fathers more than mothers report that time with their children is too scarce, and when they are unable to spend more time with them, this, in turn, relates to fathers' low levels of physical and mental well-being (Milkie, Nomaguchi, and Schieman 2019). Accordingly, the detrimental effect

of child marital breakup on parental health might be not a purely maternal phenomenon, but could also affect fathers to an equal extent. Thus, in contrast to our previous theoretical consideration, children's union dissolution could have a similar negative impact on fathers' as on mothers' health.

Given these considerations, we expect the consequences of a child's marital breakup should be divided along children's gender lines as well. Particularly, parents may perceive sons' and daughters' marital issues differently, given the gender-specific role expectations. For example, daughters are generally seen as kin-keepers because they are more socialized to be family-oriented (Kalmijn 2007; Rosenthal 1985; Rossi and Rossi 1990). In addition, while men are more vulnerable to short-term consequences of divorce for subjective measures of well-being (Leopold 2018), women experience deeper drops in social and economic resources (e.g. money, time, etc.) after divorce (Leopold 2018; Leopold and Kalmijn 2016). Thus, they might encounter more struggles and have fewer resources to provide help or social support to their parents after their divorce, or they might also need more help to tackle their issues and strains arising from it. If this is the case, it suggests that daughters' union dissolution would be more detrimental for parents' health than sons' union dissolutions. Therefore, if the expectations of the "altruistic" (Kalmijn and de Graaf 2012; Knoester 2003) and "social contagion" mechanisms (Umberson and Thomeer 2020; Wethington 2013; Wolf et al. 2015) are well-founded, we should expect that a daughter's union dissolution has a stronger detrimental impact on parental health.

Longitudinal studies have provided empirical evidence for a stronger effect of children's divorce on mothers' mental well-being (Kalmijn and de Graaf 2012), though other studies did not find such gender differential effect (Milkie et al. 2008; Tosi and Albertini 2019). Research findings are mixed also regarding children's gender. One study found no interaction between union dissolution and children's gender, even after distinguishing all the possible parent-child gender compositions (Tosi and Albertini 2019). However, a recent study using data from China shows that a son's distressing marital circumstances (including divorce) exert a burden on parental psychological distress, whereas that of a daughter show no such adverse consequence (Chen and Tong 2021).

Considering the above theoretical arguments and empirical findings, we propose the following hypotheses. First, an adult child's union dissolution has a stronger detrimental impact on health for mothers than for fathers (**Hypothesis 3a**). Second, a daughter's union dissolution rather than a son's union dissolution has a stronger detrimental impact on parental health (**Hypothesis 3b**).

4.4. Method

4.4.1. Data and sample

In this study, we address the lack of precise data on adult children's union dissolution by linking parents with *all* their adult children's marital and cohabiting histories. To do so, we used dyadic panel data from both survey and administrative sources. First, this study used data from the Dutch

component of the Survey of Health, Ageing and Retirement in Europe (SHARE)[1]. SHARE is a multidisciplinary longitudinal survey representative of the non-institutionalized population aged 50 and over (Börsch-Supan et al. 2013). One of the key advantages of SHARE is that it includes a variety of individual measures of both subjective as well as objective health. Refreshment samples are drawn regularly to compensate for attrition and to maintain the representation of the younger age cohorts (Bergmann, Kneip, et al. 2019). At baseline, SHARE enrolled a random sample of Dutch residents born in 1954 or earlier and their current partners living in the same household. Baseline interviews were conducted in 2004 (n=2,968). Follow-up interviews were carried out in 2006–2007, 2011, and 2013. Detailed information on survey participation, response rates, panel retention, and sample design of the SHARE survey is available elsewhere (Bergmann, Kneip, et al. 2019; De Luca and Peracchi 2005).

Second, Dutch SHARE respondents were linked to register data from the System of Social-statistical Datasets (SSD) (Bakker et al. 2014). Unlike previous studies, this made it possible to link each SHARE participant to all their adult children. The SSD is a combination of various administrative micro datasets, among which are the population, housing, and tax registers. The SSD covers the entire population of the Netherlands and contains detailed and complete individual-level data on family histories (e.g., the occurrence and timing of cohabitations and separations, leaving and returning to the parental home, etc.), education, work histories, and healthcare use. Consent to link survey data with administrative records was asked in SHARE wave 5 (2013).

This study performs the analysis on parent-child dyads. The initial raw sample included 23,223 observations from 11,163 dyads (6,492 parents). In this study, we use only records of individuals who met the original SHARE sample criteria, i.e., 50 years of age or older (350 observations excluded), and who had at least one child (1,241 observations excluded). From this set of dyads, both biological (94.85 per cent at baseline) and adopted children (5.15 per cent at baseline) were selected. We further restricted the sample to parents who provided consent for linking their survey data with administrative records (3,957 observations excluded)[2]. Moreover, we dropped respondents whose children were not at risk of union dissolution (i.e., they were not cohabiting at baseline) (3,954 observations deleted) or had no information about the beginning date of cohabitation (1,739 ob-

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1 This paper uses data data from the System of Social-statistical Datasets (SSD) (Bakker, van Rooijen, and van Toor 2014) and from SHARE Waves 1, 2, 4, and 5 (DOIs: https://doi.org/10.6103/SHARE.w1.700, https://doi.org/10.6103/SHARE.w2.700, https://doi.org/10.6103/SHARE.w4.700, https://doi.org/10.6103/SHARE.w5.700), see Börsch-Supan et al. (2013) for methodological details. The SHARE data collection has been funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982) and Horizon 2020 (SHARE-DEV3: GA N°676536, SERISS: GA N°654221) and by DG Employment, Social Affairs & Inclusion. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see www.share-project.org).

2 Of the 4,168 respondents participating in the fifth wave of SHARE, 3,799 (91.15 per cent) gave permission to link their survey responses to administrative data from the SSD.

servations excluded). We dropped from the sample individuals with missing information on one or more of the covariates of interest (33 observations), and on the various health indicators (968 observations). Only individuals who participated in at least two waves of SHARE data collection were included in the analyses (2,070 observations excluded). After this selection, the final analytic sample includes 654 fathers (1,307 father-child dyads) and 856 mothers (1,717 mother-child dyads), for a total of 8,911 observations. Table 13 provides descriptive information on the study sample. Appendix Table A8 describes the steps taken to refine the sample.

Table 13. Description of the SHARE variables used in the analysis.

	Whole sample (N=8,911)			Fathers (N=3,823)			Mothers (N=5,088)		
	Freq.	% (mean)	SD	Freq.	% (mean)	SD	Freq.	% (mean)	SD
Parent's characteristics									
Depression	8,911	(1.71)	1.78	3,823	(1.30)	1.53	5,088	(2.01)	1.89
Grip Strength	8,911	(34.71)	10.97	3,823	(44.07)	8.79	5,088	(27.68)	6.12
Frailty Index	8,911	(0.10)	0.08	3,823	(0.09)	0.07	5,088	(0.11)	0.09
Gender									
Fathers	3,823	42.90							
Mothers	5,088	57.10							
Age									
50-55	546	6.13		147	3.85		399	7.84	
55-60	1,371	15.39		483	12.63		888	17.45	
60-65	1,957	21.96		828	21.66		1,129	22.19	
65-70	1,833	20.57		849	22.21		984	19.34	
70-75	1,466	16.45		653	17.08		813	15.98	
75-80	1,011	11.35		517	13.52		494	9.71	
80+	727	8.16		346	9.05		381	7.49	
Marital status									
Married	7,436	83.45		3,456	90.40		3,980	78.22	
Never married	11	0.12		8	0.21		3	0.06	
Divorced	386	4.33		115	3.01		271	5.33	
Widowed	1,078	12.10		244	6.38		834	16.39	
Number of children									
1	387	4.34		182	4.76		205	4.03	
2	3,395	38.10		1,499	39.21		1,896	37.26	
3 +	5,129	57.56		2,142	56.03		2,987	58.71	

(continued)

Table 13. Continued.

	Whole sample (N=8,911)			Fathers (N=3,823)			Mothers (N=5,088)		
	Freq.	% (mean)	SD	Freq.	% (mean)	SD	Freq.	% (mean)	SD
Level of education									
Low	4,754	53.35		1,564	40.91		3,190	62.70	
Middle	2,151	24.14		1,058	27.67		1,093	21.48	
High	2,006	22.51		1,201	31.42		805	15.82	
Income quartiles									
1st	2,314	25.97		820	21.45		1,494	29.36	
2nd	2,384	26.75		1,055	27.60		1,329	26.12	
3rd	2,341	26.27		1,085	28.38		1,256	24.69	
4th	1,872	21.01		863	22.57		1,009	19.83	
Children's characteristics									
Time before/after child's divorce									
-4/-2 years	220	2.47		90	2.35		130	2.56	
-2/0 years	224	2.51		99	2.59		125	2.46	
0 (Ref.)	7,663	85.99		3,286	85.95		4,377	86.03	
0/2 years	269	3.02		114	2.98		155	3.05	
2/4 years	259	2.91		111	2.90		148	2.91	
4/6 years	276	3.10		123	3.22		153	3.01	
Child's gender									
Sons	4,346	48.77		1,839	48.10		2,507	49.27	
Daughters	4,565	51.23		1,984	51.90		2,581	50.73	
Legally divorced									
No	8123	91.16		3471	90.79		4652	91.43	
Yes	788	8.84		352	9.21		436	8.57	
Geographic distance between child and parent									
0-2 km	2,578	28.93		1,089	28.49		1,489	29.26	
2-5 km	1,481	16.62		644	16.85		837	16.45	
5-10 km	1,097	12.31		478	12.50		619	12.17	
10-60 Km	2,024	22.71		858	22.44		1,166	22.92	
60 Km+	1,562	17.53		676	17.68		886	17.41	
Co-Residence	169	1.9		78	2.04		91	1.79	
Grandchild involved in the union dissolution									
No	7461	83.73		3180	83.18		4281	84.14	
Yes	1450	16.27		643	16.82		807	15.86	

(continued)

Table 13. Continued.

	Whole sample (N=8,911)			Fathers (N=3,823)			Mothers (N=5,088)		
	Freq.	% (mean)	SD	Freq.	% (mean)	SD	Freq.	% (mean)	SD
Time since cohabitation started									
0-2 years	492	5.52		231	6.04		261	5.13	
2-4 years	630	7.07		269	7.04		361	7.1	
4-6 years	700	7.86		318	8.32		382	7.51	
6-8 years	827	9.28		360	9.42		467	9.18	
8+ years	6262	70.27		2645	69.19		3617	71.09	
Individuals	1510	100.00		654	100.00		856	100.00	
Parent-child dyads	3024	100.00		1,307	100.00		1,717	100.00	
Observations	8911	100.00		3,823	100.00		5,088	100.00	

Note: Unless otherwise indicated, values are reported in percentages. Unweighted pooled dataset (N=8,911).
Source: SHARE data, years 2004–2013 (own estimates).

4.4.2. Measures

4.4.2.1. Dependent variables

Three dimensions of health, recorded in the SHARE survey, will serve as dependent variables in the study: a measure of *mental health* (EURO-D score), a measure of *physical health* (maximum grip strength), and a measure of *general health* (based on a 40-items Frailty Index [Romero-Ortuno and Kenny 2012]). In addition to mental well-being, these two other health outcomes offer a useful model for assessing children's marital disruption links with disease processes in specific dimensions of parental health: *grip strength* as a proxy measure for overall muscle strength and physical health (Andersen-Ranberg et al. 2009; Hank et al. 2009; Jürges 2007; Rijk et al. 2016) and the *Frailty Index* as a proxy of general health (Romero-Ortuno and Kenny 2012).

The first dependent variable, depressive feelings, was measured through the EURO-D depression scale that is based on 12 items – i.e., depression, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment, and tearfulness – and ranges from 0 to 12. The scale's internal consistency has been tested and confirmed in previous research (Ploubidis and Grundy 2009; Prince et al. 1999).

The second dependent variable was grip strength (GS), which has become a widely accepted objective measure of general physical health with an independent explanatory power (Hank et al. 2009; Rijk et al. 2016) and is a strong predictor of physical vulnerability and mortality at older ages (Andersen-Ranberg et al. 2009; Hank et al. 2009; Jürges 2007; Rijk et al. 2016). This variable is an indicator of measured general functional performance and is particularly suitable for gender and international comparisons (Andersen-Ranberg et al. 2009; Wu et al. 2017). GS in kilograms was measured using a hand-held dynamometer twice, using both hands (four measurements in total for each respondent, two for each hand). We consider the maximum of the four observations as the

relevant value for each respondent (Andersen-Ranberg et al. 2009). A higher score reflects higher GS and hence better health (variable range: 1-96).

Third, we used a 40-item Frailty Index (FI), which is a count of physical and mental health problems reflecting the accumulation of potential deficits affecting a given person (Rockwood and Mitnitski 2007). This measure indicates the likelihood that frailty is present and has been consistently found to be a strong predictor of adverse health outcomes, including subsequent mortality (Fried et al. 2001; Romero-Ortuno and Kenny 2012). Unlike single-item health measures commonly used in caregiving literature, the FI can provide a more complete picture of older adults' overall health. We constructed the FI following standard procedures (Romero-Ortuno and Kenny 2012; Searle et al. 2008), employing objective health markers (e.g. grip strength), functional impairments in personal and instrumental activities of daily living, self-reported health and comorbidities, mood (sadness or depression, lack of enjoyment, etc.), limitations in cognition (impaired orientation to date: day, month, year, and day of the week, etc.), and other measures (see Appendix Table A1). Each individual's deficit points were summed and divided by the total number of deficits evaluated (in our case 40) to obtain a FI with a theoretical range from 0 (no deficits present) to 1 (all deficits present). For example, a respondent with five deficits would have a FI value of .125 (5/40). Higher values indicate a greater number of health problems and hence greater frailty. The reliability coefficient, Cronbach's alpha, for the 40 items, is 0.854, which is commonly considered appropriate to sum the items into a scale.

4.4.2.2. Independent variable

The main independent variable in the study is children's union dissolution. Unlike in the United States, cohabitation instead of marriage is much more popular and accepted in the European context (Kiernan 2002), especially in the Netherlands (Liefbroer and Fokkema 2008). For these reasons, we define "union dissolution" as the end of marriage or cohabitation through divorce or separation. We measured this variable using separate dummies for the years before and after separation (cf. Allison 1994; Brüderl and Ludwig 2014). This modelling strategy allowed us to exclude the influence of time-constant factors and, contrary to previous studies, to identify the temporal path of the causal effect more flexibly. We observed 537 (14.05 per cent) transitions to union dissolution in father-child dyads and 711 (13.97 per cent) transitions in mother-child dyads (Table 13).

4.4.2.3. Control variables

Other covariates used in the analysis refer to socio-demographic characteristics of parents and children. Considering parents' characteristics, models control for gender (0=fathers, 1=mothers), age (centred), marital status ("married and living with spouse", "never married", "divorced", and "widowed"), number of children (1, 2, 3+), level of education (*low*=ISCED 0, 1, and 2; *middle*=ISCED 3 and 4; and *high*=ISCED 5 and 6), and wave-specific income quartiles.

Regarding children's characteristics, regression models control for gender (0=sons, 1=daughters), geographical distance between parent and child ("2-5 km", "5-10 km", "10-60 Km", "60 Km+", "Co-Residence"), whether there is a grandchild aged 18 years or younger involved in the union dissolution (0=no, 1=yes), and for a variable which identifies whether the child had experienced a legal divorce/separation or not at the time of the interview (0=no, 1=yes).

The definition of time was chosen according to our analytical purposes. We aimed to measure health changes among parents with children at risk of experiencing a partnership dissolution. The onset of marital breakup risk differs across children as they start living together at different ages. To measure time consistently across individuals, we defined time as years since cohabitation ("0-2 years", "2-4 years", "4-6 years", "6-8 years", and "8+ years"). Table 13 shows all the variables used in the analyses.

4.4.3. Analytic strategy

This study uses a multilevel approach to investigate the associations between children's union dissolution and within-parent changes in mental, physical, and general health. The main advantage of this strategy is that the causal spectrum of the link between children's union dissolution and parents health can be investigated, by excluding the confounding effect of individual time-constant heterogeneity (Allison 2009; Halaby 2004; Wooldridge 2020).

The analytical strategy implemented consists of two steps. Firstly, the association between children's union dissolution and changes in parents' health outcomes was analysed in the overall sample by using random-effects (RE) models controlling for all confounding variables. Secondly, we used time-distributed FE models (also known as event studies or dummy impact functions) (Allison 1994; Brüderl 2019). Unlike classical FE methods, this dynamic strategy enables us to assess the effect of children's separation on parental health for each year around the event, and therefore to capture (*1*) potential *anticipation effects* occurring before the actual date of the children's union dissolution and (*2*) potential *adaptation effects* occurring after the marital breakup. Specifically, we estimate the following regression model:

$$Y_{it} = \alpha_i + \sum_{p=-s}^{s} \beta_p D_{it}^{p} + \beta_2 X'_{it} + \varepsilon_{it}$$

In this model, Y_{it} is the health outcome of individual i at time t. a_i represents unobserved individual time-constant factors, *i.e.*, the individual fixed-effects. D_{it}^{p} denotes a set of dummy variables where p is the time prior/after the transition to a child's union dissolution. The maximum horizon forward and backwards from the time of union dissolution is s and —s, respectively. X'_{it} is a set of covariates (time since cohabitation, age, marital status, and income quartiles, etc.). The idiosyncratic error term ε_{it} varies across individuals and over time.

Since we control for individual fixed-effects in our analysis, we include parents with children that do not separate during the observation window, as well as parents whose children have already separated more than 6 years before the survey as a control group. We assign a fixed value for the impact dummy for this group of parents that do not change over time. More precisely, we use the following categorical version of time before/after a child's union dissolution: 4-2 years pre-separation, 2 years pre-separation, first 2 years since the separation, 2-4 years since the separation, and 4-6 years since separation. If a child's union dissolution only has a temporary effect, the magnitude of the estimates would decrease over time.

Since the unit of analysis will be the parent-child dyad, parents with multiple children will be present in multiple observations in the sample. We will employ clustered standard errors to adjust the estimates for the correlation between dyads within the same parent. Moreover, the clustering of multiple observations within SHARE respondents enabled us to focus exclusively on changes within individuals (i.e., parents) over time. This approach relates temporal variation in the dependent variables only to temporal variation in the independent variables. The strength of this strategy is that it allows controlling for observed and unobserved time-invariant individual characteristics.

We estimated all models separately for fathers and mothers, as well as for sons and daughters to keep the models parsimonious and to retain information about gender differences in the level of the outcomes estimated for the reference period. To test whether separation-related changes in the health outcomes differed significantly between men and women, we estimated a series of fully interacted models. The interactions between union dissolution and parents' and children's gender estimated from fully interacted models and their relative F-tests are shown in Table A9-Table A11.

Because the health outcomes were measured on different scales, we standardized the scores of depression, GS, and FI separately by gender to allow for a direct comparison between the indicators. All data were analysed using Stata 16.

4.5. Results

Table 14 shows the results of the first step of our analysis. The results from the random-effects (RE) regression models indicate that there is an association between adult children's transition to union dissolution and parents' depressive symptoms (Euro-D) and Frailty Index (FI). We did not observe any statistically significant association between children's union dissolution and parent's grip strength (GS). More specifically, in the two years preceding an adult child's separation, depressive feelings of parents increased by approximately one-eighth of a standard deviation (or 0.23 points in the EURO-D scale ranging from 0 to 11) (b = 0.13; 95% CIs: 0.01, 0.24; $p<0.05$) and the FI by nearly one-fifth of a standard deviation (or .015 points in the FI score ranging from 0 to 1) (b = 0.19; 95% CIs: 0.09, 0.28; $p<0.001$). These divorce-related health changes are net of changes related to cohabitation duration and they held after controlling for children's gender and marital status, presence of a young grandchild involved in the marital breakup, and geographic distance between parent and children.

Fixed-effects (FE) regression models from Table 14 account for the correlation between regressors and individual time-constant unobserved heterogeneity. In line with the results from the RE models, we note an increase in parents' depressive symptoms in the period of two years preceding the union dissolution, for both depression (Table 14, b = 0.21; 95% CIs: 0.08, 0.34; $p < 0.01$) and GS (Table 14, b = 0.21; 95% CIs: 0.11, 0.31; $p < 0.001$). In the case of depression, the coefficient regarding the category "-4/-2 years" was positive and statistically significant (Table 14, b = 0.15; 95% CIs: 0.02, 0.27; $p < 0.05$). This change might give a first indication of how the process evolves: at the beginning, there is fairly noticeable stress that impacts the parent's health, and towards the child's marital decision the stress decreases. These processes might take years. There were no statistically significant associations between a child's union dissolution and GS. Interestingly, in the FE model the effect of experiencing divorce themselves on their health was not significant anymore, whereas the effects preceding (-2/0 years) the children's union dissolution were slightly larger (e.g., Table

14, b = 0.21; 95% CIs: 0.08, 0.34; p < 0.01 instead of b = 0.13; 95% CIs: 0.01, 0.24; p < 0.05). This means that keeping parent's individual characteristics constant over time enables us to find indications of an actual causal link between parental health and their adult children's relationship stress preceding union dissolution.

Table 14. Random- and fixed-effects linear regression models on parents' health (z-scores), whole sample.

	Random-effects models			Fixed-effects models		
	Depression	Grip Strength	Frailty Index	Depression	Grip Strength	Frailty Index
Time before/after child's divorce (ref.: no separation, < 4 years pre-separation)						
-4/-2 years	0.10	0.02	0.07	0.15*	0.06	0.06
	(-0.03 - 0.22)	(-0.06 - 0.11)	(-0.02 - 0.16)	(0.02 - 0.27)	(-0.03 - 0.15)	(-0.04 - 0.15)
-2/0 years	0.13*	0.04	0.19***	0.21**	0.09+	0.21***
	(0.01 - 0.24)	(-0.05 - 0.13)	(0.09 - 0.28)	(0.08 - 0.34)	(-0.01 - 0.19)	(0.11 - 0.31)
0/2 years	-0.02	0.00	-0.02	0.07	0.04	0.03
	(-0.12 - 0.09)	(-0.08 - 0.08)	(-0.09 - 0.06)	(-0.06 - 0.20)	(-0.06 - 0.13)	(-0.06 - 0.12)
2/4 years	-0.02	0.04	0.00	0.04	0.09+	0.03
	(-0.13 - 0.09)	(-0.04 - 0.12)	(-0.08 - 0.09)	(-0.09 - 0.17)	(-0.00 - 0.18)	(-0.06 - 0.13)
4/6 years	-0.06	-0.01	0.04	-0.03	0.03	0.06
	(-0.16 - 0.05)	(-0.08 - 0.06)	(-0.03 - 0.11)	(-0.16 - 0.09)	(-0.05 - 0.10)	(-0.02 - 0.14)
Parents' characteristics						
Gender (*ref.: Fathers*)						
Mothers	0.33***	0.10*	0.27***	-	-	-
	(0.24 - 0.41)	(0.02 - 0.18)	(0.18 - 0.36)			
Number of children (ref.: 1)						
2	-0.08	0.02	-0.05	-0.17	0.06	0.04
	(-0.23 - 0.07)	(-0.11 - 0.15)	(-0.20 - 0.10)	(-0.63 - 0.29)	(-0.19 - 0.31)	(-0.39 - 0.47)
3+	-0.07	0.00	-0.02	-0.17	0.06	0.01
	(-0.22 - 0.08)	(-0.14 - 0.13)	(-0.17 - 0.13)	(-0.65 - 0.30)	(-0.19 - 0.31)	(-0.43 - 0.45)
Age (centered)	0.00	0.06***	0.03***	0.00	0.06***	0.05***
	(-0.01 - 0.00)	(0.05 - 0.06)	(0.03 - 0.04)	(-0.01 - 0.01)	(0.05 - 0.07)	(0.04 - 0.06)
Marital status (ref.: Married)						
Never married	-0.14	-0.02	0.05	-0.33	-0.19+	-0.19
	(-0.56 - 0.28)	(-0.30 - 0.26)	(-0.95 - 1.04)	(-1.00 - 0.35)	(-0.40 - 0.02)	(-0.88 - 0.49)
Divorced	0.28**	0.03	0.42***	-0.31	-0.21	0.00
	(0.07 - 0.49)	(-0.11 - 0.16)	(0.19 - 0.64)	(-1.15 - 0.53)	(-0.47 - 0.05)	(-0.58 - 0.58)
Widowed	0.17*	-0.03	0.04	0.26*	0.03	0.05
	(0.04 - 0.30)	(-0.14 - 0.08)	(-0.08 - 0.17)	(0.04 - 0.48)	(-0.12 - 0.18)	(-0.10 - 0.21)

(continued)

Table 14. Continued.

	Random-effects models			Fixed-effects models		
	Depression	Grip Strength	Frailty Index	Depression	Grip Strength	Frailty Index
Level of education (ref.: Low)						
Middle	-0.05	-0.11*	-0.08	-0.14	0.04	-0.19
	(-0.14 - 0.05)	(-0.21 - -0.02)	(-0.19 - 0.04)	(-0.57 - 0.29)	(-0.23 - 0.30)	(-0.63 - 0.25)
High	-0.14**	-0.06	-0.20***	-0.25	0.15	-0.30
	(-0.24 - -0.05)	(-0.16 - 0.04)	(-0.31 - -0.10)	(-0.67 - 0.17)	(-0.15 - 0.45)	(-0.90 - 0.30)
Income quartiles (ref.: 1st)						
2nd	0.01	-0.04	-0.01	0.06	-0.04	0.03
	(-0.07 - 0.10)	(-0.10 - 0.01)	(-0.09 - 0.06)	(-0.04 - 0.16)	(-0.11 - 0.02)	(-0.04 - 0.11)
3rd	0.00	-0.01	-0.02	0.04	0.01	0.02
	(-0.08 - 0.09)	(-0.07 - 0.06)	(-0.10 - 0.05)	(-0.07 - 0.15)	(-0.06 - 0.08)	(-0.05 - 0.10)
4th	0.03	-0.02	0.01	0.12*	0.00	0.09*
	(-0.06 - 0.13)	(-0.09 - 0.05)	(-0.07 - 0.09)	(0.00 - 0.23)	(-0.07 - 0.08)	(0.00 - 0.17)
Children's characteristics						
Child's gender (ref.: sons)						
Daughters	-0.06*	0.00	-0.05+	-	-	-
	(-0.12 - -0.01)	(-0.06 - 0.05)	(-0.11 - 0.00)			
Legally divorced (ref.: no)						
Yes	0.06	0.07*	0.07	-0.01	0.07	0.01
	(-0.03 - 0.14)	(0.00 - 0.14)	(-0.02 - 0.15)	(-0.16 - 0.15)	(-0.03 - 0.17)	(-0.11 - 0.12)
Time since cohabitation (ref.: 0-2 years)						
2-4 years	-0.04	-0.04	-0.02	-0.06	-0.05	-0.06*
	(-0.13 - 0.04)	(-0.10 - 0.02)	(-0.07 - 0.03)	(-0.15 - 0.03)	(-0.11 - 0.02)	(-0.11 - -0.00)
4-6 years	-0.03	-0.01	-0.06+	-0.06	-0.04	-0.12***
	(-0.11 - 0.06)	(-0.08 - 0.06)	(-0.12 - 0.00)	(-0.16 - 0.03)	(-0.11 - 0.04)	(-0.19 - -0.05)
6-8 years	-0.06	-0.07*	-0.09**	-0.12*	-0.11**	-0.17***
	(-0.15 - 0.03)	(-0.14 - -0.00)	(-0.15 - -0.02)	(-0.23 - -0.02)	(-0.19 - -0.04)	(-0.25 - -0.09)
8+ years	-0.01	-0.08*	-0.09*	-0.06	-0.15**	-0.23***
	(-0.10 - 0.08)	(-0.15 - -0.01)	(-0.17 - -0.01)	(-0.19 - 0.07)	(-0.23 - -0.06)	(-0.34 - -0.12)
Grandchild involved in the marital breakup (ref.: no)						
Yes	0.13**	-0.01	0.08+	-	-	-
	(0.05 - 0.22)	(-0.09 - 0.06)	(-0.00 - 0.16)			

(continued)

Table 14. Continued.

	Random-effects models			Fixed-effects models		
	Depression	Grip Strength	Frailty Index	Depression	Grip Strength	Frailty Index
Geographic distance between parent and children (ref.: 0-2 km)						
2-5 km	0.12**	0.01	0.07*	0.08	-0.02	0.03
	(0.04 - 0.20)	(-0.05 - 0.08)	(0.00 - 0.14)	(-0.06 - 0.22)	(-0.11 - 0.06)	(-0.06 - 0.13)
5-10 km	0.02	0.03	0.03	-0.03	-0.01	0.01
	(-0.07 - 0.10)	(-0.04 - 0.10)	(-0.06 - 0.11)	(-0.22 - 0.15)	(-0.12 - 0.11)	(-0.13 - 0.15)
10-60 Km	0.04	-0.01	0.03	-0.02	-0.04	0.06
	(-0.03 - 0.11)	(-0.07 - 0.05)	(-0.05 - 0.10)	(-0.18 - 0.14)	(-0.13 - 0.05)	(-0.06 - 0.18)
60 Km+	0.04	0.01	0.00	-0.07	-0.01	0.07
	(-0.04 - 0.12)	(-0.06 - 0.08)	(-0.09 - 0.08)	(-0.25 - 0.11)	(-0.13 - 0.10)	(-0.08 - 0.22)
Co-Residence	0.11	0.06	0.15	0.09	0.09	0.19
	(-0.07 - 0.28)	(-0.07 - 0.18)	(-0.04 - 0.34)	(-0.19 - 0.37)	(-0.05 - 0.23)	(-0.06 - 0.44)
Constant	-0.21*	5.51***	-0.10	0.16	5.47***	0.06
	(-0.40 - -0.02)	(5.36 - 5.67)	(-0.27 - 0.08)	(-0.32 - 0.65)	(5.19 - 5.75)	(-0.42 - 0.55)
Observations	8,911	8,911	8,911	8,911	8,911	8,911
Number of parent-child dyads	3,024	3,024	3,024	3,024	3,024	3,024
Number of parents	1,510	1,510	1,510	1,510	1,510	1,510
r2_o	0.06	0.25	0.10	0.00	0.23	0.06
r2_b	0.09	0.28	0.12	0.00	0.25	0.06
r2_w	0.01	0.17	0.08	0.01	0.17	0.08
sigma_u	0.58	0.65	0.70	0.75	0.72	0.83

Notes: 95% confidence intervals in parentheses. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10

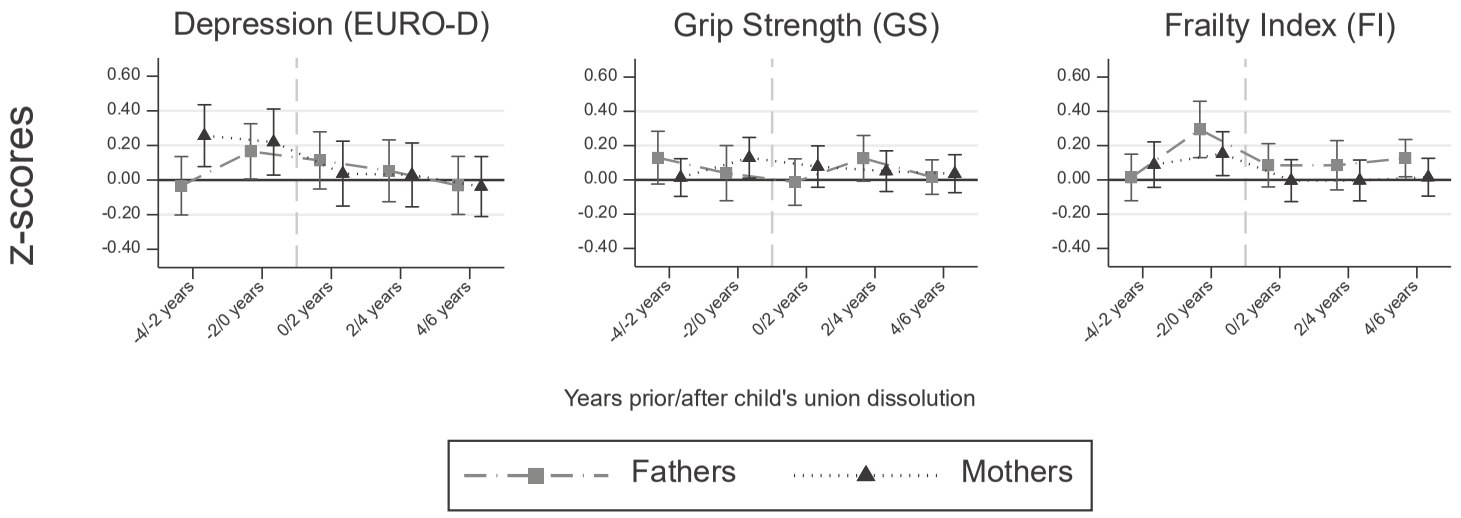
It is worth noting, however, that the effect sizes were relatively small. Other parents' characteristics, such as being a mother (*Depression*: b = 0.33; 95% CIs: 0.24, 0.41; p<0.001; *GS*: b = 0.10; 95% CIs: 0.02, 0.18; p<0.05; *FI*: b = 0.27; 95% CIs: 0.18, 0.36; p<0.001) or experiencing divorce themselves (*Depression*: b = 0.28; 95% CIs: 0.07, 0.49; p<0.01; *GS*: b = 0.03; 95% CIs: -0.11, 0.16; p>0.1; *FI*: b = 0.42; 95% CIs: 0.19, 0.64; p<0.001) had larger effects on parents' health. On the other hand, the size of the coefficients suggests that parent's health outcomes worsened before child's separation to a similar extent as having "high" versus "low" level of education (*Depression*: b = -0.14; 95% CIs: -0.24, -0.05; p<0.01; *GS*: b = -0.06; 95% CIs: -0.16, 0.04; p>0.1; *FI*: b = -0.20; 95% CIs: -0.31, -0.10; p<0.001). This suggests that intergenerational effects of a child's marital breakup on parents' health were substantively significant.

Figure 8 shows gender differences in the consequences of children's separation for the three health outcomes (depression, grip strength, and frailty), separately for mothers and fathers. Full model estimates in tabular form are shown in Appendix Table A9. Consistent with the results shown in Table 14, the findings from Figure 8 indicate that there were anticipatory effects for both fathers and mothers. For fathers, the first two years before a child's union dissolution are related to increased depression (Figure 8, b = 0.17; 95% CIs: 0.01, 0.33; $p < 0.05$) and frailty (Figure 8, b = 0.29; 95% CIs: 0.13, 0.46; $p < 0.001$). Importantly, in the case of the FI, health effects are longer lasting for fathers and extend from 4 to 6 years after a child's divorce (Figure 8, b = 0.13; 95% CIs: 0.02, 0.24; $p < 0.05$). For women, anticipatory effects on depression are stronger and occur earlier, starting 4 years before the divorce (Figure 8, b = 0.26; 95% CIs: 0.08, 0.44; $p < 0.01$) and 2 years before divorce (Figure 8, b = 0.22; 95% CIs: 0.03, 0.41; $p < 0.05$). For mothers, the impact on the FI is about half that of men (Figure 8, b = 0.15; 95% CIs: 0.02, 0.28; $p < 0.05$). Contrary to fathers, a child's marital breakup is also associated with mother's physical health, i.e., GS, 2 years before divorce (Figure 8, b = 0.13; 95% CIs: 0.01, 0.25; $p < 0.05$).

The models reported in Figure 9 test the hypothesis that a daughter's union dissolution has a stronger influence on parental health than a son's union dissolution. Full model estimates in tabular form are shown in Appendix Table A10. Contrary to our expectations, the results suggest that parents' health conditions worsened as their sons, but not their daughters, became divorced or separated. For instance, our results show an anticipation effect on all three health outcomes in the two years before a son's divorce (Figure 9, *Depression*: b = 0.34; 95% CIs: 0.17, 0.51; $p<0.001$; *GS*: b = 0.13; 95% CIs: 0.01, 0.26; $p<0.05$; *FI*: b = 0.27; 95% CIs: 0.14, 0.41; $p<0.001$) unlike the case of daughters, where the results were not statistically significant ($p>0.05$). In addition, parents whose sons experience divorce have their GS worsen 2 to 4 years after the divorce (Figure 9, b = 0.15; 95% CIs: 0.03, 0.28; $p<0.05$).

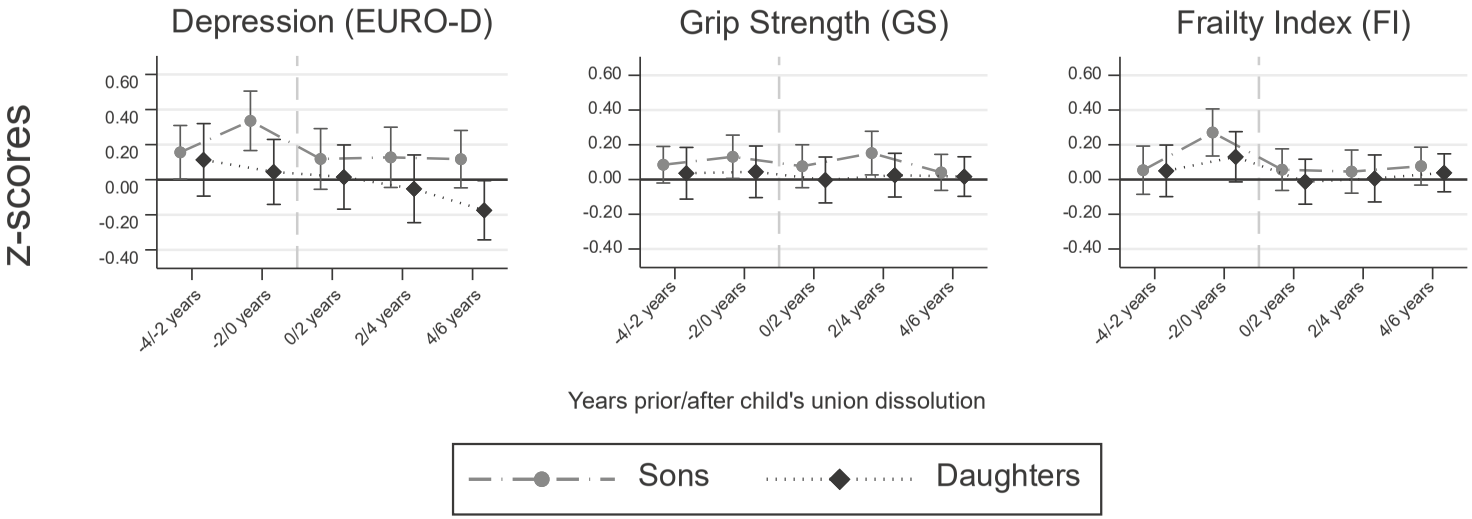
To substantiate these findings, we tested for gender differences in these associations by estimating a fully interacted time-distributed FE model to examine whether children's divorce-related changes in parental health differed significantly for fathers and mothers (Appendix Table A11), daughters and sons (Appendix Table A12), and across all the combinations of father-son, father-daughter, mother-son, and mother-daughter dyads (Appendix Table A13). In addition, we conducted a Wald test on the joint significance of all the interaction terms between gender and the union dissolution variables. The Wald tests did not reject the null hypothesis of equality of the coefficients ($P>0.05$), indicating that the interaction terms were not jointly different from zero among the gender constellations.

Figure 8. Fixed effects linear regression models on parents' health (z-scores), by parents' gender.



Notes: Observed/predicted z-scores for each health outcome: 95% confidence intervals. Category of reference: parents who do not experience a child's divorce or have experienced it more than 4 years before. Differences in health conditions are expressed in standard deviations. Positive values of Depression, GS, and FI indicate poor health. The models behind the plots are detailed in Appendix Table A9.

Figure 9. Fixed effects linear regression models on parents' health (z-scores), by child's gender.



Notes: Observed/predicted z-scores for each health outcome: 95% confidence intervals. Category of reference: parents who do not experience a child's divorce or have experienced it more than 4 years before. Differences in health conditions are expressed in standard deviations. Positive values of Depression, GS, and FI indicate poor health. The models behind the plots are detailed in Appendix Table A10.

4.6. Discussion and conclusion

In this study, we investigated how adult children's union dissolution can impact the health of older parents and how its impact differs by gender in a sample of parents aged 50 and above living in the Netherlands. Using a combination of prospective panel data (i.e., the Survey of Health, Ageing and Retirement in Europe [SHARE]) and administrative data (i.e., the System of Social-statistical Datasets [SSD]), we adopted a fixed-effects approach to investigate the links between children's union dissolution and a number of parental health outcomes (i.e., depression, grip strength, and frailty). Unique in this study is that we could link longitudinal information on the (1) marital and cohabiting history of (2) all adult children of parents that were interviewed at least twice.

In line with recent longitudinal studies on the mental effects of children's divorce (e.g., Kalmijn and de Graaf 2012; Tosi and Albertini 2019), we found that a child's divorce is generally associated with increased depression and frailty levels, and decreased grip strength. This result lends support to our first hypothesis (Hypothesis H1). In addition, the findings indicated that the negative consequences of children's divorce on parental health start to manifest in the period immediately preceding the child's separation itself (Hypothesis H2a). These results agree with the idea that union dissolution is a long-term process, often involving conflict years before the actual separation or divorce (Amato 2000), and with consequences that can extend to other family generations and health measures (Elder et al. 2003; Pearlin 2010; Pearlin et al. 1981; Pearlin and Skaff 1996).

As expected, parental health reverted to pre-divorce levels in the period two years after separation. This result implies that the health consequences of children's divorce are only temporary (Hypothesis H2b). The only exception to this pattern was the case of men's frailty, which was still compromised even after 4 years since children's union dissolution.

In line with some (Milkie et al. 2008; Tosi and Albertini 2019) but not other studies (Kalmijn and de Graaf 2012), we did not find any conspicuous gender differences in the health consequences of children's divorce. In contrast with our theoretical expectations, there were hardly any significant interaction effects between parental gender and children's marital break-up (Hypothesis H3a), as well as between the gender of the offspring and marital break-up (Hypothesis H3b). The only exception that emerged from our study concerned a stronger effect of a child's separation on depressive symptoms for mothers than for fathers in the period from 2 to 4 years before the marital break-up. This might indicate that mothers anticipate more effectively as they are better informed about children's problems beforehand, and this would reflect on their mental health years preceding the marital break-up. This result agrees with the idea that mothers are the main family kinkeepers (Kalmijn 2007; Rosenthal 1985) and therefore more aware than fathers of events, activities and tensions in their extended family.

Related to this, whereas mothers seem to cope more easily and anticipate better, fathers appear to be more caught by surprise and more hit by their children's union "failure" over time. This was particularly true for our measure of general health (*i.e.*, the Frailty Index), where fathers experienced a decline in health due to children's separation similar to that of mothers and even longer-lasting. This result is consistent with previous findings indicating that gender differences in how parenting is experienced and impacts on parental health are narrowing (Daly et al. 2013; Milkie et al. 2019; Nomaguchi and Milkie 2020). Our study reasserts that the deleterious effects of child marital break-up on parental health are not a purely maternal phenomenon.

Similarly, and contrary to our expectations, our study showed stronger consequences in the case of the divorce of a son than of a daughter. This result is in line with recent evidence indicating that a son's distressing marital circumstances exert a stronger burden on parental psychological distress than that of a daughter (Chen and Tong 2021). This could be explained by the fact that divorcing men are more vulnerable to short-term consequences of divorce for subjective measures of well-being (Leopold 2018), and parents might experience a decline in their health when children are facing those problems in their well-being (Knoester 2003).

Although this study advances knowledge in multiple ways, some important limitations should be considered for future studies. First, it was not possible with the available data to measure directly the precise mechanisms that generate the effects of children's marital break-up on their parents' health. Rather, we can only evaluate the theorized mechanisms based on their consistency with our empirical findings. For example, we were not able to measure the levels of conflictive relationships between partners before and after their union dissolution. Marital break-up might not affect health or even imply some benefits for both adult children and their parents when the relationships between (ex-)partners are highly conflictual. It would be worthwhile to consider in future studies the levels of conflict between the (ex-)spouses, as well as other potential mechanisms.

Second, and related to the preceding point, some observed changes in parental health (and the gender differences therein) might be too early in the life course to be attributed to anticipation effects. This may suggest that parents whose children eventually separated experienced a worsening of their health earlier in their lives for reasons other than their child's divorce. Reverse causality could also run from a decrease in parental health to strains in the child's relationship, and subsequently to an increase in the risk of the child's marital breakup. This might potentially be an alternative interpretation on why parental health worsen before the actual dissolution happens. However, we find it highly unlikely that decreasing parental health is the direct driving force behind an actual union dissolution of an adult child, especially because mostly it seems temporary. Our research recommends that future studies should investigate these and other potential pathways.

Third, the relatively small sample size for those subgroups of parents whose children experience divorce and the demands of fixed-effects models may have limited our ability to find significant sources of variation. Finally, our study did not consider the possibility that multiple children might experience (or not) family dissolution in starkly different ways. All things considered, future research should consider more rich data that might better capture the complexities of children's union dissolution and its consequences on parental health.

Despite these limitations, our study extends previous research in several ways. First, we analysed dyadic data linking parents with all their adult children's marital histories and distinguishing between short-term and longer-term effects of children's separation on parents' health. Second, this study examined how the effect of a child's separation may vary according to the parental health outcome considered. Our study showed how previous findings can be extended to more objective measures of general physical health, such as grip strength and frailty. Third, one of the main contributions of this study is that it unveils how parental health starts to deteriorate in the years preceding a child's union dissolution, suggesting that this period is often marred by high levels of marital distress and episodes of crisis and conflict (Amato 2000). In addition, our study does

not show remarkable gender differences, indicating that both fathers and mothers are similarly influenced by their sons' and daughters' union dissolution.

Our study suggests the need for both a policy of prevention of union dissolution and support for both separated individuals and their older parents. Professional care and family support providers should pay particular attention to delivering support for separated people and their parents not during the exact moment of separation but in the period preceding it, when the levels of conflict between the divorcees might be higher. The results about the absence of clear gender differences suggest the need for policies of support for both fathers and mothers, independently of the gender of their children.

CHAPTER 5

The pains and reliefs of the transitions into and out of spousal caregiving[1]

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1 A slightly different version of this chapter has been published as: Uccheddu, Damiano, Anne H. Gauthier, Nardi Steverink, and Tom Emery. 'The Pains and Reliefs of the Transitions into and out of Spousal Caregiving. A Cross-National Comparison of the Health Consequences of Caregiving by Gender'. *Social Science & Medicine* 240 (2019): 112517. https://doi.org/10.1016/j.socscimed.2019.112517.

CHAPTER 5

5.1. Abstract

Spousal caregiving offers a unique opportunity to investigate how gender shapes the influence of care responsibilities on health at older ages. However, empirical evidence supporting a causal link between the transitions into and out of caregiving and health is mixed. This study investigates the influence of spousal care transitions on the health of older men and women living in 17 European countries. We use five waves of the Survey of Health, Ageing and Retirement in Europe (SHARE) between the years 2004 and 2015 for a total of 43,435 individuals and 117,831 observations. Health is defined as a Frailty Index calculated from 40 items. Caregiving is defined as intensive help with personal care provided to spouses. Results from asymmetric fixed-effects linear regression models show that the transitions into caregiving have a detrimental effect on health. On the contrary, the transitions out of caregiving have in most cases no beneficial consequences on health. Most importantly, we found evidence supporting differential effects of caregiving transitions by gender and welfare arrangements: the transitions out of caregiving are associated with better health conditions only for Southern and Eastern European women. Our study highlights the asymmetric and gendered nature of care transitions and suggests that the impact of caregiving is somewhat permanent and has long-lasting effects for the caregiver. Policies should account for this asymmetry when assessing the impact and consequences of caregiving.

5.2. Introduction

In Europe, increased life expectancy is causing a rise in the number of older adults in need of long-term care (LTC) (Agree and Glaser 2009). With some geographical variations, the majority of informal care is provided by families (Agree and Glaser 2009; Verbakel et al. 2017) and, within families, the most prevalent source of caregiving in later life is a spouse (Agree and Glaser 2009; Johansson and Sundström 2005; Pickard et al. 2000). Although the proportion of older men assuming roles as caregivers is increasing (Patterson and Margolis 2019; Sharma et al. 2016), informal care responsibilities are often uniquely shouldered by women (Bertogg and Strauss 2018; Calasanti 2010; M. Pinquart and Sörensen 2006; Pinquart and Sörensen 2011; Yee and Schulz 2000). Moreover, the combinations of informal and formal care use of older adults in Europe differ considerably cross-nationally, suggesting that the provision of informal care is affected by country-specific characteristics (Johansson and Sundström 2005; Suanet, Broese van Groenou, and Van Tilburg 2012).

Caregiving can be experienced as a reason to maintain good health, which may ultimately result in lower mortality and other positive health outcomes (Fredman et al. 2015; Miyawaki et al. 2019; Roth, Fredman, and Haley 2015). Yet, the literature provides evidence that caregiving may lead to continued distress, which is assumed to translate into poor physical and mental health conditions (Pearlin et al. 1990; Pinquart and Sörensen 2003). For this reason, the disproportionate toll of care responsibilities on women might have many implications for their health (M. Pinquart and Sörensen 2006; Pinquart and Sörensen 2003; Schulz and Martire 2004; Zarit et al. 1980). This is especially true for spousal caregivers (Nieboer et al. 1998; Pinquart and Sörensen 2003), since entering this role is unique in that it "is disruptive to a wife's leisure pursuits, family relations, and marital relationship because the wife's social and marital partner is now compromised" (Seltzer and Li 2000:175). Moreover, spousal caregiving is generally intensive (Hirst 2005; Pinquart and Sörensen 2011) and many informal caregivers do not have a choice in taking on the caregiving role. This lack of choice is associated with higher levels of emotional stress, physical strain, and other negative health outcomes (Schulz et al. 2012), especially when the public LTC supply is scarce (Wagner and Brandt 2018). As Pearlin and colleagues suggest (Aneshensel et al. 1995; Pearlin and Aneshensel 1994), unlike most "careers", caregiving is unplanned and often unexpected: "becoming a caregiver is not a normatively expected transition and, therefore, is not preceded by systematic preparation" (Pearlin 2010:210). This ambiguity is more characteristic for spousal caregivers than for other types of caregivers (Montgomery and Kosloski 1994). Knowledge about the interactions between gender and spousal caregiving may contribute to the understanding of the mechanisms underlying the health conditions of older female and male caregivers.

Spousal caregiving offers a unique opportunity for investigating how gender shapes the impact of care responsibilities on health in later life (Calasanti 2010). However, while caregiving research is abundant, there are three key shortcomings. First, recent longitudinal empirical evidence found that women suffer more – in terms of mental health – from caregiving than men (Dunkle et al. 2014; Hirst 2005). On the contrary, other studies did not find such gender differential effect (e.g., Kaufman et al. 2018; Taylor et al. 2008), and a study using German data and fixed-effects models did find larger detrimental mental health effects for caregiving husbands (Hajek and König 2016).

These contradictions may reflect differences in study design across countries, sample composition, methods, and measures of health employed.

Second, previous research tends to overlook the role of the transitions into and out of caregiving in influencing older men and women's health outcomes. While existing studies are mainly focused on the comparison between groups of non-caregivers and (new) caregivers – or examined only transitions into caregiving (e.g. Marks, Lambert, and Choi 2002) or out of it (e.g., Taylor et al. 2008) – only recently some attempts have been made to investigate the effects of transitioning versus providing care in general (e.g. Dunkle et al. 2014). Moreover, while some studies indicate a beneficial health effect of transitions out of caregiving on mental health and well-being (Gaugler et al. 2010; Schulz, Beach, et al. 2003), others have found that distress increases after caregiving ends (Hirst 2005; Liu and Lou 2017). Most importantly, the current literature presumes that the effects of the transitions into and out of spousal caregiving on health are *symmetric*. That is, the effect of taking up caregiving activities on health is the same as the effect of stopping caregiving but in the opposite direction.

Third, the choice to provide care is constrained by policy and societal changes (Broese van Groenou and De Boer, 2016). Still, with very few exceptions (e.g. Wagner and Brandt 2018), there is a limited body of cross-national research on spousal caregivers' well-being and only a few comparative analyses have been conducted on gender differences in health at older ages.

This study aims to contribute to the existing literature on gender inequalities in health in later life essentially in four main ways. First, to clarify the mixed results reported in the previous literature, the differential impact of spousal caregiving on the health of women and men is assessed using cross-national longitudinal panel data. Although the existing literature uses longitudinal data, it mainly focuses on a comparison between individuals who provide care and those who do not. We aim to tackle this issue by applying a fixed-effects approach as a specific way of addressing the influence of time-constant unobserved individual factors (*i.e.,* omitted variables) that can confound the association between caregiving and health (Allison 2009; Halaby 2004). In this study, we employed an innovative approach – based on fixed-effects methods – that allow caregiving effects to be asymmetric (Allison 2019).

Second, while other previous studies tend to focus on single-item health measures (mainly depression), we adopt a multidimensional and more general conceptualisation of health using the Frailty Index as the outcome variable (Fried et al. 2001; Romero-Ortuno and Kenny 2012; Schuurmans et al. 2004). This measure is found to be a strong predictor of adverse health outcomes, including institutionalisation, disability, and subsequent mortality (Fried et al. 2001; Romero-Ortuno and Kenny 2012). Clarifying the mixed results in the past literature can guide future policies devoted to implementing physical and mental health interventions that might promote a better quality of life for the informal caregivers and for the older adults who receive that care.

Third, our research is contextualised in a sample of individuals for whom their spouses are still alive and living at home together with their spouses (Dunkle et al. 2014). Whereas other studies have especially focused on the consequences of bereavement on the health of the spousal caregiver (Stroebe et al. 2007), we are interested in studying how the transitions into and out of the role of spousal caregiver – for a spouse who might have non-critical illnesses – affect differently the personal health of older men and women.

Fourth, we will investigate what is the impact of caregiving transitions on health within four different institutional contexts which can amplify or buffer the negative consequences that derive from spousal caregiving. The institutional context in which women and men live (*e.g.,* welfare state) might mitigate the detrimental effects of informal caregiving on health, due to differences in the availability of formal care services and differences in the specific interactions between the state, the market, and the family in the provision of welfare to the individuals.

The following research questions will be addressed: (*a*) Does the transitions into the role of spousal caregiving have the same effect on individual health as the transitions out of the role of spousal caregiving (in the opposite direction)? (*b*) Does the impact of the transition into and out of caregiving on health in later life differ between women and men? (*c*) If so, does the specific welfare state arrangement play a role?

5.3. Spousal caregiving, gender, and health in context: theoretical framework and empirical evidence

5.3.1. Spousal care transitions and associations with health

Caregiving can be conceptualized as a career (Pearlin 1992). During a period of family caregiving, the demands of the role can change, even within each stage of the caregiving career (*e.g.,* during residential caregiving activities) (Pearlin 1992). Consequently, the impact of the spousal care transitions on the health of the caregiver is not static along the caregiving trajectory.

From the perspective of the "stress process" framework (Pearlin et al. 1990), the transition into the caregiver role might have detrimental consequences on health depending on the caregivers' abilities to manage stress over time. Longitudinal studies show that rates of distress vary at different stages in a caring relationship (Aneshensel et al. 1995; Cannuscio et al. 2002; Hirst 2005; Seltzer and Li 2000). On the one hand, transitions *into* caregiving are frequently associated with increased distress (Hirst 2005) and depressive symptoms (Kaufman et al. 2018), although not all studies have found a significant association (Seltzer and Li 2000). On the other hand, with some notable exceptions (e.g. Dunkle et al. 2014), prior research about transitions *out of* caregiving focuses on those whose care receiver died or were institutionalized. Among these studies, there is evidence suggesting that stopping care because of the spouse's death (Cannuscio et al. 2002; Haley et al. 2008; Li 2005; Schulz, Mendelsohn, et al. 2003) or institutionalisation (Gaugler et al. 2010) is associated with improvements in mental health and well-being. These studies suggest that stopping caregiving provides relief rather than posing health risks for family caregivers. A possible explanation that may account for this relief is related to the fact that individuals who stop caregiving might have more time and resources to care for themselves, or to experience gains in social participation and personal growth after transitioning out of the role (Seltzer and Li 2000).

The above considerations result in the following hypotheses regarding spousal care transitions and their associations with health:

H1: Transitioning into spousal caregiving activity is associated with poorer health.

H2: Transitioning out of spousal caregiving activity is associated with better health.

5.3.2. Gender and spousal caregiving transitions

Gender seems to modify the association between caregiving and health. The predominance of evidence suggests that women are more vulnerable to the negative consequences of caregiving than men (Mc Donnell and Ryan 2013; M. Pinquart and Sörensen 2006; Pinquart and Sörensen 2011; Yee and Schulz 2000).

According to one line of reasoning, based on the stress process framework (Pearlin et al. 1990), women and men live in different structural contexts in which the unequal distributions of opportunities, constraints, rewards, privileges, and responsibilities can lead to different types and intensities of stressors to which individuals are exposed. Hence, more stressors (*e.g.,* job-caregiving conflicts) and fewer personal and social resources for women (*e.g.,* lower levels of education) are suggested to result in lower levels of psychological and physical health in female than in male caregivers.

The second line of reasoning argues that the meaning of caregiving, the approach to care work, the stress that arises from care responsibilities, the coping strategies, and the social rewards of caregiving are different for men and women (Calasanti 2010; Calasanti and King 2007; Gilligan 1982; Mc Donnell and Ryan 2013; Yee and Schulz 2000). According to this perspective, traditional gender roles may define caregivers' expectations of themselves and the way the care activities should be performed (Calasanti and King 2007; Gilligan 1982; Hong and Coogle 2016). This suggests that men mainly adopt a task-oriented approach to caregiving (Mc Donnell and Ryan 2013) because they might see care responsibilities as "tasks to master and problems to solve" (Calasanti 2010:726). This orientation might provide greater feelings of control and self-efficacy and lead men to be more successful in separating their emotions from the "tasks at hand" (Calasanti 2010; Calasanti and King 2007:523; Mc Donnell and Ryan 2013).

At the same time, men are more likely to seek and receive outside assistance with caregiving from formal (*e.g.,* home-delivered meals programs) and informal sources (*e.g.,* friends or family members) than women (Mc Donnell and Ryan 2013; Yee and Schulz 2000). Moreover, men are more likely to be praised for their efforts that go beyond the traditional masculine role (Calasanti and King 2007). In contrast, women might be confronted with higher expectations – by themselves and by others – about their care responsibilities, and may feel more responsible and obliged to care (Calasanti 2010; Hong and Coogle 2016). This might lead them to view it as their responsibility to meet all of their spouse's needs – a potentially impossible goal – and introduce failures in their expected feminine role as nurturers and carers. This would imply more potential for stress for women than for men (Calasanti 2010; Calasanti and King 2007). Thus, the health effects of caregiving might be stronger for women than for men.

Guided by the above theoretical arguments and empirical literature, we evaluate the following hypotheses:

H3: Transitioning into spousal caregiving activity has a stronger detrimental impact on health for women than for men.

H4: Transitioning out of spousal caregiving activity has a stronger beneficial impact on health for women than for men.

5.3.3. Welfare state and informal caregiving

Caregivers' health conditions are influenced by the institutional context in which caregivers and care receivers are embedded. For example, the availability of formal care services might affect the individual choice to assume caring responsibilities, since the provision of informal care by families might complement or substitute the provision of formal care by the state (Bonsang 2009; Brandt 2013; Brandt, Haberkern, and Szydlik 2009; Van Houtven and Norton 2004; Kohli 1999; Künemund and Rein 1999). According to the stress process framework, formal care options help reduce intrapsychic strain which leads to stress and ultimately to negative mental and physical health outcomes (Pearlin et al. 1990). Moreover, specific policy measures might affect the extent to which it is financially feasible to withdraw from the labour market to provide informal care for family members in need (Guo and Gilbert 2007; Pavolini and Ranci 2008; Pfau-Effinger 2005).

Recent research shows that health consequences of informal care vary cross-nationally according to the characteristics of formal care options (*e.g.,* LTC), the public old age and family transfers, or the attitudes toward familial caregiving (Dujardin et al. 2011; Kaschowitz and Brandt 2017; Pearlin et al. 1990; Ruppanner and Bostean 2014; Wagner and Brandt 2018).

A central aspect of welfare state regime theory is devoted to countries' approaches to the care of dependent individuals (Esping-Andersen 1990) and there are two main propositions regarding how the state and the family interact in sharing their care responsibilities (Kaschowitz and Brandt 2017). One is the "complementarity" thesis, which postulates that public and private support are complementary (state and family complement each other); the other is the "substitution" thesis, which states that there is an inverse relationship between formal service provision and informal family care (the two types of support can substitute for each other) (Kohli 1999; Künemund and Rein 1999). The first of these, complementarity between family and state, can be seen as a specific form of division of labour in terms of "specialization" (Brandt 2013:46; Kaschowitz and Brandt 2017).

Complementarity is expected to be more prevalent in generous welfare states, where "family members are [...] enabled to give additional support to their relatives if, when and in which form they like to" (Brandt 2013:30). Therefore, in these institutional contexts, women and men might support their relatives with (low intensity) "help" instead of intensive informal care (Kaschowitz and Brandt 2017; Verbakel et al. 2017). This pattern is expected to be inverted in less generous welfare states, in which women are compelled to supply more intense forms of care and support, like spousal caregiving (Bonsang 2007; Brandt 2013; Kaschowitz and Brandt 2017).

In countries in which the availability of formal care options is more consistent (such as in Northern European countries), the negative effects of caregiving may be reduced because professional services can influence the perceived burden of care and also the stressors that are directly related to the care activities. The availability of formal care in such "service-based" countries (Haberkern and Szydlik 2008; Kaschowitz and Brandt 2017) can buffer the stressors that arise from the burdens due to fulfilling multiple social roles beyond being a caregiver (*e.g.,* that of a spouse, a parent, or an employee). On the contrary, in the more familistic countries (such as in the Southern and Eastern European countries) with stronger kinship ties, where economic uncertainty is higher, the availability of formal support for caregivers strongly limited, and in which women are primary caregivers, the provision of spousal caregiving might exert a bigger toll on women's life at older ages. Consequently, we would expect a smaller gap in health, between those who enter into caregiving and

those who do not, in those welfare arrangements in which the availability of formal care is higher and a larger gap in health in familistic ones. Similarly, we would expect a stronger beneficial effect in terms of health for those who experience a transition out of spousal caregiving in those welfare clusters that lack family policies and formal support services for the caregivers.

Considering the above literature, we propose the following hypothesis:

H5: We expect a stronger effect of caregiving transitions on health in *Southern* (Greece, Italy, Portugal, and Spain) and *Eastern* European countries (Czech Republic, Estonia, Poland, and Slovenia), compared to *Northern* (Denmark, Netherlands, and Sweden) and *Western* European countries (Austria, Belgium, France, Germany, Luxembourg, and Switzerland).

5.4. Method

5.4.1. Data

We use panel data from the Survey of Health, Ageing and Retirement in Europe (SHARE)[1] (Börsch-Supan et al. 2013). SHARE is a multidisciplinary and cross-national panel dataset of microdata on health, socioeconomic status, and family relations of older Europeans. Refreshment samples are drawn regularly to compensate for attrition and to maintain the representation of the younger age cohorts (Bergmann, Kneip, et al. 2019). Our empirical analysis uses data from the first (2004-2005), second (2006-2007), fourth (2011-2012), fifth (2013), and sixth (2015) wave of SHARE. The retrospective third (2008–2009) and seventh (2017) waves of SHARE were excluded from the analyses as they focus on the respondents' life histories and because the questionnaire and variables are not comparable to the core data. Our analysis is based on 17 countries: Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Greece, Italy, Luxembourg, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, and Switzerland.

The original SHARE sample included 243,949 person-year observations from 109,519 individuals. In this study, we use only records of individuals who met the original SHARE sample criteria, *i.e.,* 50 years of age or older (6,203 person-year excluded), and who had a spouse who also participated in the SHARE survey during the same period and not institutionalized. Therefore, we further restricted the analytical sample to couples who lived together during the whole period of observation (65,472 person-year excluded), and were married to the same person throughout the observation window (477 person-year excluded). Moreover, we dropped respondents in same-sex

1 This paper uses data from SHARE Waves 1, 2, 4, 5, 6 (DOIs: 10.6103/SHARE.w1.700, 10.6103/SHARE.w2.700, 10.6103/SHARE.w4.700, 10.6103/SHARE.w5.700, 10.6103/SHARE.w6.700), see Börsch-Supan et al. (2013) for methodological details. The SHARE data collection has been funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982) and Horizon 2020 (SHARE-DEV3: GA N°676536, SERISS: GA N°654221) and by DG Employment, Social Affairs & Inclusion. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged(see www.share-project.org).

couples (401 person-year excluded) as both would appear in the same model (i.e., as both husbands or both wives). Since we focused on the influence of spousal caregiving transitions on potential caregiver's health *changes*, we restricted our sample to those individuals who participated in the SHARE survey in at least two waves (30,609 person-year excluded). After this selection, the sample consisted of 140,787 person-year observations. An additional 22,956 person-year were dropped from the analysis because information on one or more of the covariates of interest were missing. Thus, the final analytic sample included 117,831 person-year observations from 43,435 individuals. Table 15 provides descriptive information on the study sample. Importantly, we should note that not all 17 countries participated in all five waves. The analytical model that we use can handle such an unbalanced design. The only requirement is to have observation for at least two waves.

5.4.2. Dependent variable

For the dependent variable, we use a 40-item Frailty Index (FI), which is a count of physical and mental health problems reflecting the accumulation of potential deficits affecting a given person (Rockwood and Mitnitski 2007). This measure indicates the degree of frailty present in older adults and it has been consistently found to be a strong predictor of adverse health outcomes, including subsequent mortality (Fried et al. 2001; Romero-Ortuno and Kenny 2012). Unlike single-item health measures commonly used in caregiving literature, the FI can provide a more complete picture of older adults' overall health. We constructed the FI in accordance with standard procedures (Romero-Ortuno and Kenny 2012; Searle et al. 2008), employing objective health markers (*e.g.,* grip strength), functional impairments in personal and instrumental activities of daily living, self-reported health and comorbidities, mood, limitations in cognition, and other measures. Each individual's deficit points were summed and divided by the total number of deficits evaluated (in our case 40) and then multiplied by 100. Therefore, we obtain a FI with a theoretical range from 0 (no deficits present) to 100 (all deficits present). For example, a respondent with five deficits would have a FI value of 12.5 (5/40*100). Higher values indicate a greater number of health problems and hence greater frailty. The reliability coefficient, Cronbach's alpha, for the 40 items, is 0.896. Missing values for each item were negligible: except for grip strength (7.58% of missing, 13,031 observations), all items showed less than 3% missing values. Full information on the FI deficit variables and cut-off points are reported in Appendix Table A1.

5.4.3. Independent variable

Gender and spousal care are the key independent variables. SHARE uses the following item to measure informal care inside the household: "*Is there someone living in this household whom you have helped regularly during the last twelve months with personal care, such as washing, getting out of bed, or dressing?*", with answer categories "Yes" and "No". To avoid capturing help during short-term sickness of family members, 'regularly' is explicitly meant to refer to "daily or almost daily during at least three months". To avoid problems of misclassification, individuals who provided care to other persons than a spouse (such as parents, siblings, friends, etc.) were set to missing, which amounted to about one-fourth (26.84%) of the total caregivers. Individuals who provided care to their spouses are coded as 1. Hence, the value 0 indicates "no spousal care" and the value 1 indicates "spousal care".

Table 15. Descriptive statistics of variables in the analyses.

	Whole Sample		Men		Women	
	N	% (Mean)	N	% (Mean)	N	% (Mean)
Frailty Index (FI)	117831	11.36	60996	10.79	56835	11.97
Gender						
Men	60996	51.77				
Women	56835	48.23				
Age	117831	64.87	49352	67.05	56835	63.72
Spousal Care						
No	111676	94.78	58177	95.38	53499	94.13
Yes	6155	5.22	2819	4.62	3336	5.87
Transitions into spousal caregiving						
0	113239	96.10	58818	96.43	54421	95.75
1	4546	3.86	2158	3.54	2388	4.20
2	46	0.04	20	0.03	26	0.05
Transitions out of spousal caregiving						
0	115097	97.68	59583	97.68	55514	97.68
1	2715	2.30	1406	2.31	1309	2.30
2	19	0.02	7	0.01	12	0.02
Current job situation						
Retired	65979	55.99	39059	64.04	26920	47.37
Employed or self-employed	34470	29.25	18580	30.46	15890	27.96
Non-employed	17382	14.75	3357	5.50	14025	24.68
Income (quartiles)						
First	29514	25.05	15306	25.09	14208	25.00
Second	29445	24.99	15012	24.61	14433	25.39
Third	29473	25.01	15116	24.78	14357	25.26
Fourth	29399	24.95	15562	25.51	13837	24.35
Wealth (quartiles)						
First	29511	25.05	15408	25.26	14103	24.81
Second	29460	25.00	15305	25.09	14155	24.91
Third	29458	25.00	15126	24.80	14332	25.22
Fourth	29402	24.95	15157	24.85	14245	25.06
Welfare cluster						
Northern	23670	20.09	12153	19.92	11517	20.26
Western	46067	39.10	24120	39.54	21947	38.62
Southern	24657	20.93	13046	21.39	11611	20.43
Eastern	23437	19.89	11677	19.14	11760	20.69

Note: Unless otherwise indicated, values are reported in percentages. Unweighted pooled dataset (Person-Year, N=117,831).

[a] Continuous variable: mean (in brackets).

5.4.4. Classification of countries

We grouped the European countries under analysis in four welfare clusters: *Northern* (Denmark, Netherlands, and Sweden), *Western* (Austria, Belgium, France, Germany, Luxembourg, and Switzerland), *Southern* (Greece, Italy, Portugal, and Spain), and *Eastern* (Czech Republic, Estonia, Poland, and Slovenia). These four generic welfare clusters are consistent with various social theories on cultural roots and attitudes toward caregiving and represent different geographical regions and welfare state regimes (Bambra 2007b; Esping-Andersen 1990, 1999; Ferrera 1996; Gauthier 2002; Mair 2013).

5.4.5. Potentially confounding factors

We controlled for a number of individual and couple-related factors that were likely to be associated with both the provision of care and to the health outcome (Pearlin et al. 1990): respondent's age (range 50-98), respondent's current job situation (retired, employed or self-employed, non-employed), household income and wealth quartiles (country and wave-specific), and SHARE wave.

Since we analysed unbalanced panel data (*i.e.,* the number of waves as well as the time between waves vary across individuals and countries), we controlled for the number of months that respondents spent in the observation window from the date of the last interview (variable "time under observation"). This variable allowed to control for the length of the time between SHARE waves (Emery and Mudrazija 2015).

5.4.6. Statistical methods

To examine the asymmetric associations between caregiving transitions and health we adopt a novel approach based on fixed-effects regression models (Allison 2019). By "asymmetric" it is meant to allow the effects of entering and exiting caregiving to differ in terms of magnitude. Following the procedure suggested by Allison (2019), we estimate a fixed-effects model in which we observe Y_{it} (the health outcome) and X_{it} (the original spousal care dummy variable) for time $t = 1, \ldots, 5$.

For the asymmetric fixed-effects models, we first define two dynamic counter variables of spousal care that increase with each additional transition *into* care (Z_{it}^{+}) and with each additional transition *out of* care (Z_{it}^{-}) over the 11-year follow-up period. To do so, it is necessary to decompose the difference scores of the original spousal care dummy variable (X_{it}) into a positive and a negative component:

$$X_{it}^{+} = X_{it} - X_{it-1} \text{ if } (X_{it} - X_{it-1}) > 0, \text{ otherwise } 0$$
$$X_{it}^{-} = -(X_{it} - X_{it-1}) \text{ if } (X_{it} - X_{it-1}) < 0, \text{ otherwise } 0$$

The variable X_{it}^{+} represents an increase (a transition *into* spousal caregiving) and X_{it}^{-} represents a decrease (a transition *out of* spousal caregiving). When X_{it-1} is not observed (*e.g.,* in the first wave of SHARE, when $t = 1$) both X_{it}^{+} and X_{it}^{-} are set to 0. Then, we define the following:

$$Z_{it}^{+} = \sum_{s=1}^{t} X_{is}^{+}$$

$$Z_{it}^{-} = \sum_{s=1}^{t} X_{is}^{-}$$

In this case, Z_{it}^{+} is the individual accumulation up to time t of all previous positive changes in X and Z_{it}^{-} is the accumulation up to time t of all previous negative changes in X. Since the original spousal care variable X_{it} is a dummy variable, Z_{it}^{+} represent the accumulated transitions into caregiving and Z_{it}^{-} the accumulated transitions out of caregiving. This operationalization of spousal care enables us to disentangle the effect of the transitions *into* and *out of* spousal care in the fixed-effects models (Allison 2019). The two variables permit us to assess whether spousal care has a different magnitude of effect on health when the respondents experience a transition into caregiving and out of caregiving. Applying the original spousal care dummy variable (X_{it}) would lead to a biased estimation of an asymmetrical spousal care effect. Table 15 shows descriptive information about the samples of each caregiving group. The compact formulation of the asymmetric fixed-effects model has the following generic form (Allison 2019):

$$Y_{it} = u_t + \beta^{+} Z_{it}^{+} + \beta^{-} Z_{it}^{-} + \alpha_i + \varepsilon_{it}$$

In this model, u_t represents the intercept, which is allowed to differ at each time point. The idiosyncratic error term ε_{it} varies across individuals and over time. The a_t denotes unobserved individual time-constant factors. The strength of this approach is that it allows to control for unobserved time-invariant characteristics of a person (*e.g.,* genetic predisposition or personality) and to estimate an asymmetrical spousal care effect on health.

A drawback of this approach is that the fixed-effects estimator cannot estimate time-constant effects. Moreover, while this design formally eliminates the threat of time-constant unobserved heterogeneity, time-varying omitted variables (such as previous histories of health) can still result in biased estimates. Another implication of this model, as we discuss more in the conclusion, is that Y_{it} depends on the entire previous history of changes in X. The fact that we do not know the entire individual caregiving history prior to the first wave of SHARE is not a problem, however, because that history will be adjusted for by standard fixed-effects methods (Allison 2019:8). Following the indications provided by Allison (2019), we perform a series of Wald tests to assess whether the effects of caregiving on health are symmetric ($\beta^{+} = -\beta^{-}$).

To formally test whether the association between caregiving and health varies across gender and welfare clusters, we estimated a fully interacted regression model with product terms for caregiving, gender, and welfare cluster for all older adults combined. To ease the interpretation of the three-way interactions, we also present average marginal effects (AME) in graphical form, along with their confidence intervals. Last, we conduct a series of chi-square tests to examine whether the differences in the marginal effects are statistically different from zero. The difference between any two marginal effects is estimated using the 'mlincom' command in a Stata package called SPost13 by Long and Freese (2014). All models include standard errors clustered at the household level, which adjusts for clustering within couples (Wooldridge 2020). All data were analysed using Stata 15.1

5.5. Results

Table 16 presents the results of asymmetric fixed-effects linear regression models – estimated separately for each gender – where we evaluated the longitudinal associations between the transitions into and out of spousal caregiving with frailty, adjusted for the covariates previously described. The results in Table 16 show that the transition *into* caregiving has detrimental consequences in terms of health, for both men and women. For example, the transition into spousal care leads to an increase of 2.33 points in the FI for women (Table 16, β=2.33; 95% CIs: 1.91, 2.74; p<0.001). By contrast, transitions *out of* caregiving are inversely related to the FI. This would suggest a beneficial effect of stopping spousal caregiving on health. However, this difference is very small in magnitude and statistically significant only for women (Table 16, β=-0.63; 95% CIs: -1.20, -0.06; p<0.05).

Further results from Table 16 deserve comments, though they are not the focus of interest of this article. Consistent with previous research on the scarring effects of unemployment, the results reveal that being non-employed is positively associated with poor health for men. More interestingly, the size of the coefficients suggests that individual's frailty levels increase with the transitions into spousal caregiving (*e.g.,* Table 16, Men, β=2.28; 95% CIs: 1.80, 2.76; p<0.001) to a greater extent as experiencing non-employment (*e.g.,* Table 16, Men, β=1.39; 95% CIs: 0.98, 1.80; p<0.001). The models show a statistically significant negative effect of retirement on changes in frailty levels, for both men (Table 16, β=-0.58; 95% CIs: -0.80, -0.36; p<0.001) and women (Table 16, β=-0.47; 95% CIs: -0.72, -0.22; p<0.001). Regarding the role of income and wealth, a Wald test for joint significance confirms that the intra-individual change in income and wealth does not cause a substantive change in health after midlife (p>0.05).

To investigate whether caregiving-related changes in the FI differed significantly by gender and welfare cluster, we estimated an asymmetric fixed-effects model with interaction terms between caregiving, gender, and welfare cluster. Figure 10 reports the estimated average differences in the FI for men and women who experience transitions into and out of caregiving, compared to not experiencing transitions, across the four welfare clusters (full model estimates in tabular form are shown in Appendix Table A14).

Table 16. Results of asymmetric fixed-effects linear regression models on frailty, by gender.

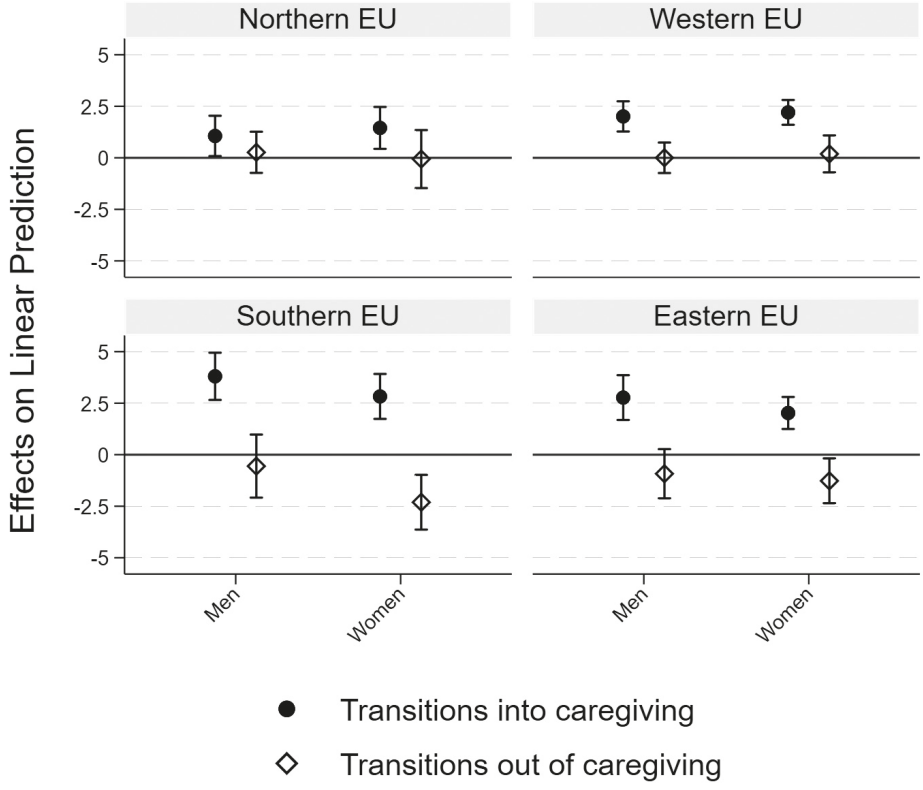
	Men		Women	
	β	95% CI	β	95% CI
Transition into spousal caregiving	2.28***	1.80,2.76	2.33***	1.91,2.74
Transition out of spousal caregiving	-0.35	-0.89,0.19	-0.63*	-1.20,-0.06
Age	0.41***	0.38,0.44	0.35***	0.32,0.38
Current Job Situation (ref.: Employed or Self-employed)				
Retired	-0.58***	-0.80,-0.36	-0.47***	-0.72,-0.22
Non-employed	1.39***	0.98,1.80	0.17	-0.12,0.46
Income (ref: First quartile)				
Second quartile	0.00	-0.17,0.18	-0.05	-0.24,0.14
Third quartile	-0.02	-0.20,0.16	0.07	-0.13,0.26
Fourth quartile	0.01	-0.18,0.21	0.20+	-0.00,0.40
Wealth (ref: First quartile)				
Second quartile	-0.21*	-0.42,-0.00	0.09	-0.13,0.31
Third quartile	-0.28*	-0.51,-0.04	-0.02	-0.26,0.22
Fourth quartile	-0.12	-0.38,0.14	0.03	-0.23,0.30
Time under observation	-0.00*	-0.01,-0.00	-0.00**	-0.01,-0.00
Constant	-15.89***	-17.69,-14.08	-10.10***	-11.88,-8.32
rho	0.694		0.731	
sigma_u	7.929		8.702	
R^2 (adjusted)	0.064		0.046	
R^2 (within)	0.064		0.047	
R^2 (overall)	0.098		0.089	
R^2 (between)	0.110		0.102	
N. of groups (individuals)	22335		21100	
N. of observations	60996		56835	

Source: SHARE data, years 2004-2015 (own estimates). Unweighted results. Models include all the control variables.
Note: 95% confidence intervals in second column
*+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001*

Figure 10 shows that the detrimental health effect of the transitions *into* spousal caregiving is statistically significant in all the four institutional contexts and for both genders. However, we do not observe any statistically significant gender difference with respect to transitioning into caregiving in any of the four institutional contexts examined (differences between marginal effects are reported in Appendix Table A15).

The pattern is more complex in the case of transitions *out of* spousal caregiving. Results from Figure 10 indicate that the beneficial health effect of the transition out of spousal caregiving is statistically significant only for female caregivers living in Southern and Eastern European countries. For example, women living in Southern European countries who experience transitions out of caregiving have on average 2.31 less points in the FI than those who do not experience transitions out of spousal caregiving (Figure 10, AME=-2.31; 95% CIs: -3.63, -0.98; p<0.001), after controlling for age, current job situation, income, and wealth. A Wald test (on $\beta^{+} = -\beta^{-}$) further confirmed that there is evidence for a symmetrical effect of caregiving on frailty for women living in Southern and Eastern European countries (p>0.10). Compared with men, the impact of the transition out of caregiving appears to be stronger for women who live in Southern Europe (Appendix Table A15).

Figure 10. Asymmetric fixed-effects linear regression models: predicted average differences in frailty, by welfare cluster and gender. Estimates and 95 per cent confidence intervals.



Note: Models include all the control variables. Complete models are displayed in Appendix Table A14.
Source: SHARE data, years 2004-2015 (own estimates). Unweighted results.

Concerning our research question regarding the health consequences of caregiving within different welfare systems, Figure 10 also shows how the effects of caregiving transitions are markedly larger in Southern and Eastern European countries compared to the Northern and Western European countries. To further substantiate these findings, we conducted a series of chi-square tests to examine whether the difference in the marginal effects across welfare clusters is statistically different from zero (Appendix Table A16). Considering the transitions *into* caregiving, in comparison to Western Europe (diff.=1.795; 95% CIs: 0.438, 3.152; p<0.01) and, even more, to Northern Europe (diff.=2.743; 95% CIs: 1.241, 4.245; p<0.001), men living in Southern Europe exhibit the largest differences in the FI. For women, statistically significant differences in marginal effects across welfare clusters are observed only when comparing Southern and Northern Europe (diff.=1.376; 95% CIs: -0.116, 2.867; p<0.10). Considering the transitions *out of* caregiving, the differences between welfare clusters are statistically significant only among women. For example, the difference in marginal effects between Southern and Northern European women equals to -2.2 points in the FI (diff.=-2.245; 95% CIs: -4.179, -0.310; p<0.05). Analyses stratified by welfare cluster and gender show similar patterns as observed in the main analyses (Appendix Table A17).

5.6. Discussion and conclusion

In this study, we investigated how the transitions into and out of spousal caregiving impact on health after midlife and how this impact differs by gender and macro-level contexts in a sample of individuals aged 50 and above living in 17 European countries. Most important, we considered a sample of adults for whom their spouses are still alive and who are still living together and not in an institution. Using prospective panel data from five waves of the Survey of Health, Ageing and Retirement in Europe (SHARE), we adopted a novel approach to investigate the influence of informal care transitions on the health conditions of older European men and women. Framing our theoretical elaboration within a macro-comparative approach, we examined the importance of the availability of formal care services and of the differences in the specific interactions between the state, the market, and the family in addressing care needs.

In line with recent longitudinal studies on the mental effects of caregiving (e.g., Kaufman et al. 2018), we found that transitioning into caregiving activity is frequently associated with increased frailty levels in all the four European contexts under analysis. This result lends support to hypothesis H1. Conversely, transitions out of spousal caregiving are associated with better health, but only for female caregivers who live in Southern (Greece, Italy, Portugal, and Spain) and Eastern (Czech Republic, Estonia, Poland, and Slovenia) European countries (hypothesis H2). No significant interaction effects between gender and transitions into spousal caregiving are found (hypothesis H3). However, interaction effects between gender and transitions out of caregiving are found in the Southern European welfare cluster, where women beneficiate more than men in terms of health from the transitions out of caregiving (hypothesis H4). Comparative results show that the health effects of spousal caregiving appear to be strongest for men and women living in Southern and Eastern European countries, less strong in Western European countries, and smallest in Northern European countries (hypothesis H5). All in all, these results lend support to the idea of a familistic and sub-protective regime characterizing Southern (Bambra 2007b) and Eastern European countries (Mair 2013).

The study has three important limitations that should be considered for future studies. First, the exact timing of the transitions into or out of care between waves is not known. In other words, spousal caregiving that starts and ends between successive waves is missed altogether. Similarly, no information is available about respondents' caregiving experiences and health trajectories before their first interview for the SHARE. This implies that previous life course events and trajectories of caregiving and health can be considered only to a very limited extent and we could not fully address the problem of health selection in earlier caregiving history, leaving open other causality-related problems such as the possible bias driven by the "healthy caregiver effect" (Fredman et al. 2015; Roth et al. 2015) or unobserved time-varying heterogeneity (Halaby, 2004). This uncertainty about the transitions, therefore, calls for a different approach and data source that could overcome this insufficiency by allowing more precise modelling of month-by-month detailed caregiving histories.

Second, it is important to recognize that what is important for caregivers' health is not only transitioning into caregiving, but also the duration of care. In other words, some caregivers could easily cope with a relatively short time of caregiving, but beyond that time it starts to have its negative consequences on individual health. Because we are focusing on caregiving transitions, our approach did not allow us to assess the potential cumulative effects of caregiving on health.

Third, even though we excluded bereavement, divorce, and spouse's institutionalization, we recognize the possibility that other factors can account for the differences between those who continued caregiving and those who stopped providing care to their spouse. A variety of factors, unobserved in our study, could have influenced the individuals' propensity to stop providing care. For example, a spouse's health might have improved or external individuals (*e.g.,* other relatives, friends, etc.) provided their support to the caregiver or his or her spouse. These factors might have different effects on caregivers' health conditions. Our research recommends that future studies should investigate these and other potential pathways.

Despite the above-mentioned limitations, this study is, to our knowledge, the first longitudinal cross-national investigation of the magnitude of the relationship between spousal care transitions and health in relation to gender in a sample of older adults over a 11-year period. Our results clearly show that the transitions into the role of spousal caregiver have a detrimental influence in terms of health for both men and women and in all the four welfare clusters under analysis. On the contrary, the transitions out of spousal caregiving appear to have no beneficial effect on health in some contexts. This suggests that the impact of caregiving is somewhat permanent and has lasting effects on the caregiver. Although the results imply that on average the negative consequences of the transitions *into* spousal caregiving outweigh the positive ones arising from the transitions *out of* caregiving, the good news is that the detrimental effects of spousal caregiving on health appear to be reversible for women living in Southern and Eastern European countries. At the same time, this might be a direct consequence of the fact that in those less generous welfare states, where care responsibilities are strongly endogenized within the family, women are constrained to provide more intensive forms of informal family caregiving (Bonsang 2007; Brandt 2013; Kaschowitz and Brandt 2017). When women are experiencing their caregiver role as burdensome, in a context in which the outside formal and informal support is scarce, this may lead to health problems due to the highest levels of stress and fewer resources available to cope with it. Exiting from such an intensive caregiving task can then embody a relief. Compared with the Northern European countries – where low

intensity "help" is more common – in the Southern and Eastern European countries the caregiver burden might be so much higher that stopping intensive informal care provides a stronger positive influence on health.

This study highlights the asymmetric and gendered nature of care transitions and the need to account for care trajectories when assessing the impact and consequences of caregiving. A better understanding of the spousal caregiver career over the life course is important for all those who plan and provide care for both the caregiver and potentially for the impaired spouse.

CHAPTER 6

Discussion and conclusion

CHAPTER 6

6.1. Introduction

Several studies have shown that at all ages, women report a worse health condition than men (e.g. Crimmins et al. 2011; Crimmins and Saito 2001; Dahlin and Härkönen 2013). This dissertation investigated the complex relationships between gender and health in later life, in a life course and comparative perspective. Chapters 2 to 5 examined different mechanisms that relate to gender inequalities in social and economic resources, family relationships, and care responsibilities. In this final chapter, I summarize the findings for each chapter (section 6.2). Then, I discuss their scientific relevance and highlight the main contributions to the literature (section 6.3). In section 6.4 I reflect on some limitations of this dissertation and identify directions for future research. Finally, I conclude with some final remarks (section 6.5).

6.2. Summary of findings

The first empirical contribution of this dissertation focuses on gender differences based on determinants of health that are of a socioeconomic nature (Chapter 2). More specifically, I have investigated how the longitudinal association between SES and health in later life varies by gender and welfare context. The study was based on individual-level panel data from SHARE (Börsch-Supan et al. 2013). For the dependent variable, I used the 40-item Frailty Index (FI) (Romero-Ortuno and Kenny 2012), which is a count of physical and mental health problems reflecting the accumulation of potential deficits affecting a given person. As independent variables, I used detailed information on the level of education, income, and wealth of each SHARE respondent. Statistical analyses were conducted using linear hybrid models (Allison 2009; Bell et al. 2019; Bell and Jones 2015) and stratified by welfare cluster: Northern Europe (Denmark and Sweden), Southern Europe (Italy and Spain), and Western Europe (Austria, Belgium, France, Germany, and Switzerland).

The results from Chapter 2 support previous cross-sectional findings that, while SES is a predictor of health in later life, it does not have the same impact across gender within different socioeconomic contexts. More specifically, results from this study corroborate the hypothesis that, compared with men, SES is weakly associated with health changes for women living in countries with high de-familialization and decommodification. In Southern (Italy and Spain) and Western European countries (Austria, Belgium, France, Germany, and Switzerland) the impact of education and wealth on health was stronger for women than for men. Conversely, in Northern Europe (Denmark and Sweden) the results showed no gender difference according to SES. These differences might be due to the more generous, decommodifying welfare state policies of the Scandinavian countries (Esping-Andersen 1990, 1999) since they might better protect against the health consequences of low SES (Bambra 2005a). In addition, the highest levels of de-familialization in the Northern European countries may have contributed to smaller gender inequalities in health than in the less redistributive and protective Southern and Western European societies (Bambra 2004, 2007a). Overall, these findings suggest that health in later life may be a result of complex combinations of socioeconomic and family circumstances taking place over time from early adulthood onwards.

Chapter 3 builds on findings from Chapter 2 and adopts a life course perspective to deepen the understanding of how gendered work and family life courses are related to health inequalities in later life. In this study, I derived complete employment and fertility trajectories between ages 15 and 49 by employing data from the SHARELIFE's Job Episodes Panel (Brugiavini et al. 2019). This dataset rearranges information taken from SHARE (waves 1, 2, 4, 5, and 6) and SHARELIFE (waves 3 and 7) to create a longitudinal dataset containing the labour market and parenthood status of each respondent throughout her or his life. This study employed an objective measure of general physical health as a dependent variable (i.e., grip strength). Work-family life courses served as the main independent variable and were identified from annual retrospective information about employment and parenthood status between ages 15 and 49. Work-family life courses were obtained using sequence analysis and hierarchical cluster analysis. Finally, I estimated a series of multivariable regression models to predict which work-family clusters were related to grip strength at the time of the interview.

Results from this chapter are in line with theories on stress exposure (e.g., Pearlin 2010; Pearlin et al. 1981) and cumulative disadvantages (Bartley and Plewis 2002; McDonough et al. 2015),

and support the idea that work-related strains have a stronger health consequence for men than for women (Frone 2000; Steverink et al. 2011). Moreover, parents' life courses characterized by long or repeated periods out of the labour market are associated with poor health in later life as compared to parents with strong labour market attachment. For both fathers and mothers, this finding lends support to the role enhancement theory (Barnett and Hyde 2001; Lahelma et al. 2002; Nordenmark 2004). In addition, Chapter 3 provides evidence that the institutional context in which gendered work and family responsibilities unfold might play an important role in shaping the relationships between life course types and physical health in later life. As other studies have also shown (Zella and Harper 2018, 2020), results from this chapter support the hypothesis that countries more disposed to promote combinations of work and family responsibilities can play a role in protecting parents from adverse health effects in old age.

Chapter 4 investigated the impact that adult children's union dissolution can have on the health of their older parents. The study matches panel data from the Dutch component of SHARE (waves 1, 2, 4, and 5) with micro-level data from administrative sources from Statistics Netherlands (CBS), namely the System of Social-statistical Datasets (SSD). The study adopts distributed fixed-effects linear regression models to analyse changes in parents' health conditions before, during, and after a child's union dissolution. This study uses the Frailty Index, depression (EURO-D), and grip strength as dependent variables. The main independent variable in the study is children's union dissolution (i.e., the end of a marriage or a cohabitation through divorce or separation).

Results from Chapter 4 are in line with recent longitudinal studies on the mental effects of children's divorce (Kalmijn and de Graaf 2012; Tosi and Albertini 2019) and indicate that a child's divorce is generally associated with increased depression and frailty levels, and decreased grip strength. Previous findings can therefore be extended to more objective measures of general physical health, such as grip strength and frailty. In addition, the results indicated that the negative consequences of children's divorce on parental health start to manifest in the period preceding the child's separation itself. This agrees with the idea that union dissolution is a long-term process, often involving conflict years before the actual separation or divorce (Amato 2000), and with consequences that can extend to other family generations and health measures (Elder et al. 2003; Pearlin 2010; Pearlin et al. 1981; Pearlin and Skaff 1996). This study does not show remarkable gender differences, indicating that both fathers and mothers are similarly influenced by their sons' and daughters' union dissolution. The only exception that emerged from the study concerned a stronger effect of a child's separation on depressive symptoms for mothers than for fathers in the period from 2 to 4 years before the children's marital break-up. Similarly, and contrary to the expectations, results showed stronger health consequences in the case of the divorce of a son than of a daughter.

Chapter 5 examined how gender shapes the influence of care responsibilities at older ages on subsequent health. In doing so, I focused on spousal caregiving and analysed whether the differential effects of caregiving transitions for men and women existed between different welfare state arrangements. This empirical contribution was based on data from all available SHARE waves (1, 2, 4, 5, and 6). The health outcome of interest was the Frailty Index, counting the deficits in health an individual had. The main independent variable was intensive help with personal care provided to spouses (i.e., informal spousal caregiving). This study employed an innovative approach – based on fixed-effects regression methods – that allowed caregiving effects to be asymmetric (Allison 2019).

The results from Chapter 5 corroborate the hypothesis that transitioning into the spousal caregiving role is associated with detrimental consequences for health across diverse institutional contexts. This result is in line with recent longitudinal studies on the mental effects of caregiving (e.g., Kaufman et al. 2018). Conversely, transitions out of the role of spousal caregiving were generally associated with better health. While no significant interaction was found between gender and transitions into spousal caregiving, interaction effects between gender and transitions out of caregiving were found in the Southern European welfare cluster, where women beneficiate more than men in terms of health from the transitions out of caregiving. In line with the proposed hypothesis, comparative results showed that the health effects of spousal caregiving appear to be strongest for men and women living in Southern and Eastern European countries, less strong in Western European countries, and smallest in Northern European countries. Overall, these results lend support to the idea of a familistic and sub-protective welfare regime characterizing Southern (Bambra 2007b) and Eastern European countries (Mair 2013).

6.3. Scientific and societal relevance (overall contribution)

The main aim of this dissertation was to provide a more in-depth picture of the complex relationships between gender and health in later life. Here I discuss the scientific and societal relevance of the findings summarised in section 6.2 above and reflect on the research approach.

This dissertation contributed to the field of research on gender inequalities in health in later life in several ways. First, it documents how **different micro-level mechanisms** impact men and women differently and consequently help understand the gender inequalities in later life health. Four such mechanisms are investigated:

The first one is the unequal allocation of social and economic resources between men and women and how this contributes to the health gender gap (Chapter 2). This is done by adopting a social stratification perspective and shows that, while SES is important to maintain good health conditions later in life, older women suffer more than men from lack of socioeconomic resources.

The second mechanism goes beyond later-life SES and suggests that the gendered health consequences of social and economic factors extend to early life histories of family and work responsibilities (Chapter 3). Adopting a life course perspective, this mechanism assumes that adverse early life combinations of work and family responsibilities are associated with poor health for older men and women.

The third mechanism extends the life course perspective to other family members and generations (Elder 1994, cf. "linked lives" 1995; Settersten 2005) to advance our understating of how life course interdependencies with "significant others" (i.e., children, and partners) might be important for the gender health gap in later life. Chapter 4 assess how fathers and mothers respond to the union dissolution (i.e., the end of marriage or cohabitation through divorce or separation) of adult sons or daughters in terms of health. Chapter 5 focuses on spousal caregiving and shows that the transitions out of the caregiving role are more strongly associated with better health conditions for women than for men in sub-protective institutional contexts with a high reliance on family support as a form of welfare provision.

Second, the dissertation points to the importance of the **societal context** in shaping the relationship between gender and health outcomes in later life. It does so by combining micro and macro

determinants of health and showing how multiple dimensions of men's and women's social lives (namely SES, work and family life courses, intergenerational relationships, and informal caregiving) are of different importance for the health of older men and women living in different institutional settings. The empirical chapters of this dissertation suggest that the above-mentioned micro-level mechanisms "function" strongly under particular institutional conditions. For example, the more de-commodifying and de-familializing welfare arrangements of Social Democratic countries might reduce gender inequalities in health at later ages, especially amongst those from the lowest SES groups (Chapter 2). Similarly, the links between work-family trajectories and health appear to hold in the presence of a context in which institutions do not allow parents to combine work and family responsibilities (Chapter 3). Finally, Chapter 5 suggests that the transitions out of spousal caregiving are more strongly associated with better health conditions for Southern and Eastern European women.

Third, this dissertation contributed to the previous literature adopting an **interdisciplinary approach** and overcoming some of its methodological limitations. Because of the complexity that needs to be considered when studying gender and health at older ages, this dissertation drew on several disciplines that have made many contributions to the study of this topic (including demography, gerontology, public health, social policy, and sociology). In addition to this, I advocated for a strong longitudinal approach to the study of gender inequalities in later life health. Particularly, this dissertation suggests that studying intra-individual change with panel data is vital to understanding the life course processes underlying gender inequalities in health at older ages. Unobserved permanent individual characteristics (such as biological factors or childhood conditions) may confound the associations analysed in this dissertation (e.g., between informal caregiving and subsequent health). For this reason, whenever possible, I applied advanced fixed-effects approaches as a specific way of addressing these endogeneity issues. In Chapter 2 "hybrid" (between-within) models are employed as a specific way of addressing the problems related to time-constant unobserved individual factors (i.e., omitted variables). In Chapter 4 the impact of children's divorce is differentiated by gender dyads and a particular focus is given to the "anticipatory" health effects of children's divorce on parental health. In Chapter 5 it is tested whether the transitions into and out of the role of spousal caregiving are asymmetric (i.e., it is allowed the effects of entering and exiting caregiving to differ in terms of magnitude). In addition, in Chapter 3 a very nuanced view is taken on reconstructing complete work and family trajectories from age 15 to 49. This dissertation also showed the relevance of a more integrative analytical approach that accounts for multiple pathways in the development of health declines, and the interactions of these factors.

The fourth key contribution of this dissertation regards the inclusion of **different measures of health as outcome variables**. Due to data limitations, previous studies analysing the links between gender and health mainly rely on subjective assessments of health (e.g., self-reported health). This dissertation looks at more objective and diverse indicators of general health. Chapters 2, 4, and 5 focus on the Frailty Index validated with SHARE data by Romero-Ortuno and Kenny (2012). Chapters 3 and 4 both contribute to the literature by extending the research questions to an objective measure of muscle strength and overall physical health assessed by a dynamometer (i.e., grip strength) (Andersen-Ranberg et al. 2009; Wahrendorf et al. 2020). Chapter 4 also looks at depressive feelings, measured with the EURO-D depression scale (Ploubidis and Grundy 2009;

Prince et al. 1999), and contrasts this measure *vis-à-vis* with the Frailty Index and grip strength. By looking at different subjective and objective measures of health, this dissertation may help to come to a wider agreement about the impact that different social and economic factors and life courses might have on the health conditions of older men and women living in European countries (Spitzer and Weber 2019).

6.4. Directions for future research

The picture outlined in the previous section 6.3 suggests that the intersections between social factors, gender, and health in later life will continue to be a central topic of a large literature on health inequality. With this dissertation, I hope to contribute to the further exploration of this topic, but I also hope to stimulate others to take up the following challenges.

The first challenge is to investigate the intersections between gender and health at older ages by combining a holistic life course approach with a transition-centred approach (Brüderl 2019). Most studies that examine gender differences in health in later life focus on disentangling the effects of single factors (usually measured after midlife) that contribute to the gap. However, an important set of questions investigated in this dissertation suggests that in determining the gender gap in health what matters most are the *long-term* rather than the short-term health consequences of family responsibilities and circumstances. Hence, there is a need for a more integrative approach that tracks health and family inequalities from early childhood onwards. Recent methodological advances indicate how life course research might become more explanatory by combining a holistic approach (e.g., sequence analysis) with a transition-centred approach (e.g., fixed-effects panel regression) for causal analysis (Brüderl 2019). New surveys about family change (such as the Generations and Gender Survey [GGS], Gauthier, Cabaço, and Emery 2018) – which combine retrospective life course trajectories with prospective longitudinal panel data – could deepen the substantial understanding of the interrelationships between gender and health in later life, for example by investigating explanations in terms of life course, period, or generational effects. As these research infrastructures continue with additional waves, the potential for detailed analyses on gender and health will expand considerably.

A second challenge is to link micro-level (individual) information to macro-level data on specific welfare policies which are theoretically relevant to gender inequalities in health. This could deepen the substantial findings on which specific mechanism (e.g., a specific policy measure, country differences in social norms, etc.) links macro-level welfare state characteristics to individual-level health outcomes (Högberg 2018; Lundberg et al. 2015). This dissertation showed the potential of comparative and longitudinal panel data to provide some first assessments of this larger research question. Addressing this point may further facilitate policy-makers to formulate strategies for improving women's and men's quality of life and health in general, thereby reducing the health care costs associated with treating older patients.

Third, longitudinal designs are often accompanied by methodological limitations related to data missingness. Two challenges that generally emerge in ageing surveys are related to item non-response and panel attrition – *i.e.*, the loss of individuals between waves due to death or other drop-out mechanisms (Banks et al. 2010; Chandola and O'Shea 2013; Chatfield, Brayne, and Matthews 2005). Generally, in the analyses of this dissertation, missing values were negligible: except for some

health outcomes (e.g., grip strength, about 8% of missing cases), other variables showed less than 5% missing values. As most missing data in our analyses came from the dependent variable, imputation techniques were not advisable (Carpenter and Kenward 2013). Regarding panel attrition, research suggests that it is not random (Fitzgerald, Gottschalk, and Moffitt 1998) and in panel ageing studies it tends to be higher among the oldest olds, respondents of lower socio-economic status, and those in poorer health (Banks et al. 2010; Chatfield et al. 2005). While panel attrition is present in the SHARE data, previous analyses have found only very little if any evidence of selective panel attrition bias in SHARE (Bergmann, Kneip, et al. 2019; Kneip, Malter, and Sand 2015).

Many influential studies suggest that attrition does not lead to serious biases in the economic sense, even in the presence of statistical evidence of attrition bias (Cheng and Trivedi 2015; Jones 2007; Neumark and Kawaguchi 2004). This dissertation makes efforts to address the issue of attrition due to mortality or health-related non-response. It does so by using "refreshment" samples provided by SHARE (Chapters from 3 to 5) and adopting a strategy based on inverse probability weighting (IPW) (Chapter 2) (Tchetgen et al. 2012; Wooldridge 2002, 2010). Using refreshment samples in longitudinal designs results in lower levels of bias in the parameter estimates and increased statistical power and efficiency (Mazen and Tong 2020; Mazen, Tong, and Taylor 2019; Taylor, Tong, and Maxwell 2020). Adopting the IPW as a method to adjust for attrition gives more weight to those respondents with key demographic, socioeconomic, and health characteristics leading to a high probability of dropping out of the panel (Tchetgen et al. 2012; Wooldridge 2002, 2010). This dissertation underlines that future research projects should carefully consider the issue of missing data and benefit from recent methodological advances aimed at correcting potential panel attrition and item non-response bias.

Fourth, the intersections between social factors, gender, and health are especially important now in these uncertain times. In December 2019, a new coronavirus (SARS-CoV-2) arose, causing a pandemic of acute respiratory disease in humans (COVID-19). From January 2020 to January 2022, there have been more than 300 million confirmed cases and more than 5.50 million confirmed deaths from the COVID-19 pandemic in the world (99.65 million cases and 1.56 million deaths in Europe) (Our World in Data 2022). This pandemic represents a catastrophic global crisis that poses new challenges to public health and many other aspects of society.

Several empirical and theoretical studies stress that the COVID-19 pandemic must be studied from a life course (Settersten et al. 2020; Thomeer, Yahirun, and Colón-López 2020) and gender perspective (Bambra, Albani, and Franklin 2020; Gausman and Langer 2020). While emerging estimates suggest that men and women are equally likely to be diagnosed with COVID-19, men have higher health risks and vulnerabilities (GlobalHealth5050 2020): at the global level, for every 10 women there are 11 hospitalisations, 19 intensive care units (ICU) admissions, and 15 confirmed deaths from the COVID-19 in men (GlobalHealth5050 2020). While the immediate effects of COVID-19 (e.g., contagions and mortality) appear to be stronger for men, several gender-related factors may also exacerbate the impact of the COVID-19 pandemic on women globally.

Some gender-related issues emerging from the COVID-19 pandemic represent a major concern and fit into a large literature on health inequalities. The first important direction for further research on the gendered consequences of COVID-19 is related to the health effects of the economic recession caused by the pandemic. With this regard, it is important to examine how the new economic

circumstances affect the health conditions of women and men differently. The economic downturn that started in 2020 led to sharp employment losses, especially among women in some contexts (Alon et al. 2020; Meekes, Hassink, and Kalb 2020) but not in others (Brini et al. 2021; Hupkau and Petrongolo 2020). One of the main reasons behind the increase in female unemployment rates are thought to be due to the fact that female employment is concentrated in heavily affected sectors (e.g., catering, child day-care, etc.), and due to increased childcare needs that push women to drop out from the labour market (Alon et al. 2020). Even though the education expansion and increased labour market participation have improved women's health overall (Klumb and Lampert 2004), large socio-economic inequalities in health among women over 50 still exist in the US and Europe (Shaw et al. 2014; Uccheddu et al. 2019a). As the COVID-19 induced economic crisis deepens, there will be serious consequences for both men and women health and well-being. Investigating the role of the family structure and relationships as a buffer in the links between job loss and individual health is of primary importance.

The second direction for future research on gender and COVID-19 regards the increased need for family (informal) caregiving. Women are often overrepresented in the sector of informal and formal caregiving (Langer et al. 2015) and empirical evidence suggests that they are more vulnerable to its negative health consequences than men (Mc Donnell and Ryan 2013; M. Pinquart and Sörensen 2006; Pinquart and Sörensen 2011; Yee and Schulz 2000) especially in some Southern and Eastern European countries (Uccheddu et al. 2019b). The outbreak of the COVID-19 has led some governments to compulsorily close schools and childcare facilities. This increases the care needs of children within the family, and many parents may be thrust into adverse combinations of work and family responsibilities. In addition, the high number of infections thrust many individuals to suddenly take (intensive) care of their closest relatives to meet their immediate or long-term needs. Therefore, it would be important for future research to study the gendered consequences of informal caregiving and other family responsibilities in these times of enormous uncertainty.

Related to the previous point, in later life, a particular painful role is that of surviving a parent, spouse, or adult child who has died of COVID-19 (Thomeer et al. 2020; Wang et al. 2021). The gendered health consequences of the bereavement process for a surviving parent, spouse, or child should be accounted for. This and other aspects of health inequalities covered in this dissertation might be extended to investigate the consequences of the COVID-19 pandemic on further dimensions of gender equality, such as the rise in domestic violence that appears to have occurred during the crisis (Gelder et al. 2020; Oertelt-Prigione 2020; Thomeer et al. 2020).

6.5. Concluding remarks

This dissertation focused on the topic of health, more specifically on gender inequalities in health in later life. The intersections between gender and health are a particularly interesting topic for the social sciences, both from a substantive and methodological point of view.

The main conclusion from this dissertation is that the links between gender and health in later life are complex, and several social factors and life course events affect different aspects of these links. First, SES impacts the health of older women and men differently across countries belonging to different institutional contexts. Women, as compared to men, are particularly affected by their socioeconomic position, and especially in sub-protective welfare settings. Second, early-life family

and work trajectories are associated with health in later life differentially for men and women, and across institutional contexts (i.e., welfare states). Accumulated stress and care responsibilities over the life course – and the institutional framing of these – are very important for health in later life, and especially for women. Third, life course interdependencies with "significant others" (i.e., children, and partners) are central for health in later life. Just as individual life course events are important for the health of older men and women, so too are the health consequences originating from the bonds with other family members.

This dissertation investigated several aspects of the links between gender and health in later life from different perspectives. Although they create an interesting unity, all these perspectives may not be equally important. Single life course events experienced after mid-life are relevant for the health of older men and women. However, the *long-term* consequences of accumulated stress, disadvantages, and family responsibilities that originate in the early stages of the life course might be even more important and should be investigated further. This dissertation stresses the need for a very wide and integrated approach to the study of family responsibilities and inequalities to better understand the links between gender and health at older ages. In conclusion, this study addressed key policy-relevant gaps in existing research, contributing to knowledge that may inform policy supporting high-quality healthy ageing and equal opportunities for both men and women.

CHAPTER 7

References
Appendix
Nederlandse Samenvatting
Acknowledgements
About the Author

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Table A1. Frailty Index (FI) deficit variables and cut-off points.

Variable	SHARE code	Variable description	Cut-Point
FI_bmi	bmi (*)	Body mass index (Kg/m^2) deficit	<18.5 or ≥30 = 1 25 to <30 = 0.5 18.5 to <25 = 0
FI_phactiv	br015_ br016_	Activities requiring moderate or vigorous physical activity: hardly ever, or never	Yes = 1, No = 0
FI_maxgrip	maxgrip (*)	Grip strength (kg) deficit	**Men**: - For BMI ≤ 24, GS ≤ 29 - For BMI > 24 and ≤ 28, GS ≤ 30 - For BMI > 28, GS ≤ 32 **Women**: - For BMI ≤ 23, GS ≤ 17 - For BMI > 23 and ≤ 26, GS ≤ 17.3 - For BMI > 26 and ≤ 29, GS ≤ 18 - For BMI > 29, GS ≤ 21
FI_sad	mh002_	Sad or depressed last month	Yes = 1, No = 0
FI_ hopelessness	mh003_	Hopelessness (Absence of hopes for the future)	Yes = 1, No = 0
FI_appetite	mh011_ mh012_	Diminution in the desire for food and/or eating less than usual	Yes = 1, No = 0
FI_fatigue	mh013_	Fatigue	Yes = 1, No = 0
FI_enjoyment	mh016	Lack of enjoyment	Yes = 1, No = 0
FI_orienti	orienti (*)	Impaired orientation in time test (i.e., less than good): date, month, year, and day of week	Yes = 1, No = 0
FI_srh	ph003_ ph052_	Self-report of health	Excellent = 0 Very good = 0.25 Good = 0.5 Fair = 0.75 Poor = 1
FI_longtermill	ph004_	Long-term illness	Yes = 1, No = 0
FI_heartattack	ph006d1	Doctor told you had: heart attack	Yes = 1, No = 0
FI_cancer	ph006d10	Doctor told you had: cancer	Yes = 1, No = 0
FI_parkinson	ph006d12	Doctor told you had: Parkinson disease	Yes = 1, No = 0
FI_fracture	ph006d14	Doctor told you had: hip fracture or femoral fracture	Yes = 1, No = 0
FI_ hypertension	ph006d2	Doctor told you had: high blood pressure or hypertension	Yes = 1, No = 0
FI_stroke	ph006d4	Doctor told you had: stroke	Yes = 1, No = 0

(continued)

Table A1. Continued.

Variable	SHARE code	Variable description	Cut-Point
FI_diabetes	ph006d5	Doctor told you had: diabetes or high blood sugar	Yes = 1, No = 0
FI_lungdisease	ph006d6	Doctor told you had: chronic lung disease	Yes = 1, No = 0
FI_arthritis (**)	ph006d8 ph006d19 (wave 5 and 6) ph006d20 (wave 5 and 6)	Doctor told you had: arthritis	Yes = 1, No = 0
FI_falling	ph010d7	Bothered by: falling down	Yes = 1, No = 0
FI_fearfall	ph010d8	Bothered by: fear of falling down	Yes = 1, No = 0
FI_dizziness	ph010d9	Bothered by: dizziness, faints, or blackouts	Yes = 1, No = 0
FI_walk100	ph048d1	Difficulties: walking 100 metres	Yes = 1, No = 0
FI_chair	ph048d3	Difficulties: getting up from chair	Yes = 1, No = 0
FI_stairs	ph048d5	Difficulties: climbing one flight of stairs	Yes = 1, No = 0
FI_arms	ph048d7	Difficulties: reaching or extending arms above shoulder	Yes = 1, No = 0
FI_lift5kg	ph048d9	Difficulties: lifting or carrying weights over 5 kilos	Yes = 1, No = 0
FI_dressing	ph049d1	Difficulties: dressing, including shoes and socks	Yes = 1, No = 0
FI_phone	ph049d10	Difficulties: telephone calls	Yes = 1, No = 0
FI_medications	ph049d11	Difficulties: taking medications	Yes = 1, No = 0
FI_garden	ph049d12	Difficulties: doing work around the house or garden	Yes = 1, No = 0
FI_money	ph049d13	Difficulties: managing money	Yes = 1, No = 0
FI_walkRoom	ph049d2	Difficulties: walking across a room	Yes = 1, No = 0
FI_bathing	ph049d3	Difficulties: bathing or showering	Yes = 1, No = 0
FI_eating	ph049d4	Difficulties: eating, cutting up food	Yes = 1, No = 0
FI_bed	ph049d5	Difficulties: getting in or out of bed	Yes = 1, No = 0
FI_toilet	ph049d6	Difficulties: using the toilet, including getting up or down	Yes = 1, No = 0
FI_hotmeal	ph049d8	Difficulties: preparing a hot meal	Yes = 1, No = 0
FI_shopping	ph049d9	Difficulties: shopping for groceries	Yes = 1, No = 0

Notes:

(*) This variable is taken from the Survey of Health, Ageing and Retirement in Europe (SHARE) "gv_imputations" module, but I have excluded the imputed values.

(**) Starting in Wave 5, respondents are asked if they have ever had rheumatoid arthritis (ph006d19) or osteoarthritis/other rheumatism (ph006d20) as separate questions. FI_arthritis is coded as 1 if the respondent indicates having had at least one of the conditions.

Table A2. Linear hybrid models predicting frailty, by welfare cluster and gender. Beta coefficient (first column) and 95% confidence intervals (second column).

	Southern											
	Men (Model 1)		Men (Model 2)		Men (Model 3)		Women (Model 1)		Women (Model 2)		Women (Model 3)	
	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.
Within Variance												
Age	0.121***	0.064,0.177	0.122***	0.066,0.179	0.122***	0.066,0.179	0.043*	0.003,0.082	0.042*	0.002,0.081	0.042*	0.002,0.081
Age^2	-0.002***	-0.003,-0.001	-0.002***	-0.003,-0.001	-0.002***	-0.003,-0.001	-0.001***	-0.001,-0.000	-0.001***	-0.001,-0.000	-0.001***	-0.001,-0.000
Age^3	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000***	0.000,0.000
Marital status (ref.: Married)												
Never Married	-	-	-	-	-	-	-	-	-	-	-	-
Divorced	0.043	-0.002,0.088	0.043	-0.002,0.088	0.043	-0.001,0.088	-0.019	-0.060,0.022	-0.018	-0.060,0.024	-0.018	-0.060,0.025
Widowed	0.017	-0.013,0.047	0.017	-0.014,0.047	0.016	-0.014,0.047	0.021*	0.004,0.038	0.023**	0.006,0.040	0.023**	0.006,0.040
Number of children (ref.: Childless)												
1	0.001	-0.032,0.034	0.000	-0.033,0.033	0.000	-0.033,0.033	-0.015	-0.061,0.031	-0.015	-0.061,0.031	-0.015	-0.061,0.031
2	0.012	-0.019,0.042	0.011	-0.020,0.041	0.012	-0.019,0.042	-0.002	-0.047,0.043	-0.001	-0.046,0.043	-0.001	-0.046,0.044
3+	0.019	-0.016,0.054	0.018	-0.016,0.053	0.018	-0.016,0.053	0.008	-0.033,0.048	0.009	-0.032,0.049	0.009	-0.032,0.049
Income (ref.: 1st quartile)												
2nd quartile			0.002	-0.005,0.010	0.002	-0.006,0.010			-0.005	-0.013,0.003	-0.005	-0.013,0.003
3rd quartile			0.006	-0.002,0.014	0.005	-0.003,0.013			-0.005	-0.014,0.004	-0.005	-0.013,0.004
4th quartile			0.008	-0.001,0.017	0.007	-0.002,0.016			0.009	-0.001,0.018	0.009	-0.000,0.018
Wealth (ref.: 1st quartile)												
2nd quartile					0.003	-0.006,0.012					0.003	-0.005,0.011
3rd quartile					0.004	-0.006,0.015					0.000	-0.010,0.009
4th quartile					0.010*	0.000,0.019					-0.001	-0.012,0.009
Wave (ref.: [1] 2004-05)												
[2] 2006-07	0.004	-0.044,0.053	0.006	-0.043,0.054	0.004	-0.044,0.052	0.025	-0.016,0.066	0.025	-0.016,0.066	0.025	-0.016,0.066
[4] 2011-12	0.014	-0.104,0.132	0.016	-0.102,0.135	0.012	-0.105,0.130	0.075	-0.024,0.174	0.076	-0.023,0.175	0.076	-0.023,0.175
[5] 2013	0.026	-0.125,0.177	0.029	-0.122,0.181	0.024	-0.125,0.174	0.097	-0.030,0.224	0.099	-0.029,0.226	0.099	-0.029,0.226
[6] 2015	0.015	-0.170,0.199	0.018	-0.167,0.204	0.012	-0.172,0.196	0.102	-0.054,0.257	0.104	-0.052,0.260	0.104	-0.052,0.260
Between Variance												
Age	-0.015	-0.131,0.102	-0.009	-0.123,0.106	-0.007	-0.123,0.110	-0.019	-0.113,0.075	-0.013	-0.109,0.083	-0.003	-0.094,0.089
Age^2	0.000	-0.001,0.002	0.000	-0.002,0.002	0.000	-0.002,0.002	0.000	-0.001,0.002	0.000	-0.001,0.002	0.000	-0.001,0.001
Age^3	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000
Marital status (ref.: Married)												
Never Married	0.023	-0.006,0.052	0.021	-0.008,0.050	0.02	-0.009,0.049	0.002	-0.023,0.028	-0.006	-0.032,0.019	-0.009	-0.035,0.016
Divorced	-0.007	-0.030,0.016	-0.008	-0.031,0.014	-0.01	-0.033,0.013	0.042	-0.000,0.085	0.037	-0.003,0.078	0.032	-0.010,0.074
Widowed	-0.004	-0.028,0.020	-0.004	-0.028,0.020	-0.004	-0.028,0.020	0.014	-0.002,0.029	0.008	-0.008,0.024	0.007	-0.009,0.023

(continued)

Table A2. Continued.

	Southern											
	Men (Model 1)		Men (Model 2)		Men (Model 3)		Women (Model 1)		Women (Model 2)		Women (Model 3)	
	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.
Number of children (ref.: Childless)												
1	0.004	-0.019,0.027	0.004	-0.019,0.028	0.004	-0.018,0.027	-0.002	-0.026,0.021	-0.001	-0.024,0.022	0.000	-0.022,0.023
2	0.005	-0.016,0.027	0.005	-0.016,0.027	0.006	-0.015,0.026	0.008	-0.013,0.029	0.007	-0.014,0.028	0.006	-0.015,0.027
3+	0.026*	0.003,0.048	0.024*	0.001,0.046	0.022*	0.001,0.044	0.033**	0.011,0.055	0.028*	0.006,0.050	0.025*	0.003,0.046
Level of Education (ref.: Low)												
Medium	-0.016*	-0.028,-0.003	-0.011	-0.023,0.002	-0.010	-0.022,0.002	-0.038***	-0.049,-0.027	-0.029***	-0.041,-0.018	-0.022***	-0.034,-0.011
High	-0.028***	-0.044,-0.012	-0.020*	-0.036,-0.004	-0.018*	-0.035,-0.002	-0.056***	-0.071,-0.040	-0.041***	-0.058,-0.025	-0.032***	-0.049,-0.016
Income (ref.: 1st quartile)												
2nd quartile			0.002	-0.023,0.028	0.004	-0.021,0.030			-0.018	-0.043,0.007	-0.007	-0.032,0.017
3rd quartile			-0.017	-0.038,0.005	-0.012	-0.035,0.010			-0.023*	-0.044,-0.003	-0.008	-0.029,0.013
4th quartile			-0.022*	-0.042,-0.001	-0.015	-0.037,0.007			-0.043***	-0.063,-0.024	-0.02	-0.041,0.002
Wealth (ref.: 1st quartile)												
2nd quartile					-0.013	-0.035,0.010					-0.026*	-0.049,-0.003
3rd quartile					-0.018	-0.040,0.004					-0.044***	-0.064,-0.023
4th quartile					-0.018	-0.038,0.002					-0.059***	-0.079,-0.039
Country												
Spain	0		0		0		0		0		0	
Italy	-0.003	-0.013,0.007	-0.004	-0.014,0.006	-0.004	-0.014,0.006	-0.005	-0.015,0.006	-0.006	-0.017,0.004	-0.009	-0.019,0.002
Austria												
Germany												
France												
Switzerland												
Belgium												
Sweden												
Denmark												
Wave (ref.: [1] 2004-05)												
[2] 2006-07	-0.093*	-0.164,-0.022	-0.093*	-0.165,-0.022	-0.093*	-0.165,-0.022	-0.087*	-0.164,-0.010	-0.083*	-0.160,-0.006	-0.073	-0.149,0.003
[4] 2011-12	-0.069*	-0.123,-0.015	-0.070*	-0.124,-0.015	-0.069*	-0.123,-0.015	-0.078*	-0.140,-0.016	-0.077*	-0.138,-0.016	-0.070*	-0.130,-0.010
[5] 2013	-0.084**	-0.140,-0.028	-0.084**	-0.140,-0.028	-0.083**	-0.139,-0.027	-0.088**	-0.149,-0.027	-0.085**	-0.146,-0.024	-0.070*	-0.130,-0.009
[6] 2015	-0.143***	-0.204,-0.083	-0.144***	-0.204,-0.083	-0.143***	-0.204,-0.083	-0.150***	-0.214,-0.086	-0.152***	-0.216,-0.088	-0.144***	-0.208,-0.080
Constant	0.441	-2.203,3.084	0.308	-2.302,2.919	0.265	-2.376,2.907	0.532	-1.591,2.655	0.402	-1.775,2.579	0.167	-1.900,2.234
AIC	-13795.88		-13798.33		-13798.28		-15850.50		-15879.48		-15907.49	
BIC	-13593.61		-13556.90		-13517.71		-15642.00		-15630.62		-15618.27	
No. of observations	5039		5039		5039		6161		6161		6161	
No. of groups (individuals)	1347		1347		1347		1689		1689		1689	

(continued)

Table A2. Continued.

	Western											
	Men (Model 1)		Men (Model 2)		Men (Model 3)		Women (Model 1)		Women (Model 2)		Women (Model 3)	
	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.
Within Variance												
Age	0.063***	0.033,0.094	0.064***	0.033,0.094	0.064***	0.034,0.095	0.021	-0.001,0.043	0.021	-0.001,0.043	0.021	-0.001,0.044
Age^2	-0.001***	-0.002,-0.001	-0.001***	-0.002,-0.001	-0.001***	-0.002,-0.001	-0.000**	-0.001,-0.000	-0.000**	-0.001,-0.000	-0.000**	-0.001,-0.000
Age^3	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000***	0.000,0.000
Marital status (ref.: Married)												
Never Married	-0.009	-0.043,0.025	-0.008	-0.042,0.025	-0.008	-0.041,0.025	-0.025	-0.064,0.014	-0.025	-0.063,0.014	-0.026	-0.064,0.013
Divorced	0.011	-0.012,0.033	0.012	-0.011,0.034	0.011	-0.011,0.034	0.019	-0.009,0.047	0.019	-0.009,0.047	0.018	-0.010,0.047
Widowed	0.000	-0.014,0.015	0.000	-0.014,0.015	0.001	-0.014,0.015	0.001	-0.009,0.011	0.001	-0.009,0.011	0.002	-0.008,0.012
Number of children (ref.: Childless)												
1	0.011	-0.006,0.028	0.011	-0.006,0.028	0.011	-0.006,0.028	0.015	-0.003,0.033	0.015	-0.003,0.033	0.014	-0.003,0.032
2	0.004	-0.011,0.020	0.004	-0.011,0.020	0.004	-0.012,0.020	0.006	-0.012,0.025	0.006	-0.012,0.025	0.006	-0.012,0.024
3+	0.006	-0.012,0.023	0.006	-0.012,0.023	0.006	-0.012,0.023	0.007	-0.012,0.025	0.007	-0.012,0.025	0.006	-0.012,0.025
Income (ref.: 1st quartile)												
2nd quartile			0.003	-0.002,0.008	0.003	-0.002,0.008			0.002	-0.003,0.006	0.002	-0.003,0.006
3rd quartile			0.003	-0.002,0.008	0.003	-0.002,0.008			0.001	-0.004,0.005	0.001	-0.004,0.005
4th quartile			0.002	-0.002,0.007	0.002	-0.002,0.007			0.001	-0.003,0.006	0.002	-0.003,0.006
Wealth (ref.: 1st quartile)												
2nd quartile					-0.001	-0.006,0.005					-0.002	-0.007,0.003
3rd quartile					-0.002	-0.008,0.004					-0.007**	-0.013,-0.002
4th quartile					-0.001	-0.007,0.005					-0.002	-0.008,0.004
Wave (ref.: [1] 2004-05)												
[2] 2006-07	0.003	-0.006,0.011	0.003	-0.006,0.011	0.002	-0.006,0.011	0.010**	0.003,0.018	0.010**	0.003,0.018	0.010**	0.003,0.018
[4] 2011-12	0.019	-0.005,0.044	0.019	-0.005,0.044	0.019	-0.005,0.043	0.034**	0.011,0.057	0.034**	0.011,0.057	0.033**	0.010,0.056
[5] 2013	0.024	-0.008,0.055	0.023	-0.008,0.055	0.023	-0.009,0.054	0.040**	0.011,0.070	0.040**	0.011,0.070	0.040**	0.010,0.069
[6] 2015	0.023	-0.016,0.062	0.023	-0.016,0.062	0.022	-0.017,0.061	0.045*	0.009,0.082	0.045*	0.009,0.081	0.044*	0.008,0.081
Between Variance												
Age	-0.021	-0.066,0.023	-0.013	-0.059,0.033	-0.004	-0.049,0.041	-0.033	-0.079,0.013	-0.024	-0.070,0.022	-0.02	-0.065,0.025
Age^2	0.000	-0.000,0.001	0.000	-0.001,0.001	0.000	-0.001,0.001	0.000	-0.000,0.001	0.000	-0.000,0.001	0.000	-0.000,0.001
Age^3	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000
Marital status (ref.: Married)												
Never Married	0.012	-0.003,0.026	0.004	-0.011,0.018	0.001	-0.014,0.015	0.019*	0.004,0.035	0.01	-0.006,0.025	0.006	-0.010,0.021
Divorced	0.009	-0.001,0.020	0.005	-0.005,0.016	0	-0.010,0.010	0.022***	0.012,0.033	0.014*	0.003,0.024	0.005	-0.006,0.015
Widowed	0.023**	0.009,0.037	0.022**	0.008,0.036	0.021**	0.007,0.036	0.014***	0.006,0.022	0.007	-0.001,0.016	0.004	-0.004,0.012

(continued)

Table A2. Continued.

	Western											
	Men (Model 1)		Men (Model 2)		Men (Model 3)		Women (Model 1)		Women (Model 2)		Women (Model 3)	
	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.
Number of children (ref.: Childless)												
1	-0.002	-0.014,0.010	-0.003	-0.015,0.009	-0.005	-0.017,0.007	0.009	-0.004,0.022	0.009	-0.004,0.021	0.007	-0.006,0.019
2	-0.01	-0.021,0.002	-0.011	-0.022,0.000	-0.011	-0.022,0.001	-0.003	-0.015,0.009	-0.004	-0.016,0.008	-0.003	-0.015,0.009
3+	0.000	-0.011,0.012	-0.003	-0.015,0.009	-0.005	-0.017,0.006	0.003	-0.009,0.016	0.000	-0.013,0.012	-0.002	-0.014,0.010
Level of Education (ref.: Low)												
Medium	-0.017***	-0.024,-0.010	-0.012***	-0.019,-0.005	-0.009*	-0.016,-0.002	-0.024***	-0.030,-0.017	-0.019***	-0.025,-0.012	-0.015***	-0.021,-0.008
High	-0.031***	-0.039,-0.024	-0.020***	-0.028,-0.013	-0.014***	-0.021,-0.006	-0.037***	-0.044,-0.030	-0.026***	-0.033,-0.018	-0.019***	-0.026,-0.011
Income (ref.: 1st quartile)												
2nd quartile			-0.015*	-0.028,-0.002	-0.013	-0.026,0.000			-0.019**	-0.031,-0.006	-0.015*	-0.027,-0.002
3rd quartile			-0.029***	-0.042,-0.017	-0.021**	-0.033,-0.008			-0.028***	-0.040,-0.016	-0.017**	-0.029,-0.005
4th quartile			-0.041***	-0.052,-0.029	-0.027***	-0.039,-0.016			-0.046***	-0.057,-0.034	-0.027***	-0.039,-0.016
Wealth (ref.: 1st quartile)												
2nd quartile					-0.018**	-0.030,-0.006					-0.023***	-0.034,-0.011
3rd quartile					-0.037***	-0.047,-0.027					-0.036***	-0.046,-0.025
4th quartile					-0.041***	-0.051,-0.031					-0.052***	-0.062,-0.042
Country												
Spain												
Italy												
Austria	0		0		0		0		0		0	
Germany	0.010*	0.000,0.020	0.007	-0.003,0.016	0.005	-0.004,0.015	0.008	-0.002,0.018	0.006	-0.004,0.015	0.004	-0.005,0.014
France	0.006	-0.004,0.016	0.006	-0.003,0.016	0.007	-0.002,0.017	0.012**	0.003,0.021	0.013**	0.004,0.022	0.014**	0.005,0.022
Switzerland	-0.039***	-0.049,-0.028	-0.038***	-0.048,-0.028	-0.036***	-0.046,-0.026	-0.039***	-0.050,-0.028	-0.037***	-0.048,-0.027	-0.037***	-0.048,-0.026
Belgium	-0.002	-0.011,0.007	-0.003	-0.012,0.007	-0.002	-0.012,0.007	0.012**	0.003,0.021	0.012**	0.003,0.021	0.012**	0.003,0.021
Sweden												
Denmark												
Wave (ref.: [1] 2004-05)												
[2] 2006-07	-0.110***	-0.170,-0.051	-0.109***	-0.167,-0.050	-0.099***	-0.156,-0.042	-0.132***	-0.187,-0.077	-0.126***	-0.181,-0.071	-0.121***	-0.175,-0.067
[4] 2011-12	-0.078***	-0.118,-0.039	-0.078***	-0.118,-0.038	-0.071***	-0.110,-0.032	-0.105***	-0.145,-0.065	-0.102***	-0.142,-0.062	-0.098***	-0.137,-0.059
[5] 2013	-0.072**	-0.115,-0.029	-0.068**	-0.110,-0.026	-0.062**	-0.103,-0.021	-0.074***	-0.114,-0.035	-0.070***	-0.109,-0.030	-0.068***	-0.107,-0.029
[6] 2015	-0.114***	-0.155,-0.072	-0.113***	-0.154,-0.072	-0.102***	-0.142,-0.061	-0.109***	-0.150,-0.067	-0.104***	-0.145,-0.063	-0.093***	-0.132,-0.053
Constant	0.678	-0.340,1.696	0.507	-0.532,1.546	0.297	-0.736,1.330	0.921	-0.126,1.968	0.747	-0.300,1.794	0.667	-0.358,1.692
AIC	-42039.85		-42094.98		-42173.99		-47441.40		-47494.83		-47620.90	
BIC	-41779.60		-41790.11		-41824.51		-47175.79		-47183.68		-47264.22	
No. of observations	12529		12529		12529		14603		14603		14603	
No. of groups (individuals)	3545		3545		3545		4070		4070		4070	

(continued)

Table A2. Continued.

	Northern											
	Men (Model 1)		Men (Model 2)		Men (Model 3)		Women (Model 1)		Women (Model 2)		Women (Model 3)	
	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.
Within Variance												
Age	0.047**	0.015,0.079	0.048**	0.016,0.080	0.048**	0.016,0.081	-0.002	-0.030,0.025	-0.003	-0.030,0.025	-0.002	-0.030,0.026
Age^2	-0.001***	-0.001,-0.000	-0.001***	-0.001,-0.000	-0.001***	-0.001,-0.000	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000
Age^3	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000
Marital status (ref.: Married)												
Never Married	-0.029	-0.060,0.002	-0.03	-0.061,0.001	-0.030*	-0.060,-0.000	-0.039*	-0.075,-0.003	-0.039*	-0.075,-0.003	-0.040*	-0.076,-0.003
Divorced	-0.006	-0.025,0.014	-0.006	-0.025,0.014	-0.007	-0.026,0.013	-0.006	-0.022,0.011	-0.005	-0.021,0.011	-0.005	-0.021,0.011
Widowed	0.004	-0.017,0.025	0.004	-0.017,0.024	0.003	-0.017,0.024	-0.002	-0.015,0.010	-0.002	-0.015,0.010	-0.003	-0.015,0.010
Number of children (ref.: Childless)												
1	0.003	-0.018,0.024	0.002	-0.019,0.024	0.003	-0.019,0.024	-0.011	-0.031,0.008	-0.011	-0.031,0.008	-0.011	-0.031,0.008
2	0.006	-0.016,0.028	0.006	-0.016,0.028	0.006	-0.016,0.028	-0.001	-0.021,0.018	-0.001	-0.021,0.018	-0.001	-0.021,0.018
3+	0.003	-0.019,0.026	0.003	-0.019,0.026	0.003	-0.019,0.026	-0.016	-0.037,0.005	-0.016	-0.037,0.005	-0.016	-0.037,0.005
Income (ref.: 1st quartile)												
2nd quartile			-0.003	-0.010,0.004	-0.003	-0.010,0.004			0.001	-0.004,0.006	0.001	-0.004,0.006
3rd quartile			-0.003	-0.010,0.004	-0.003	-0.010,0.004			-0.001	-0.007,0.004	-0.001	-0.007,0.004
4th quartile			-0.004	-0.011,0.003	-0.003	-0.010,0.004			0.001	-0.005,0.007	0.001	-0.005,0.008
Wealth (ref.: 1st quartile)												
2nd quartile					-0.007	-0.015,0.001					-0.003	-0.009,0.003
3rd quartile					-0.003	-0.011,0.005					-0.003	-0.010,0.005
4th quartile					-0.003	-0.013,0.006					-0.003	-0.012,0.005
Wave (ref.: [1] 2004-05)												
[2] 2006-07	0.025**	0.008,0.042	0.025**	0.008,0.042	0.025**	0.007,0.042	0.000	-0.017,0.017	0.000	-0.017,0.017	0.000	-0.017,0.016
[4] 2011-12	0.060*	0.013,0.107	0.060*	0.013,0.107	0.059*	0.012,0.107	0.000	-0.045,0.044	0.000	-0.044,0.044	0.000	-0.044,0.044
[5] 2013	0.075*	0.015,0.136	0.075*	0.014,0.135	0.074*	0.014,0.135	0.000	-0.057,0.056	0.000	-0.056,0.057	0.000	-0.056,0.056
[6] 2015	0.087*	0.014,0.161	0.087*	0.013,0.161	0.086*	0.013,0.160	-0.003	-0.072,0.066	-0.002	-0.071,0.067	-0.002	-0.071,0.067
Between Variance												
Age	0.056*	0.001,0.111	0.070*	0.014,0.126	0.074**	0.020,0.129	-0.041	-0.111,0.029	-0.028	-0.098,0.042	-0.022	-0.092,0.048
Age^2	-0.001*	-0.002,-0.000	-0.001*	-0.002,-0.000	-0.001**	-0.002,-0.000	0.001	-0.000,0.002	0.000	-0.001,0.001	0.000	-0.001,0.001
Age^3	0.000*	0.000,0.000	0.000**	0.000,0.000	0.000**	0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000
Marital status (ref.: Married)												
Never Married	0.030*	0.007,0.054	0.013	-0.011,0.036	0.01	-0.013,0.032	0.008	-0.010,0.027	-0.004	-0.023,0.015	-0.011	-0.030,0.008
Divorced	0.013	-0.001,0.028	0.003	-0.011,0.017	-0.004	-0.018,0.010	0.018**	0.005,0.032	0.004	-0.010,0.018	-0.003	-0.017,0.011
Widowed	0.004	-0.012,0.020	-0.006	-0.023,0.010	-0.009	-0.025,0.007	0.006	-0.009,0.021	-0.005	-0.020,0.011	-0.011	-0.026,0.004

(continued)

Table A2. Continued.

	Northern											
	Men (Model 1)		Men (Model 2)		Men (Model 3)		Women (Model 1)		Women (Model 2)		Women (Model 3)	
	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.	β	95% C.I.
Number of children (ref.: Childless)												
1	0.007	-0.014,0.028	0.006	-0.015,0.027	0.007	-0.013,0.027	-0.016	-0.035,0.004	-0.015	-0.035,0.004	-0.016	-0.035,0.003
2	0.002	-0.015,0.018	0.001	-0.015,0.018	0.002	-0.014,0.018	-0.024**	-0.042,-0.006	-0.023*	-0.041,-0.005	-0.023*	-0.041,-0.005
3+	0.007	-0.010,0.024	0.006	-0.011,0.022	0.005	-0.011,0.021	-0.011	-0.030,0.007	-0.013	-0.031,0.006	-0.016	-0.034,0.002
Level of Education (ref.: Low)												
Medium	-0.012*	-0.022,-0.002	-0.005	-0.015,0.005	-0.004	-0.014,0.006	-0.012*	-0.022,-0.002	-0.007	-0.017,0.003	-0.005	-0.015,0.005
High	-0.025***	-0.034,-0.015	-0.014**	-0.023,-0.004	-0.011*	-0.021,-0.001	-0.030***	-0.040,-0.020	-0.019***	-0.030,-0.009	-0.014**	-0.024,-0.004
Income (ref.: 1st quartile)												
2nd quartile			-0.031**	-0.050,-0.011	-0.024*	-0.044,-0.005			-0.020*	-0.039,-0.001	-0.016	-0.034,0.003
3rd quartile			-0.039***	-0.058,-0.020	-0.028**	-0.048,-0.009			-0.033***	-0.050,-0.016	-0.020*	-0.037,-0.003
4th quartile			-0.059***	-0.077,-0.041	-0.044***	-0.064,-0.024			-0.054***	-0.072,-0.036	-0.033***	-0.052,-0.014
Wealth (ref.: 1st quartile)												
2nd quartile					-0.036***	-0.052,-0.020					-0.034***	-0.050,-0.018
3rd quartile					-0.042***	-0.056,-0.027					-0.043***	-0.057,-0.028
4th quartile					-0.036***	-0.052,-0.020					-0.045***	-0.060,-0.030
Country												
Spain												
Italy												
Austria												
Germany												
France												
Switzerland												
Belgium												
Sweden	0		0		0		0		0		0	
Denmark	0.014**	0.006,0.023	0.012**	0.003,0.020	0.012**	0.004,0.021	0.013**	0.004,0.021	0.012**	0.004,0.021	0.011**	0.003,0.020
Wave (ref.: [1] 2004-05)												
[2] 2006-07	-0.102**	-0.164,-0.039	-0.094**	-0.155,-0.034	-0.092**	-0.152,-0.031	-0.080*	-0.150,-0.010	-0.077*	-0.146,-0.009	-0.066	-0.135,0.003
[4] 2011-12	-0.100***	-0.146,-0.054	-0.089***	-0.133,-0.045	-0.085***	-0.129,-0.041	-0.074**	-0.128,-0.021	-0.070**	-0.122,-0.018	-0.059*	-0.111,-0.006
[5] 2013	-0.082**	-0.130,-0.033	-0.073**	-0.120,-0.026	-0.070**	-0.116,-0.023	-0.067*	-0.123,-0.011	-0.059*	-0.115,-0.004	-0.05	-0.106,0.006
[6] 2015	-0.146***	-0.199,-0.093	-0.129***	-0.180,-0.078	-0.124***	-0.176,-0.073	-0.082**	-0.134,-0.030	-0.076**	-0.128,-0.025	-0.069**	-0.120,-0.018
Constant	-1.144	-2.409,0.120	-1.411*	-2.694,-0.127	-1.519*	-2.778,-0.259	1.094	-0.498,2.686	0.873	-0.722,2.468	0.705	-0.892,2.302
AIC	-19890.58		-19932.52		-19975.50		-21254.01		-21276.95		-21317.90	
BIC	-19677.21		-19679.13		-19682.11		-21038.00		-21020.44		-21020.89	
No. of observations	5814		5814		5814		6313		6313		6313	
No. of groups (individuals)	1586		1586		1586		1718		1718		1718	

Source: SHARE data, years 2004-2015 (own estimates). Ref.: reference category. * p<0.05, ** p<0.01, *** p<0.001

Table A3. Linear hybrid models predicting frailty, by welfare cluster. Beta coefficient (first column) and 95% confidence intervals (second column)

	Southern		Western		Northern	
	β	95% C.I.	β	95% C.I.	β	95% C.I.
Within Variance						
Age	0.075***	0.043,0.108	0.039***	0.021,0.057	0.023*	0.002,0.044
Age^2	-0.001***	-0.002,-0.001	-0.001***	-0.001,-0.000	-0.000**	-0.001,-0.000
Age^3	0.000***	0.000,0.000	0.000***	0.000,0.000	0.000***	0.000,0.000
Marital status (ref.: Married)						
Never Married	-	-	-0.019	-0.046,0.007	-0.034**	-0.058,-0.010
Divorced	0.017	-0.018,0.052	0.016	-0.002,0.034	-0.006	-0.019,0.007
Widowed	0.023**	0.008,0.038	0.001	-0.007,0.009	0.000	-0.010,0.011
Number of children (ref.: Childless)						
1	-0.008	-0.037,0.022	0.013*	0.001,0.025	-0.003	-0.018,0.011
2	0.005	-0.024,0.034	0.005	-0.007,0.017	0.003	-0.012,0.018
3+	0.013	-0.015,0.041	0.006	-0.006,0.019	-0.005	-0.021,0.010
Income (ref.: 1st quartile)						
2nd quartile	0.002	-0.006,0.009	0.003	-0.002,0.008	-0.003	-0.010,0.004
3rd quartile	0.004	-0.004,0.012	0.003	-0.002,0.008	-0.003	-0.011,0.004
4th quartile	0.006	-0.003,0.015	0.002	-0.002,0.007	-0.003	-0.010,0.004
Wealth (ref.: 1st quartile)						
2nd quartile	0.003	-0.006,0.012	0.000	-0.006,0.005	-0.007	-0.016,0.001
3rd quartile	0.004	-0.006,0.015	-0.001	-0.007,0.004	-0.003	-0.011,0.005
4th quartile	0.010*	0.000,0.019	-0.001	-0.007,0.006	-0.003	-0.012,0.006

(continued)

Table A3. Continued.

*Interaction: Gender * Income*						
Women * 2nd quartile	-0.007	-0.018,0.004	-0.001	-0.008,0.005	0.004	-0.005,0.013
Women * 3rd quartile	-0.009	-0.021,0.003	-0.002	-0.009,0.004	0.002	-0.007,0.011
Women * 4th quartile	0.003	-0.010,0.016	-0.001	-0.007,0.006	0.004	-0.005,0.013
*Interaction: Gender * Wealth*						
Women * 2nd quartile	0.000	-0.012,0.012	-0.002	-0.009,0.006	0.005	-0.006,0.015
Women * 3rd quartile	-0.005	-0.019,0.009	-0.006	-0.014,0.002	0.001	-0.010,0.012
Women * 4th quartile	-0.011	-0.025,0.003	-0.002	-0.011,0.007	0.000	-0.013,0.012
Wave (ref.: [1] 2004-05)						
[2] 2006-07	0.015	-0.016,0.047	0.007*	0.001,0.012	0.012*	0.000,0.024
[4] 2011-12	0.047	-0.029,0.122	0.027**	0.010,0.044	0.03	-0.002,0.063
[5] 2013	0.064	-0.033,0.161	0.032**	0.011,0.054	0.038	-0.003,0.080
[6] 2015	0.061	-0.058,0.180	0.035*	0.008,0.061	0.043	-0.007,0.094
Between Variance						
Age	0.000	-0.070,0.071	-0.012	-0.045,0.020	0.024	-0.022,0.070
Age^2	0.000	-0.001,0.001	0.000	-0.000,0.001	0.000	-0.001,0.000
Age^3	0.000	-0.000,0.000	0.000	-0.000,0.000	0.000	-0.000,0.000
Marital status (ref.: Married)						
Never Married	0.006	-0.014,0.025	0.005	-0.006,0.015	-0.002	-0.017,0.013
Divorced	0.014	-0.011,0.038	0.003	-0.004,0.011	-0.004	-0.014,0.006
Widowed	0.01	-0.003,0.023	0.009**	0.003,0.016	-0.009	-0.020,0.002

(continued)

Table A3. Continued

	Southern		Western		Northern	
	β	95% C.I.	β	95% C.I.	β	95% C.I.
Number of children (ref.: Childless)						
1	0.000	-0.016,0.017	0.001	-0.007,0.010	-0.005	-0.019,0.009
2	0.004	-0.011,0.019	-0.007	-0.015,0.001	-0.012	-0.023,0.000
3+	0.021**	0.006,0.037	-0.004	-0.012,0.005	-0.006	-0.018,0.006
Level of Education (ref.: Low)						
Medium	-0.005	-0.017,0.008	-0.006	-0.013,0.001	-0.003	-0.013,0.007
High	-0.015	-0.032,0.001	-0.012**	-0.020,-0.004	-0.011*	-0.020,-0.001
Income (ref.: 1st quartile)						
2nd quartile	0.000	-0.026,0.025	-0.015*	-0.027,-0.002	-0.025*	-0.044,-0.006
3rd quartile	-0.014	-0.036,0.009	-0.022***	-0.034,-0.009	-0.026**	-0.045,-0.008
4th quartile	-0.012	-0.034,0.010	-0.027***	-0.039,-0.016	-0.040***	-0.059,-0.022
Wealth (ref.: 1st quartile)						
2nd quartile	-0.011	-0.034,0.011	-0.018**	-0.030,-0.007	-0.037***	-0.053,-0.021
3rd quartile	-0.018	-0.040,0.003	-0.037***	-0.047,-0.027	-0.043***	-0.057,-0.029
4th quartile	-0.02	-0.040,0.000	-0.041***	-0.051,-0.031	-0.037***	-0.053,-0.021
*Interaction: Gender * Level of Education*						
Women * Medium	-0.021*	-0.038,-0.005	-0.011*	-0.020,-0.002	-0.002	-0.015,0.011
Women * High	-0.021	-0.044,0.002	-0.008	-0.018,0.003	-0.003	-0.016,0.010
*Interaction: Gender * Income*						
Women * 2nd quartile	-0.005	-0.040,0.030	0.001	-0.017,0.019	0.007	-0.019,0.033
Women * 3rd quartile	0.006	-0.025,0.036	0.006	-0.011,0.023	0.002	-0.022,0.025
Women * 4th quartile	-0.010	-0.040,0.020	0.001	-0.015,0.017	0.002	-0.022,0.025
*Interaction: Gender * Wealth*						
Women * 2nd quartile	-0.014	-0.046,0.017	-0.004	-0.020,0.012	0.004	-0.018,0.027
Women * 3rd quartile	-0.025	-0.055,0.005	0.002	-0.013,0.016	0.002	-0.018,0.023
Women * 4th quartile	-0.037**	-0.066,-0.009	-0.011	-0.025,0.003	-0.007	-0.028,0.015

(continued)

Table A3. Continued

Gender (ref.: Men)						
Women	0.068***	0.044,0.092	0.021**	0.006,0.035	0.01	-0.011,0.030
Country						
Spain	0					
Italy	-0.007	-0.014,0.000				
Austria			0			
Germany			0.005	-0.002,0.012		
France			0.011***	0.004,0.018		
Switzerland			-0.036***	-0.044,-0.029		
Belgium			0.005	-0.001,0.012		
Sweden					0	
Denmark					0.012***	0.006,0.018
Wave (ref.: [1] 2004-05)						
[2] 2006-07	-0.086**	-0.140,-0.032	-0.115***	-0.154,-0.075	-0.079***	-0.125,-0.032
[4] 2011-12	-0.073***	-0.115,-0.031	-0.089***	-0.116,-0.061	-0.071***	-0.105,-0.036
[5] 2013	-0.078***	-0.120,-0.036	-0.067***	-0.095,-0.039	-0.059**	-0.096,-0.022
[6] 2015	-0.147***	-0.193,-0.101	-0.098***	-0.126,-0.069	-0.096***	-0.132,-0.060
Constant	0.052	-1.539,1.643	0.478	-0.262,1.217	-0.363	-1.418,0.693
AIC	-29642.37		-89741.877		-41275.409	
BIC	-29217.597		-89232.951		-40838.621	
No. of observations	11200		27132		12127	
No. of groups (individuals)	3036		7615		3304	

Source: SHARE data, years 2004-2015 (own estimates)
Note: Ref.: reference category.
* p<0.05, ** p<0.01, *** p<0.001

Table A4. Associations between work-family life course type and grip strength in older ages (higher = better): results of linear regression analyses (Men).

	Grip strength (GS)	
	β	95% CI
Work–family lifecourse type (ref. Working, Two children)		
Working, Childless	-1.093**	-1.801,-0.384
Working, One Child Early	-0.585	-1.403,0.232
Working, One Child	-0.942*	-1.678,-0.207
Working, Two Children Early	-0.217	-1.047,0.613
Working, Two Children Later	0.198	-0.419,0.814
Working, Large Family Early	-0.169	-0.946,0.608
Working, Large Family	-0.782*	-1.410,-0.154
Working, Large Family Later	-0.466	-1.266,0.334
Working, Later Family (from age 25)	-0.396	-1.011,0.218
Working, Later Family (from age 35)	-2.608***	-3.609,-1.607
Unstable Work, Family	-2.530***	-3.585,-1.476
Age	-0.568***	-0.587,-0.550
Education (ref. Low)		
Medium	0.982***	0.590,1.375
High	1.289***	0.799,1.779
Income quartile (ref. First quartile)		
Second quartile	0.942***	0.470,1.414
Third quartile	1.225***	0.730,1.720
Fourth quartile	1.889***	1.379,2.399
Marital status (ref. Living with a spouse)		
Living as a single	-1.129***	-1.603,-0.656

(continued)

Table A4. Continued.

Wave (ref. 3)		
7	-1.322***	-1.746,-0.898
Welfare cluster (ref. Social Democratic)		
Liberal	-2.546***	-3.452,-1.640
Conservative	-1.102***	-1.725,-0.479
Southern European	-4.654***	-5.306,-4.001
Baltic	0.013	-0.696,0.721
CEE	-2.464***	-3.069,-1.860
Childhood health status		
General health (ref. Excellent)		
Very good	-0.350+	-0.748,0.047
Good	-0.166	-0.613,0.281
Fair	-0.676+	-1.436,0.083
Poor	-0.959	-2.224,0.306
Missed school for 1 month or longer (ref. No)		
Yes	0.328	-0.537,1.194
Confined to bed or home for 1 month or longer (ref. No)		
Yes	0.710	-0.242,1.661
In hospital for 1 month or longer (ref. No)		
Yes	-0.803+	-1.628,0.023
Constant	81.877***	80.404,83.350
AIC	82525.266	
BIC	82760.305	
r2	0.307	
Observations	11441	

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table A5. Associations between work-family life course type and grip strength in older ages (higher = better): results of linear regression analyses (Women).

	Grip strength (GS)	
	β	95% CI
Work–family lifecourse type (ref. Working, Two children)		
Working, Childless	-0.336	-0.801,0.129
Not Working, Childless	-1.413***	-2.140,-0.685
Working, One Child	-0.204	-0.788,0.381
Working, Two Children Spaced	-0.102	-0.635,0.430
Working, Two Children Early	-0.244	-0.732,0.244
Working, Two Children Later	-0.050	-0.493,0.393
Working, Large Family Early	0.052	-0.420,0.523
Working, Large Family	0.693**	0.186,1.200
Not Working, Large Family Early	-0.170	-0.708,0.368
Not Working, Large Family	-0.406	-0.929,0.116
Not Working, Large Family Later	-1.262***	-1.878,-0.647
Work Drop-out, Two Children	-0.502+	-1.051,0.048
Work Drop-out Later, Two Children	-0.919***	-1.447,-0.392
Work Break, Large Family	-0.075	-0.500,0.351
Age	-0.320***	-0.332,-0.308
Education (ref. Low)		
Medium	0.718***	0.465,0.972
High	1.034***	0.710,1.358
Income quartile (ref. First quartile)		
Second quartile	0.506***	0.210,0.801
Third quartile	0.695***	0.379,1.010
Fourth quartile	0.671***	0.340,1.002
Marital status (ref. Living with a spouse)		
Living as a single	-0.422***	-0.666,-0.177

(continued)

Table A5. Continued.

Wave (ref. 3)		
7	-0.998***	-1.268,-0.728
Welfare cluster (ref. Social Democratic)		
Liberal	-0.605+	-1.228,0.018
Conservative	0.247	-0.179,0.674
Southern European	-2.371***	-2.810,-1.931
Baltic	1.728***	1.282,2.175
CEE	-0.071	-0.475,0.333
Childhood health status		
General health (ref. Excellent)		
Very good	-0.209	-0.464,0.046
Good	-0.399**	-0.671,-0.127
Fair	-1.167***	-1.593,-0.740
Poor	-1.993***	-2.713,-1.273
Missed school for 1 month or longer (ref. No)		
Yes	-0.138	-0.646,0.370
Confined to bed or home for 1 month or longer (ref. No)		
Yes	0.322	-0.217,0.861
In hospital for 1 month or longer (ref. No)		
Yes	-0.016	-0.527,0.495
Constant	47.628***	46.601,48.655
AIC	96490.227	
BIC	96756.371	
r2	0.261	
Observations	14826	

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table A6. Associations between work-family life course type and grip strength in older ages (higher = better): results of linear regression analyses with interaction effects (Men).

	β	95% CI
Work–family lifecourse type (ref. Working, Two children)		
Working, Childless	-0.623	-2.661,1.415
Working, One Child Early	0.893	-1.705,3.491
Working, One Child	-1.69	-4.385,1.005
Working, Two Children Early	-0.109	-2.532,2.315
Working, Two Children Later	0.53	-1.473,2.534
Working, Large Family Early	0.56	-1.779,2.899
Working, Large Family	0.195	-1.715,2.105
Working, Large Family Later	0.564	-1.599,2.727
Working, Later Family (from age 25)	-0.589	-2.447,1.270
Working, Later Family (from age 35)	-3.598*	-6.761,-0.435
Unstable Work, Family	-1.555	-5.143,2.033
Age of respondent at the time of interview	-0.569***	-0.588,-0.551
Education (ref. Low)		
Medium	0.957***	0.562,1.351
High	1.275***	0.781,1.768
Income quartile (ref. First quartile)		
Second quartile	0.925***	0.453,1.398
Third quartile	1.208***	0.712,1.704
Fourth quartile	1.836***	1.323,2.350
Marital status (ref. Living with a spouse)		
Living as a single	-1.105***	-1.582,-0.629
Wave (ref. 3)		
7	-1.256***	-1.687,-0.826

(continued)

Table A6. Continued

Welfare cluster (ref. Social Democratic)		
Liberal	-0.562	-3.369,2.244
Conservative	-1.644*	-3.245,-0.043
Southern European	-3.583***	-5.446,-1.720
Baltic	0.087	-1.679,1.852
CEE	-1.969*	-3.479,-0.460
Childhood health status		
General health (ref. Excellent)		
Very good	-0.375+	-0.774,0.024
Good	-0.167	-0.614,0.281
Fair	-0.666+	-1.429,0.098
Poor	-0.994	-2.258,0.271
Missed school for 1 month or longer (ref. No)		
Yes	0.334	-0.533,1.201
Confined to bed or home for 1 month or longer (ref. No)		
Yes	0.719	-0.233,1.671
In hospital for 1 month or longer (ref. No)		
Yes	-0.795+	-1.620,0.030

(continued)

Table A6. Continued

	β	95% CI
*Interaction: Life course type*Welfare cluster*		
Working, Childless # Liberal	-3.482+	-7.258,0.293
Working, Childless # Conservative	0.003	-2.417,2.422
Working, Childless # Southern European	-1.202	-3.893,1.489
Working, Childless # Baltic	-0.249	-3.009,2.511
Working, Childless # CEE	-0.138	-2.589,2.314
Working, One Child Early # Liberal	-3.577	-10.740,3.585
Working, One Child Early # Conservative	0.32	-2.801,3.442
Working, One Child Early # Southern European	-0.996	-4.791,2.799
Working, One Child Early # Baltic	-1.871	-4.986,1.245
Working, One Child Early # CEE	-2.334	-5.270,0.602
Working, One Child # Liberal	1.272	-3.527,6.071
Working, One Child # Conservative	2.138	-0.919,5.195
Working, One Child # Southern European	1.13	-2.299,4.558
Working, One Child # Baltic	0.731	-2.505,3.967
Working, One Child # CEE	-0.033	-2.996,2.930
Working, Two Children Early # Liberal	-0.16	-6.923,6.604
Working, Two Children Early # Conservative	2.358	-0.665,5.382
Working, Two Children Early # Southern European	-1.244	-4.787,2.299
Working, Two Children Early # Baltic	-0.003	-3.240,3.233
Working, Two Children Early # CEE	-0.695	-3.427,2.038
Working, Two Children Later # Liberal	-1.581	-5.557,2.394
Working, Two Children Later # Conservative	0.919	-1.441,3.279
Working, Two Children Later # Southern European	-1.5	-4.033,1.033
Working, Two Children Later # Baltic	-0.682	-3.213,1.848
Working, Two Children Later # CEE	-0.25	-2.545,2.045
Working, Large Family Early # Liberal	-2.06	-6.619,2.500
Working, Large Family Early # Conservative	0.256	-2.523,3.035
Working, Large Family Early # Southern European	-1.674	-4.692,1.344
Working, Large Family Early # Baltic	0.035	-3.177,3.248

(continued)

Table a6. Continued

	β	95% CI
*Interaction: Life course type*Welfare cluster*		
Working, Childless # Liberal	-3.482+	-7.258,0.293
Working, Childless # Conservative	0.003	-2.417,2.422
Working, Childless # Southern European	-1.202	-3.893,1.489
Working, Childless # Baltic	-0.249	-3.009,2.511
Working, Childless # CEE	-0.138	-2.589,2.314
Working, One Child Early # Liberal	-3.577	-10.740,3.585
Working, One Child Early # Conservative	0.32	-2.801,3.442
Working, One Child Early # Southern European	-0.996	-4.791,2.799
Working, One Child Early # Baltic	-1.871	-4.986,1.245
Working, One Child Early # CEE	-2.334	-5.270,0.602
Working, One Child # Liberal	1.272	-3.527,6.071
Working, One Child # Conservative	2.138	-0.919,5.195
Working, One Child # Southern European	1.13	-2.299,4.558
Working, One Child # Baltic	0.731	-2.505,3.967
Working, One Child # CEE	-0.033	-2.996,2.930
Working, Two Children Early # Liberal	-0.16	-6.923,6.604
Working, Two Children Early # Conservative	2.358	-0.665,5.382
Working, Two Children Early # Southern European	-1.244	-4.787,2.299
Working, Two Children Early # Baltic	-0.003	-3.240,3.233
Working, Two Children Early # CEE	-0.695	-3.427,2.038
Working, Two Children Later # Liberal	-1.581	-5.557,2.394
Working, Two Children Later # Conservative	0.919	-1.441,3.279
Working, Two Children Later # Southern European	-1.5	-4.033,1.033
Working, Two Children Later # Baltic	-0.682	-3.213,1.848
Working, Two Children Later # CEE	-0.25	-2.545,2.045
Working, Large Family Early # Liberal	-2.06	-6.619,2.500
Working, Large Family Early # Conservative	0.256	-2.523,3.035
Working, Large Family Early # Southern European	-1.674	-4.692,1.344
Working, Large Family Early # Baltic	0.035	-3.177,3.248

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table A7. Associations between work-family life course type and grip strength in older ages (higher = better): results of linear regression analyses with interaction effects (Women).

	β	95% CI
Work–family lifecourse type (ref. Working, Two children)		
Working, Childless	-0.601	-2.062,0.859
Not Working, Childless	-4.024*	-7.588,-0.460
Working, One Child	-1.336	-3.143,0.472
Working, Two Children Spaced	0.082	-2.003,2.166
Working, Two Children Early	-0.289	-2.355,1.777
Working, Two Children Later	-0.739	-2.081,0.604
Working, Large Family Early	0.635	-0.833,2.104
Working, Large Family	1.13	-0.337,2.596
Not Working, Large Family Early	-1.105	-3.580,1.370
Not Working, Large Family	0.29	-2.290,2.870
Not Working, Large Family Later	1.989	-1.203,5.180
Work Drop-out, Two Children	-1.669	-3.937,0.599
Work Drop-out Later, Two Children	-1.67	-3.896,0.557
Work Break, Large Family	0.171	-1.085,1.426
Age of respondent at the time of interview	-0.323***	-0.336,-0.311
Education (ref. Low)		
Medium	0.685***	0.429,0.941
High	1.027***	0.702,1.352
Income quartile (ref. First quartile)		
Second quartile	0.499***	0.202,0.796
Third quartile	0.680***	0.364,0.996
Fourth quartile	0.659***	0.328,0.989

(continued)

Table A7. Continued

Marital status (ref. Living with a spouse)		
Living as a single	-0.420***	-0.665,-0.175
Wave (ref. 3)		
7	-0.937***	-1.211,-0.664
Welfare cluster (ref. Social Democratic)		
Liberal	0.937	-1.653,3.528
Conservative	-0.017	-1.267,1.233
Southern European	-3.149***	-4.540,-1.757
Baltic	1.738**	0.539,2.937
CEE	-0.117	-1.232,0.998
Childhood health status		
General health (ref. Excellent)		
Very good	-0.181	-0.436,0.075
Good	-0.389**	-0.661,-0.117
Fair	-1.153***	-1.579,-0.728
Poor	-1.907***	-2.627,-1.187
Missed school for 1 month or longer (ref. No)		
Yes	-0.165	-0.673,0.344
Confined to bed or home for 1 month or longer (ref. No)		
Yes	0.31	-0.229,0.850
In hospital for 1 month or longer (ref. No)		
Yes	-0.01	-0.522,0.502

(continued)

Table A7. Continued

	β	95% CI
*Interaction: Life course type*Welfare cluster*		
Working, Childless # Liberal	-0.998	-3.976,1.980
Working, Childless # Conservative	-0.409	-2.173,1.355
Working, Childless # Southern European	2.183*	0.243,4.124
Working, Childless # Baltic	0.672	-1.095,2.438
Working, Childless # CEE	-0.051	-1.761,1.660
Not Working, Childless # Liberal	1.792	-3.514,7.098
Not Working, Childless # Conservative	2.242	-1.651,6.135
Not Working, Childless # Southern European	3.932*	0.147,7.716
Not Working, Childless # Baltic	0.016	-5.321,5.354
Not Working, Childless # CEE	2.349	-1.561,6.258
Working, One Child # Liberal	-1.152	-5.851,3.548
Working, One Child # Conservative	1.284	-1.030,3.597
Working, One Child # Southern European	2.944*	0.060,5.829
Working, One Child # Baltic	1.522	-0.545,3.588
Working, One Child # CEE	0.786	-1.292,2.864
Working, Two Children Spaced # Liberal	2.135	-2.380,6.650
Working, Two Children Spaced # Conservative	-0.659	-3.304,1.986
Working, Two Children Spaced # Southern European	1.363	-1.688,4.414
Working, Two Children Spaced # Baltic	-0.367	-2.660,1.926
Working, Two Children Spaced # CEE	-0.249	-2.476,1.977
Working, Two Children Early # Liberal	-7.260*	-13.471,-1.049
Working, Two Children Early # Conservative	0.113	-2.421,2.646
Working, Two Children Early # Southern European	0.955	-1.908,3.819
Working, Two Children Early # Baltic	-0.215	-2.499,2.068
Working, Two Children Early # CEE	0.068	-2.102,2.239
Working, Two Children Later # Liberal	-0.733	-4.107,2.641
Working, Two Children Later # Conservative	0.655	-1.098,2.409
Working, Two Children Later # Southern European	1.381	-0.484,3.246
Working, Two Children Later # Baltic	0.483	-1.111,2.078
Working, Two Children Later # CEE	1.266	-0.283,2.814
Working, Large Family Early # Liberal	-1.759	-5.640,2.122
Working, Large Family Early # Conservative	-0.596	-2.486,1.294
Working, Large Family Early # Southern European	-0.812	-2.904,1.281
Working, Large Family Early # Baltic	-0.124	-1.867,1.618
Working, Large Family Early # CEE	-1.005	-2.650,0.640
Working, Large Family # Liberal	-2.896+	-6.139,0.348
Working, Large Family # Conservative	-1.003	-2.972,0.966
Working, Large Family # Southern European	-1.379	-3.482,0.723

(continued)

Table A7. Continued

	β	95% CI
*Interaction: Life course type*Welfare cluster*		
Working, Childless # Liberal	-0.998	-3.976,1.980
Working, Childless # Conservative	-0.409	-2.173,1.355
Working, Childless # Southern European	2.183*	0.243,4.124
Working, Childless # Baltic	0.672	-1.095,2.438
Working, Childless # CEE	-0.051	-1.761,1.660
Not Working, Childless # Liberal	1.792	-3.514,7.098
Not Working, Childless # Conservative	2.242	-1.651,6.135
Not Working, Childless # Southern European	3.932*	0.147,7.716
Not Working, Childless # Baltic	0.016	-5.321,5.354
Not Working, Childless # CEE	2.349	-1.561,6.258
Working, One Child # Liberal	-1.152	-5.851,3.548
Working, One Child # Conservative	1.284	-1.030,3.597
Working, One Child # Southern European	2.944*	0.060,5.829
Working, One Child # Baltic	1.522	-0.545,3.588
Working, One Child # CEE	0.786	-1.292,2.864
Working, Two Children Spaced # Liberal	2.135	-2.380,6.650
Working, Two Children Spaced # Conservative	-0.659	-3.304,1.986
Working, Two Children Spaced # Southern European	1.363	-1.688,4.414
Working, Two Children Spaced # Baltic	-0.367	-2.660,1.926
Working, Two Children Spaced # CEE	-0.249	-2.476,1.977
Working, Two Children Early # Liberal	-7.260*	-13.471,-1.049
Working, Two Children Early # Conservative	0.113	-2.421,2.646
Working, Two Children Early # Southern European	0.955	-1.908,3.819
Working, Two Children Early # Baltic	-0.215	-2.499,2.068
Working, Two Children Early # CEE	0.068	-2.102,2.239
Working, Two Children Later # Liberal	-0.733	-4.107,2.641
Working, Two Children Later # Conservative	0.655	-1.098,2.409
Working, Two Children Later # Southern European	1.381	-0.484,3.246
Working, Two Children Later # Baltic	0.483	-1.111,2.078
Working, Two Children Later # CEE	1.266	-0.283,2.814
Working, Large Family Early # Liberal	-1.759	-5.640,2.122
Working, Large Family Early # Conservative	-0.596	-2.486,1.294
Working, Large Family Early # Southern European	-0.812	-2.904,1.281
Working, Large Family Early # Baltic	-0.124	-1.867,1.618
Working, Large Family Early # CEE	-1.005	-2.650,0.640
Working, Large Family # Liberal	-2.896+	-6.139,0.348
Working, Large Family # Conservative	-1.003	-2.972,0.966
Working, Large Family # Southern European	-1.379	-3.482,0.723

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table A8. Stepwise sample selection steps. Percentages refer to individuals left from the initial sample.

	Individuals	Parent-Child Dyads	Observations	Sample reduction (% left from the initial sample)		
				Individuals	Parent-Child Dyads	Observations
Initial sample	6,492	11,163	23,223	100.00	100.00	100.00
SHARE eligibility criteria not met	6,372	11,005	22,873	98.15	98.58	98.49
Childless	5,744	10,365	21,632	88.48	92.85	93.15
Respondents not linkable to the SSD	3,240	7,854	17,675	49.91	70.36	76.11
Respondents with missing values in the dependent variables	3,071	7,563	16,707	47.30	67.75	71.94
Respondents' children were not at risk of partnership dissolution	2,699	5,542	12,753	41.57	49.65	54.92
Respondents' children had no information on the start date of cohabitation.	2,552	5,108	11,014	39.31	45.76	47.43
Respondents with missing values in the independent variables	2,547	5,094	10,981	39.23	45.63	47.29
Respondents participated in only one SHARE wave	1,510	3,024	8,911	23.26	27.09	38.37

Table A9. Fixed effects linear regression models on parents' health (z-scores), by parents' gender.

	Fathers			Mothers		
	Depression	Grip Strength	Frailty Index	Depression	Grip Strength	Frailty Index
Time before/after child's divorce (ref.: no separation, < 4 years pre-separation)						
-4/-2 years	-0.03	0.13+	0.01	0.26**	0.01	0.09
	(-0.20 - 0.14)	(-0.02 - 0.28)	(-0.12 - 0.15)	(0.08 - 0.44)	(-0.10 - 0.12)	(-0.04 - 0.22)
-2/0 years	0.17*	0.04	0.29***	0.22*	0.13*	0.15*
	(0.01 - 0.33)	(-0.12 - 0.20)	(0.13 - 0.46)	(0.03 - 0.41)	(0.01 - 0.25)	(0.02 - 0.28)
0/2 years	0.11	-0.01	0.09	0.04	0.08	-0.00
	(-0.05 - 0.28)	(-0.15 - 0.12)	(-0.04 - 0.21)	(-0.15 - 0.23)	(-0.04 - 0.20)	(-0.13 - 0.12)
2/4 years	0.05	0.13+	0.09	0.03	0.05	-0.00
	(-0.13 - 0.23)	(-0.01 - 0.26)	(-0.06 - 0.23)	(-0.15 - 0.21)	(-0.07 - 0.17)	(-0.12 - 0.12)
4/6 years	-0.03	0.02	0.13*	-0.04	0.04	0.02
	(-0.20 - 0.14)	(-0.08 - 0.12)	(0.02 - 0.24)	(-0.21 - 0.14)	(-0.07 - 0.15)	(-0.09 - 0.13)
Parents' characteristics						
Number of children (ref.: 1)						
2	0.16	0.01	-0.23	-0.45	0.11	0.28
	(-0.18 - 0.50)	(-0.40 - 0.41)	(-0.87 - 0.41)	(-1.07 - 0.16)	(-0.19 - 0.40)	(-0.14 - 0.69)
3+	0.25+	0.02	-0.22	-0.50	0.10	0.22
	(-0.01 - 0.51)	(-0.37 - 0.42)	(-0.80 - 0.36)	(-1.13 - 0.12)	(-0.21 - 0.41)	(-0.22 - 0.66)
Age (centered)	0.01	0.06***	0.05***	-0.01	0.06***	0.05***
	(-0.00 - 0.02)	(0.05 - 0.07)	(0.03 - 0.06)	(-0.03 - 0.00)	(0.05 - 0.07)	(0.04 - 0.07)
Marital status (ref.: Married)						
Never married	-0.42*	-0.33*	0.13	-0.28	-0.09	-0.68
	(-0.79 - -0.05)	(-0.58 - -0.08)	(-0.22 - 0.48)	(-1.59 - 1.04)	(-0.27 - 0.09)	(-1.59 - 0.23)
Divorced	0.20	-0.26	0.42	-0.59	-0.23	-0.17
	(-0.56 - 0.95)	(-0.60 - 0.08)	(-0.17 - 1.01)	(-1.65 - 0.46)	(-0.55 - 0.08)	(-0.87 - 0.53)
Widowed	0.48***	0.04	0.09	0.24+	0.05	0.06
	(0.22 - 0.75)	(-0.13 - 0.21)	(-0.18 - 0.35)	(-0.04 - 0.52)	(-0.15 - 0.24)	(-0.13 - 0.25)
Level of education (ref.: Low)						
Middle	0.18	0.34+	0.03	-0.50*	-0.21	-0.39
	(-0.37 - 0.74)	(-0.02 - 0.70)	(-0.38 - 0.43)	(-1.00 - -0.01)	(-0.51 - 0.09)	(-0.99 - 0.21)
High	0.02	0.46*	-0.01	-0.48+	-0.11	-0.64
	(-0.59 - 0.62)	(0.10 - 0.81)	(-0.35 - 0.33)	(-1.02 - 0.05)	(-0.45 - 0.23)	(-1.66 - 0.38)

(continued)

Table A9. Continued.

Income quartiles (ref.: 1st)						
2nd	0.09	-0.05	0.04	0.03	-0.04	0.03
	(-0.03 - 0.21)	(-0.15 - 0.05)	(-0.06 - 0.13)	(-0.11 - 0.17)	(-0.12 - 0.04)	(-0.08 - 0.14)
3rd	0.02	-0.01	-0.05	0.05	0.03	0.08
	(-0.10 - 0.14)	(-0.12 - 0.10)	(-0.14 - 0.04)	(-0.11 - 0.21)	(-0.07 - 0.12)	(-0.03 - 0.20)
4th	0.07	-0.07	0.04	0.14+	0.06	0.12+
	(-0.06 - 0.20)	(-0.19 - 0.05)	(-0.06 - 0.14)	(-0.03 - 0.32)	(-0.03 - 0.16)	(-0.01 - 0.25)
Children's characteristics						
Legally divorced (ref.: no)						
Yes	0.04	0.04	-0.00	-0.05	0.10	0.00
	(-0.16 - 0.23)	(-0.12 - 0.19)	(-0.15 - 0.14)	(-0.29 - 0.18)	(-0.03 - 0.23)	(-0.18 - 0.18)
Time since cohabitation (ref.: 0-2 years)						
2-4 years	-0.13*	-0.01	-0.09*	-0.01	-0.08+	-0.03
	(-0.25 - -0.01)	(-0.10 - 0.09)	(-0.16 - -0.02)	(-0.15 - 0.12)	(-0.16 - 0.01)	(-0.11 - 0.06)
4-6 years	-0.12*	-0.01	-0.11*	-0.01	-0.07	-0.12*
	(-0.24 - -0.00)	(-0.12 - 0.10)	(-0.20 - -0.02)	(-0.16 - 0.13)	(-0.16 - 0.03)	(-0.22 - -0.02)
6-8 years	-0.17*	-0.10+	-0.18**	-0.08	-0.13*	-0.16**
	(-0.31 - -0.04)	(-0.22 - 0.02)	(-0.29 - -0.06)	(-0.24 - 0.08)	(-0.23 - -0.02)	(-0.28 - -0.04)
8+ years	-0.12	-0.11	-0.19*	-0.02	-0.18**	-0.25**
	(-0.29 - 0.05)	(-0.23 - 0.02)	(-0.35 - -0.04)	(-0.20 - 0.17)	(-0.30 - -0.06)	(-0.41 - -0.10)
Geographic distance between parent and children (ref.: 0-2 km)						
2-5 km	-0.02	-0.00	-0.07	0.13	-0.04	0.09
	(-0.17 - 0.14)	(-0.13 - 0.12)	(-0.22 - 0.07)	(-0.07 - 0.34)	(-0.15 - 0.06)	(-0.03 - 0.21)
5-10 km	0.02	-0.01	-0.03	-0.09	-0.01	0.03
	(-0.21 - 0.24)	(-0.18 - 0.17)	(-0.26 - 0.19)	(-0.36 - 0.18)	(-0.16 - 0.14)	(-0.13 - 0.19)
10-60 Km	0.01	-0.00	0.08	-0.05	-0.07	0.04
	(-0.21 - 0.22)	(-0.14 - 0.13)	(-0.10 - 0.26)	(-0.27 - 0.18)	(-0.19 - 0.05)	(-0.13 - 0.21)
60 Km+	-0.02	-0.02	0.12	-0.12	-0.01	0.00
	(-0.24 - 0.20)	(-0.17 - 0.12)	(-0.05 - 0.30)	(-0.40 - 0.15)	(-0.17 - 0.16)	(-0.23 - 0.24)
Co-Residence	0.01	0.08	0.25	0.16	0.11	0.12
	(-0.33 - 0.36)	(-0.10 - 0.27)	(-0.13 - 0.64)	(-0.29 - 0.60)	(-0.10 - 0.33)	(-0.19 - 0.43)
Constant	-0.57*	5.23***	-0.01	0.72*	5.61***	0.08
	(-1.01 - -0.12)	(4.80 - 5.66)	(-0.63 - 0.61)	(0.09 - 1.34)	(5.27 - 5.94)	(-0.44 - 0.60)
Observations	3,823	3,823	3,823	5,088	5,088	5,088
Number of pid_dyad	1,307	1,307	1,307	1,717	1,717	1,717
sigma_u	0.626	0.721	0.695	0.862	0.732	0.920
r2_o	0.00791	0.242	0.0470	1.53e-06	0.198	0.0602
r2_b	0.00590	0.261	0.0448	0.000211	0.220	0.0652
r2_w	0.0208	0.201	0.103	0.0224	0.164	0.0842

Table A10. Fixed effects linear regression models on parents' health (z-scores), by children's gender.

	Sons			Daughters		
	Depression	Grip Strength	Frailty Index	Depression	Grip Strength	Frailty Index
Time before/after child's divorce (ref.: no separation, < 4 years pre-separation)						
-4/-2 years	0.16*	0.09	0.05	0.11	0.04	0.05
	(0.00 - 0.31)	(-0.02 - 0.19)	(-0.09 - 0.19)	(-0.09 - 0.32)	(-0.11 - 0.19)	(-0.10 - 0.20)
-2/0 years	0.34***	0.13*	0.27***	0.04	0.04	0.13+
	(0.17 - 0.51)	(0.01 - 0.26)	(0.14 - 0.41)	(-0.14 - 0.23)	(-0.10 - 0.19)	(-0.01 - 0.28)
0/2 years	0.12	0.08	0.06	0.02	-0.00	-0.01
	(-0.05 - 0.29)	(-0.05 - 0.20)	(-0.06 - 0.18)	(-0.17 - 0.20)	(-0.13 - 0.13)	(-0.14 - 0.12)
2/4 years	0.13	0.15*	0.05	-0.05	0.03	0.01
	(-0.04 - 0.30)	(0.03 - 0.28)	(-0.08 - 0.17)	(-0.25 - 0.14)	(-0.10 - 0.15)	(-0.13 - 0.14)
4/6 years	0.12	0.04	0.08	-0.17*	0.02	0.04
	(-0.05 - 0.28)	(-0.06 - 0.14)	(-0.03 - 0.19)	(-0.34 - -0.01)	(-0.10 - 0.13)	(-0.07 - 0.15)
Parents' characteristics						
Number of children (ref.: 1)						
2	-0.52	-0.01	-0.27	0.09	0.13	0.24
	(-1.21 - 0.17)	(-0.44 - 0.42)	(-0.90 - 0.36)	(-0.30 - 0.48)	(-0.14 - 0.40)	(-0.14 - 0.63)
3+	-0.42	0.02	-0.14	-0.01	0.09	0.06
	(-1.08 - 0.25)	(-0.39 - 0.43)	(-0.76 - 0.48)	(-0.43 - 0.40)	(-0.18 - 0.36)	(-0.34 - 0.45)
Age (centered)	0.00	0.07***	0.05***	-0.01	0.06***	0.04***
	(-0.01 - 0.02)	(0.06 - 0.07)	(0.04 - 0.07)	(-0.02 - 0.01)	(0.05 - 0.07)	(0.03 - 0.06)
Marital status (ref.: Married)						
Never married	-0.21	-0.30	0.11	-0.43	-0.10	-0.52
	(-0.81 - 0.39)	(-0.66 - 0.07)	(-0.25 - 0.48)	(-1.50 - 0.65)	(-0.30 - 0.09)	(-1.47 - 0.44)
Divorced	-0.45	-0.20	-0.19	-0.22	-0.23	0.11
	(-1.83 - 0.92)	(-0.50 - 0.10)	(-0.93 - 0.56)	(-0.81 - 0.37)	(-0.57 - 0.11)	(-0.50 - 0.72)
Widowed	0.29*	0.13	0.12	0.24*	-0.04	0.00
	(0.02 - 0.56)	(-0.06 - 0.32)	(-0.08 - 0.31)	(0.00 - 0.48)	(-0.19 - 0.10)	(-0.17 - 0.17)
Level of education (ref.: Low)						
Middle	0.01	0.06	-0.03	-0.30	-0.00	-0.32
	(-0.63 - 0.65)	(-0.28 - 0.40)	(-0.46 - 0.39)	(-0.72 - 0.12)	(-0.33 - 0.32)	(-0.93 - 0.30)
High	-0.02	0.28	-0.11	-0.48*	0.05	-0.49
	(-0.49 - 0.44)	(-0.12 - 0.67)	(-0.56 - 0.34)	(-0.96 - -0.01)	(-0.24 - 0.34)	(-1.32 - 0.34)

(continued)

Table A10. Continued

	Sons			Daughters		
	Depression	Grip Strength	Frailty Index	Depression	Grip Strength	Frailty Index
Time before/after child's divorce (ref.: no separation, < 4 years pre-separation)						
-4/-2 years	0.16*	0.09	0.05	0.11	0.04	0.05
	(0.00 - 0.31)	(-0.02 - 0.19)	(-0.09 - 0.19)	(-0.09 - 0.32)	(-0.11 - 0.19)	(-0.10 - 0.20)
-2/0 years	0.34***	0.13*	0.27***	0.04	0.04	0.13+
	(0.17 - 0.51)	(0.01 - 0.26)	(0.14 - 0.41)	(-0.14 - 0.23)	(-0.10 - 0.19)	(-0.01 - 0.28)
0/2 years	0.12	0.08	0.06	0.02	-0.00	-0.01
	(-0.05 - 0.29)	(-0.05 - 0.20)	(-0.06 - 0.18)	(-0.17 - 0.20)	(-0.13 - 0.13)	(-0.14 - 0.12)
2/4 years	0.13	0.15*	0.05	-0.05	0.03	0.01
	(-0.04 - 0.30)	(0.03 - 0.28)	(-0.08 - 0.17)	(-0.25 - 0.14)	(-0.10 - 0.15)	(-0.13 - 0.14)
4/6 years	0.12	0.04	0.08	-0.17*	0.02	0.04
	(-0.05 - 0.28)	(-0.06 - 0.14)	(-0.03 - 0.19)	(-0.34 - -0.01)	(-0.10 - 0.13)	(-0.07 - 0.15)
Parents' characteristics						
Number of children (ref.: 1)						
2	-0.52	-0.01	-0.27	0.09	0.13	0.24
	(-1.21 - 0.17)	(-0.44 - 0.42)	(-0.90 - 0.36)	(-0.30 - 0.48)	(-0.14 - 0.40)	(-0.14 - 0.63)
3+	-0.42	0.02	-0.14	-0.01	0.09	0.06
	(-1.08 - 0.25)	(-0.39 - 0.43)	(-0.76 - 0.48)	(-0.43 - 0.40)	(-0.18 - 0.36)	(-0.34 - 0.45)
Age (centered)	0.00	0.07***	0.05***	-0.01	0.06***	0.04***
	(-0.01 - 0.02)	(0.06 - 0.07)	(0.04 - 0.07)	(-0.02 - 0.01)	(0.05 - 0.07)	(0.03 - 0.06)
Marital status (ref.: Married)						
Never married	-0.21	-0.30	0.11	-0.43	-0.10	-0.52
	(-0.81 - 0.39)	(-0.66 - 0.07)	(-0.25 - 0.48)	(-1.50 - 0.65)	(-0.30 - 0.09)	(-1.47 - 0.44)
Divorced	-0.45	-0.20	-0.19	-0.22	-0.23	0.11
	(-1.83 - 0.92)	(-0.50 - 0.10)	(-0.93 - 0.56)	(-0.81 - 0.37)	(-0.57 - 0.11)	(-0.50 - 0.72)
Widowed	0.29*	0.13	0.12	0.24*	-0.04	0.00
	(0.02 - 0.56)	(-0.06 - 0.32)	(-0.08 - 0.31)	(0.00 - 0.48)	(-0.19 - 0.10)	(-0.17 - 0.17)
Level of education (ref.: Low)						
Middle	0.01	0.06	-0.03	-0.30	-0.00	-0.32
	(-0.63 - 0.65)	(-0.28 - 0.40)	(-0.46 - 0.39)	(-0.72 - 0.12)	(-0.33 - 0.32)	(-0.93 - 0.30)
High	-0.02	0.28	-0.11	-0.48*	0.05	-0.49
	(-0.49 - 0.44)	(-0.12 - 0.67)	(-0.56 - 0.34)	(-0.96 - -0.01)	(-0.24 - 0.34)	(-1.32 - 0.34)

Table A11. Fixed effects linear regression models on parents' health (z-scores), whole sample. Interaction effects between parents' gender and children's union dissolution.

	Depression	Grip Strength	Frailty Index
Time before/after child's divorce (ref.: no separation, < 4 years pre-separation)			
-4/-2 years	-0.03	0.13+	0.01
	(-0.20 - 0.14)	(-0.02 - 0.28)	(-0.12 - 0.15)
-2/0 years	0.17*	0.04	0.29***
	(0.01 - 0.33)	(-0.12 - 0.20)	(0.13 - 0.46)
0/2 years	0.11	-0.01	0.09
	(-0.05 - 0.28)	(-0.15 - 0.12)	(-0.04 - 0.21)
2/4 years	0.05	0.13+	0.09
	(-0.13 - 0.23)	(-0.01 - 0.26)	(-0.06 - 0.23)
4/6 years	-0.03	0.02	0.13*
	(-0.20 - 0.14)	(-0.08 - 0.12)	(0.02 - 0.24)
*Interaction (Parent's gender*Union dissolution)*			
Mother * -4/-2 years	0.29*	-0.12	0.07
	(0.04 - 0.54)	(-0.31 - 0.07)	(-0.12 - 0.26)
Mother * -2/0 years	0.05	0.09	-0.14
	(-0.20 - 0.30)	(-0.11 - 0.29)	(-0.35 - 0.07)
Mother * 0/2 years	-0.08	0.09	-0.09
	(-0.33 - 0.17)	(-0.09 - 0.27)	(-0.27 - 0.09)
Mother * 2/4 years	-0.02	-0.07	-0.09
	(-0.28 - 0.23)	(-0.25 - 0.10)	(-0.28 - 0.10)
Mother * 4/6 years	-0.01	0.02	-0.11
	(-0.25 - 0.23)	(-0.13 - 0.17)	(-0.27 - 0.04)
Parents' characteristics			
Number of children (ref.: 1)			
2	0.16	0.01	-0.23
	(-0.17 - 0.50)	(-0.40 - 0.41)	(-0.86 - 0.41)
3+	0.25+	0.02	-0.22
	(-0.01 - 0.51)	(-0.37 - 0.42)	(-0.80 - 0.36)
Age (centered)	0.01	0.06***	0.05***
	(-0.00 - 0.02)	(0.05 - 0.07)	(0.03 - 0.06)

(continued)

Table A11. Continued.

	Depression	Grip Strength	Frailty Index
Marital status (ref.: Married)			
Never married	-0.42*	-0.33*	0.13
	(-0.79 - -0.05)	(-0.58 - -0.08)	(-0.22 - 0.48)
Divorced	0.20	-0.26	0.42
	(-0.56 - 0.95)	(-0.60 - 0.07)	(-0.17 - 1.01)
Widowed	0.48***	0.04	0.09
	(0.22 - 0.75)	(-0.12 - 0.21)	(-0.18 - 0.35)
Level of education (ref.: Low)			
Middle	0.18	0.34+	0.03
	(-0.37 - 0.74)	(-0.02 - 0.70)	(-0.38 - 0.43)
High	0.02	0.46*	-0.01
	(-0.59 - 0.62)	(0.10 - 0.81)	(-0.35 - 0.33)
Income quartiles (ref.: 1st)			
2nd	0.09	-0.05	0.04
	(-0.03 - 0.21)	(-0.15 - 0.05)	(-0.06 - 0.13)
3rd	0.02	-0.01	-0.05
	(-0.10 - 0.14)	(-0.12 - 0.10)	(-0.14 - 0.04)
4th	0.07	-0.07	0.04
	(-0.06 - 0.20)	(-0.19 - 0.05)	(-0.06 - 0.14)
*Interaction (Gender * Number of children)*			
Mother * 2	-0.62+	0.10	0.50
	(-1.32 - 0.09)	(-0.40 - 0.60)	(-0.26 - 1.26)
Mother * 3+	-0.75*	0.07	0.44
	(-1.43 - -0.07)	(-0.43 - 0.58)	(-0.29 - 1.16)
*Interaction (Gender * Age)*	-0.02*	-0.00	0.00
	(-0.04 - -0.00)	(-0.02 - 0.01)	(-0.02 - 0.02)
*Interaction (Gender * Marital status)*			
Mother * Never married	0.14	0.24	-0.82
	(-1.22 - 1.51)	(-0.07 - 0.55)	(-1.79 - 0.16)
Mother * Divorced	-0.79	0.03	-0.59
	(-2.08 - 0.51)	(-0.43 - 0.49)	(-1.50 - 0.32)
Mother * Widowed	-0.24	0.00	-0.03
	(-0.62 - 0.14)	(-0.25 - 0.26)	(-0.35 - 0.30)

(continued)

Table A11. Continued.

	Depression	Grip Strength	Frailty Index
*Interaction (Gender * Level of education)*			
Mother * Middle	-0.69+	-0.55*	-0.42
	(-1.43 - 0.06)	(-1.02 - -0.08)	(-1.14 - 0.31)
Mother * High	-0.50	-0.57*	-0.63
	(-1.30 - 0.31)	(-1.06 - -0.07)	(-1.70 - 0.44)
*Interaction (Gender * Income quartiles)*			
Mother * 2nd	-0.06	0.01	-0.01
	(-0.24 - 0.13)	(-0.12 - 0.13)	(-0.16 - 0.14)
Mother * 3rd	0.03	0.04	0.13+
	(-0.17 - 0.23)	(-0.11 - 0.18)	(-0.01 - 0.28)
Mother * 4th	0.08	0.13+	0.08
	(-0.14 - 0.29)	(-0.02 - 0.29)	(-0.08 - 0.25)
Children's characteristics			
Legally divorced (ref.: no)			
Yes	0.04	0.04	-0.00
	(-0.16 - 0.23)	(-0.12 - 0.19)	(-0.15 - 0.14)
Time since cohabitation (ref.: 0-2 years)			
2-4 years	-0.13*	-0.01	-0.09*
	(-0.25 - -0.01)	(-0.10 - 0.09)	(-0.16 - -0.02)
4-6 years	-0.12*	-0.01	-0.11*
	(-0.24 - -0.00)	(-0.12 - 0.10)	(-0.20 - -0.02)
6-8 years	-0.17*	-0.10+	-0.18**
	(-0.31 - -0.04)	(-0.22 - 0.02)	(-0.29 - -0.06)
8+ years	-0.12	-0.11	-0.19*
	(-0.29 - 0.05)	(-0.23 - 0.02)	(-0.35 - -0.04)
Geographic distance between parent and children (ref.: 0-2 km)			
2-5 km	-0.02	-0.00	-0.07
	(-0.17 - 0.14)	(-0.13 - 0.12)	(-0.22 - 0.07)
5-10 km	0.02	-0.01	-0.03
	(-0.21 - 0.24)	(-0.18 - 0.17)	(-0.26 - 0.19)
10-60 Km	0.01	-0.00	0.08
	(-0.21 - 0.22)	(-0.13 - 0.13)	(-0.10 - 0.26)
60 Km+	-0.02	-0.02	0.12
	(-0.23 - 0.20)	(-0.17 - 0.12)	(-0.05 - 0.30)

(continued)

Table A11. Continued.

	Depression	Grip Strength	Frailty Index
Co-Residence	0.01	0.08	0.25
	(-0.33 - 0.36)	(-0.10 - 0.27)	(-0.13 - 0.64)
*Interaction (Gender * Child legally divorced)*			
Mother * Yes	-0.09	0.06	0.00
	(-0.40 - 0.22)	(-0.14 - 0.26)	(-0.23 - 0.23)
*Interaction (Gender * Time since cohabitation)*			
Mother * 2-4 years	0.11	-0.07	0.06
	(-0.07 - 0.29)	(-0.19 - 0.06)	(-0.05 - 0.17)
Mother * 4-6 years	0.11	-0.06	-0.01
	(-0.08 - 0.30)	(-0.20 - 0.09)	(-0.14 - 0.12)
Mother * 6-8 years	0.09	-0.02	0.02
	(-0.12 - 0.30)	(-0.18 - 0.13)	(-0.15 - 0.18)
Mother * 8+ years	0.10	-0.07	-0.06
	(-0.15 - 0.35)	(-0.25 - 0.10)	(-0.28 - 0.16)
*Interaction (Gender * Geographic distance between parent and children)*			
Mother * 2-5 km	0.15	-0.04	0.16+
	(-0.11 - 0.41)	(-0.21 - 0.13)	(-0.02 - 0.35)
Mother * 5-10 km	-0.11	-0.00	0.07
	(-0.46 - 0.25)	(-0.23 - 0.22)	(-0.21 - 0.34)
Mother * 10-60 Km	-0.06	-0.07	-0.04
	(-0.37 - 0.26)	(-0.25 - 0.11)	(-0.29 - 0.20)
Mother * 60 Km+	-0.11	0.02	-0.12
	(-0.46 - 0.24)	(-0.20 - 0.24)	(-0.42 - 0.18)
Mother * Co-Residence	0.14	0.03	-0.13
	(-0.42 - 0.71)	(-0.25 - 0.31)	(-0.63 - 0.36)
Constant	0.17	5.44***	0.04
	(-0.24 - 0.57)	(5.18 - 5.71)	(-0.36 - 0.44)
Observations	8,911	8,911	8,911
Number of pid_dyad	3,024	3,024	3,024
sigma_u	1.001	0.752	0.832
r2_o	0.0242	0.192	0.0644
r2_b	0.0454	0.208	0.0685
r2_w	0.0219	0.179	0.0913

Table A12. Fixed effects linear regression models on parents' health (z-scores), whole sample. Interaction effects between children's gender and union dissolution.

	Depression	Grip Strength	Frailty Index
Time before/after child's divorce (ref.: no separation, < 4 years pre-separation)			
-4/-2 years	0.16*	0.09	0.05
	(0.00 - 0.31)	(-0.02 - 0.19)	(-0.09 - 0.19)
-2/0 years	0.34***	0.13*	0.27***
	(0.17 - 0.51)	(0.01 - 0.26)	(0.14 - 0.41)
0/2 years	0.12	0.08	0.06
	(-0.05 - 0.29)	(-0.05 - 0.20)	(-0.06 - 0.18)
2/4 years	0.13	0.15*	0.05
	(-0.04 - 0.30)	(0.03 - 0.28)	(-0.08 - 0.17)
4/6 years	0.12	0.04	0.08
	(-0.05 - 0.28)	(-0.06 - 0.14)	(-0.03 - 0.19)
*Interaction (gender*union dissolution)*			
Daughter * -4/-2 years	-0.04	-0.05	-0.00
	(-0.30 - 0.21)	(-0.23 - 0.13)	(-0.22 - 0.21)
Daughter * -2/0 years	-0.29*	-0.09	-0.14
	(-0.54 - -0.05)	(-0.28 - 0.11)	(-0.33 - 0.05)
Daughter * 0/2 years	-0.10	-0.08	-0.07
	(-0.35 - 0.14)	(-0.26 - 0.10)	(-0.24 - 0.10)
Daughter * 2/4 years	-0.18	-0.13	-0.04
	(-0.44 - 0.08)	(-0.31 - 0.05)	(-0.22 - 0.14)
Daughter * 4/6 years	-0.29*	-0.02	-0.04
	(-0.52 - -0.06)	(-0.18 - 0.13)	(-0.19 - 0.12)
Parents' characteristics			
Number of children (ref.: 1)			
2	-0.52	-0.01	-0.27
	(-1.21 - 0.17)	(-0.44 - 0.42)	(-0.90 - 0.36)
3+	-0.42	0.02	-0.14
	(-1.08 - 0.25)	(-0.39 - 0.43)	(-0.76 - 0.48)
Age (centered)	0.00	0.07***	0.05***
	(-0.01 - 0.02)	(0.06 - 0.07)	(0.04 - 0.07)

(continued)

Table A12. Continued.

	Depression	Grip Strength	Frailty Index
Marital status (ref.: Married)			
Never married	-0.21	-0.30	0.11
	(-0.81 - 0.39)	(-0.66 - 0.06)	(-0.25 - 0.48)
Divorced	-0.45	-0.20	-0.19
	(-1.83 - 0.92)	(-0.50 - 0.10)	(-0.93 - 0.56)
Widowed	0.29*	0.13	0.12
	(0.02 - 0.56)	(-0.06 - 0.32)	(-0.08 - 0.31)
Level of education (ref.: Low)			
Middle	0.01	0.06	-0.03
	(-0.63 - 0.65)	(-0.28 - 0.40)	(-0.46 - 0.39)
High	-0.02	0.28	-0.11
	(-0.49 - 0.44)	(-0.12 - 0.67)	(-0.56 - 0.34)
Income quartiles (ref.: 1st)			
2nd	0.06	-0.03	0.02
	(-0.06 - 0.18)	(-0.10 - 0.05)	(-0.07 - 0.10)
3rd	0.03	0.02	0.02
	(-0.09 - 0.16)	(-0.06 - 0.10)	(-0.07 - 0.11)
4th	0.12	0.01	0.10*
	(-0.02 - 0.26)	(-0.08 - 0.10)	(0.00 - 0.19)
*Interaction (Gender * Number of children)*			
Daughter * 2	0.61*	0.14	0.52+
	(0.01 - 1.20)	(-0.33 - 0.60)	(-0.07 - 1.10)
Daughter * 3+	0.41	0.07	0.20
	(-0.13 - 0.94)	(-0.36 - 0.50)	(-0.33 - 0.72)
*Interaction (Gender * Age)*	-0.01	-0.01*	-0.01
	(-0.03 - 0.00)	(-0.02 - -0.00)	(-0.02 - 0.00)
*Interaction (Gender * Marital status)*			
Daughter * Never married	-0.22	0.20	-0.63
	(-1.21 - 0.78)	(-0.07 - 0.46)	(-1.64 - 0.38)
Daughter * Divorced	0.23	-0.03	0.30
	(-0.84 - 1.31)	(-0.44 - 0.39)	(-0.43 - 1.02)
Daughter * Widowed	-0.05	-0.17*	-0.11
	(-0.29 - 0.20)	(-0.34 - -0.01)	(-0.30 - 0.08)
*Interaction (Gender * Level of education)*			
Daughter * Middle	-0.31	-0.06	-0.28

(continued)

Table A12. Continued.

	Depression	Grip Strength	Frailty Index
	(-0.90 - 0.29)	(-0.44 - 0.32)	(-0.84 - 0.28)
Daughter * High	-0.46+	-0.23	-0.38
	(-0.98 - 0.06)	(-0.56 - 0.10)	(-1.02 - 0.27)
*Interaction (Gender * Income quartiles)*			
Daughter * 2nd	-0.01	-0.03	0.03
	(-0.13 - 0.11)	(-0.10 - 0.04)	(-0.06 - 0.12)
Daughter * 3rd	0.02	-0.03	0.00
	(-0.12 - 0.15)	(-0.11 - 0.05)	(-0.09 - 0.10)
Daughter * 4th	-0.01	-0.02	-0.02
Children's characteristics			
Legally divorced (ref.: no)			
Yes	0.02	0.08	0.02
	(-0.18 - 0.22)	(-0.05 - 0.21)	(-0.14 - 0.17)
Time since cohabitation (ref.: 0-2 years)			
2-4 years	-0.13+	-0.03	-0.08+
	(-0.27 - 0.01)	(-0.12 - 0.05)	(-0.16 - 0.00)
4-6 years	-0.15*	-0.07	-0.16***
	(-0.28 - -0.01)	(-0.16 - 0.03)	(-0.25 - -0.07)
6-8 years	-0.25**	-0.13**	-0.21***
	(-0.41 - -0.10)	(-0.23 - -0.03)	(-0.32 - -0.10)
8+ years	-0.18*	-0.18**	-0.28***
	(-0.36 - -0.00)	(-0.30 - -0.06)	(-0.43 - -0.13)
Geographic distance between parent and children (ref.: 0-2 km)			
2-5 km	0.14	-0.06	0.07
	(-0.08 - 0.36)	(-0.18 - 0.07)	(-0.07 - 0.21)
5-10 km	-0.10	-0.08	-0.02
	(-0.37 - 0.17)	(-0.23 - 0.07)	(-0.20 - 0.16)
10-60 Km	-0.03	-0.07	0.05
	(-0.28 - 0.21)	(-0.19 - 0.05)	(-0.11 - 0.22)
60 Km+	-0.16	0.00	0.00
	(-0.46 - 0.14)	(-0.16 - 0.17)	(-0.23 - 0.23)
Co-Residence	-0.12	-0.06	0.08
	(-0.54 - 0.29)	(-0.25 - 0.14)	(-0.27 - 0.43)

(continued)

Table A12. Continued.

	Depression	Grip Strength	Frailty Index
*Interaction (Gender * Child legally divorced)*			
Daughter * Yes	-0.06	-0.02	-0.01
	(-0.40 - 0.28)	(-0.22 - 0.19)	(-0.26 - 0.23)
*Interaction (Gender * Time since cohabitation)*			
Daughter * 2-4 years	0.14	-0.04	0.04
	(-0.05 - 0.33)	(-0.16 - 0.09)	(-0.07 - 0.15)
Daughter * 4-6 years	0.18+	0.06	0.08
	(-0.01 - 0.36)	(-0.08 - 0.19)	(-0.04 - 0.20)
Daughter * 6-8 years	0.26**	0.03	0.09
	(0.07 - 0.46)	(-0.10 - 0.17)	(-0.05 - 0.23)
Daughter * 8+ years	0.24*	0.07	0.10
	(0.02 - 0.45)	(-0.08 - 0.22)	(-0.07 - 0.27)
*Interaction (Gender * Geographic distance between parent and children)*			
Daughter * 2-5 km	-0.09	0.04	-0.06
	(-0.36 - 0.17)	(-0.12 - 0.21)	(-0.25 - 0.13)
Daughter * 5-10 km	0.13	0.14	0.05
	(-0.19 - 0.45)	(-0.07 - 0.34)	(-0.17 - 0.27)
Daughter * 10-60 Km	-0.01	0.04	-0.00
	(-0.31 - 0.30)	(-0.14 - 0.21)	(-0.23 - 0.23)
Daughter * 60 Km+	0.20	-0.04	0.13
	(-0.17 - 0.57)	(-0.27 - 0.18)	(-0.17 - 0.42)
Daughter * Co-Residence	0.46+	0.29*	0.23
	(-0.05 - 0.97)	(0.05 - 0.54)	(-0.23 - 0.70)
	(-0.15 - 0.14)	(-0.11 - 0.07)	(-0.12 - 0.08)
Constant	0.20	5.48***	0.11
	(-0.29 - 0.69)	(5.18 - 5.77)	(-0.38 - 0.61)
Observations	8,911	8,911	8,911
Number of pid_dyad	3,024	3,024	3,024
sigma_u	0.810	0.725	0.844
r2_o	0.000522	0.220	0.0505
r2_b	0.000100	0.240	0.0504
r2_w	0.0169	0.177	0.0871

Table A13. Fixed effects linear regression models on parents' health (z-scores), whole sample. Interaction effects between children's and parents' gender, and union dissolution.

	Depression	Grip Strength	Frailty Index
Time before/after child's divorce (ref.: no separation, < 4 years pre-separation)			
-4/-2 years	0.01	0.19*	0.00
	(-0.24 - 0.26)	(0.02 - 0.36)	(-0.21 - 0.22)
-2/0 years	0.26*	0.12	0.37**
	(0.04 - 0.48)	(-0.08 - 0.33)	(0.13 - 0.61)
0/2 years	0.09	0.01	0.10
	(-0.15 - 0.33)	(-0.18 - 0.21)	(-0.05 - 0.24)
2/4 years	0.05	0.16	0.13
	(-0.17 - 0.27)	(-0.05 - 0.37)	(-0.04 - 0.31)
4/6 years	0.13	0.09	0.09
	(-0.09 - 0.36)	(-0.05 - 0.24)	(-0.06 - 0.25)
*Interaction (Parent's gender*Union dissolution)*			
Mother * -4/-2 years	0.23	-0.17	0.08
	(-0.08 - 0.55)	(-0.38 - 0.04)	(-0.20 - 0.35)
Mother * -2/0 years	0.13	0.00	-0.16
	(-0.20 - 0.46)	(-0.26 - 0.26)	(-0.44 - 0.12)
Mother * 0/2 years	0.04	0.10	-0.07
	(-0.31 - 0.38)	(-0.15 - 0.35)	(-0.29 - 0.16)
Mother * 2/4 years	0.12	-0.03	-0.15
	(-0.21 - 0.44)	(-0.29 - 0.23)	(-0.40 - 0.09)
Mother * 4/6 years	-0.06	-0.10	-0.03
	(-0.39 - 0.26)	(-0.30 - 0.10)	(-0.25 - 0.18)
*Interaction (Child's gender*Union dissolution)*			
Daughter * -4/-2 years	-0.08	-0.12	0.01
	(-0.45 - 0.28)	(-0.42 - 0.18)	(-0.28 - 0.31)
Daughter * -2/0 years	-0.25	-0.17	-0.19
	(-0.57 - 0.08)	(-0.46 - 0.13)	(-0.48 - 0.09)
Daughter * 0/2 years	0.03	-0.06	-0.03
	(-0.31 - 0.36)	(-0.34 - 0.22)	(-0.28 - 0.21)
Daughter * 2/4 years	-0.00	-0.08	-0.10
	(-0.35 - 0.34)	(-0.35 - 0.20)	(-0.39 - 0.18)
Daughter * 4/6 years	-0.32*	-0.15	0.05
	(-0.64 - -0.00)	(-0.38 - 0.08)	(-0.16 - 0.26)

(continued)

Table A13. Continued.

	Depression	Grip Strength	Frailty Index
Interaction (Parent's gender * Child's gender * union dissolution)			
Mother * Daughter * -4/-2 years	0.14	0.10	0.00
	(-0.37 - 0.66)	(-0.27 - 0.48)	(-0.42 - 0.43)
Mother * Daughter * -2/0 years	-0.06	0.17	0.07
	(-0.54 - 0.43)	(-0.21 - 0.55)	(-0.32 - 0.47)
Mother * Daughter * 0/2 years	-0.16	-0.01	-0.04
	(-0.64 - 0.32)	(-0.37 - 0.35)	(-0.38 - 0.31)
Mother * Daughter * 2/4 years	-0.24	-0.07	0.14
	(-0.73 - 0.26)	(-0.42 - 0.29)	(-0.23 - 0.51)
Mother * Daughter * 4/6 years	0.12	0.24	-0.14
	(-0.33 - 0.58)	(-0.07 - 0.56)	(-0.43 - 0.16)
Parents' characteristics			
Number of children (ref.: 1)			
2	-0.15	0.08	0.04
	(-0.61 - 0.31)	(-0.18 - 0.33)	(-0.38 - 0.47)
3+	-0.15	0.08	0.01
	(-0.63 - 0.33)	(-0.18 - 0.33)	(-0.42 - 0.45)
Age (centered)	-0.00	0.06***	0.05***
	(-0.01 - 0.01)	(0.05 - 0.07)	(0.04 - 0.06)
Marital status (ref.: Married)			
Never married	-0.32	-0.20+	-0.18
	(-0.99 - 0.35)	(-0.41 - 0.02)	(-0.84 - 0.48)
Divorced	-0.28	-0.21	0.01
	(-1.14 - 0.57)	(-0.47 - 0.05)	(-0.58 - 0.59)
Widowed	0.27*	0.03	0.06
	(0.04 - 0.49)	(-0.12 - 0.18)	(-0.10 - 0.21)
Level of education (ref.: Low)			
Middle	-0.14	0.03	-0.19
	(-0.57 - 0.29)	(-0.23 - 0.30)	(-0.63 - 0.25)
High	-0.26	0.15	-0.30
	(-0.67 - 0.16)	(-0.15 - 0.45)	(-0.90 - 0.29)
Income quartiles (ref.: 1st)			
2nd	0.06	-0.04	0.03
	(-0.04 - 0.16)	(-0.11 - 0.02)	(-0.04 - 0.11)

(continued)

Table A13. Continued.

	Depression	Grip Strength	Frailty Index
3rd	0.04	0.01	0.02
	(-0.07 - 0.15)	(-0.06 - 0.08)	(-0.05 - 0.10)
4th	0.11+	0.00	0.09*
	(-0.00 - 0.23)	(-0.07 - 0.08)	(0.00 - 0.17)
Children's characteristics			
Legally divorced (ref.: no)			
Yes	-0.02	0.07	0.01
	(-0.17 - 0.14)	(-0.03 - 0.17)	(-0.11 - 0.12)
Time since cohabitation (ref.: 0-2 years)			
2-4 years	-0.06	-0.04	-0.06*
	(-0.16 - 0.03)	(-0.11 - 0.02)	(-0.11 - -0.00)
4-6 years	-0.06	-0.04	-0.12***
	(-0.16 - 0.03)	(-0.11 - 0.03)	(-0.19 - -0.05)
6-8 years	-0.12*	-0.11**	-0.17***
	(-0.23 - -0.01)	(-0.19 - -0.04)	(-0.25 - -0.08)
8+ years	-0.06	-0.15**	-0.22***
	(-0.19 - 0.07)	(-0.23 - -0.06)	(-0.33 - -0.11)
Geographic distance between parent and children (ref.: 0-2 km)			
2-5 km	0.09	-0.02	0.03
	(-0.05 - 0.23)	(-0.11 - 0.06)	(-0.06 - 0.13)
5-10 km	-0.03	-0.00	0.01
	(-0.22 - 0.16)	(-0.12 - 0.11)	(-0.13 - 0.14)
10-60 Km	-0.02	-0.04	0.06
	(-0.18 - 0.14)	(-0.13 - 0.05)	(-0.06 - 0.19)
60 Km+	-0.05	-0.01	0.07
	(-0.23 - 0.13)	(-0.12 - 0.10)	(-0.08 - 0.23)
Co-Residence	0.09	0.10	0.19
	(-0.19 - 0.38)	(-0.04 - 0.24)	(-0.06 - 0.44)
Constant	0.14	5.45***	0.06
	(-0.35 - 0.63)	(5.18 - 5.73)	(-0.43 - 0.54)
Observations	8,911	8,911	8,911
Number of pid_dyad	3,024	3,024	3,024
sigma_u	0.752	0.720	0.826
r2_o	0.00720	0.225	0.0601
r2_b	0.00574	0.246	0.0617
r2_w	0.0150	0.176	0.0849

Table A14. Results of asymmetric fixed-effects linear regression models on frailty.

	β	95% CI
Age	0.38***	0.36,0.40
*Interaction: gender*welfare cluster*caregiving*		
Men * Northern EU * Transition in	1.06*	0.08,2.04
Men * Western EU * Transition in	2.01***	1.28,2.74
Men * Southern EU * Transition in	3.80***	2.66,4.95
Men * Eastern EU * Transition in	2.77***	1.69,3.86
Women * Northern EU * Transition in	1.45**	0.43,2.47
Women * Western EU * Transition in	2.20***	1.60,2.81
Women * Southern EU * Transition in	2.83***	1.74,3.92
Women * Eastern EU * Transition in	2.02***	1.25,2.80
Men * Northern EU * Transition out	0.27	-0.73,1.27
Men * Western EU * Transition out	0.00	-0.74,0.74
Men * Southern EU * Transition out	-0.55	-2.08,0.98
Men * Eastern EU * Transition out	-0.92	-2.12,0.27
Women * Northern EU * Transition out	-0.06	-1.47,1.35
Women * Western EU * Transition out	0.19	-0.71,1.08
Women * Southern EU * Transition out	-2.31***	-3.63,-0.98
Women * Eastern EU * Transition out	-1.27*	-2.35,-0.18
Current Job Situation (ref.: Employed or Self-employed)		
Retired	-0.49***	-0.66,-0.32
Non-employed	0.59***	0.36,0.83
Income (ref: First quartile)		
Second quartile	-0.03	-0.17,0.11
Third quartile	0.02	-0.13,0.16
Fourth quartile	0.10	-0.05,0.25
Wealth (ref: First quartile)		
Second quartile	-0.07	-0.22,0.09
Third quartile	-0.15+	-0.33,0.02
Fourth quartile	-0.05	-0.25,0.15
Time under observation	-0.00***	-0.01,-0.00
Constant	-13.14***	-14.48,-11.79
rho	0.715	

(continued)

Table A14. Continued.

	β	95% CI
sigma_u	8.355	
R2 (adjusted)	0.055	
R2 (within)	0.056	
R2 (overall)	0.088	
R2 (between)	0.099	
N. of groups (individuals)	43435	
N. of observations	117831	

Source: SHARE data, years 2004-2015 (own estimates). Unweighted results. Models include all the control variables.
Note: 95% confidence intervals in second column
*+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001*

Table A15. Results of asymmetric fixed-effects linear regression models on frailty. Average marginal effects by welfare cluster and gender.

	AME	p-value		95 percent confidence intervals	
Transitions into caregiving					
Northern EU					
Men	1.060	0.034	*	0.082	2.039
Women	1.451	0.005	**	0.435	2.468
Gap (men - women)	-0.391	0.592		-1.822	1.040
Western EU					
Men	2.008	0.000	***	1.275	2.741
Women	2.204	0.000	***	1.603	2.806
Gap (men - women)	-0.196	0.680		-1.128	0.736
Southern EU					
Men	3.803	0.000	***	2.659	4.947
Women	2.827	0.000	***	1.736	3.918
Gap (men - women)	0.976	0.230		-0.617	2.569
Eastern EU					
Men	2.772	0.000	***	1.685	3.858
Women	2.024	0.000	***	1.248	2.800
Gap (men - women)	0.748	0.272		-0.587	2.082
Transitions out of caregiving					
Northern EU					
Men	0.267	0.601		-0.732	1.265
Women	-0.062	0.931		-1.469	1.345
Gap (men - women)	0.328	0.709		-1.399	2.056
Western EU					
Men	0.002	0.996		-0.738	0.741
Women	0.189	0.680		-0.707	1.084
Gap (men - women)	-0.187	0.751		-1.341	0.967

(continued)

Table A15. Continued.

	AME	p-value		95 percent confidence intervals	
Southern EU					
Men	-0.553	0.479		-2.083	0.977
Women	-2.306	0.001	**	-3.634	-0.978
Gap (men - women)	1.753	0.086	+	-0.246	3.752
Eastern EU					
Men	-0.923	0.130		-2.117	0.270
Women	-1.267	0.022	*	-2.355	-0.180
Gap (men - women)	0.344	0.672		-1.248	1.936

Source: SHARE data, years 2004-2015 (own estimates). Complete models are displayed in Appendix Table A14.
Note: Pairwise comparison between men and women within each welfare cluster.
AME: Average marginal effects
+ *p<0.10,* **p<0.05,* ***p<0.01,* ****p<0.001* (two-tailed test)

Table A16. Differences in the marginal effects of caregiving transitions on frailty.

			Men			
			Northern	Western	Southern	Eastern
Transitions into caregiving	*Men*	Northern	0	-0.948	-2.743 ***	-1.711 *
		Western	0.948	0	-1.795 *	-0.763
		Southern	2.743 ***	1.795 **	0	1.031
		Eastern	1.711 *	0.763	-1.031	0
			Women			
			Northern	Western	Southern	Eastern
	Women	Northern	0	-0.753	-1.376 +	-0.573
		Western	0.753	0	-0.623	0.180
		Southern	1.376 +	0.623	0	0.803
		Eastern	0.573	-0.180	-0.803	0
			Men			
			Northern	Western	Southern	Eastern
Transitions out of caregiving	*Men*	Northern	0	0.265	0.820	1.190
		Western	-0.265	0	0.555	0.925
		Southern	-0.820	-0.555	0	0.370
		Eastern	-1.190	-0.925	-0.370	0
			Women			
			Northern	Western	Southern	Eastern
	Women	Northern	0	-0.250	2.245 *	1.206
		Western	0.250	0	2.495 **	1.456 *
		Southern	-2.245 *	-2.495 **	0	-1.039
		Eastern	-1.206	-1.456 *	1.039	0

Source: SHARE data, years 2004-2015 (own estimates). Complete models are displayed in Appendix Table A14.

Note: Pairwise differences between welfare clusters, by gender. Rows reflect the minuend, and the columns reflect the subtrahend.

+ *p<0.10, *p<0.05, **p<0.01, ***p<0.001* (two-tailed test)

Table A17. Results of asymmetric fixed-effects linear regression models on frailty, by welfare cluster and gender.

	Northern Europe				Western Europe		
	Men		Women		Men		
	β	95% CI	β	95% CI	β	95% CI	β
Age	0.31***	0.26,0.36	0.28***	0.23,0.33	0.49***	0.44,0.53	0.41***
Transition into spousal caregiving	1.22*	0.24,2.20	1.85***	0.83,2.86	1.64***	0.92,2.37	2.07***
Transition out of spousal caregiving	0.38	-0.63,1.38	0.24	-1.17,1.65	-0.29	-1.03,0.46	0.09
Current Job Situation (ref.: Employed or Self-employed)							
Retired	-0.27	-0.68,0.14	-0.32	-0.78,0.14	-1.14***	-1.46,-0.82	-0.75***
Non-employed	1.54**	0.55,2.53	0.35	-0.19,0.88	1.09**	0.42,1.77	-0.16
Income (ref: First quartile)							
Second quartile	-0.28+	-0.61,0.05	0.06	-0.28,0.39	0.04	-0.22,0.31	-0.18
Third quartile	-0.49**	-0.84,-0.14	0.16	-0.20,0.52	0.27+	-0.01,0.55	-0.08
Fourth quartile	-0.35+	-0.73,0.02	0.21	-0.18,0.59	0.08	-0.22,0.37	0.01
Wealth (ref: First quartile)							
Second quartile	-0.05	-0.44,0.34	-0.02	-0.43,0.40	-0.18	-0.50,0.13	0.25
Third quartile	-0.25	-0.70,0.20	-0.09	-0.57,0.40	-0.31+	-0.65,0.04	0.10
Fourth quartile	-0.27	-0.78,0.24	-0.12	-0.67,0.43	-0.01	-0.40,0.37	0.25
Time under observation	0.00	-0.00,0.01	0.00	-0.01,0.00	0.00	-0.01,0.00	0.00
Constant	-11.42***	-14.45,-8.40	-8.05***	-11.03,-5.07	-20.82***	-23.55,-18.09	-14.38***
rho	0.687		0.733		0.726		0.744
sigma_u	6.505		7.387		7.833		8.225
R2 (adjusted)	0.070		0.048		0.086		0.070
R2 (within)	0.071		0.049		0.087		0.071
R2 (overall)	0.089		0.067		0.082		0.085
R2 (between)	0.097		0.073		0.088		0.091
N. of groups (individuals)	4285		4125		8628		7995
N. of observations	12153		11517		24120		21947

Table A17. Results of asymmetric fixed-effects linear regression models on frailty, by welfare cluster and gender.

	Southern Europe				Eastern Europe			
Women	Men		Women		Men		Women	
95% CI	β	95% CI	β	95% CI	β	95% CI	β	95% CI
0.36,0.45	0.37***	0.31,0.44	0.31***	0.24,0.38	0.52***	0.41,0.62	0.40***	0.31,0.49
1.46,2.67	3.84***	2.68,5.00	3.04***	1.93,4.15	2.61***	1.51,3.70	2.32***	1.53,3.11
-0.81,0.98	-0.52	-2.05,1.00	-2.14**	-3.48,-0.79	-1.06+	-2.26,0.15	-1.02+	-2.12,0.08
-1.12,-0.38	-0.44	-1.00,0.11	0.06	-0.71,0.83	0.03	-0.53,0.59	-0.53+	-1.12,0.06
-0.57,0.24	1.59***	0.72,2.45	-0.06	-0.83,0.72	1.74***	0.88,2.60	1.82***	0.94,2.71
-0.47,0.11	0.16	-0.29,0.60	0.04	-0.46,0.54	0.02	-0.41,0.46	-0.03	-0.46,0.40
-0.38,0.21	0.09	-0.36,0.54	0.13	-0.40,0.66	-0.25	-0.69,0.18	0.08	-0.33,0.50
-0.31,0.34	0.51*	0.03,1.00	0.54*	0.01,1.06	-0.27	-0.71,0.17	0.15	-0.27,0.57
-0.07,0.57	-0.22	-0.70,0.26	-0.14	-0.69,0.40	-0.42+	-0.91,0.07	0.15	-0.33,0.64
-0.24,0.44	-0.10	-0.65,0.45	-0.30	-0.90,0.30	-0.46+	-0.97,0.04	0.09	-0.41,0.59
-0.13,0.63	0.19	-0.40,0.78	-0.14	-0.80,0.52	-0.62*	-1.21,-0.03	-0.08	-0.63,0.47
-0.01,0.00	0.00	-0.01,0.00	0.00	-0.01,0.01	-0.02**	-0.03,-0.01	-0.02***	-0.03,-0.01
-17.14,-11.62	-13.73***	-18.01,-9.45	-6.53**	-10.86,-2.20	-19.96***	-26.61,-13.31	-10.76***	-16.50,-5.02
	0.605		0.679		0.703		0.731	
	7.643		9.296		9.028		9.284	
	0.061		0.042		0.042		0.027	
	0.062		0.043		0.043		0.028	
	0.130		0.113		0.106		0.107	
	0.156		0.139		0.123		0.126	
	4855		4376		4567		4604	
	13046		11611		11677		11760	

Source: SHARE data, years 2004-2015 (own estimates). Unweighted results. Models include all the control variables.

Note: 95% confidence intervals in second column

*+ p<0.10, *p<0.05, **p<0.01, ***p<0.001*

Nederlandse samenvatting

De afgelopen decennia is veel onderzoek verricht naar genderongelijkheid in gezondheid. Het terugdringen van ongelijkheid tussen mannen en vrouwen is een van de belangrijkste doelstellingen van onderzoek en beleid omtrent actief en gezond ouder worden. Uit verschillende studies is gebleken dat in vrijwel alle samenlevingen vrouwen langer leven dan mannen, maar dat vrouwen wel systematisch vaker aangeven ziek te zijn, beperkingen te ervaren vanwege hun gezondheid en gebruik te maken van gezondheidszorg. Afgezien van biologische kenmerken kunnen verscheidene factoren aan de basis liggen van de ongelijkheid tussen mannen en vrouwen op gezondheidsgebied. Ongelijkheden tussen mannen en vrouwen op het gebied van sociale en werkgerelateerde posities en economische middelen kunnen ertoe bijdragen dat genderverschillen in lichamelijke en geestelijke gezondheid gedurende de levensloop groter worden. Hoewel steeds duidelijker wordt welke rol verschillende sociale en economische factoren spelen bij de verklaring van genderongelijkheden in gezondheid, blijven belangrijke vragen onbeantwoord, zoals hoe ongelijkheid in gezondheid op latere leeftijd samenhangt met genderongelijkheden op het werk en in het gezin.

In dit proefschrift onderzoek ik of, en in welke mate, specifieke levensloopgebeurtenissen (of reeksen van gebeurtenissen) op een verschillende manier de gezondheidstoestand van oudere mannen en vrouwen beïnvloeden. Om dit doel te bereiken gebruik ik een veelzijdige benadering van genderongelijkheden in gezondheid om de specifieke mechanismen die de samenhang tussen gender en de gezondheidstoestand op latere leeftijd veroorzaken beter te begrijpen. Daarbij heb ik verschillende aspecten van genderongelijkheid in gezondheid vanuit verschillende perspectieven - en in verschillende Europese landen – onderzocht. Ik kijk hierbij naar een specifieke reeks mechanismen die verband houden met de ongelijkheid tussen mannen en vrouwen op het gebied van sociale en economische hulpbronnen, familierelaties en zorgtaken.

Twee thema's staan centraal in deze dissertatie. Het eerste thema is gericht op de ongelijke verdeling van sociale en economische hulpbronnen tussen mannen en vrouwen (bijvoorbeeld ongelijkheden tussen mannen en vrouwen op het gebied van onderwijs en de arbeidsmarkt) als mogelijke verklaring voor genderongelijkheden in gezondheid. Onderzoek naar dit onderwerp richt zich voornamelijk op de vraag hoe verschillen in sociaaleconomische status (SES) kunnen leiden tot ongelijke gezondheidsuitkomsten voor mannen en vrouwen.

Er zijn echter maar weinig studies die hebben onderzocht in hoeverre de differentiële invloed van SES op de gezondheid van vrouwen en mannen varieert tussen (institutionele) contexten op macroniveau. Daarom is één van de uitgangspunten van het proefschrift een vergelijkende benadering met vooral aandacht voor het internationale perspectief en langetermijnonderzoek naar het proces waarin sociale en economische factoren verweven zijn met gezinsverantwoordelijkheden en zo bijdragen aan genderongelijkheden in gezondheid op latere leeftijd.

Het tweede thema van deze dissertatie betreft ongelijkheden in de verdeling van gezinstaken tussen mannen en vrouwen. Naast sociaaleconomische hulpbronnen dragen ook andere specifieke aspecten van de sociale organisatie van het leven en de relaties van mannen en vrouwen bij aan genderongelijkheden in gezondheid op latere leeftijd. Sociale rollen, rolgebonden activiteiten en verschillen in de sociale of economische lasten van gezinsverantwoordelijkheden worden als een tweede centrale verklaring beschouwd. Zo kunnen bijvoorbeeld de ongelijke verdeling van onbeta-

ald gezinswerk (bijvoorbeeld de opvoeding van kinderen, mantelzorg, etc.) of de dubbele belasting van betaald werk en onbetaald gezinswerk als fundamentele sociale determinanten van gezondheid worden beschouwd. Een gevolg van deze ongelijkheden is dat vrouwen in vergelijking met mannen vaker aan stress worden blootgesteld, wat op zijn beurt negatieve gevolgen heeft voor de gezondheid.

Om de bovengenoemde onderwerpen te onderzoeken - d.w.z. de ongelijke verdeling van sociaaleconomische middelen en gezinsverantwoordelijkheden tussen mannen en vrouwen – worden twee algemene kaders als uitgangspunt van dit proefschrift genomen: het levensloopperspectief en de theorieën van sociale stress. Het levensloopperspectief is een theoretische benadering die kan worden gebruikt om de latere levensjaren te begrijpen als het gevolg van keuzes, kansen en beperkingen in de eerdere levensloop. Volgens dit perspectief wordt de gezondheid in het latere leven beïnvloed en bepaald door de manier waarop het levenstraject zich ontwikkelt en verweven is met de arbeids- en gezinsverantwoordelijkheden op jongere leeftijd. Belangrijk is dat de levensloop nauw verbonden is met geslacht, aangezien mannen en vrouwen systematisch verschillende biografische paden en tempo's, cruciale levensgebeurtenissen en met elkaar verbonden levens volgen, die gezondheidsongelijkheid vorm kunnen geven. Als vrouwen bijvoorbeeld in bepaalde levensfasen intensief zorg verlenen aan hulpbehoevende familieleden en deze zorgverlening weinig positieve uitkomsten oplevert, kan dit voor hen een bron zijn van gezondheidsachterstand ten opzichte van mannen van vergelijkbare leeftijd.

Theorieën over sociale stress conceptualiseren stress als het resultaat van buitensporige eisen in combinatie met onvoldoende middelen om aan die eisen tegemoet te komen. Binnen dit kader kunnen werk en gezinsleven gezien worden als domeinen die individuele beloningen met zich mee kunnen brengen (bijvoorbeeld meer sociaaleconomische of gezondheidgerelateerde middelen) maar ook stress en spanning. Deze stressfactoren kunnen op hun beurt leiden tot negatieve welzijnsuitkomsten. Onbetaalde zorgtaken voor het gezin, echtscheiding of onvrijwillig baanverlies zijn typische voorbeelden van gezins- en werk-gerelateerde stressfactoren die de gezondheidstoestand van een individu gedurende het leven beïnvloeden. Daarom worden deze processen in verband gebracht met nadelige gezondheidsuitkomsten in het latere leven, voor zowel de lichamelijke als de geestelijke gezondheid, en met name voor vrouwen.

Naast de conceptuele integratie van het levensloopperspectief met theorieën over sociale stress benadrukt dit proefschrift het belang van het heuristische principe van "verbonden levens" ('linked lives') – d.w.z. de erkenning dat het leven van individuen ingebed is in sociale relaties met naaste anderen en daardoor beïnvloed wordt, vooral over generaties heen door banden van verwantschap. Dit suggereert dat de levensloop van een persoon het welzijn van een familielid van een andere generatie kan beïnvloeden via de banden binnen het familienetwerk. Aangezien de banden van vrouwen als moeders, dochters, zussen en grootmoeders families binden, wordt in dit proefschrift de mogelijkheid onderzocht dat een stressvolle levensloopgebeurtenis in de jonge generatie (d.w.z. van kinderen, en vooral dochters) kan leiden tot een sterkere achteruitgang in de gezondheid van de oudere generatie (d.w.z. moeders).

Bovendien suggereert de levenslooptheorie dat individuele keuzes en gedragingen op microniveau sociaal gestructureerd worden door de institutionele context waarin individuen ingebed zijn. Instituties, zoals de welvaartsstaat, hebben een grote invloed op de volksgezondheid en spelen een belangrijke rol in het aanpakken van de fundamentele oorzaken van gezondheidsongelijkheid.

Dit proefschrift beschouwt de sociale organisatie van de welvaartsstaat als een belangrijke kracht die de associatie tussen sociale omstandigheden, levensloopgebeurtenissen van sociale aard, en statussen - zoals geslacht - aan de ene kant en gezondheid, ziekte en genezing aan de andere kant, kan beïnvloeden.

Om een meer diepgaand beeld te schetsen van de complexe relaties tussen gender en gezondheid op latere leeftijd, is dit proefschrift georganiseerd aan de hand van vier reeksen onderzoeksvragen. Ten eerste richt dit proefschrift zich op genderverschillen veroorzaakt door sociaaleconomische en sociale determinanten van gezondheid. Daarbij onderzoek ik in welke mate de differentiële impact van drie indicatoren van SES (namelijk opleiding, inkomen en vermogen) op de gezondheid van vrouwen en mannen varieert tussen verschillende contexten op macroniveau (Hoofdstuk 2). Ten tweede gebruik ik een levensloopperspectief om te analyseren hoe het hele gezins- en werktraject in het vroege leven samenhangt met de gezondheid in het latere leven, om zo beter te begrijpen hoe gezinsverantwoordelijkheden een impact hebben op de gezondheid in het latere leven (hoofdstuk 3). Ten derde richt ik me op stressvolle demografische transities die tijdens de volwassenheid worden ervaren. Om de rol van deze gebeurtenissen te onderzoeken, heb ik naar de intergenerationele gevolgen van echtscheiding gekeken, die nog relatief zelden zijn onderzocht. Door het levensloopperspectief uit te breiden naar andere generaties van dezelfde familie, onderzoek ik de invloed die de verbreking van het huwelijk van volwassen kinderen kan hebben op de gezondheid van hun oudere ouders (Hoofdstuk 4). Ten vierde onderzoek ik of en hoe gezinsverantwoordelijkheden op latere leeftijd een rol spelen bij het ontrafelen van de relatie tussen gender en gezondheid. Daartoe heb ik onderzocht of de invloed van het verlenen van mantelzorg aan de partner op de gezondheid op latere leeftijd verschilt tussen oudere vrouwen en mannen en tussen verschillende institutionele contexten (Hoofdstuk 5).

Om de hierboven genoemde onderzoeksvragen te beantwoorden, maakt dit proefschrift gebruik van paneldata op individueel niveau uit zowel enquêtes als administratieve bronnen. Enerzijds analyseer ik gegevens van de Survey of Health, Ageing and Retirement in Europe (SHARE). Anderzijds maak ik gebruik van een gegevenskoppeling tussen de Nederlandse component van SHARE en unieke administratieve longitudinale gegevens van het Centraal Bureau voor de Statistiek (CBS), namelijk het Systeem van Sociaal-Statistische Datasets (SSD). Deze twee gegevensbronnen hebben drie grote voordelen. Ten eerste bevatten zij herhaalde informatie over dezelfde analyse-eenheid (d.w.z. het individu) op verschillende tijdstippen en maken zij daarom het gebruik van statistische methoden mogelijk die specifiek zijn voor longitudinale gegevens, hetgeen van cruciaal belang is voor het onderzoeken van het proces van ouder worden. Ten tweede zijn zij bijzonder goed geschikt voor levenslooponderzoek. SHARE bevat retrospectieve gegevens over een lange periode, gericht op het vastleggen van de volledige levensgeschiedenis van de respondenten op het gebied van fertiliteit, werkgelegenheid en partnerschap. Ook de SSD bevat longitudinale informatie op microniveau over de familiegeschiedenis van elk kind van de SHARE-respondenten. Om deze reden opent het de mogelijkheid om het levensloopperspectief aanzienlijk uit te breiden naar andere gezinsgeneraties. Ten derde is SHARE doelbewust opgezet om vergelijkbare multidisciplinaire gegevens te verstrekken uit representatieve steekproeven onder de Europese bevolking in 29 landen. Hierdoor kunnen de resultaten worden gegeneraliseerd naar de gehele populatie van oudere Europeanen en Nederlanders.

Dit proefschrift beoogt een bredere overeenstemming te bereiken over de impact van sociale factoren op verschillende dimensies van de gezondheid van mannen en vrouwen in het latere leven. Daarom gebruik ik, afhankelijk van de doelstellingen van de specifieke studie, verschillende gezondheidsuitkomsten als afhankelijke variabele. De belangrijkste maat die in dit proefschrift wordt gebruikt is de Frailty Index, een toegankelijke en gevoelige leeftijdsonafhankelijke indicator voor de accumulatie van gezondheidsgebreken in multidimensionale gezondheidsdomeinen. De gebruikte Frailty Index combineert 40 verschillende gezondheidstekorten, variërend van fysieke frailty markers zoals gewichtsverlies (body mass index deficit, vermindering van eetlust, etc.) en handknijpkracht tot andere factoren zoals cognitie (verminderde oriëntatie), stemming (droefheid of depressie, gebrek aan plezier, etc.) en beperkingen in activiteiten van het dagelijks leven. Deze gezondheidsmaat wordt gebruikt in de hoofdstukken 2, 4 en 5. Naast de Frailty Index wordt in dit proefschrift gebruik gemaakt van een maat voor objectieve lichamelijke gezondheid (hoofdstukken 3 en 4) en een maat voor geestelijke gezondheid (hoofdstuk 4). Als maat voor lichamelijke gezondheid wordt in de hoofdstukken 3 en 4 een objectieve maat voor spierkracht en algehele lichamelijke gezondheid (d.w.z. handknijpkracht) gebruikt, die wordt gemeten met een dynamometer. Voor de meting van de geestelijke gezondheid wordt in hoofdstuk 4 gebruik gemaakt van depressieve gevoelens, gemeten met de EURO-D-depressieschaal. Deze schaal is gebaseerd op 12 vragen over somberheid, pessimisme, doodswens, schuld, slaap, interesse, prikkelbaarheid, eetlust, vermoeidheid, concentratie, plezier en huilen, en loopt van 0 tot 12.

Elk hoofdstuk van dit proefschrift levert een unieke bijdrage aan de huidige literatuur over ongelijkheid tussen mannen en vrouwen op het gebied van gezondheid op latere leeftijd. De resultaten van hoofdstuk 2 suggereren dat, hoewel SES een voorspeller is van gezondheid op latere leeftijd, het niet hetzelfde effect heeft voor mannen en vrouwen in verschillende sociaaleconomische contexten. Meer specifiek is de relatie tussen SES en gezondheidsveranderingen zwakker voor vrouwen dan voor mannen in landen met een hoge defamilisatie en decommodificatie . In Zuid- (Italië en Spanje) en West-Europese landen (Oostenrijk, België, Frankrijk, Duitsland en Zwitserland) is het effect van opleiding en welvaart op de gezondheid sterker voor vrouwen dan voor mannen. In Noord-Europa (Denemarken en Zweden) daarentegen vertonen de resultaten geen genderverschillen naar gelang van SES. Deze verschillen zouden te wijten kunnen zijn aan het genereuzere welvaartsstaatbeleid van de Scandinavische landen, aangezien zij wellicht beter beschermen tegen de gezondheidsgevolgen van een lage SES. Bovendien kunnen de hoogste niveaus van defamilisatie in de Noord-Europese landen hebben bijgedragen aan kleinere genderongelijkheden in gezondheid vergeleken met de minder herverdelende en beschermende Zuid- en West-Europese samenlevingen. In het algemeen suggereren deze bevindingen dat gezondheid op latere leeftijd het resultaat kan zijn van complexe combinaties van sociaaleconomische en gezinsomstandigheden die zich vanaf de vroege volwassenheid voordoen.

De resultaten van hoofdstuk 3 zijn in overeenstemming met theorieën over blootstelling aan stress en cumulatieve achtergesteldheid, en ondersteunen het idee dat werk-gerelateerde spanningen een sterker effect hebben op de gezondheid van mannen dan van vrouwen. Bovendien wordt de levensloop van ouders die lange of herhaalde perioden buiten de arbeidsmarkt verblijven, geassocieerd met een slechte gezondheid op latere leeftijd in vergelijking met ouders met een sterke binding aan de arbeidsmarkt. Voor zowel vaders als moeders ondersteunt deze bevinding de theorie van

de rolversterking ('role enhancement theory'). Hoofdstuk 3 levert ook bewijs dat de institutionele context waarin de werk- en gezinsverantwoordelijkheden van mannen en vrouwen zich ontvouwen een belangrijke rol kan spelen bij het vormgeven van de relaties tussen levenslooptypen en lichamelijke gezondheid op latere leeftijd. De resultaten van dit hoofdstuk ondersteunen de hypothese dat landen die meer geneigd zijn om combinaties van werk en gezinstaken te bevorderen ouders beter kunnen beschermen tegen nadelige gezondheidseffecten op latere leeftijd.

Hoofdstuk 4 geeft aan dat de echtscheiding van kinderen over het algemeen samenhangt met meer depressie en kwetsbaarheid ('frailty'), en minder knijpkracht, bij de ouders. Bovendien geven de bevindingen aan dat de negatieve gevolgen van echtscheiding van kinderen op de gezondheid van de ouders, zich beginnen te manifesteren in de periode direct voorafgaand aan de scheiding van het kind. Deze resultaten bevestigen het idee dat de ontbinding van een relatie een langdurig proces is, waarbij conflicten vaak al jaren voor de feitelijke scheiding of echtscheiding een rol spelen, met gevolgen die zich kunnen uitstrekken tot andere gezinsgeneraties en gezondheidsmaten. Het belangrijkste is dat er geen opvallende genderverschillen werden gevonden in de gezondheidsgevolgen van de scheiding van kinderen: de studie toont aan dat er nauwelijks significante interactie-effecten zijn tussen het geslacht van de ouders en de echtscheiding van de kinderen, en evenmin tussen het geslacht van de kinderen en de echtscheiding.

De resultaten van hoofdstuk 5 bevestigen de hypothese dat de overgang naar de rol van mantelzorger voor de partner gepaard gaat met nadelige gevolgen voor de eigen gezondheid. Omgekeerd hangen transities uit de rol van verzorger voor de partner over het algemeen samen met een betere gezondheid. Interessant is dat er geen significante interactie is gevonden tussen geslacht en de overgang naar de rol van mantelzorger voor de partner, maar dat er wel interactie-effecten zijn gevonden tussen geslacht en de overgang uit de rol van mantelzorger in het Zuid-Europese welvaartscluster, waar vrouwen meer dan mannen in termen van gezondheid profiteren van de overgang uit de rol van mantelzorger. Bovendien blijkt uit vergelijkende resultaten dat de gezondheidseffecten van zorgverlening aan de partner het sterkst zijn voor mannen en vrouwen in Zuid- en Oost-Europese landen, minder sterk in West-Europese landen, en het minst sterk in Noord-Europese landen. In het algemeen ondersteunen deze resultaten het idee van een familiair en minder beschermend welvaartsstelsel dat kenmerkend is voor Zuid- en Oost-Europese landen.

De belangrijkste conclusie van dit proefschrift is dat de verbanden tussen gender en gezondheid op latere leeftijd complex zijn, en dat verschillende sociale factoren en levensloopgebeurtenissen van invloed zijn op verschillende aspecten van deze verbanden. Uit het proefschrift kunnen drie belangrijke conclusies worden getrokken. Ten eerste heeft SES een verschillend effect op de gezondheid van oudere vrouwen en mannen in landen met verschillende welvaartsstelsels. Vrouwen worden, in vergelijking met mannen, in het bijzonder beïnvloed door hun sociaaleconomische positie, en vooral in minder beschermende welvaartsstaten. Ten tweede hangen het gezins- en arbeidstraject in het begin van het leven voor mannen en vrouwen en voor verschillende institutionele contexten (d.w.z. welvaartsstaten) op verschillende wijze samen met de gezondheid op latere leeftijd. Geaccumuleerde stress en zorgverantwoordelijkheden gedurende de levensloop - en de institutionele omkadering daarvan - zijn van groot belang voor de gezondheid op latere leeftijd, en vooral voor vrouwen. Ten derde is de onderlinge afhankelijkheid tussen "belangrijke anderen" (d.w.z. kinderen en partners) in de loop van het leven van belang voor de gezondheid op latere leeftijd. Net zoals individuele

levensloopgebeurtenissen belangrijk zijn voor de gezondheid van oudere mannen en vrouwen, zijn ook de gezondheidsgevolgen die voortvloeien uit de banden met andere familieleden van belang.

In dit proefschrift zijn verschillende aspecten van het verband tussen gender en gezondheid op latere leeftijd vanuit verschillende perspectieven onderzocht. Hoewel ze een interessant geheel vormen, zijn al deze perspectieven niet even belangrijk. Levensloopgebeurtenissen op middelbare leeftijd en daarna zijn belangrijk voor de gezondheid van oudere mannen en vrouwen. De langetermijngevolgen van geaccumuleerde stress, een achtergestelde sociaaleconomische positie en gezinsverantwoordelijkheden, die hun oorsprong vinden in de vroegere levensloop, blijken echter belangrijker te zijn en zouden nader onderzocht moeten worden. Dit proefschrift benadrukt de noodzaak van een zeer brede en geïntegreerde benadering van de studie van gezinsverantwoordelijkheden en -ongelijkheden om de verbanden tussen gender en gezondheid op oudere leeftijd beter te begrijpen. Concluderend kan worden gesteld dat deze studie belangrijke beleidsrelevante leemten in bestaand onderzoek heeft opgevuld en heeft bijgedragen aan kennis die als basis kan dienen voor beleid ter ondersteuning van gezond ouder worden en gelijke kansen voor mannen als vrouwen.

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Damiano Uccheddu was born on June 14, 1987 in Carbonia, Italy. He studied at the University of Cagliari (Italy) where he obtained a Bachelor's degree in Social Sciences for Development from the Faculty of Economics, Law, and Political Sciences in 2012. He continued his studies at the University of Trento (Italy) where he obtained a Research Master's degree in Sociology and Social Research from the faculty of Sociology in 2016. Damiano further continued his studies at the University of Trento, Faculty of Information Engineering and Computer Science, where he attended an advanced course in Technologies for Active and Healthy Aging in 2016-2017.

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