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Changes in intergenerational support between parents and children after parental retirement

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Abstract

In empirical studies on predictors of intergenerational support, retirement status has often been neglected. This study aims to improve the understanding of support relationships between parents and children by examining the influence of retirement with differentiations by gender and retirement duration. Based on previous theoretical reasonings and empirical findings, hypotheses on retirement's impact on changes in grandparenting and the exchange of other instrumental and financial support are derived and tested with fixed effects regressions on panel data of 7 waves from the Survey of Health, Ageing and Retirement in Europe. Results are diverse. Fathers provide more instrumental support while mothers grandparent less, receive more instrumental support and provide more and receive less financial support after retirement. Intergenerational support exchanges tend to decline within a retirement durations of 10 years and changes over time are more pronounced for mothers than fathers. Grandparenting and downward instrumental support decline from being stronger in the first retirement years and weaker in later ones than before retirement. Upward financial support is likewise rarer in later stages of retirement. Mothers show a stronger decline of grandparenting over time than fathers, receive increasingly more instrumental support with retirement duration and provide more financial support throughout the whole observed retirement duration than before retirement. The utilization of retirement as a covariate in future research on intergenerational support relations and implication for intergenerational relations in an ageing Europe are discussed.

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1 Introduction

The term "intergenerational support" summarizes different kinds of support exchanges between generations in families, be they of a practical, financial or emotional nature, and its arrangement and extent have empirically proven to be a momentous aspect of the lives of many parents as well as their adult children. Providing support to children has been shown to increase the life satisfaction of older people (Lowenstein et al., 2007; Schwarz et al., 2010). Likewise, a moderate amount of received support by children increases parental well-being (Djundeva et al., 2015; Silverstein et al., 1996). Similarly, adult children can benefit from the social capital provided by their parents, especially if the parents take care of their grandchildren (Pessin et al., 2021; Pink, 2018; Rutigliano, 2020). Furthermore, Intergenerational interactions in the context of the family may have consequences for intergenerational relations on the societal level, for example concerning welfare state redistributions (Szydlik, 1995) or ageism (Cadieux et al., 2019; Yaghoobzadeh et al., 2020).

Contrary to assumptions about the decline of intergenerational relations for the sake of nuclear family relations (Parsons, 1944) and about the increase of the (daughters') burden to care for parents in the context of rising life expectancies and low fertility rates (Brody et al., 1983), intergenerational support relations did not change, for example in Germany, decisively in the last decades (Steinbach et al., 2020). Nevertheless, intergenerational support may gain more relevance in the future since the ongoing demographic developments of increasing life expectancies and low-level fertility implicate less opportunities for exchanging intragenerational support and more opportunities for exchanging intergenerational support as less siblings and more members of older generations become available. The life course transition of retirement entails the restructuring of several areas of life, likely also the intergenerational support relations with children, and in the face of an unprecedentedly vast retirement wave of the Baby Boomer generation that already begun and will continue in the next decades in Europe (Eurostat, 2020), intergenerational support and its aforementioned implications could alter considerably in the near future.

Intergenerational support has been examined in manyfold empirical studies (for an overview see Kalmijn, 2014), but consequences of retirement for it were rarely the focus of research. For a thorough investigation of this association analyses of longitudinal data are highly recommendable since they allow to trace changes within the same persons before and after retirement, whereas cross-sectional study designs result in mere group comparisons of retired and non-retired. The existing longitudinal studies that include analyses of changes in intergenerational support after retirement focus on the practical help provided from parents to children and, all in all, indicate a positive impact of retirement (Grünwald et al., 2021; Kahn et al., 2011; van den Bogaard et al., 2014). However, together they cover only the contexts of the Netherlands and of Wisconsin (USA) and they do not investigate how instrumental support from children to parents and financial exchanges between them change after retirement. Beyond the value of a better understanding of social processes after retirement, enhanced knowledge about its impact is also relevant for the study of other causal factors of intergenerational support as it guides the selection of retirement status as a covariate or not in empirical studies, which has in turn consequences for the biasedness of their causal inferences (Elwert, 2014; Pearl and Mackenzie, 2019). All in all, the contribution of this study is supposed to extend the insufficient knowledge about the impact of retirement on changes in intergenerational support between parents and children in both directions by examining with a longitudinal study design for the first time in a Europe-wide context and with the broadest differentiation of intergenerational support dimensions so far.

This study's research question is: What is the influence of the transition of parental retirement on the subsequent intergenerational support between parents and their children? The objective is not to examine intergenerational support during the transition of retirement (e.g. in Damman and van Duijn, 2017; van Solinge and Henkens, 2008), but how support relations of retired persons differ from non-retired ones and how these differences vary with the length of retirement in Europe. Thereby, the latent construct of intergenerational support will be differentiated into financial support, grandparenting and other instrumental support. Although the term intergenerational solidarity can be used to encompass the relations of more than two generation, the scope of this study is limited to parent-child relationships. The focus is put on the strongest support exchange relations between a parent and the set of its children, instead of on all parent-child relationships, and within-person changes of each parent instead of cross-sectional associations are modelled in order to reduce bias in causal inference. Due to the overwhelming salience of gender differences in previous research on intergenerational support relations, the differentiations of interest are additionally investigated by means of parental gender differences.

The study is structured as follows. Chapter 2 introduces the concept of intergenerational support regarding its differentiations and its origin from the research on intergenerational solidarity. Taking a life course perspective, possible mechanisms and confounders of the impact of retirement on five intergenerational support dimensions are discussed. Furthermore, a review of previous research on the research question is provided. Chapter 3 explains how samples are derived from the Survey of Health, Ageing and Retirement in Europe (SHARE) and modelled with fixed effects regressions, and presents results of the statistical analyses. Chapter 4 summarizes the approach of the study and its results, highlights strengths and limitations and derives from them directions for future research. It further discusses consequences of the findings considering retirement in covariate selections and societal implications for an ageing Europe.

2 Theoretical Framework

This chapter introduces intergenerational support in 2.1 by elucidating its differentiations and outlining its role in the framework of intergenerational solidarity. 2.2 compiles theoretical arguments in order to derive hypotheses on the association between retirement and the different intergenerational support dimensions and summarizes them in a conceptual model. This is followed by an examination of previous research results on the associations between work reductions and the different intergenerational support dimensions in 2.3. Finally, 2.4 discusses the covariate selection based on theoretical reasoning, empirical results and covariate usage in previous publications.

The publications that are referred to in this chapter are based on queries in the Web of Science from which key publications were identified and whose sources and citing articles were additionally examined. The main query at the beginning of the literature examination that led to over 600 initial results was: "*TS=(("intergenerational support" OR "intergenerational solidarit*") AND (support OR grandparent* OR retire* OR transition* OR "Health, Ageing and Retirement" OR "SHARE survey" OR "gender roles" OR "gender difference$"))*". This and other searches together have certainly not identified all relevant publications, but they provided a comprehensive basis of peer-reviewed scientific journal articles that enabled a broad familiarization with the topic.

2.1 Intergenerational Support and Intergenerational Solidarity

Intergenerational support is differentiated into instrumental, emotional and financial support (Kalmijn, 2014). Emotional support consists of encouragement, advice and other expressions of emotional involvement (Kahn et al., 2011). Instrumental support covers a variety of behaviours like help with the household or administrative work, grandparenting or personal care and financial support can take the form of transfers of money, giving goods, paying bills or assisting with loans (Kalmijn, 2014). Grandparenting, i.e. childcare or babysitting, will be examined separately from other forms of instrumental support in this study as it has been done in previous research (e.g. in Henretta et al., 2002; Igel et al., 2009; Igel and Szydlik, 2011; Kahn et al., 2011; Schmidt et al., 2016). In the following, instrumental support is not meant to be including grandparenting and this study will focus on grandparenting as well as the exchanges of instrumental and financial support.

Intergenerational support can take place upward or downward when children provide support to parents and parents to children respectively. Grandparenting is the only kind of support here that solely proceeds downwards, whereas elder care as the candidate for its upward counterpart is not examined in this study. How the overall support streams relate to each other is studied mainly from two perspectives: Altruism and exchange theory (Kalmijn, 2014; Lye, 1996). Both are based on the rational choice perspective which states that people act in order to maximize subjective utilities and altruism is present when the well-being of others is subjectively considered as a benefit, for example because it fosters a sense of meaning (Kalmijn, 2014). Parental altruism towards their children can additionally be framed as an investment into antecedents that is evolutionary adaptive and therefore genetically predisposed (Eggebeen and Hogan, 1990). Exchange theory, on the other hand, states that the motivation to provide support is the expectation of a benefit by receiving reciprocal support in exchange (Lye, 1996). Exchange can take place immediately, when one kind of support is provided shortly after another kind is received, or intertemporal, i.e. parents provide more help to their children when they are young and the direction of support reverses over the life course (Silverstein et al., 2002).

In general, intergenerational support has been studied within the concept of intergenerational solidarity that was developed by Vern L. Bengtson and colleagues with the aim to identify dimensions that describe social cohesion between generations within families and to explain how they are related to each other (Steinbach, 2010). The scientifically most influential aspects of their work on intergenerational solidarity are the definition and operationalization of six – and later seven – dimensions that together are supposed to reflect the latent construct of intergenerational solidarity. The dimensions are presented in table 1, along with manifest variables for their measurement as the dimensions are themselves latent constructs. Intergenerational support is represented by the dimension of functional solidarity and is part of the first three dimensions that concern behaviours or their consequences, whereas the following three are reflecting the mental relatedness of family members to each other (Kalmijn, 2014). As a response to criticism of not considering conflict in intergenerational relations, it has been established as a seventh dimension in the framework of a solidarity-conflict model (Bengtson et al., 2002).

The first six intergenerational solidarity dimensions have been conceptualized in different causal models with intergenerational support playing different roles. Rossi and Rossi (1990) hypothesize that intergenerational support is caused by all other five solidarity dimensions directly or indirectly, i.e. it is the mere result of developments in the other dimensions. Contrary to that, Roberts et al. (1991) hypothesize intergenerational support being caused by structural and normative solidarity and causing affectual and associational solidarity.

Table 1 Dimensions of intergenerational solidarity

Dimension	Definition	Empirical indicator
1. Associational solidarity	The frequency of contact between intergenerational family members	Frequency of intergenerational interaction
2. Functional solidarity	Help and support, both emotional and instrumental, that family members exchange	Frequency of intergenerational exchanges of assistance (e.g., financial, physical, emotional)
3. Structural solidarity	Geographic proximity, including coresidence, between family members that affect opportunities for interaction	Residential propinquity of family member
4. Affective solidarity	Emotional closeness or the positive feelings family members express for one another	Ratings of affection, warmth, closeness, understanding, trust, respect, etc. for family members
5. Consensual solidarity	Agreement in opinions, values, and orientations, including religious orientation, between the generations	Intrafamilial concordance among individual measures of specific values, attitudes, and beliefs
6. Normative solidarity	Norms and expectations regarding familistic values, and filial and parental expectations	Ratings of importance of family and intergenerational roles
7. Conflict	Tension or disagreement, even if not openly expressed, between family members	Frequency of intergenerational conflicts or tensions

Source: Adapted from Giarrusso and Putney (2020, p. 2) and Bengtson and Roberts (1991, p. 857).

Empirical studies inspired by these theoretical considerations indicate, that intergenerational support is often associated with other intergenerational solidarity dimensions and that it might be caused by as well as causing them (Kalmijn, 2014), whereby the focus will be put on the former causal direction in the following. A lower distance between parents and children, also referred to as intergenerational proximity, is considered to create opportunities for grandparenting and instrumental support and has been shown to be a significant predictor of grandparenting (Heylen et al., 2012) as well as downward (Hillcoat-Nallétamby and Dharmalingam, 2003; Mulder and van der Meer, 2009) and upward (Heylen et al., 2012; Leopold, 2012; Silverstein and Litwak, 1993; Vergauwen and Mortelmans, 2020) instrumental support. Intergenerational proximity is also associated with more intergenerational contact (de Bruycker, 2008; Deane et al., 2016; Hank, 2007; Ward et al., 2014), which in turn is likewise positively associated with, for example, downward instrumental and financial intergenerational support (Hillcoat-Nallétamby and Dharmalingam, 2003). The association between intergenerational proximity, contact and support is underlined by a series of studies that apply latent class analyses on intergenerational solidarity dimensions in order to explore latent types of intergenerational solidarity. They regularly find subsamples in which combinations of two or all three dimensions are at the same time likely or unlikely, even though types in which these dimensions are unrelated are identified as well (e.g. in Hogerbrugge and Silverstein, 2015; Schenk and Dykstra, 2012; Silverstein and Bengtson, 1997; van Gaalen and Dykstra, 2006). In the chapters 2.2 and 2.4, changes in structural and associational solidarity will be hypothesized to

emerge from retiring and mediating its impact on intergenerational support or to confound the relationship between the two respectively, and although the other solidarity dimensions can be argued to vary over the life course as well, even normative solidarity (Clark et al., 2009; Del Corso and Lanz, 2013; Gans and Silverstein, 2006), and to be associated with intergenerational support, possible causal links from or to retirement could not be identified from previous theoretical reasoning or empirical research, making a discussion of these solidarity dimensions' association with intergenerational support irrelevant.

A large extent of the research on intergenerational solidarity distinguished between mothers and fathers and consistently found stronger intergenerational ties for mothers than fathers. Reviews of previous research agree in their summaries that the assumptions that mothers have more frequent intergenerational contact and closer intergenerational relations, occupy the role of the "kinkeeper" who keeps family members in touch with each other and provide and receive more intergenerational support are widely confirmed (Kalmijn, 2014; Lye, 1996; Silverstein et al., 2006; Szydlik, 1995).

2.2 Implications of Retirement for Intergenerational Support

This study examines the consequences of retirement from a life course perspective. In this paradigm, a person's life is regarded as interweaved trajectories that are shaped by historical contexts, the age-specific timing of transitions, the embeddedness in social relationships and the person's individual agency (Elder, 1994). The interweaved nature of life course trajectories stresses that changes in trajectories, for example those concerning professional careers and family relationships, are interdependent (Bengtson and Allen, 1993). The possible influences of the transition to and the trajectory of retirement on providing intergenerational support through mechanisms of more time availability, increased religiosity, stronger financial restrictions, changing distance between parents and children, role change and disengagement are discussed in the following. In the life course perspective, such mechanisms can vary across individual characteristics of the involved persons like gender (Elder, 1994), which is why these mechanisms are additionally examined concerning gender differences. Furthermore, the notion of *linked lives* as a label for social embeddedness has particular relevance for this study as it emphasizes that changes in a person's life course are affected by and affect the life courses of others (Elder, 1994). This notion emphasizes that children adapt their support provision relation to a parent's situation, which is discussed hereafter concerning children's responses to parental financial constrains and distance changes to parents. However, hypotheses based on immediate exchange processes are not formulated, although they would be plausible, since their implications are too manyfold: It could be argued that any increase or decrease of any kind of intergenerational support by one party is followed by any increase or decrease of any kind of support by the other party, even within the same kind of support, for example when providing goods is exchanged with financial transfers or physical help in the household with administrative work.

2.2.1 Opportunities and Restrictions

The contexts of working and being retired differ in the opportunities and restrictions they impose. A main restriction that is associated with professional life is the scarcity of free time. Swedish data from 2000 and 2010, for example, shows that people spend on average four to five hours per day on paid work when aged 55-64, the last decade before the usual Swedish retirement age of 65, whereas older age groups spent less than one hour on this (Vilhelmson et al., 2021). Providing instrumental support and grandparenting are time-consuming activities that are more likely to become possible and their opportunity costs are reduced if more free time is available. Therefore, hypotheses H_1 and H_2 are: *Retiring is associated with an increase*

of downward instrumental support and *retiring is associated with an increase of grandparenting.*

Diverging gender differences can be argued to result from being freed from spending time on work. One argument is that employed men are working more hours than employed women before retiring, which is why the free time of the former is more restricted before retirement. Landivar (2015) shows that across 23 developed countries men in dual-earner couples work between 2 and 20 hours more per week than their wives. Data from Portugal further finds that women already have reduced their number of working hours more often than men before retiring (Machado and Portela, 2014). As the difference in time availability for providing intergenerational support before and after retirement is larger for men than woman, hypotheses H_{1a} and H_{2a} are: *Retiring is associated with a stronger increase of downward instrumental support for fathers* and *retiring is associated with a stronger increase of grandparenting for fathers.* On the other side, it was argued in 2.1 that mothers tend to provide in general more intergenerational support than fathers. Despite being freed from time restrictions to al lesser extent, mothers could have a stronger unfulfilled desire than fathers to allocate a part of their working hours to providing support to their children before retirement, leading to the hypotheses H_{1b} and H_{2b} are: *Retiring is associated with a stronger increase of downward instrumental support for mothers* and *retiring is associated with a stronger increase of grandparenting for mothers.*

Religiosity is a potential aspect of parents that might increase because of the relief from time constrains after retirement and mediate the impact on intergenerational support. Religiosity varies over the life course and increases compared to mid-life in older age when the perception of approaching death increases (Lois, 2013). Considering retirement, Silverstein and Bengtson (2018) hypothesize that the free time associated with it allows to engage more with religious thoughts and activities and find a positive yet not significant association between retirement and religiosity. Furthermore, religiosity can be hypothesized to increase the propensity to provide support as support practices are encouraged by religious teachings and institutions (Steinbach and Silverstein, 2020). Research on the association between parental religiosity and intergenerational support has not been carried out to my knowledge, but findings that adult children's religiosity is positively associated with providing support to their parents (Gans et al., 2009; Silverstein et al., 2019; Tosi and Oncini, 2020) indicate that the same association is likely to exist concerning parental religiosity. Therefore, religiosity as a mediator contributes to the line of reasoning for the hypotheses H_1 and H_2.

A major opportunity that arises from being part of the workforce and that decreases with the transition to retirement is the availability of financial resources. In the EU-27 in 2018, the median pension income of 65-74 year olds was 58% of the median work income of people aged 50-59 (Eurostat, 2020). The reduced availability of financial resources after retirement is likely to lower the willingness to share the same absolute amount as before retirement, leading to the hypothesis H_3: *Retiring is associated with a decrease of downward financial support.* During the transition of retirement the gender income gap widens, from 3.6% more median equalised net income for men than women in the age group 55-64 to 11.4% higher levels of income for men than women when aged 65 or more in the EU-27 in 2018 (Eurostat, 2020). From this, hypothesis H_{3a} is derived: *Retiring is associated with a stronger decrease of downward financial support by mothers.* Furthermore, the decrease of parental financial resources following retirement might incentivize children to support their parents and above all their especially disadvantaged mothers, leading to the hypotheses H_4 and H_{4a}: *Retiring is associated with an increase of upward financial support* and *retiring is associated with a stronger increase of upward financial support for mothers.*

Furthermore, after retirement, a person is not anymore bound to living close to its former working place, and Litwak and Longino (1987) distinct in their developmental model of aged mobility three types of post-retirement moves: Amenity, assistance and institutional moves. Amenity moves take place shortly after retirement with the aim to move to a living place that offers more amenities, given that the person is healthy and wealthy enough to do so. The authors refuse to assume whether this increases or decreases the distance to relatives and therewith the possibility to provide and receive instrumental support and to grandparent, since moving closer to children in order to receive emotional support or care during acute illnesses might also constitute amenities. Contrary to that, assistance moves are clearly aiming at decreasing the distance to relatives in order to receive continuously help with everyday household tasks that cannot be fulfilled autonomously anymore. Additionally, the argument in 2.1 that intergenerational proximity and support exchange have been empirically found to be positively associated contributes to this reasoning. Finally, an institutional move means a move to a care facility when the need for care becomes a too overwhelming physical, mental or time-related burden for the relatives. Although this step means a strong decline or complete disappearance of support exchanges between family members, it is negligible in the comparison of retired and non-retired persons, as it usually happens at an age at which most people are retired. By focusing on assistance moves and in spite of the possibility that assistance moves can also consist of moves further away from children when one moves closer to siblings or other kin, the model can be interpreted as predicting increasing received support after retirement. Therefore, hypothesis H_5 states: *Retiring is associated with an increase of upward instrumental support*. At the same time, decreasing the distance to children increases, in line with hypothesis H_2, the opportunities to grandparent.

2.2.2 Role Changes

Beyond opportunities and restrictions, other mechanisms may be initiated by retirement. Role theory emphasizes that retirement means the loss of roles associated with being a working person, which however could be substituted by stronger involvement with the roles of a family member. Role theory is a broad conceptualization of social statuses and associated behaviours that is relevant in the research on life course transitions since it contributes the perspective that transitions are indicating the exit and entry of social roles (George, 1993). From this perspective, the transition of retirement is associated with the loss of job roles like being a colleague, specialist, superior, breadwinner, etc. that have to be followed by an increased engagement with other roles, e.g. as a parent or grandparent (Barnes-Farrell, 2003). Whereas it cannot be hypothesized from this in which direction intergenerational financial transactions change since engaging more with the role as an financially supporting family member is disincentivized by the restriction of having less financial resources available, becoming more engaged as a family member that is providing instrumental support and grandparenting is compatible with a retired person's opportunity of having more free time available, and contributes another explanation for the hypotheses H_1 and H_2. Additionally, Kahn et al. (2011) argue that men might tend more than woman to invest in their careers before retirement, possibly leading to a stronger need for reorientation for them. The implicit stronger involvement in intergenerational support activities for fathers compared to mothers is in line with the hypotheses H_{1a} and H_{2a}.

According to disengagement theory, the loss of roles in older ages, and especially of job roles, is not followed by a search for new ones but instead by withdrawal from social life. The original theory illustrates that societies demand older workers to withdraw from work as a starting point to let them more and more disengage from society and being increasingly preoccupied with oneself (Cumming and Henry, 1961). This process is thought to happen in the interest of the older persons concerned, since they are assumed to wish to disengage from secular bonds in

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order to sustain a positive self-image in the expectation of the approaching death that is independent from social circumstances (Cumming and Henry, 1961). More recent theoretical developments based on disengagement theory uphold the idea of a long-term distancing from society in the late stages of life, but rather focus on the adaption to constrains that people face with increasing age by allocating their resources to key life domains, for example by reducing social contacts or the extent of contacts in order to safeguard essential aspects of personal relationships (Zhang and Lin, 2020). Disengagement theory and its variants imply that retiring is followed by a disengagement from interactions with the family, especially by a decrease of time-consuming and exhausting support dimensions, leading to the hypotheses H_6 and H_7: *Retiring is associated with a decrease of downward instrumental support* and *retiring is associated with a decrease of grandparenting*. Concerning financial support, the implications of disengagement theory can be interpreted in two ways. On the one hand and as stated in hypothesis H_3, parents might provide less financial support to children since they become less involved with their children and their needs. On the other hand, disengagement theory can be interpreted to predict retirement as being characterised by less consumption and instead an increasingly ascetic lifestyle which may leave more financial resources to give away to children than before retirement, despite the decrease in financial resources (van Solinge and Henkens, 2008). Therefore, hypothesis H_8 states: *Retiring is associated with an increase of downward financial support.*

The association between retirement and intergenerational support could be additionally mediated by increased intergenerational contact. The positive association between contact and support was discussed in 2.1 and Szinovacz and Davey (2001) investigate the relation between retirement and intergenerational contact. They hypothesize parent-child visits to be positively affected by retirement and that this association is mediated by the increased availability of time, decreased distance between parents and children and parents' role reorientation after retirement. However, with longitudinal U.S. data spanning the late 1980s and early 1990s, they find parent-child visits not to be affected by retirement in general but to vary by subgroups. For example, they report increases of visits after retirement for parent-child dyads living close to each other and decreases of visits after retirement for mothers without grandchildren. However, these findings are not considered in the further formulation of hypotheses.

2.2.3 Retirement Duration

The difference in intergenerational support between retired and non-retired persons is likely to differ by the duration of retirement. Szinovacz and Davey (2001) argue that the retirement transition is followed by a short-term engagement with rather self-oriented non-routine activities after which behavioural patterns become more stable. Based on findings by Ekerdt et al. (1985) that life satisfaction differs in the first two years compared to longer periods of retirement, Szinovacz and Davey (2001) hypothesize intergenerational contact to be more likely after two or more years after retirement, but find no consistent duration effects. Nevertheless, their reasoning of a lag of the impact of retirement on intergenerational relations is similar to the aforementioned developmental model of aged mobility that predicts support exchange enhancing assistance moves after a period of amenity moves. This model was argued to implicate increases in upward instrumental support and grandparenting. When neglecting institutional moves, assistance moves accumulate with the duration of retirement and make these increases more likely to happen over time. The according hypotheses H_{2x} and H_{5x} can be expressed as follows: *The association between retiring and grandparenting increases with the duration of retirement* and *the association between retiring and upward instrumental support increases with the duration of retirement*. Contrary to that, disengagement theory argues for a gradual decrease of time-demanding intergenerational support over time, leading to the hypotheses H_{6x}

and H_{7x}: T*he association between retiring and downward instrumental support decreases with the duration of retirement* and *the association between retiring and grandparenting decreases with the duration of retirement*. When institutional moves are considered, the developmental model of aged mobility rather predicts a parabolic than a linear development of intergenerational support over time, i.e. an increase after assistance moves and thereafter a decrease after institutional moves, but in order to keep the set of hypotheses manageable, non-linear and gender-differenced hypotheses are not discussed here, nevertheless the existence of respective statistical associations will be explored in chapter 3.

The hypotheses formulated in this chapter partly predict opposing associations but are not considering the possibility of continuity. The not so far mentioned alternative hypothesis of no change of intergenerational support exchanges after retirement is explained by continuity theory as presented in Atchley (1989). The author describes this theory as assuming that people are motivated by their individual preferences as well as their social environment to adapt to late life transitions by continuingly applying behavioural strategies known from one's own past. Continuing known behaviours is incentivized, among other things, by the efficiency of automated decision-making processes, its contribution to being regarded by oneself and others as having a consistent identity across the life course and its contribution to remaining predictable for one's social environment. Unlike its predecessor, activity theory, which states that aging people aspire to reproduce experienced behaviours into old age, continuity theory considers that aging is accompanied by increasing restrictions that require adaptive changes in certain areas while continuity is the norm in others. However, continuity theory is assumed to take place in the context of a "normal aging", limiting its scope to late life transitions that are common among a large majority of a population, in contrast to, for example, drastic health or financial status declines that require an extensive adaption of the lifestyle. With the exception of extreme life course transitions, the theory predicts a maintenance of the extents of down- and upward support after the retirement transition.

2.2.4 Conceptual Model

Figure 1 depicts the conceptual model in two separate illustrations. The upper one shows how the hypotheses H_1 to H_8 come into being by means of the different mediators. To be concise, religiosity and intergenerational contact are not depicted. However, they constitute, together with time, financial resources, intergenerational proximity, role change and disengagement, the mediators of the causal model which must not be included as covariates in the analyses, since this would lead to overcontrol bias in causal inference from statistical associations (Pearl and Mackenzie, 2019). The lower illustration presents in which way being a mother compared to being a father and the duration of retirement constitute interactions hypotheses.

2.3 Previous Research

Since quantitative research that includes retirement in statistical analyses is rare, studies that consider the association of any change in labour force status with intergenerational support exchanges are examined to receive an overview of previous empirical findings. Retirees are part of the set of people that are not part of the labour force which also includes the labour force statuses of students, homemakers, persons in maternity leave and persons that are unable or not willing to work. Not being part of the labour force shares with unemployment the attribute that a person is not employed, but the distinction between the two types is that unemployed persons are job-seeking. Therefore, the difference between retirement and unemployment is larger than between retirement and other types of not being part of the labour force. Being "not employed" will be used here as term for either being not part of the labour force or unemployed and the term "employed" for employed as well as self-employed.

Figure 1 Conceptual model with separate illustrations for main and interaction hypotheses
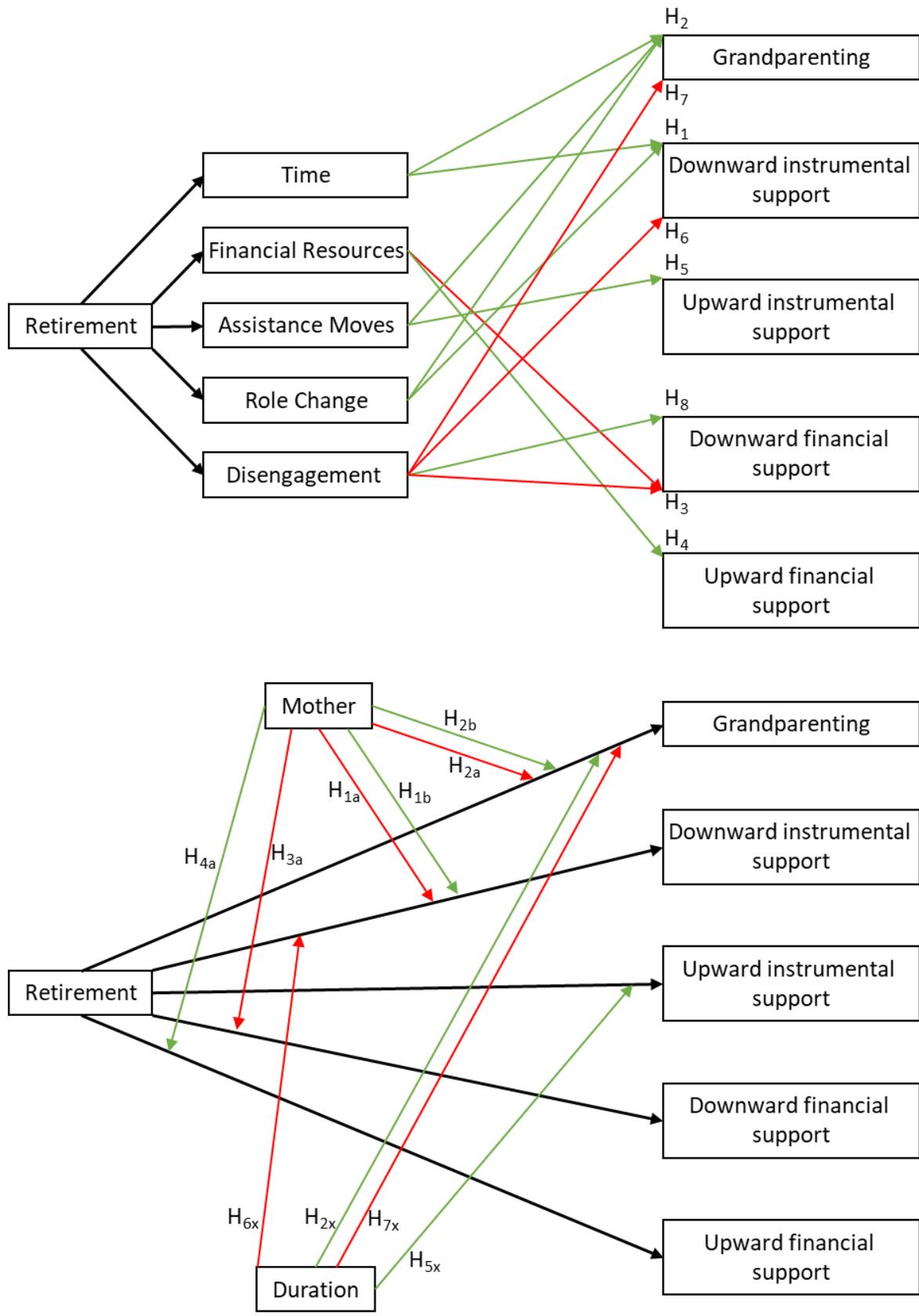
Notes: Green and red arrows indicate positive and negative impacts respectively.
Source: Own illustration

From search queries in the Web of Sciences and overviews in previous research (Grünwald et al., 2021; Kahn et al., 2011; Lakomý and Kreidl, 2015; Wong et al., 2020) 4 longitudinal and 9 cross-sectional studies were identified that provide labour force status associations with at least one intergenerational support dimension. Studies utilizing intergenerational support in latent class analyses were not investigated as they do not allow to distinguish the contribution of intergenerational support compared to other dimensions in statistical analyses with the derived classes as dependent variables. The results of Gerstel and Gallagher (1994) and Gerstel and Gallagher (2001) are also not considered here, because their small overall sample sizes of less than 200 participants lead to very high standard errors in separate analyses for mothers and fathers that make the underestimation of effects likely.

The research question of this study has been investigated in the most fitting way so far by van den Bogaard et al. (2014) and Grünwald et al. (2021). Both analyse 2-wave longitudinal survey data that was collected in the Netherlands and find overall positive retirement effects on grandparenting and downward instrumental support. Van den Bogaard et al. (2014) investigate the impact of being retired compared to not being retired in wave 2 after having worked 24 or more hours in wave 1 on downward instrumental support and find a positive association, while only partly retiring does not change the provision of instrumental support. Grünwald et al. (2021) find that the transition from employment to retirement is associated with a significant increase of grandparenting and non-significant increases in providing instrumental support, whereby instrumental support is not restricted to children and both results are less significant for retirees with a postretirement job.

Further longitudinal studies find positive associations of working less with grandparenting as well as gender differences. Kahn et al. (2011) find in bivariate regressions of longitudinal data that reducing full-time employment to part-time between two waves increases the likelihood to grandparent and to provide instrumental support only for mothers, whereas the same associations are only found for fathers when regarding the transition from full-time employment to retirement. A fixed effects regression of non-gender-differenced labour force status with being employed as reference in Lakomý and Kreidl (2015) shows that not employed and unemployed parents significantly more grandparent, while part-time working makes no significant difference. Additionally, positive associations of not being employed with grandparenting are found in separate cross-sectional analyses only for mothers.

Longitudinal studies have the advantage to capture the change of persons before and after they retire, whereas cross-sectional designs only represent group differences between retired and non-retired persons. Nevertheless, the majority of studies on intergenerational support that include labour force statuses are cross-sectional and their results should not be neglected in this review, even if the labour force status of a parent plays only a secondary role as a covariate in them, whereas it is the main independent variable in the aforementioned longitudinal studies. Emery (2013) includes several manifestations of parents' household labour force status with being retired as reference category in cross-sectional analyses. It remains unclear, how the labour force status of couples with different statuses are treated in this study, but the statistical results indicate that employed parental households are more likely and homemaker households are less likely to provide financial support to their children compared to retired parental households, while being unemployed or disabled is not significantly associated. Hillcoat-Nallétamby and Dharmalingam (2003) compare not being employed and being unemployed with being employed with a significantly negative association of not being employed with downward instrumental and financial support, whereby instrumental support includes grandparenting. Hank and Stuck (2008) report that employed and not employed persons do not significantly differ from retirees in their provision of instrumental support to kin and other persons.

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In several cross-sectional studies employment is adjusted for without a further differentiation of whether a person is unemployed or not part of the labour force. In a comparison of the United States and Great Britain, Henretta et al. (2002) report a positive association between fathers' employment with downward financial support and negative associations of mothers' employment with grandparenting and downward instrumental support, whereby the latter association is positive in Great Britain and the associations for the three dimensions are insignificant for unmarried fathers and mothers. In other studies, not being employed is positively (Aassve et al., 2012; Hank and Buber, 2009; Igel and Szydlik, 2011) and not (Silverstein and Marenco, 2001; Uhlenberg and Hammill, 1998) associated with grandparenting and not associated with upward instrumental and financial support (Taniguchi and Kaufman, 2017).

Table 2 provides an overview of the associations with three intergenerational support dimensions of interest by type of labour force status and study design. The first two columns include labour force statuses and respective reference categories, whereby the labour force status is selected to always constitute being less or equally involved in productive work than the reference category. The last column includes notes on gender differentiations by means of separate models for mothers and fathers or gender interactions with the labour force status. Upward support dimensions are not included as they are understudied with only one existing cross-sectional study that finds no significant associations with being employed or not for the context of Japan (Taniguchi and Kaufman, 2017). Henretta et al. (2002) is not included due to its varying results for various sub-groups. The table tends to show that grandparenting is positively associated with working less, whereby this association is especially pronounced in longitudinal studies and differentiations by mothers and fathers show mixed results. The same applies to the association with downward instrumental support, although insignificant associations are more frequent. Not being part of the labour force is negatively associated with downward financial support according to cross-sectional studies. A more detailed overview of the studies regarding the sample, geographical and temporal context, the role of the variable of interest and the utilization of mediators defined here is given in the Appendix in table A1, but this additional information appears not to improve the understanding of previous research.

2.4 Covariate Selection

In order to approach causal inference by means of the statistical associations that will be examined in chapter 3, an as complete as possible set of confounders has to be identified and included as covariates in the analyses. Confounders are variables that are causing the independent variable (here: retiring) as well as a moderator or the dependent variable (here: intergenerational support), and not adjusting for them would cause omitted variable bias (Pearl and Mackenzie, 2019). Thereby, it is irrelevant whether the causal influences are proven, but as long as there is suspicion of a causal relationship a confounder should be adjusted for, except its causal impact is falsified (Elwert, 2014). Another source of bias in causal inference are colliders, i.e. variables that become additional confounders under certain conditions of variable adjustment (Elwert, 2014; Pearl and Mackenzie, 2019). The consideration of colliders has, however, not established in quantitative social scientific research and will also not be examined in this place, as it would require a thorough examination of all causal impacts of each confounder, but their possible existence is a reason to constrain the set of covariates. Yet another source of bias in the analysis of social relations that comes into being when predictors of the emergence and maintenance of the relation are not adjusted for (Elwert, 2014), has not to be considered here, since parent-child relationships are not influenced by selection processes, apart from seldom adoptions and rejections of children.

Table 2 Overview of statistical associations between labour force status and intergenerational support

Vari-able	Reference	Study	Grand-parent	Downward instrumental support	Downward financial support	Gender diffe-rence
Retired						
	Full-time employed	Kahn et al., 2011	+ for fathers	+ for fathers		0 for mothers
	Employed	van den Bogaard et al., 2014		+		not modelled
	Employed	Grünwald et al., 2021	+	0		not modelled
	Employed	Hank and Stuck, 2008		0		not modelled
	Employed	Emery, 2013			-	not modelled
	Un-employed	Emery, 2013			0	not modelled
	Un-employed	Hank and Stuck, 2008		0		not modelled
	Homemaker	Emery, 2013			+	not modelled
	Disabled	Emery, 2013			0	not modelled
Not part of labour force						
	Employed	Lakomý and Kreidl, 2015	+			not modelled
	Employed	Uhlenberg and Hammill, 1998	0			separate models for mothers and fathers
	Employed	Hillcoat-Nallétamby and Dharmalingam, 2003		-	-	not modelled
Unemployed						
	Employed	Lakomý and Kreidl, 2015	+			in cross-sectional analyses + only for mothers
	Employed	Hillcoat-Nallétamby and Dharmalingam, 2003		0	0	not modelled
Not employed						
	Employed	Igel and Szydlik, 2011	+			not modelled
	Employed	Silverstein and Marenco, 2001	0			not modelled
	Employed	Hank and Buber, 2009	+			+ more significant for fathers
	Employed	Aassve et al., 2012	+			not modelled
Part-time						
	Full-time	Kahn et al., 2011	+ for mothers	+ for mothers		0 for fathers
	Full-time	Lakomý and Kreidl, 2015	0			not modelled
	Full-time	Silverstein and Marenco, 2001	0			not modelled

Notes: +, - and 0 stand for positive, negative and insignificant associations. Greyish highlighted rows indicate longitudinal study design.

Source: Own representation.

This includes time-constant variables that should be adjusted for in cross-sectional analyses but that are automatically adjusted for in within estimations like age, gender, ethnicity, migration background, parents' education level, previous family relationships and life history, and urban-rural, country and welfare regime differences. The advantage of a within estimation lies further in the automatic adjustment of time-constant confounders that are not captured by the available data or that are even not thought about by researchers (Andreß et al., 2013). Group differences by means of time-constant explanatory variables, e.g. gender differences, can nevertheless be modelled with fixed effects regression by including them in interaction terms with time-varying variables (Giesselmann and Schmidt-Catran, 2020). In case that mere gender differences in intergenerational solidarity without interactions would be of interest but all other time-constant variation should still be adjusted for, hybrid effects models could be applied (Andreß et al., 2013).

The health status of the parent is time-varying and has been found to be a strong predictor of the timing of retirement as well as intergenerational support. Scharn et al. (2018) compile studies on the association between poor health conditions and early retirement of which they report several to find a positive association, though several also to find no association. Health deterioration and the accompanying need for care of parents was found to decrease intergenerational distance (Vergauwen and Mortelmans, 2020), to increase upward instrumental (Ermisch, 2014; Kalmijn and Saraceno, 2008; Vergauwen and Mortelmans, 2020) and any kind of instrumental support (Cheng et al., 2015; Katz et al., 2010) and to have mixed associations with grandparenting and downward instrumental support (Igel and Szydlik, 2011; Schmidt et al., 2016). Adjusting for health status has been widely applied in studies with intergenerational support as dependent variable (e.g. in Cheng et al., 2015; Hillcoat-Nallétamby and Dharmalingam, 2003; Hogan et al., 1993; Kahn et al., 2011; Lakomý and Kreidl, 2015; Silverstein et al., 2002; Spitze and Logan, 1991; Whitbeck et al., 1994). However, health could also be argued to be a mediator when retirement improves health, for example because retirement is associated with spending more time on physical activities that contribute to one's health (Lahti et al., 2011). The SHARE survey utilized in this research could have provided a solution that would allow to adjust for health-induced retirement decisions and avoiding overcontrolling health changes after retirement by asking retired participants whether their ill health condition was a reason for their retirement, however, significant non-response on this item is discussed in 3.4 and speaks against its inclusion.

At the same time, parents are themselves children in parent-child relationships for many of whom the need for care for their very old aged parents is salient at the end of their professional career (Bertogg et al., 2021; Vlachantoni et al., 2020). And the practice of care for parents' parents has been found to be associated with parents' early retirement timing (Stoiko and Strough, 2019). It could be argued to constrain the opportunities to be involved with one's own children, but contrary to that, empirical research finds positive associations between caring for own parents and providing support to one's children in some way (Vlachantoni et al., 2020) and grandparenting (Zelezna, 2018). Likewise, the need for care of any other person may affect retirement timing, as shown for example for the parent's partner (Dentinger and Clarkberg, 2002), as well as intergenerational support exchange with children. However, adjusting for any support provided to other persons than children would probably result in overcontrol bias. Therefore, a covariate that reflects intensive support provision could be operationalized as personal care provided to coresidents. Such a covariate was not applied yet in studies with intergenerational support as dependent variable, but it is similar to the utilized covariates of parents' health condition (Kahn et al., 2011) or having an ageing parent (Hillcoat-Nallétamby and Dharmalingam, 2003). However, instead of adjusting for a behaviour that takes place after retirement, as in the paragraph before adjusting for the question whether the ill health of a

relative or friend was a reason for retirement would appear to be an even better approach if, as in the paragraph above, the non-response on this item lets it become impractical as a covariate.

Another possible confounder is the retirement status of the parent's partner. Retirement timing has been shown to depend on the retirement status of the partner (Jackson, 2017; Sousa et al., 2021). The partner's employment status affects the available financial resources and likely financial support exchanges therewith. Furthermore, the situations of having a partner that is employed compared to having a partner being retired or unemployed or having no partner constitutes different local ties for a person that affect the propensity to move (Mulder and Malmberg, 2014). Adjusting for the employment status change of the partner is not recommendable however, since the retirement status of the partner might be likewise affected by the own retirement transition and mediate intergenerational support changes of a couple with its children. A more elegant way would have appeared again to adjust for the question in SHARE whether retiring at the same time as the partner was a reason for retirement, but is not applied for the same reason as mentioned above.

Other confounders arise from the partnership statuses of the parent as well as the children, which change through marriages, divorces, spousal loss and respective events in non-marital partner relationships. Having a partner is considered to be associated with having more available resources that increase the propensity to provide and decrease the need to receive intergenerational support but the processes at the initiations and ends of partnerships may also be very resource demanding and could have the opposite consequences (Min et al., 2021). Furthermore, conflict preceding and following dissolutions may worsen intergenerational relations and the propensity of support therewith (Albertini and Garriga, 2011) and the decrease of intergenerational support after the end of a partnership is considered to be stronger for fathers probably because they depend on mothers to keep intergenerational relations intact while being partnered (Kalmijn, 2007). Empirical studies find that partnered parents significantly more grandparent (Igel and Szydlik, 2011), that children's marriages are associated with less upward instrumental support and children's divorce with more downward instrumental support (Min et al., 2021) and that children receive larger financial transfers after marriage (Leopold, 2011). Findings also show mixed gender-differenced variations after parental partner status changes in intergenerational distance (Shapiro, 2003) and intergenerational support (Amato et al., 1995; Ha et al., 2006; Kalmijn, 2013, 2015; Lin, 2008; Marks, 1995) and after children's partner status changes on intergenerational support (Bucx et al., 2012; Huang et al., 2021; Spitze et al., 1994; Yahirun and Hamplová, 2014). Parent's partnership status has been identified to be relevant in the way that the absence of a partner's financial support delays retirement (Madero-Cabib et al., 2016), that widowhood has a deteriorating impact on health (Schreiber, 2018) and that the partner's retirement status is considered in the retirement timing of partnered people (Jackson, 2017; Sousa et al., 2021), whereas the latter does not play a role for non-partnered. For children's partnership status, the link to parental retirement timing is less intuitive, but can for example be established through findings that the children's financial dependency, which is likely to vary with their partnership status, has been found to affect retirement timing (Henkens and Tazelaar, 1994; Miller et al., 2018; Szinovacz et al., 2001). Furthermore, adjusting for the partnership statuses of both parents and children is common practice in research with intergenerational support as dependent variable (e.g. in Bucx et al., 2012; Cheng et al., 2015; Emery, 2013; Kahn et al., 2011; Kalmijn and Saraceno, 2008; Lakomý and Kreidl, 2015; Silverstein et al., 2006; Szinovacz and Davey, 2012; Vergauwen and Mortelmans, 2020).

Previous research indicates that the number of children and grandchildren influences the timing of retirement as well as intergenerational support relations. Although the studied population of people being 50 years or older has largely passed fertile ages, there could be considerable variation through the death of children, especially for parents in older ages. Studies on a European

scale with SHARE data show that having more children and grandchildren is associated with retiring earlier (Litwin and Tur-Sinai, 2015; Lumsdaine and Vermeer, 2015), and that having children is associated with later retirements of fathers, whereas the direction of association for women depends on the birth cohort (Hank and Korbmacher, 2013). A higher number of children and grandchildren can mean more opportunities to provide support. Contrary to that, lower numbers may lead to focuses on fewer but stronger exchange relationships. The number of children (e.g. in Bucx et al., 2012; Cheng et al., 2015; Emery, 2013; Henretta et al., 2002; Hillcoat-Nallétamby and Dharmalingam, 2003; Kalmijn and Saraceno, 2008; Lakomý and Kreidl, 2015; Spitze and Logan, 1991) and grandchildren (e.g. in Igel and Szydlik, 2011; Lakomý and Kreidl, 2015; Vlachantoni et al., 2020) has been utilized as covariate in studies with intergenerational support as dependent variable. Further differentiations in the examination of grandparenting have been applied considering the age of the youngest grandchildren and the proposed age thresholds vary strongly. They range from only adjusting for whether the youngest grandchild is in preschool age (Hogan et al., 1993) or is under 14 (Aassve et al., 2012; Heylen et al., 2012) to adjustments with several binary variables on age ranges of the youngest grandchild of 0-3, 4-6 and 7-12 (Igel et al., 2009; Igel and Szydlik, 2011), of 0-3, 4-8 and 9-15 (Stueve and O'Donnell, 1989) and even of five dummy variables (Hank and Buber, 2009). A middle way regarding this spectrum that will be applied here is to control for the number of children under 7 and between 7 and 13.

Children's financial dependency from parents is a further potential confounder but is not straightforwardly operationalized in the available data. Retirement delays were found to be associated with the financial dependency of children from parents (Henkens and Tazelaar, 1994; Miller et al., 2018; Szinovacz et al., 2001) and downward financial support obviously results from this dependency. An indicator of financial dependency that is utilized as covariate might be the cohabitation of parents with children (e.g. in Bucx et al., 2012; Ha et al., 2006; Henretta et al., 2002; Kahn et al., 2011; Katz et al., 2010; Lakomý and Kreidl, 2015; Stueve and O'Donnell, 1989; Szinovacz and Davey, 2012). However, intergenerational cohabitation is a mediator as it might as well result from assistance move after retirement and should not be adjusted for therefore. Another approach would be to argue that the extent of children's employment affects the probability of financial dependency from parents. This appears even more reasonable when considering that Wong et al. (2020) summarize several studies that show that children's employment is positively associated with upward financial support and negatively with upward instrumental support, even though Spitze and Logan (1991) and Ingersoll-Dayton et al. (1996) find no respective significant associations. Adjusting for children's employment status has also been practiced in previous research (e.g. in Emery, 2013; Kalmijn and Saraceno, 2008; Lakomý and Kreidl, 2015; Min et al., 2021; Spitze and Logan, 1991; Stueve and O'Donnell, 1989; Szinovacz and Davey, 2012).

Yet another operationalization of children's financial dependency could be made by means of the children's ages. Kalmijn and Saraceno (2008) control for whether a child that is 21 years old or older is living with a parent and Henretta et al. (2002) for whether all children are above age 24 or not. Considering that in the EU-27 in 2013 only a third of people aged 20-24 were employed and not in education whereas the majority of the age group 25-29 was exclusively employed (Eurostat, 2015), 25 years of age appears to be a reasonable threshold for indicating the financial dependency of children, which is why the number of children under 25 will be adjusted for.

3 Analysis

In this chapter, the hypotheses that have been put forward are tested. For this, SHARE data and the samples drawn from it are described in 3.1. The subchapters 3.2-4 explain the operationalization of the dependent, independent and control variables and 3.5 provides descriptive statistics. In 3.6, the analytical approach is outlined and regression diagnostics are summarized, before 3.7 presents the results and discusses their implications for the hypotheses. The preparation of the data for this chapter took place with the programming language R and the descriptive statistics, regression diagnostics and fixed effects regressions were performed with Stata.

3.1 Sample

This research uses data from each wave of the Survey of Health, Ageing and Retirement in Europe (SHARE) except the third. SHARE is a panel survey with 8 waves so far that have been mainly conducted in 2004, biennially between 2007 and 2017 and in 2020, whereby the set of participating countries steadily grew from 11 Northern, Central and Southern European countries until all EU member countries except Great Britain were represented from wave 7 in 2017 onwards (SHARE-ERIC, 2021). The surveyed population consists of people aged 50 years or older who were drawn differently in each country but with the common aim of representativeness (Börsch-Supan et al., 2013). Regarding the first four waves, the response rate was between 49% and 62% and the panel attrition between 73% and 81%, whereby a response to the latter problem was the survey of refreshment samples (Börsch-Supan et al., 2013). The predominantly retrospective wave 3 of SHARE is not utilized because it is lacking measurements on the dependent and independent variables.

Each of the five intergenerational support dimensions is modelled as dependent variable with two different samples, resulting in 10 samples utilized here. An indirect assumption on which the theoretical reasonings in 2.2 are based is that retirement follows employment and previous longitudinal studies restricted their samples to people who were employed before retirement (Grünwald et al., 2021; Kahn et al., 2011; van den Bogaard et al., 2014). For this reason, for each intergenerational support dimension a sample with non-missing values on the respective dimension is created that is restricted to participants who were employed in the wave before they retired and to non-retired but employed observations. However, it could not be ruled out that these samples also include participants whose labour force status changed between the measurement of the employment and the retirement. Contrary to the aforementioned longitudinal studies, the data does not allow to differentiate between or exclude participants who were part-time employed before retirement. Additionally, in order to test whether the results based on the first five models are robust to variations in the sample and to explore whether transitions from non-employment to retirement are different from transitions from employment, another five samples are introduced that differ from the first ones by additionally including observations and participants with any labour force statuses. An overall hypothesis regarding these more extensive samples is that they show weaker associations for retirement than those restricted to employment, since the lifestyles associated with the additionally included labour force statuses before retirement of unemployment, homemaking or being permanently sick or disabled are likely to be closer to the lifestyle during retirement than it is the case during employment.

After deriving the subpopulations of interest from the available data, large unbalanced samples remain, whereby observation exclusions due to missing values are considerable. The 7 utilized waves of SHARE consist of 383,832 interviews that were conducted with 139,760 participants. 342,609 and 173,780 observations remain after excluding participants who participated only in one wave and who were already retired when participating for the first time, respectively. 19%

of the latter number of observations had to be excluded because retirement status or timing was missing. Since the dependent variables are measured on the basis of intergenerational support exchanges in the 12 months before an interview, interviews that took place less than 12 months after a retirement were excluded to avoid capturing reversed causal effects. This further reduces the number of observations from 141,457 to 136,030, and 58,407 observations remain after excluding observations without children. 57,186 or 2% less observations remain after excluding missing values in covariates. This sample has almost none missing values on instrumental support variables, but of the financial support variables about 9% are missing. Observations with grandchildren make up 34,492 observations of which almost none have missing values on grandparenting. Due to these varying sample sizes every dependent variable is modelled with the largest possible sample of complete cases. The sample sizes further reduce by 35-43% when only employed before retirement are considered.

3.2   Dependent Variables

Separate models are fitted for each of five dependent variables: Grandparenting, downward and upward instrumental support and downward and upward financial support. The measurements are gathered in SHARE by asking first to or from whom the respective support is provided, whereby the surveyed persons could nominate each time up to three persons, except for grandparenting, where the amount of support is inquired for each grandchild. For every support exchange dimension, if no child was nominated or no grandparenting declared for any grandchild, the respective dependent variable receives the value 0. Before the respective amount of support and the involved persons were inquired for each dependent variable, the respondent was asked whether the support exchange took place at all. A missing value on these filter questions was the criteria to declare the respective dependent variables as having missing values or not. Additionally, the samples for grandparenting are restricted to parents who have at least one grandchild directly before and after retirement.

Grandparenting as well as downward and upward instrumental support are measured with a four-item scale. For every grandchild, the respondents were asked whether they, on average, looked after it "about daily", "about every week", "about every month" or "less often" in the last twelve months. The same scale was used to inquire the extent of help the respondents or their spouses received from friends, neighbours or family outside the household. When information on several children or grandchildren existed, the strongest relationship in each support dimension was selected. The answer categories could have been translated into exchanging support 365, 52, 12 and 6 times in the 12 months, but I made the decision to treat the four answer categories together with no support exchange as if they would have the same distance on a metric scale by recoding "about daily" to 1, "about every week" to 0.75, "about every month" to 0.5 and "less often" to 0.25 with no support exchange as 0. The assumption behind this coding is that the transition from one frequency category to the next implicates more or less the same marginal utility for any categories since a few more or less support acts in a low exchange relationship considerably change the nature of such a relationship, whereas they are hardly noticed in a high exchange relationship. Furthermore, with the aforementioned recoding observations with the highest value of 365 were found to become very influential on the coefficients of the statistical models.

Contrary to the other intergenerational support dimensions, not the extent but only the existence of downward and upward financial support is surveyed. The questions were whether persons inside or outside the household received or provided any financial or material support amounting to 250€ or more in the last twelve months and up to three persons could be nominated each time. The interviewer instructions state to include any kinds of indirect transfers, so that the variables cover the reduction of living costs as it is also investigated in research with other

European datasets (e.g. in Iacovou and Davia, 2019; Verbist et al., 2020). Only donations to charities and loans are not supposed to be included. If any financial support relation from or to a child exists, the respective dependent variable is 1, otherwise 0. However, it remains questionable how consistent the validity of the questions on the provision of 250€ are due to inflation of the currency between the waves.

3.3 Independent Variables

The independent variable is the retirement status of a person or, to be more precise, the transition or non-transition to retirement in the context of within estimations. In SHARE, participants are asked about their current employment situation with the possible response categories of being retired, employed or self-employed, unemployed, permanently sick or disabled and being a homemaker. Retired persons receive the value 1 and all other non-missing observations 0.

The implementation of interaction terms with retirement changes the meaning of the independent variable of retirement and requires to interpret all interactions together to receive a differentiated picture of the association of retirement on the dependent variables. Retirement is differentiated by the retirement duration by means of an interaction term between the two variables. Fortunately, not only the years but also the months of both the retirement as well as the interviews are available in SHARE, from which the retirement duration can be calculated. Some participants declare different retirement dates in different waves, probably because they revised their decision to retire. For them, the latest retirement date was selected as overall retirement date. Participants that declare a retirement date before a wave in which they state not to be retired yet are completely removed from the dataset. Likewise, persons who state retirement dates after the interview date are removed as well. Due to the restriction that observations in which retirement took place less than 12 months before the interview are excluded, the lowest value for retirement duration is 1 year for retired persons. By including the interaction term of retirement duration with retirement, the independent variable of retirement becomes the predictor of the extrapolated instant effect of retirement. Observations that are not or not yet retired receive the value 0 for retirement duration. This value is insignificant, since it is multiplied with zero in the interaction with retirement status for these observations. However, retirement duration is not included as a single covariate because of the distorting values of the non-retired.

Retirement is also interacted with the gender of the participant in order to identify gender differences. Gender is coded with 1 for being a mother and 0 for being a father. It is a time-invariant variable, however, in an interaction term with retirement it becomes time-variant. By also including this interaction term, the independent variable of retirement stands for the impact of the retirement transition after zero years for fathers and the interaction term represents the deviation from the father's effect for mothers.

Retirement, retirement duration and gender are further multiplied to form a three-way interaction that captures how the dependent variable changes after retirement for mothers compared to fathers over time. The inclusion of this interaction lets the retirement-duration interaction become the coefficient of how the retirement impact changes over time for fathers and lets the retirement-mother interaction represent how the effect of retirement differs from fathers for mothers immediately after retirement. Model comparisons with additional interactions of squared retirement duration with retirement as well as retirement and gender by means of Bayesian Information Criterion show that the more extensive models yield a better bias-variance trade-off except in models with upward financial support as dependent variable. These two interactions are therefore also included in each model, whereby the interpretation of the other independent variables does not change as a consequence.

3.4 Covariates

The partnership status of the participants is operationalized with binary variables for being married and widowed. Only the marital status but not the partnership status are inquired in SHARE. However, statistics from the USA and Great Britain show that cohabitation without being married is, although becoming more frequent, relatively rare at older ages (Office for National Statistics, 2020; Stepler, 2017). With the assumption that the same is true for the rest of Europe, marital status is an appropriate proxy variable for partnership status for the surveyed population. A binary variable for being divorced is not introduced because it is a linear combination of switching in marital status from 1 to 0 and remaining not widowed. Knowing whether the person is divorced or not would only provide information on whether an unmarried and not widowed person was ever married or not, which is also asked in SHARE and could be included as a binary variable, but this does not appear to be relevant as a covariate. The abovementioned sources in this paragraph, in addition, indicate that marital status becomes less synonymous with partnership status the lower the age is. Fortunately, SHARE provides information on the partnership and not only on the marital status of the children.

The partnership and employment status of the set of children is operationalized as the share of children being partnered and employed with a range between 0 and 1. In SHARE, it is difficult, if not impossible, to trace changes within children across waves and to link data from SHARE modules on support exchanges to the module of children's demographics, which is, by the way, the reason why children are not differentiated by gender. Therefore, the best possible solution appeared to be to include the share of all children with a certain status, even if it does not capture the status changes of key children appropriately. Missing values on children's partnership and employment status were recoded to 0 before the shares were calculated and when the number of partnered or employed children was higher than the number of children, the respective share was set to 1. A difference between the first two and the other waves is that in the former only the partnership and employment statuses of the first four children were inquired, whereas in the latter information on up to 20 children is available. Probably because of this the shares of partnered and employed children are on average higher in the first two waves than in the others with an overlap of the 95% confidence intervals for the employment share. The partnership share is 2.5 times higher in the first two waves than in the rest, but the bias resulting from possible artificial partnership share declines between the waves 2 and 4 nevertheless appear to be too negligible to distort the data by downscaling the values in the first two waves or to decrease the data quality in the waves 4-8 by applying the partnership share calculation with only the first four children in them as well.

Missing values in the number of children were imputed, whereas this was not possible for the number of grandchildren. SHARE provides the numbers of children and grandchildren alive, but they can be also alternatively calculated by counting for how many children the gender was stated and how many children every child has, respectively. For observations in which the original and the alternative measurement is available, the variables for the number of children show a very high correlation and a constant and slope of almost zero and one in a linear model, while the same does not pertain for the original and alternative measurements of the number of grandchildren. Therefore, missing values of the former were imputed and observations with missing values in the latter removed. Values for the number of grandchildren above 39 are removed since frequencies of grandchildren values decrease until this value and increase thereafter again. The calculation of the number of children under age 25 was hampered by the beforementioned problem that the year of birth of children is available in the first two waves only for the first four children. The result is that this number is on average higher in the first two waves than in the other ones, but the 95% confidence intervals overlap.

Due to creating very influential observations identified in regression diagnostics, observations of participants in which the number of children and children under 25 changes by more than 3 between two waves were excluded, resulting in the exclusion of about 300 of over 50,000 observations. Likewise, 200 further observations were removed for the same reason because their grandchildren number declined by more than 5 or increased by more than 12 between two waves. The limits for the three variables were chosen because observations beyond them were rare and appeared to be very unreasonable.

The information about whether the youngest grandchild is under 7, between 7 and 13 or older is captured in two binary variables. The number of grandchildren in the respective age groups could not be derived since only the age of the youngest child of each child is asked in SHARE. Also for the calculation of these two binary variables the problem persists that in the first two waves only information on the first four children are available. Positive values for both variables are again more frequent in the first two waves than in the other with significant differences concerning the youngest child being less than 7 years old.

Unfortunately, the questions on the reasons for retirement were answered only by about every 6th participant, making it impossible to exclude the observations with missing values without introducing considerable biases by only model the other observations that are very likely in some way systematically selected into answering the question. The alternative would be to adjust for changes in the health status, the provision of personal care to persons in the same household and for the employment status of the partner as it was done especially for the own health status in previous research on intergenerational support. But it was also argued in 2.4 that changes in own health and the employment status of the partner between waves might be, at least partly, the consequences of retirement and adjusting for them could lead to overcontrol bias therefore. Furthermore, data on the labour force status of the partner is rare in SHARE. Whether a participant provides personal care in one's own household was not answered in about 20% of the observations which would have to be excluded when this covariate should be included, with the same potential problematic consequences as stated at the beginning of this paragraph. This is why the safest way to proceed appears to avoid controlling for the possible confounders of own health, the need for care of close persons and the labour force status of the partner.

3.5 Descriptive Statistics

Table 3 presents descriptive statistics separated by mothers and fathers for a sample of participants that retired after being employed and with observations that are complete by means of having no missing values in any dependent, independent or control variable. The sample is also restricted to having more than one observation per participant. This sample is not utilized by any of the regression models in 3.7, but it represents a core sample that is included in every of the ten models and is very similar to the sample for grandparenting as dependent variable with participants being employed before retirement.

The descriptive statistics for the dependent variables are in line with previous findings except for upward instrumental support. That a large share of grandparents grandparent in Europe and that the shares of parents providing and receiving instrumental support is relatively low has been observed in previous publications based on SHARE (e.g. Albertini et al., 2007). The exceptional difference to previous publications is that upward financial support is quite common in this sample although it has been often found to be among the rarest kinds of support exchange (e.g. Albertini et al., 2007; Cheng et al., 2015; Hogan et al., 1993), what questions the representativeness of the sample concerning upward financial support relations. Likewise, in the two samples for the models with upward instrumental support as dependent variable its overall

shares are only slightly lower. A possible explanation is that a large share of participants who did not receive financial support did not answer the respective questions for some reasons. However, this could also only partly explain the high shares of upward financial support, since only about 9% of the values for it are missing. Another reason for the exceptionally often upward financial support might lie in some kind of structural selection of participants into the sample, but even for observations of the first wave the share of existing upward financial support is 27% in this sample, whereas Albertini et al. (2007) report 3%. Upward financial support does also not appear to be exceptionally higher in any single wave compared to the others what speaks against disproportional panel mortality of participants who do not receive financial support as an explanation. It remains to say that the uncommon values for upward financial support might be due to a combination of these and other reasons and the results of the models of it as dependent variable should be treated with particular caution. Beyond that, the share of children partnered appears to be underrated, likely because the share of non-response on the partnership status of children is high and was coded to be zero.

The statistical modelling is furthermore unlikely to suffer from too few variation of the dependent and independent variables. In this core sample alone, 10,418 observations are followed by a further survey of the same participant, in 2,199 of which a retirement transition takes place as well as 5,346 changes in grandparenting, 2,283 changes in downward instrumental, 1,415 changes in upward instrumental, 683 changes in downward financial and 3,209 changes in upward financial support.

Moreover, smaller and non-Eastern European countries tend to be overrepresented in the sample. Countries from the largest continental European countries Germany, France and Italy that participated in SHARE since the first wave make up only about 1000, 1400 and 400 observations respectively, whereas countries with considerably smaller populations like Sweden, Denmark or Luxembourg are represented with up to 2100 observations each. Since SHARE started with wave 1 mainly in Western Europe and gradually expanded with each wave into more and more former communist countries until the EU-27 were covered since wave 7, Eastern European countries largely lack the participations in the first waves. An exception is Estonia that started participating in wave 4 and is represented with about 1900 observations in the sample. Except the countries Bulgaria, Cyprus, Finland, Latvia, Lithuania, Malta, Romania and Slovakia that started participating in wave 7 and are not at all represented in this sample, all other EU countries and Switzerland contribute at least 40 observations.

3.6 Analytical Strategy and Regression Diagnostics

On each of the ten samples, fixed effects regressions are applied with the respective dependent variables and the same set of independent and control variables. Fixed effects models fit within-demeaned data, i.e. the variables of each participant are subtracted by the participant's mean value of the variable. Such a within-estimation avoids serial correlation in panel data that would lead to an overestimation of statistical associations and has the in 2.4 mentioned causal inferential advantage of neutralizing observed and unobserved confounders. In order not to receive coefficients on the hypothetical retirement durations of zero years for fathers and mothers as described in 3.3 but at the average retirement duration in a sample, the retirement duration was subtracted by its grand mean, i.e. the mean retirement duration in a whole sample, before the modelling. To receive beyond that an overview of how retirement effects are for mothers and fathers after each year of retirement up to 10 years, the coefficients of the models are used to calculate and plot these differentiated effect sizes. 10 years were chosen as upper limit, because the 95% percentile of retirement duration in the sample used for the descriptive statistics are 10.4 years. Moreover, although it could be argued that logistic regression models might be more appropriate to estimate the probabilities of changes of the binary dependent variables of

Table 3 Descriptive statistics of observations included in each sample of 3.7

Variables	Mothers (N = 9403, n =3258)				Fathers (N = 6666, n = 2393)			
	Mean	% non-zero	Min	Max	Mean	% non-zero	Min	Max
Grandparenting	.43	73%	0	1	.34	62%	0	1
Downward instrumental support	.067	12%	0	1	.072	16%	0	1
Upward instrumental support	.048	10%	0	1	.028	6.3%	0	1
Downward financial support		4.7%	0	1		2.8%	0	1
Upward financial support		28%	0	1		33%	0	1
Retirement		27%	0	1		32%	0	1
Retirement duration	4.61	-	1	15.1	4.70	-	1	14.8
Married		58%	0	1		79%	0	1
Widowed		15%	0	1		4.8%	0	1
Number of children	2.44	-	1	12	2.61	-	1	12
Number of grandchildren	3.17	-	1	32	3.13	-	1	31
Share of children partnered	.18	30%	0	1	.19	32%	0	1
Share of children employed	.92	93%	0	1	.89	91%	0	1
Number of children under 25	.19	15%	0	6	.29	20%	0	8
Youngest grandchild aged 0-6		34%	0	1		37%	0	1
Youngest grandchild aged 7-13		7.6%	0	1		6.8%	0	1

Notes: N = number of observations; n = number of participants; mean not presented for binary variables.
Source: Own table

intergenerational financial exchange, linear probability models by means of fixed effects regressions are preferred here to preserve a uniform modelling approach and because linear probability models are an appropriate tool when their results are interpreted only in terms of marginal effects (Breen et al., 2018). A dichotomization of all dependent variables might have been a possible strategy as well, but would have a loss of information on the extent of grandparenting and instrumental support exchanges as a consequence.

Regression diagnostics are performed to investigate possible sources of bias in the models with OLS regressions of demeaned data for each of the ten samples. Several regression diagnostic

tools are not applicable to fixed effects models in Stata. At the same time OLS regressions of data where the variable values of each participants are subtracted by the mean of a participant's variable lead to the same coefficients as with fixed effects modelling, with the exception that significances are overestimated since the degrees of freedom are not adjusted downwards considering the number of participants. However, this bias compared to fixed effects models is not affecting the regression diagnostics.

The independent variables are not considerably biased by multicollinearity. Multicollinearity means a high association of an independent variable with other independent or control variables and leads to strong fluctuations of the independent variable's coefficients as a consequence of minor changes in the sample or the variable selection. A common threshold for multicollinearity becoming worrisome is crossed when 90% of an independent variable's variation are explained by the other variables. In the given samples, the independent variables' variations are less than 80% explained. A further reason for grand-demeaning the retirement duration was that the subsequent introduction of squared duration interactions did not lead to strong collinearity, whereas this was the case in several non-grand-demeaned samples.

The assumption of normal distributions of the residuals are violated in all models to varying extents. P-P and Q-Q plots show across the whole range of values that the normality assumption is violated slightly in the models for grandparenting and becomes stronger and stronger violated in the models for upward financial, instrumental and downward financial support. However, Pek et al. (2018) argue that violations of the normality assumption do not considerably bias significance levels in large samples, making an adjustment of the data or the models unnecessary.

Heteroscedasticity remains an unresolved problem in most of the models. Heteroscedasticity describes a situation in which the variance of the residuals differs across the values of the independent variables and leads to varying standard errors within a model. All applied models are significantly heteroscedastic except for the model on grandparenting with the sample restricted to employment. Since the distribution of the numbers of children, grandchildren and children under age 25 are right-skewed, adding or replacing these variables with their log-transformed values was attempted. This led become the sparsely heteroscedastic model for grandparenting in the sample with any employment become homoscedastic, but did not improve the other models and worsened heteroscedasticity in some, so that the general inclusion of logged variables was avoided.

It was possible to separate unreasonable influential observations out but other influential observations remain in considerable number. Influential observations have exceptional values in the dependent as well as independent variables and can develop strong influences on the model coefficients. Cook's distance is used to estimate how strongly the inclusion of each observation changes the model coefficients and the inspection of the most influential ones in every model revealed that large changes in the numbers of children, grandchildren and children under 25 led to several very influential observations, which is why measurement concerning these variables were taken as described in 3.4. Afterwards, in each model 3-7% influential observations remained that are exceptional, mostly due to demeaned absolute dependent variable values of 0.4 to 0.85, demeaned retirement duration values of 5 to 8 and demeaned squared retirement duration values of 30 to 85, as well as some demeaned absolute values over 0.5 for being married or widowed. Since these values do not appear to arise from measurement errors or to be unreasonable, further changes to the samples were not applied.

3.7 Results

Table 4 provides an overview of the coefficients of the ten models from which visualizations of the gender-differenced effects of retirement over the duration of retirement in figure 2 are derived. The mean retirement durations at the bottom of table 4 inform about for which retirement duration the coefficient of retirement and the interaction of retirement with being a mother are valid. Effects in figure 2 are presented in the range of 0 to 10 years and significances are defined on the basis of 95% confidence intervals, whereby gender differences for each year are calculated separately. Larger illustrations of the graphs in figure 2 can be found in the Appendix in the figures A1-A5. The two samples utilized for each dependent variable will be referred to as "employment sample" and "any employment sample".

Average treatment effects, i.e. the retirement effect when retirement duration is disregarded, for fathers and mothers are expressed in the first two independent variables in table 4 as a result of the grand-demeaning of the retirement durations. For fathers, they are only significant concerning downward instrumental support and retirement increases this dimension for them by 0.017 and 0.012 scale points in the employment and any employment samples respectively. For mothers, average treatment effects are significantly negative concerning grandparenting with a decrease of 0.028 and 0.033 scale points in the two samples and only in the employment sample concerning upward financial support with a decrease of 0.035 scale points. Likewise, average treatment effects are significantly positive for mothers when regarding upward instrumental support which increases by 0.01 scale points after retirement in both samples and downward financial support which increases by 0.022 and 0.017 scale points in the employment and any employment samples respectively.

The retirement effect on grandparenting is positive instantly after retirement and decreases with retirement duration until becoming negative. In both samples, grandparenting is significantly higher until 1 year after retirement for mothers and until 3 years after retirement for fathers. After 4 years for mothers and 6 years for fathers grandparenting becomes significantly less frequent than before retirement. Therefore, H_2 and H_7 are supported at the beginning and later stages of retirement respectively. The hypotheses H_{2a}, being reversely formulated as a stronger decline of grandparenting after retirement for mothers, is supported from 2 years after retirement onwards in the any employment sample and from 5 years after retirement onwards in the employment sample. The significant linear declines of the effects of grandparenting over time for both genders are in line with H_{7x}. In the employment sample, the effect sizes range from 0.068 scale points more grandparenting immediately after retirement for fathers and 0.16 scale points less grandparenting 10 years after retirement for mothers on a 0 to 1 scale for grandparenting.

Downward instrumental support is positively associated with retirement between the first and third years after retirement for mothers and between 2 to 7 years after retirement for fathers, whereby the latter is only true until the sixth year in the any employment sample. This supports H_1 in the respective years and overall refutes H_6. Contrary to H_{1a}, H_{1b} and H_{6x}, no gender or linear duration differences in retirement effects exist. However, in the employment sample the squared retirement duration is significantly negative for fathers. In the employment sample, the largest retirement effect sizes are 0.013 scale points after zero years for mothers and 0.012 after 4 years for fathers.

Upward instrumental support increases significantly with retirement duration to become significantly positive after 4 years for mothers and changes insignificantly for fathers. This partly supports H_5. Gender differences become significant 3 and 7 years after retirement in the any employment and employment samples respectively. The linear increase of the retirement, as predicted by H_{5x}, is only significant for mothers. Furthermore, a negative squared duration ef-

Table 4 Fixed effects regressions on intergenerational support dimensions with restricted and any labour force status samples

|	Grandparenting		Downward instrumental support		Upward instrumental support		Downward financial support		Upward financial support	
	Employed	Any	Employed	Any	Employed	Any	Employed	Any	Employed	Any
Retirement	-0.000111	-0.00229	0.0166***	0.0118**	0.00273	-0.00396	0.00118	0.00174	-0.0256	-0.00995
	(0.0111)	(0.0103)	(0.00502)	(0.00444)	(0.00389)	(0.00438)	(0.00534)	(0.00501)	(0.0139)	(0.0116)
Retirement* Mother	-0.0281*	-0.0311*	-0.00901	-0.00782	0.00692	0.0138*	0.0205**	0.0155*	-0.00973	0.000764
	(0.0138)	(0.0127)	(0.00661)	(0.00573)	(0.00512)	(0.00564)	(0.00704)	(0.00647)	(0.0183)	(0.0149)
Retirement* Duration	-0.0159***	-0.0153***	0.000716	0.0000221	0.00136	0.00116	0.000392	-0.000383	-0.00527	-0.00422
	(0.00313)	(0.00294)	(0.00143)	(0.00118)	(0.00111)	(0.00116)	(0.00149)	(0.00132)	(0.00388)	(0.00306)
Retirement* Mother*Duration	-0.00514	-0.00373	-0.00274	-0.00200	0.00206	0.00219	0.000561	-0.0000815	-0.00621	-0.00533
	(0.00412)	(0.00376)	(0.00195)	(0.00156)	(0.00151)	(0.00154)	(0.00206)	(0.00176)	(0.00534)	(0.00407)
Retirement* Duration^2	-0.0000726	0.000185	-0.000614*	-0.000243	-0.000461*	-0.000166	-0.000182	-0.0000874	-0.000736	-0.000735
	(0.000654)	(0.000606)	(0.000293)	(0.000240)	(0.000227)	(0.000237)	(0.000305)	(0.000270)	(0.000791)	(0.000622)
Retirement* Mother* Duration^2	-0.000441	-0.000661	0.000651	0.000239	0.000660*	0.000304	0.0000741	0.0000804	0.00173	0.00130
	(0.000867)	(0.000780)	(0.000403)	(0.000324)	(0.000313)	(0.000319)	(0.000421)	(0.000365)	(0.00110)	(0.000843)
Married	-0.0243	0.0336	-0.0117	-0.0149	-0.0231**	-0.0173*	-0.00931	-0.00709	-0.0136	-0.0150
	(0.0262)	(0.0232)	(0.00993)	(0.00857)	(0.00769)	(0.00844)	(0.0102)	(0.00942)	(0.0265)	(0.0217)
Widowed	-0.0348	-0.0260	0.000231	-0.00883	0.0267*	0.0523***	0.00207	0.0157	-0.0248	-0.0145
	(0.0312)	(0.0258)	(0.0134)	(0.0104)	(0.0104)	(0.0102)	(0.0138)	(0.0114)	(0.0359)	(0.0263)
Number of children	0.00722	0.00488	-0.00143	0.0000105	0.000305	-0.00295	0.000813	0.00226	0.0175*	0.0188**
	(0.00641)	(0.00571)	(0.00315)	(0.00261)	(0.00244)	(0.00257)	(0.00334)	(0.00296)	(0.00870)	(0.00683)
Number of grandchildren	0.0227***	0.0215***	0.00207*	0.00166*	0.000534	0.000793	0.00315**	0.00144	-0.00580*	-0.00634**
	(0.00220)	(0.00182)	(0.00101)	(0.000800)	(0.000781)	(0.000789)	(0.00109)	(0.000928)	(0.00283)	(0.00214)
Share of children partnered	-0.0259*	-0.0339***	-0.00262	-0.00450	-0.00519*	-0.00590*	-0.00869**	-0.00900***	-0.0175*	-0.00989
	(0.0106)	(0.00865)	(0.00295)	(0.00242)	(0.00229)	(0.00239)	(0.00311)	(0.00272)	(0.00808)	(0.00628)

Table 4 continued

	Grandparenting		Downward instrumental support		Upward instrumental support		Downward financial support		Upward financial support	
	Employed	Any	Employed	Any	Employed	Any	Employed	Any	Employed	Any
Share of children employed	0.0138 (0.00895)	0.0255*** (0.00718)	0.000782 (0.00383)	0.00199 (0.00297)	0.000505 (0.00297)	-0.00325 (0.00293)	0.00577 (0.00403)	-0.00535 (0.00334)	0.0565*** (0.0105)	0.0419*** (0.00770)
Number of children under 25	-0.00808 (0.00659)	-0.0116* (0.00570)	-0.00944*** (0.00208)	-0.00861*** (0.00176)	-0.00243 (0.00161)	-0.00304 (0.00173)	-0.00728*** (0.00221)	-0.00611** (0.00199)	-0.00946 (0.00574)	-0.00680 (0.00460)
Youngest grandchild aged 0-6	0.0301*** (0.00679)	0.0595*** (0.00539)	0.00668* (0.00301)	0.0108*** (0.00234)	-0.000444 (0.00233)	-0.00504* (0.00231)	-0.00365 (0.00321)	-0.00234 (0.00267)	0.0147 (0.00834)	0.0178** (0.00615)
Youngest grandchild aged 7-13	0.0362*** (0.0104)	0.0683*** (0.00776)	0.00519 (0.00577)	0.00535 (0.00404)	0.00365 (0.00447)	-0.00725 (0.00398)	-0.0103 (0.00606)	-0.00464 (0.00454)	0.0205 (0.0158)	0.00890 (0.0105)
Constant	0.309*** (0.0276)	0.231*** (0.0255)	0.0611*** (0.0111)	0.0546*** (0.00966)	0.0440*** (0.00858)	0.0643*** (0.00952)	0.0287* (0.0114)	0.0362*** (0.0106)	0.257*** (0.0297)	0.205*** (0.0245)
Mean retirement duration	4.36	4.38	4.45	4.59	4.45	4.59	4.47	4.57	4.47	4.57
N	5,968	10,506	12,573	19,531	12,574	19,534	11,289	17,454	11,298	11,298
n	17,124	30,028	36,765	57,123	36,771	57,134	32,778	50,615	32,810	50,643
Within-R^2	0.0263	0.0266	0.00373	0.00278	0.00528	0.00654	0.00559	0.00381	0.00429	0.00297

Notes: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; Employed = Sample with employed or retired observations; Any = Sample with any employment status; N = number of observations; n = number of participants.

Source: Own table

Figure 2 Retirement effects on dimensions of intergenerational support by gender and retirement duration
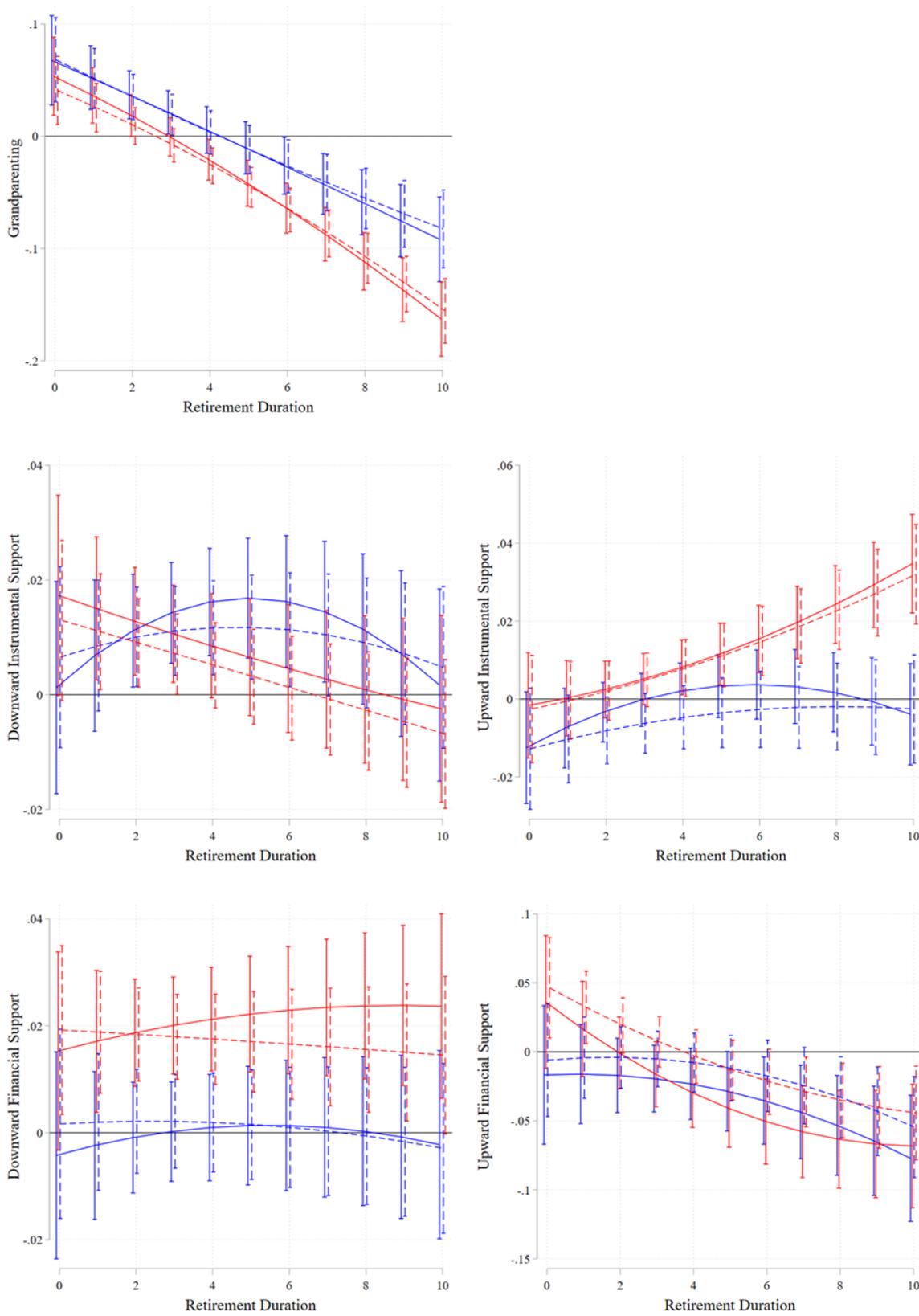
Notes: Red = Mothers; Blue = Fathers; Solid = Sample of employed persons before retirement; Dashed = Sample with any labour force status before retirement. Whiskers = 95% confidence intervals.
Source: Own table

fect exists for fathers but not mothers in the employed sample. The retirement effect reaches an effect size of 0.035 scale points for mothers after 10 years.

Downward financial support increases after retirement, as predicted by H_8 and contrary to H_3, but only for mothers while it does not change significantly for fathers. The associations for mothers are insignificant 0 years after retirement in the employment sample and 10 years after retirement in the any employment sample. Duration effects are insignificant and, contrary to H_{3a}, gender differences are significant in all years except 0 years after retirement in the employment sample and from 2 years after retirement onwards in the any employment sample. The probability increase after retirement to become a financially supporting mother is with 2.4 percentage points highest after 9 years in the employment sample.

Upward financial support declines after retirement over time and is the intergenerational support dimension in which the retirement effects differ most between the employment and any employment sample. The only positive retirement effect that supports H_4 is found for mothers until 1 year after retirement in the any employment sample. Associations become negative 4 and 6 years after retirement for mothers and fathers respectively in the employment sample and 7 and 8 years after retirement in the any employment sample. Contrary to the assumption of a stronger positive association for mothers in H_{4a}, no significant gender differences exist. The effect sizes are significantly declining over time for mothers. The most negative associations are found in the employment sample 10 years after retirement, with a 7.7 percentage points lower probability for fathers and a 6.8 percentage points lower probability for mothers to receive financial support from children compared to before being retired.

4 Conclusion

This study attempted to contribute to the scarce knowledge about the consequences of parental retirement on intergenerational support exchanges between parents and children. Theoretical considerations in regard of the consequences of the transition of retirement were discussed, and more time availability, increased religiosity, decreased financial resources, moves for the receipt of assistance by children, enhanced identification with family roles and disengagement from secular bonds were proposed as possible mechanism from which hypotheses on the impact of retirement on the intergenerational support dimensions of grandparenting and the mutual exchange of instrumental and financial support were derived, with differentiations by the gender of the parent and the duration of retirement. A set of possible confounders was derived from theoretical reasonings and empirical findings, although several confounders could not or only partly be operationalized for the analyses. Furthermore, previous research were reviewed, finding a tendency for increased grandparenting and other downward instrumental support after retirement and other forms of work time reduction.

A main contribution of this study is not only that retirement effects were found to vary across genders and different intergenerational support dimensions, but that it is also shown for the first time how these effects develop over the duration of the first ten years of retirement. On average, fathers provide more instrumental support while mothers grandparent less, receive more instrumental support and provide more and receive less financial support after retirement. Results further indicate that intergenerational support tends to decline with retirement duration. While showing positive associations of retirement with grandparenting and downward instrumental support in the first years of retirement, these dimensions as well as upward financial support are rarer in later years of retirement than before retirement. Relatively stable associa-

tions over time are found regarding downward financial support for both genders and instrumental support to fathers. Only upward instrumental support to mothers increases and becomes more and more positively significant with the duration of retirement.

Furthermore, mothers' changes of intergenerational support exchanges tend to be more pronounced than fathers'. The negative associations of later stages of retirement with grandparenting is stronger for mothers than fathers. Throughout the duration range, retirement effects on downward financial support for mothers are positive while being insignificant for fathers. And upward instrumental support to fathers' does not significantly change after retirement while it is higher in later stages of retirement for mothers.

The extent to which from these statistical associations causal relationships can be derived is limited. The utilized samples are certainly to some extent biased in terms of representativeness. Beneath the participant selection in the first place, panel mortality and non-responses on dependent, independent and control variables are potentially systematically distorting effect directions and sizes. Beyond that, time-varying confounders were only partly or not at all adjusted for, either because respective complete data was missing or because they were not though about in the first place, and the same covariate selection for five different dependent variables is unlikely to be optimal for each of them. Survey data in general may lead to under- or overestimations of the causal effects of interest. In line with the developmental stake hypothesis that parents tend to evaluate their intergenerational relationships more positive than younger generations (Aquilino, 1999; Lynott and Roberts, 1997; Shapiro, 2004; Steinbach et al., 2019; Winkeler et al., 2000), Cheng et al. (2015) indicate that the same applies for intergenerational support exchanges, which would limit the objectiveness of the parental survey answers and demand verifications from future research on the same question based on data (also) collected from children. An underestimation of the retirement consequences for intergenerational support could have also taken place in this study if the decision to retire leads to adaptions to the future retirement situation already before its actual occurrence, namely if commitment to work is gradually reduced and the salience of other activities is increased instead in regard of the approaching transition (Lumsdaine and Vermeer, 2015; Wang and Shultz, 2010).

On the other hand, this study nevertheless contributes to an approximation of the scientific knowledge on the impact of retirement on intergenerational support exchange. By applying within estimations, biases from time-constant confounders were ruled out and an extensive discussion of possible mediators and time-varying confounders and a corresponding covariate selection make an under- or overcontrolling less likely. With these measurement the likelihood rises that the modelling approach made in this study approximates a randomized controlled trial which is the least biased study design concerning causal inference but neither ethical nor feasible considering the research objective. Regression diagnostics revealed that assumptions for linear regressions are violated, but they also allowed to undertake adjustments to decrease biases in the modelling. And by utilizing two different samples, one with participants employed before retirement and one with any employment status, for each intergenerational support dimension, results did not differ considerably, speaking for a robustness of the results. Variations of data, operationalizations, covariate selections and models in future research could cumulate in a more differentiated and a more undoubted understanding of the research question.

Several directions for further research arise from this study. From the analyses, no evaluation of the validity of the proposed mechanisms can be derived. Several hypotheses are supported at least for certain gender and retirement duration combinations while others found no support at all, but in this study, the refutation of hypotheses should not be considered as a falsification of mechanisms since this was not the focus of the modelling. Future research could put emphases on this by applying mediation analyses or focusing on single mechanisms. It could further

be investigated with SHARE, how the impact of retirement on intergenerational support varies between countries or welfare regimes with multi-level analyses. Further interactions concerning age groups could be applied to clarify whether the changes of support relationships over the duration of retirement are the consequence of retirement or mere age effects that occur in ages when most people are retired. And in regard of ever-increasing life expectancies the opportunities for intergenerational relations between grandparents and grandchildren and even great-grandparents and great-grandchildren increases and could become the focus of the research question addressed here.

Beyond this, future research could consider retirement as a covariate in studies with intergenerational support as dependent variable in which the independent variable might be affected by retirement as well. The findings in previous longitudinal studies that retirement is associated with subsequent intergenerational support changes are further substantiated by this study, even though the changes were found not only to be positive but also negative depending on which dimensions were considered in this study. Previous longitudinal studies focused only on retirement transitions of persons employed before retirement and derived the need to adjust for retirement only for this group. However, the similarity of results in this study when including only participants who were employed before retirement and participants without this restriction indicates that the retirement transition has consequences for intergenerational support exchanges not only in transitions from employment but from any employment status. But it remains yet unclear, whether the effects of retirement could also be captured by adjusting for whether a person is part of the labour force or whether a person is working or not, which is the more common approach in the existing literature.

This study contributes to a marginal extent to the understanding of intergenerational relations in aging European societies. In disregard of the participants' contexts, this study focused on the examination of processes on the individual level. Implications on the national level cannot be derived since welfare systems are very diverse in Europe and not distinguished in the analyses. However, this study claims to have a certain representativeness for the whole of Europe, even if certain countries are highly overrepresented. This Europe is overall characterized by increasing life expectancies that tend to remain higher for women and by a retirement wave in the coming decades. With this in mind, the identified average effect sizes of retirement of up to about 3% increases and decreases of the support dimension scale ranges are neither tremendous nor negligible. The strongest intergenerational support changes after retirement were identified concerning grandparenting. The increases of grandparenting immediately after retirement are exceeded by its strong decline with the duration of retirement, without being clear whether this development stems from a lack of propositions by the grandparents or a lower demand of their children. Whether the average decrease of mothers grandparenting after retirement leads to more unfulfilled wishes for help by children with childcare remains questionable therefore, but the accompanying decrease in contact between grandparents in grandchildren likely weakens intergenerational ties beyond parent-child relations. The tendency to provide more instrumental support in the first years after retirement can be interpreted as a positive development if it does indeed relieve younger generations as well as increase the well-being of retirees. The increasing instrumental support receipt of mothers over the duration of retirement can be interpreted positively as a satisfaction of mothers' increasing need in higher ages to receive support or negatively as a burden for children who can share the task with ever-less siblings and as a source for feelings of guilt for parents. Moreover, in the light of the finding that mothers tend to provide more to and receive less financial support from the next generation, apprehensions that a high share of retirees in a society are an economic burden for the subsequent generations are mitigated.

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Appendix

Table A1 Overview of statistical associations between labour force status and intergenerational support

| Variable	Reference	Study	Role of the variable	Study design	Data	Sample and Context	Years	Moderators	Grandparent	Downward instrumental support	Downward financial support	Gender difference
Retired												
Full-time employed	Kahn et al., 2011		Independent variable in bivariate regressions	Longitudinal (2 waves)	Wisconsin Longitudinal Study	Wisconsin (USA) 1957 high school graduate cohort, measurement in 2004, restricted to full-time employed in 1993	1993-2004	-	+ for fathers	+ for fathers		0 for mothers
Employed	van den Bogaard et al., 2014		Independent variable	Longitudinal (2 waves)	Netherlands Kinship Panel Study	Persons aged 50-65 who work 24+ hours per week during the first wave in the Netherlands	2002-2007	Income		+		not modelled
Employed	Grünwald et al., 2021		Independent variable	Longitudinal (2 waves)	NIDI Pension Panel Study	Working persons aged 60-65 in 2015 in the Netherlands	2015-2018	Income	+	0		not modelled
Employed	Hank and Stuck, 2008		Covariate	Cross-sectional	SHARE wave 1	Parents aged 50+ in 11 European countries	2004	-		0		not modelled
Employed	Emery, 2013		Covariate	Cross-sectional	SHARE wave 2	Parents aged 50+ in 14 European countries	2006	Income			-	not modelled
Unemployed	Emery, 2013										0	not modelled
Unemployed	Hank and Stuck, 2008									0		not modelled
Homemaker	Emery, 2013										+	not modelled
Disabled	Emery, 2013										0	not modelled

Variable	Reference	Study	Role of the variable	Study design	Data	Sample and Context	Years	Moderators	Grandparent	Downward instrumental support	Downward financial support	Gender difference
Not part of labour force												
	Employed	Lakomý and Kreidl, 2015	Independent variable	Longitudinal (3 unbalanced waves)	SHARE wave 1-3	Parents aged 50+ in 19 European countries	2004-2011	Distance	+			not modelled
	Employed	Uhlenberg and Hammill, 1998	Covariate	Cross-sectional	National Survey of Families and Households wave 2	Grandparents in the USA	1992-1993	Distance	0			separate models for mothers and fathers
	Employed	Hillcoat-Nallétamby and Dharmalingam, 2003	Covariate	Cross-sectional	Transactions in the Midlife Family Survey	Parents aged 40-54 and adult children in New Zealand	1997	Income, religion, distance, contact		-	-	not modelled
Unemployed												
	Employed	Lakomý and Kreidl, 2015							+			in cross-sectional analyses + only for mothers
	Employed	Hillcoat-Nallétamby and Dharmalingam, 2003								0	0	not modelled
Not employed												
	Employed	Igel and Szydlik, 2011	One of many independent variables	Cross-sectional	SHARE wave 1	Parents aged 50+ in 11 European countries	2004	Distance	+			not modelled
	Employed	Silverstein and Marenco, 2001	Covariate	Cross-sectional	Own survey	Grandparents in the USA	1997-1998	Income	0			not modelled

Variable	Reference	Study	Role of the variable	Study design	Data	Sample and Context	Years	Moderators	Grandparent	Downward instrumental support	Downward financial support	Gender difference
	Employed	Hank and Buber, 2009	Covariate	Cross-sectional	SHARE wave 1	Parents aged 50+ in 11 European countries	2004	Distance	+			+ more significant for fathers
	Employed	Aassve et al., 2012	Covariate	Cross-sectional	SHARE wave 2	Parents aged 50+ in 14 European countries	2004-2006	-	+			not modelled
Part-time												
	Full-time employed	Kahn et al., 2011							+ for mothers	+ for mothers		0 for fathers
	Employed	Lakomý and Kreidl, 2015							0			not modelled
	Employed	Silverstein and Marenco, 2001							0			not modelled

Notes: +, - and 0 stand for positive, negative and insignificant associations. Repetitive cells are omitted after a study is introduced.
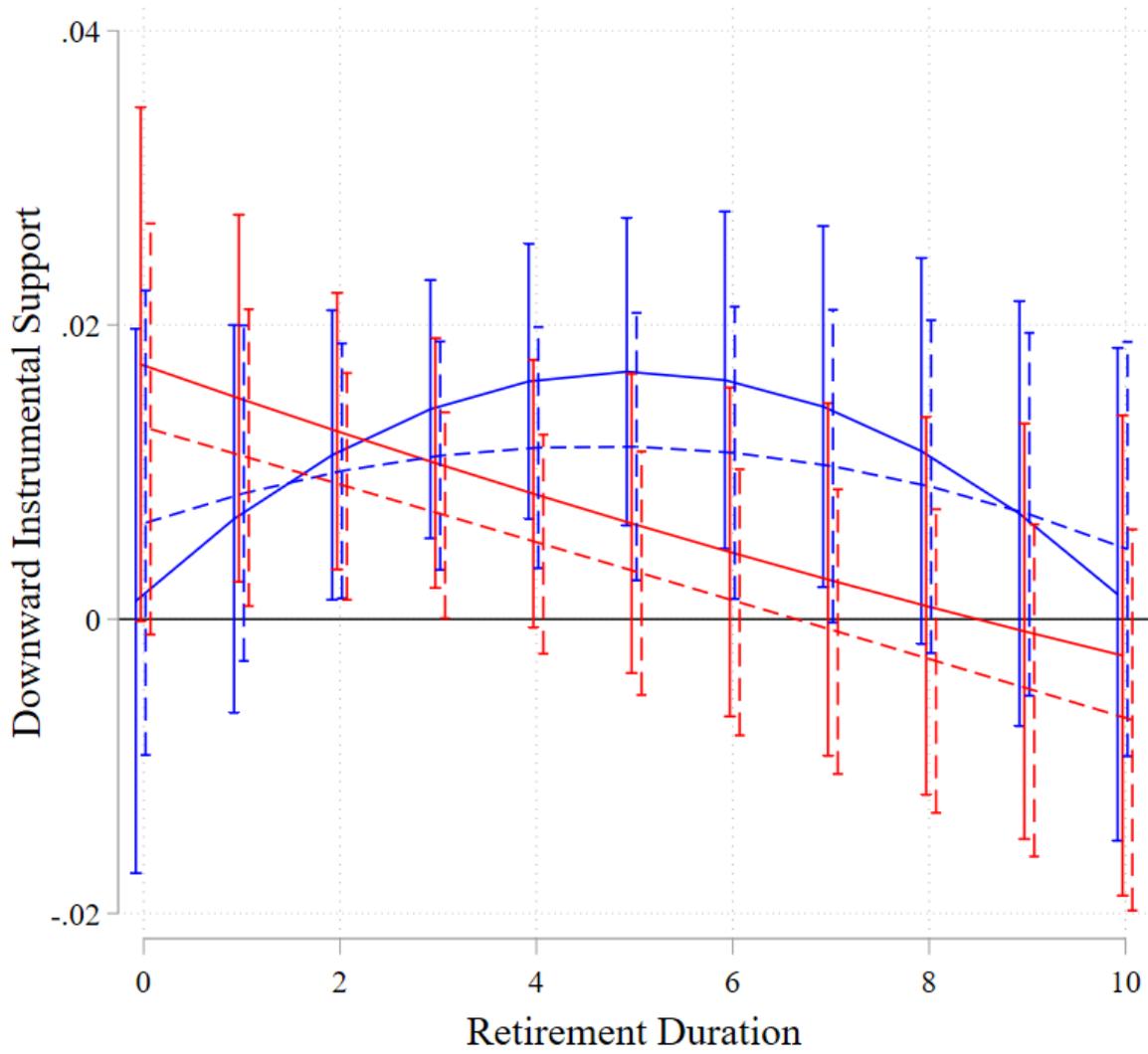
Source: Own representation.

Figure A1 Retirement effects on grandparenting by gender and retirement duration
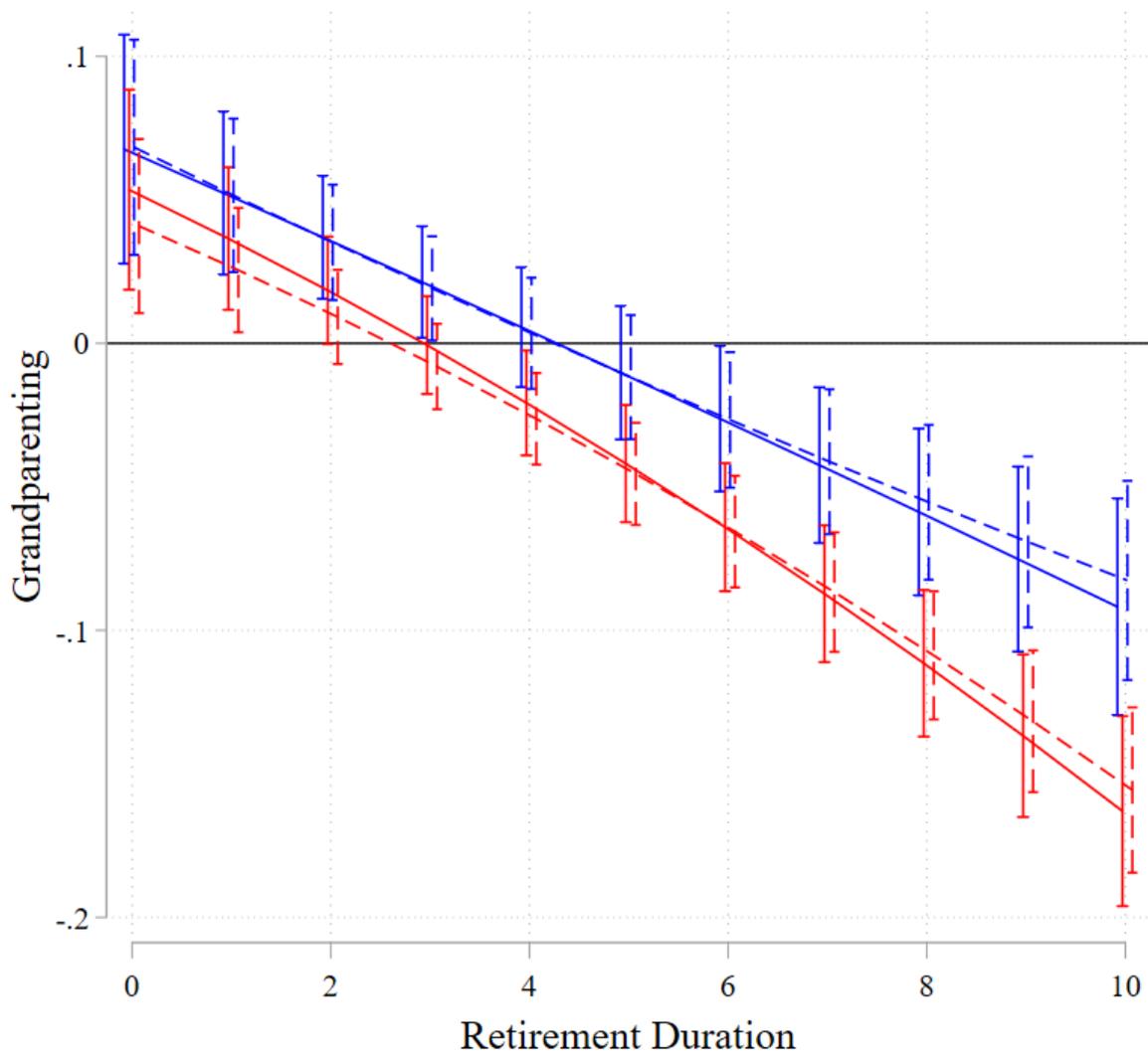
Notes: Red = Mothers; Blue = Fathers; Solid = Sample of employed persons before retirement; Dashed = Sample with any labour force status before retirement. Whiskers = 95% confidence intervals.
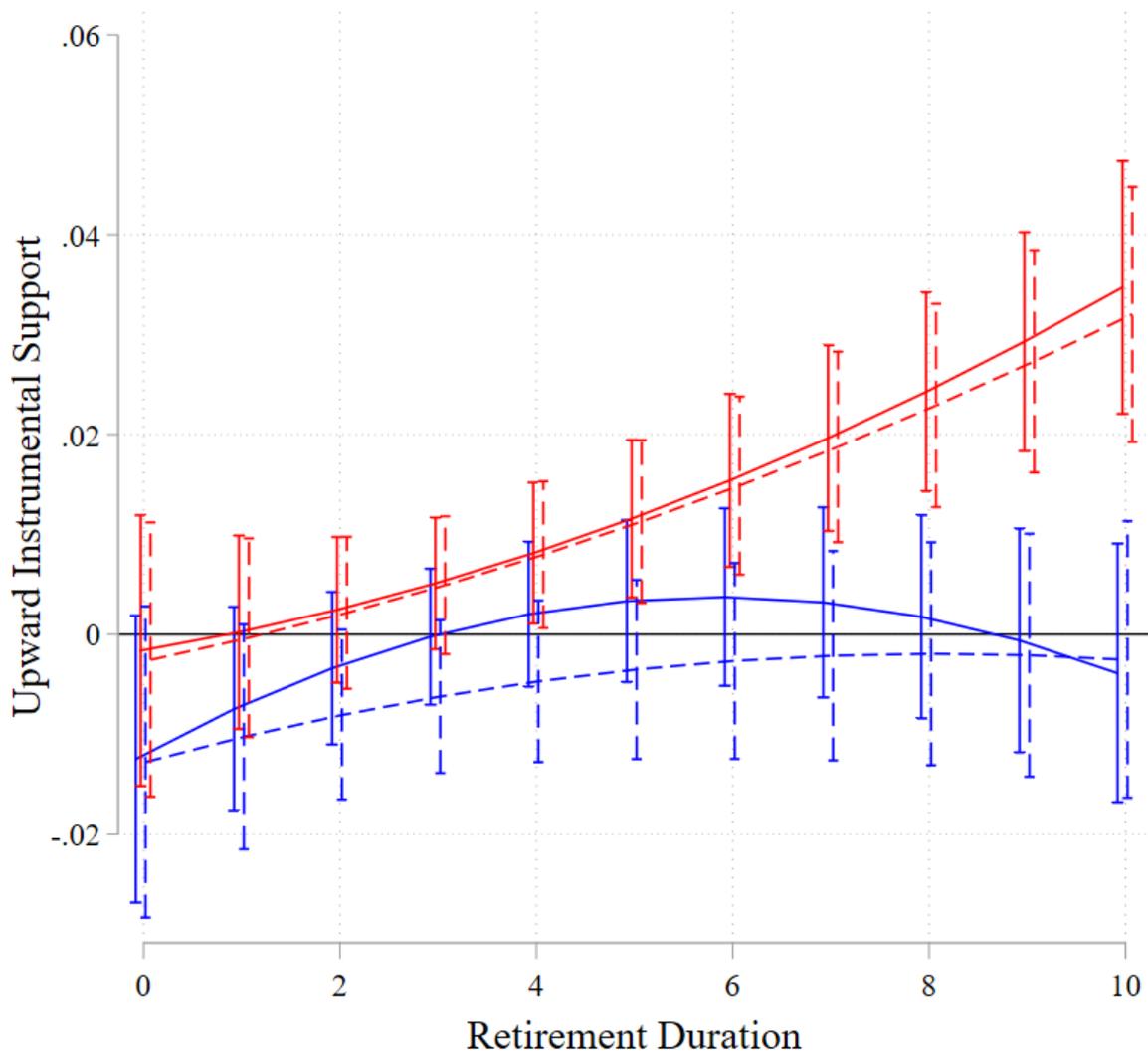
Source: Own table

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Figure A2 Retirement effects on downward instrumental support by gender and retirement duration

Notes: Red = Mothers; Blue = Fathers; Solid = Sample of employed persons before retirement; Dashed = Sample with any labour force status before retirement. Whiskers = 95% confidence intervals.
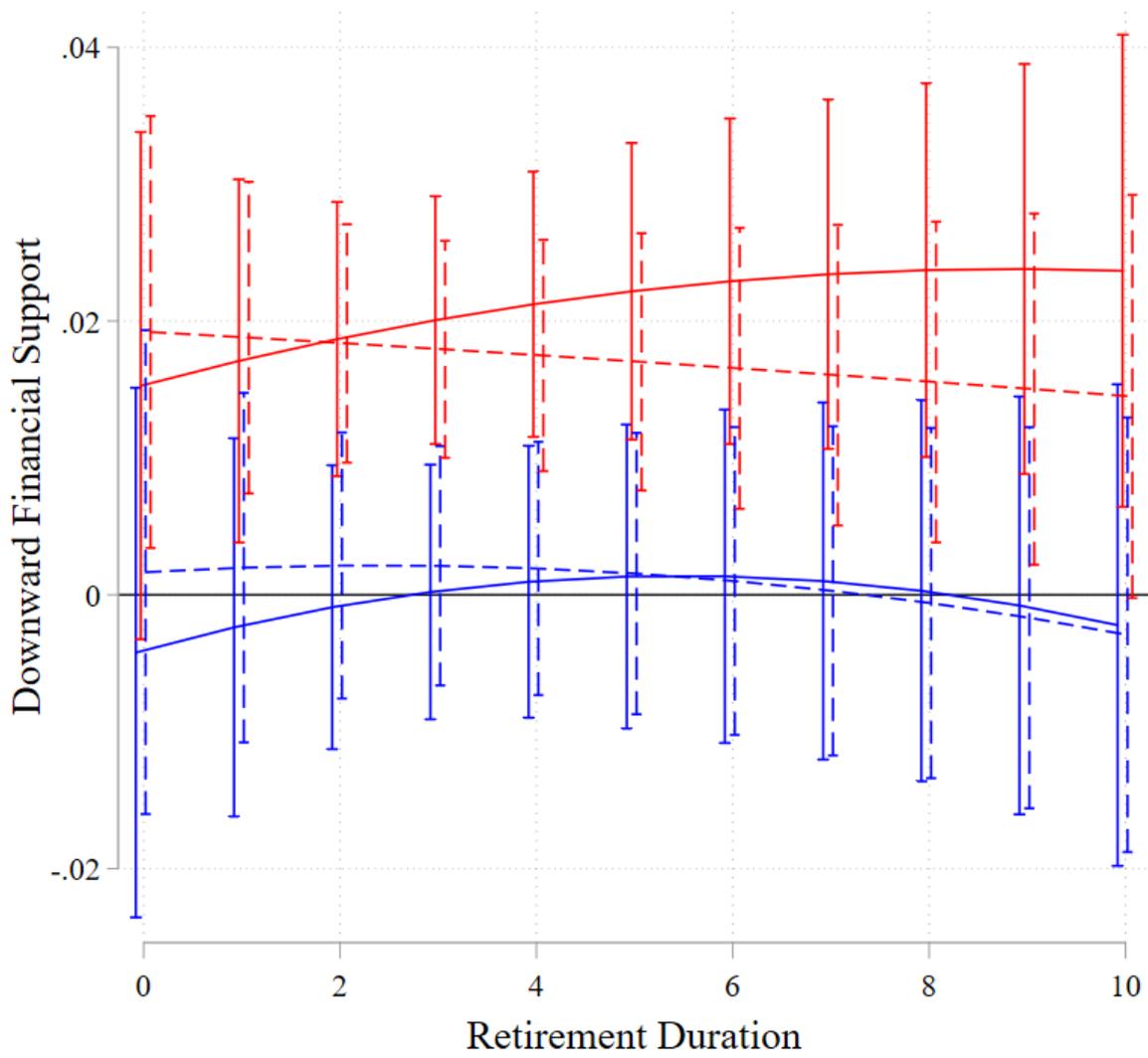Source: Own table

Figure A3 Retirement effects on upward instrumental support by gender and retirement duration

Notes: Red = Mothers; Blue = Fathers; Solid = Sample of employed persons before retirement; Dashed = Sample with any labour force status before retirement. Whiskers = 95% confidence intervals.
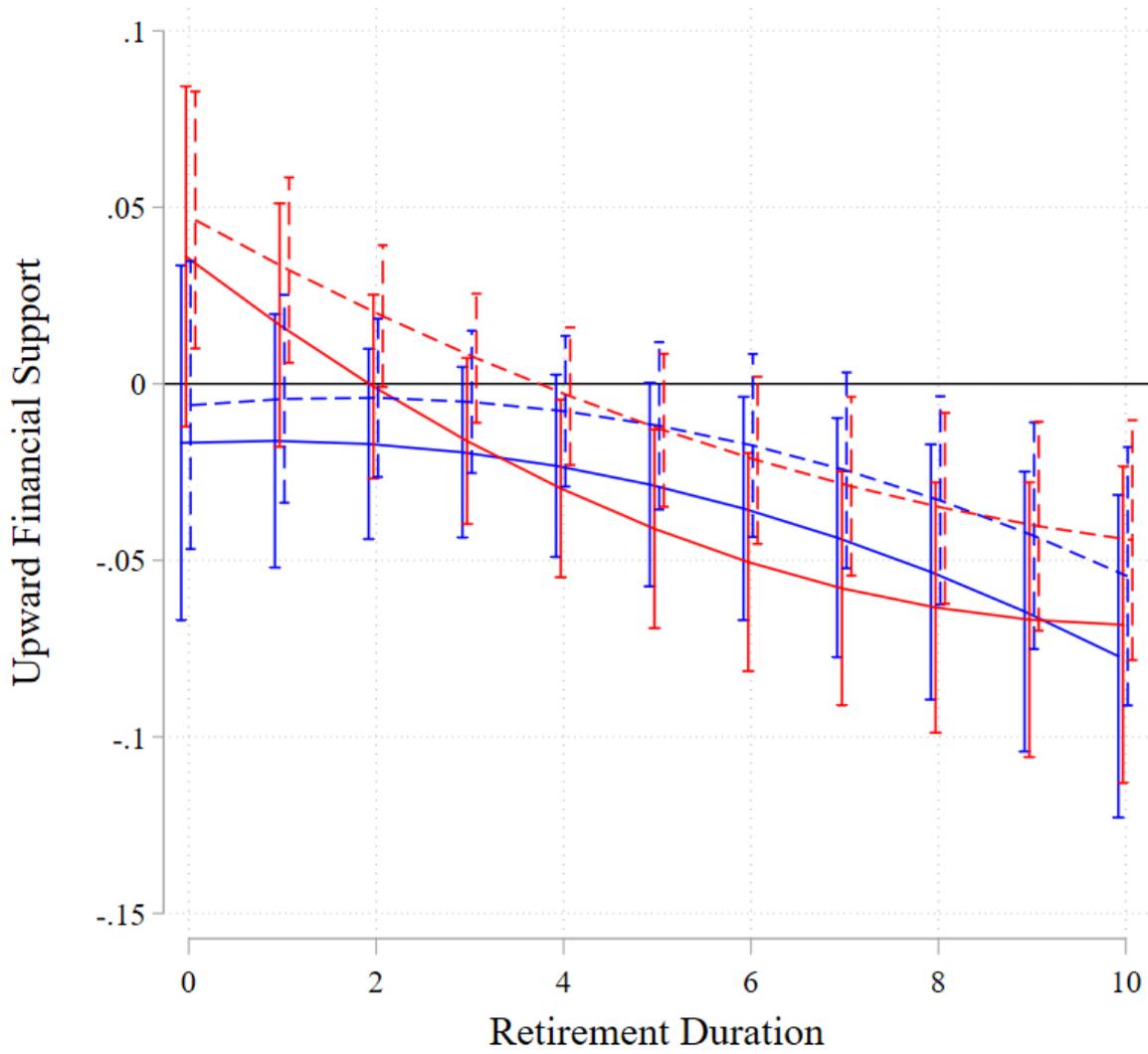Source: Own table

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Figure A4 Retirement effects on downward financial support by gender and retirement duration

Notes: Red = Mothers; Blue = Fathers; Solid = Sample of employed persons before retirement; Dashed = Sample with any labour force status before retirement. Whiskers = 95% confidence intervals.
Source: Own table

Figure A5 Retirement effects on upward financial support by gender and retirement duration

Notes: Red = Mothers; Blue = Fathers; Solid = Sample of employed persons before retirement; Dashed = Sample with any labour force status before retirement. Whiskers = 95% confidence intervals.
Source: Own table

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