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Maternal employment and statutory retirement age for their parents: An analysis across 15 European countries

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Abstract: This thesis examines the role of grandparents' statutory retirement age for mothers' employment across 15 European countries. The goal is to improve our understanding of how the macro-level policy shapes mothers' employment outcomes through its impact on downward intergenerational support. Individual-level data from the Survey of Health, Ageing and Retirement in Europe (SHARE) between 2004 and 2015 are complemented with country-level data on legal retirement ages from the Mutual Information System on Social Protection (MISSOC). The empirical analysis estimates logistic regression models on a sample of 5,673 grandparent-mother dyads (9,545 dyad-wave observations). No support is found of a substantial or significant overall effect of legal retirement age on maternal employment. The result is robust to important variation in the sample and different specifications of statutory retirement age. While the suspected mediation path through grandparents' employment and childcare behaviour tends to be underpinned, it could not be assessed with confidence. Heterogeneity analyses suggest that increases in statutory retirement age impact differently the employment of mothers without tertiary education and of those with children younger than 3 years. Differences by partnership status are not statistically significant. In total, these results indicate that the legal retirement age might be more relevant for mothers' employment when they have a higher need for cheap and flexible grandparent-provided childcare. Further research is needed distinguishing countries by more than one macro-institution and based on samples with greater variability in legal retirement ages.

Keywords: *maternal employment, retirement age, grandparents, childcare, SHARE*

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Abbreviations

AIC	Akaike information criterion
AME	Average marginal effect
BIC	Bayesian information criterion
ESS	European Social Survey
GGS	Gender and Generations Survey
ILO	International Labour Organization
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
MEA	Munich Center for the Economics of Aging
MISSOC	Mutual Information System on Social Protection
OECD	Organisation for Economic Co-operation and Development
SHARE	Survey of Health, Ageing and Retirement in Europe

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1 Introduction

1.1 Background and problem statement

In Europe, grandparents play an important role in facilitating mothers' employment (e.g.: Aassve et al., 2012a; Dimova & Wolff, 2011). Hank and Buber (2009) show based on data of 10 European countries that 58 % of grandmothers and 49 % of grandfathers took care of at least one of their grandchildren in 2003/2004, despite improvements on the provision of formal childcare in many European countries. In this context, grandparent-provided childcare is considered especially relevant for women's employment "whenever childcare is either not free or universally available" (Arpino, Pronzato, & Tavares, 2014, p. 370). Gray (2005), notes that grandparents' role in grandchild care-assistance may cause a trade-off between their labour force participation and the one of their children:

"[...] if the employment rate of those in their early 60s rises, the supply of grandparent childcare may start to dwindle. There is therefore a potentially serious conflict between two current goals of employment policy in the UK, and possibly in the EU more widely; on the one hand the goal of raising the employment rate of seniors in order to improve labour supply and address difficulties in pension provision, and on the other hand the goal of increasing the proportion of mothers in work." (Gray, 2005, p. 575)

Next to enabling mothers' employment, increasing employment of elderly remained a ubiquitous and wide-spread political goal. Since the late 1990s, adjusting statutory ages of retirement to persistent longevity gains and changing age structures has become an increasingly popular instrument to pursue this goal in industrialised countries (OECD, 2017). Some countries – amongst them Denmark, Finland, Hungary, Italy, the Netherlands, Portugal, Sweden and the Slovak Republic – even created an automatic adjustment mechanism for retirement age, by linking it to life expectancy. Effective ages of retirement entry largely follow the legal arrangements. Women in OECD countries entered retirement on average with 61.2 years in 2002 and with 63.6 years in 2016, for men the ages even increased from 62.2 to 65.1 years on average (OECD, 2017, p. 49 Figure 6.2). The OECD (2017, p. 50) expects the trends of rising legal and effective retirement ages to continue. Casting a glance at the average ages of first grandparenthood in Europe reinforces the relevance of retirement legislation: Women's age at grandparenthood is on average 52 years in Germany; 53 in France, Italy, and the UK, and 55 in Spain (Glaser, Di Gessa, & Tinker, 2014). When grandparents retire, their oldest grandchildren are thus still rather young.

Meanwhile, the link between grandparental childcare and maternal labour supply has become well understood (see section 2.2.2). However, the role of legal retirement regulations rarely is empirically investigated, albeit it has not escaped the attention of scholars studying grandparents' role in maternal labour force participation. Many of these scholars warn that policies targeted at higher labour supply of the grandparent generation may come at the cost of mothers' labour supply (Aparicio-Fenoll & Vidal-Fernandez, 2015; Kanji, 2017; Posadas & Vidal-Fernandez, 2013; Zamorro, 2011). In addition, the role of legal retirement age repeatedly has been subject to a demand for further research (Hank & Buber, 2009; Henkens et al., 2017). Three notable exceptions investigate on legal retirement age's relation with maternal labour supply. These studies by Aparicio-Fenoll and Vidal-Fernandez (2015) and Bratti, Frattini, and Scervini (2018) on Italy and by Johnsen (2015) on Norway find evidence for a substantial negative impact of higher legal retirement ages on mothers' labour supply.

1.2 Objective and research questions

This thesis aims to contribute to the existing research on maternal labour force participation and intergenerational relationships in welfare states, by tracing an arc to the role of grandparents' statutory retirement age. This macro-level arrangement will be studied across 15 European countries (Austria, Belgium, Denmark, Estonia, France, Germany, Italy, Luxembourg, the Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and Switzerland). The data on 5,673 grandparent-mother dyads with 9,545 dyad-wave observations is compiled from five waves of the Survey of Health, Ageing and Retirement in Europe (SHARE) between 2004 and 2015. Statutory retirement age information comes from the Mutual Information System on Social Protection (MISSOC) between 2004 and 2014. The central question of interest – *How is the statutory retirement age related to maternal employment?* – is divided into three sub-questions:

1. How does grandparents' legal retirement age affect maternal employment?
2. Is the effect mediated through grandparent-provided childcare?
3. What is the role of mothers' childcare needs in the effect of legal retirement age on maternal labour force participation?

The terms *statutory* and *legal* retirement age are used interchangeably in this thesis to denote the country-specific legal age from which a full old-age pension might be received. It always refers to the grandparent generation.¹ Previous literature identifies two possible mediation paths of grandparents' legal retirement age: Grandchild care and financial transfers to descending ties (e.g.: Aparicio-Fenoll & Vidal-Fernandez, 2015). The retirement age could affect both through its effect on the employment status of a grandparent at a certain age: Remaining employed instead of entering retirement likely decreases the amount of temporal resources but increases the amount of liquid assets grandparents have at their disposal. Thus, it increases grandparents' capacity to look after grandchildren and decreases their capacity to financially support descendent ties. Therefore, mediation is an important concept for the research question. This thesis focusses on the channel of grandchild care, albeit the path of financial transfers will receive some attention as an alternative explanation, too. The third sub-question discerns mothers by some characteristics that determine their need for informal childcare. This way, heterogeneity in the effect of retirement age on mothers' employment decisions can be detected, when they have different partnerships statuses, educational levels, or children of different ages.

1.3 Scientific and societal relevance

The immediate political and societal relevance of the topic lies at hand. In ageing societies, the retirement age is a comparatively easy-to-change institution and increasingly used in government's pursuit of a higher labour force participation of elderly persons (OECD, 2017). If a policy of increasing retirement age creates a trade-off between mothers' and grandparents' employment chances and extends the middle generation mothers' career-family conflict to the grandparent generation (Hank & Buber, 2009), then this is an issue of public interest and should be subject to public debate. In practice, an improved understanding of the interplay of structural conditions and intergenerational family relationships may help to create political sensitivity for unforeseen and unwanted consequences of well-intended regulations. Once awareness is raised among the public and policymakers, research results may inform progressive policies that aim at averting negative consequences from existing regulations.

Advancing our knowledge of contextual factors in the family-support realm is also of major theoretical interest to the social sciences. Ample evidence corroborates the micro level significance of grandparents' childcare support and that it differs by macro-level – welfare state, cultural norms – context (see overviews by: Zanella, 2017; Del Boca, 2015). Exploring the role of single policies for women's professional chances is identified as the logical and required next step towards a more nuanced understanding of the circumstances that promote and constrain each generation's labour force participation in a context of interlinked lives (Dykstra, 2018). Complex social realities in intergenerational relationships render plausible an effect of grandparents' legal retirement age on mothers' labour force participation. Therefore, understanding the consequences of retirement age beyond its direct effect on elderly persons is theoretically and substantially relevant.

Turning the view towards the legal retirement age, a determinant of grandparents' employment and childcare behaviour, has at least one major methodological advantage to directly studying the latter two. The statutory retirement age is not subject to individual choice, other than by democratic processes. Hence, it avoids many issues related to unobserved preferences and self-selection. Moreover, a distinctive feature of this thesis is that multiple countries with retirement reforms at several points in time are considered. This should render the estimate of the policy's impact more robust compared to exploiting information on a single country or a single point in time solely.

The chapters of the thesis are structured as follows: Chapter 2 introduces the theoretical background and reviews the empirical literature with an eye on determinants of grandparents' retirement and childcare behaviour and their link with mothers' labour supply. Studies on legal retirement age are examined in more detail, locating the present research alongside this existing literature. At the end of Chapter 2, the resulting conceptual model and hypotheses are presented. Chapter 3 outlines the data sources and sample selection before explaining the variables and the analytical strategy. Chapter 4 first starts with the descriptive analyses of mothers' employment and legal retirement age. Second, following the structure given by the hypotheses, multivariate results of logistic regressions on mothers'

employment are presented. The results are, third, examined in their robustness. Chapter 5 summarises and discusses the results as well as the main limitations of the analysis. It concludes with an outlook for future research and considerations for policymakers who seek to raise employment by increasing the legal retirement age.

2 Theoretical framework

2.1 Theoretical background

2.1.1 Demographic conditions and intergenerational family support

The question of how maternal employment is linked with the legal retirement age is inherently about intergenerational relationships. Social-psychological and demographic approaches to the latter call attention to the importance of taking into account interdependent relations between human lives, and in particular to the vertical interdependence of intergenerationally linked lives (Dykstra & Hagestad, 2016; Elder, 1994). In addition, several demographic, social and economic developments point towards a historically unprecedented relevance of grandparent-grandchild relationships in Western societies (Bengtson & Roberts, 1991). The demographic transition brought about an increased length of life and low fertility going along with fewer grandchildren per grandparent and a greater overlap in the lives of grandparents and grandchildren than ever before. In turn, this implies a greater availability of grandparents to grandchildren (Bengtson, 2001). Besides, increasing female employment and divorce rates suggest a rising importance of grandparents' childcare involvement for the middle and the grandchild generation. Indeed, research in and the UK (Gray, 2005) and the Netherlands (Geurts, van Tilburg, Poortman, & Dykstra, 2015) shows an upward trend in the development of grandparental childcare since the 1980s (UK) and 1990s (Netherlands) that is associated with maternal employment and single motherhood. Against constantly rising rates of grandmothers' employment participation, Hank and Buber go as far to predict a need to reconceptualise "the need to balance work and family commitments [as] a multigenerational family matter" (2009, p. 69). This considered, Hagestad's (2006) demand for taking a three-generation perspective on grandparent-grandchild relationships seems all the more justified since decisions and characteristics of grandparents, parents, and grandchildren are interdependent.

2.1.2 Political context of family support

Next to the demographic and social dimensions, structural conditions outside the family bear on intergenerational support, childcare arrangements and maternal labour supply. Public policies provide the legal framework that structures the life course of individuals (Kohli, 1985). Cross-generational relationships are shaped by the macro-political context through its function of enabling, mandating, easing, or constraining reliance and support between family members (e.g.: Attias-Donfut, Ogg, & Wolff, 2005; Dykstra, 2018; Dykstra & Hagestad, 2016; Saraceno & Keck, 2008).

Since policies operate through the social and economic context, policy outcomes can be understood as effects of policies interacted with a context of labour market characteristics and social values (Saraceno & Keck, 2010). If family resources are backed up by the public provision of money and support, intergenerational transfers are more likely and less intense in terms of money and time spent (Brandt & Deindl, 2013). Consequently, the grandparents' role for mothers' employment likely depends on the specific socio-economic conditions and welfare state regime. In countries with large early childcare gaps, less generous parental leave policy contexts² and where employment usually is full-time, the need for frequent childcare by grandparents should be highest (Bordone et al., 2017; Di Gessa, Glaser, Price, Ribe, & Tinker, 2016; Glaser et al., 2014). There, intergenerational support plays an important role for mothers' employment. Against this background, the different welfare state regimes are found associated with typical patterns of intergenerational support through financial transfers and childcare help: In the Nordic countries downward assistance in money and kind from parents to children is more common but less intense than in the Southern European countries. Continental European countries are located between the two (Albertini, Kohli, & Vogel, 2007; Di Gessa et al., 2016; Hank & Buber, 2009; Igel & Szydlik, 2011).³

Lastly, the political context is important for individuals' work and childcare preferences, too. Goerres and Tepe (2010) suggest understanding childcare preferences as shaped by existing institutional arrangements in the policy and family-solidarity domain. Specifically, their framework posits when state support to families and children and actual help between family members are on a high level, individuals are likely to prefer higher public childcare support. When individuals experience state support as the norm, they seem to develop demands for it as this support also relieves their family members. Nevertheless, in democracies the people are the sovereign. That means, the link between individual values, attitudes, behaviours and the policy context works in both directions (Saraceno & Keck, 2008).

In sum, the ideas collected so far advocate that individual decisions on childcare and work by grandparents and mothers should not be taken as isolated or completely individualist. Rather, it is useful to see them as resulting from the interaction with family-ties in a given but fluid demographic, social, economic and political setting. This highlights the importance of taking into account national differences in the political and institutional context of grandparents' childcare assistance and mothers' employment.

2.1.3 Endogeneity of employment and childcare decisions

A key methodological challenge to the study of grandparents' retirement and grandchild care's effect on maternal employment arises from their endogeneity (e.g.: Aassve et al., 2012a; Arpino et al., 2014). Grandparents might look after their grandchildren simply because mothers work. Apart from this, unobserved preferences of individuals in two generations are relevant to mothers' employment. Independent of the retirement conditions, work-oriented grandparents may have a greater desire to stay employed at older ages and they may have lower preferences to give childcare than their family-oriented counterparts. Both these variables are endogenous. Moreover, mothers' unobserved work-family orientation is shaped by their parents' attitude towards female employment (Aassve et al., 2012a). As the parental role-model, their mother's attitude should matter. Together with a mothers' preferences on the 'externalness' of childcare (El-Attar, 2013), her work-family orientation influences her decision to work. This given, low grandparental childcare involvement is likely for mothers with very high and very low preferences for employment. The reason is grandparents' childcare involvement will be low either because the mother prefers to personally care for her child and to stay home (traditional work-family orientation) or because she prefers formal childcare and to be employed (modern work-family orientation) (Arpino et al., 2014). Therefore, not controlling for mothers' and grandparents' employment and childcare preferences will positively or negatively bias⁴ the estimates of the effect of grandparental retirement and childcare on maternal labour force participation.

2.2 Related empirical literature

2.2.1 Determinants of grandparents' retirement and grandchild care

The legal age of retirement constrains a grandparent's retirement behaviour by defining the point in time when the first pension benefits become available. There is ample evidence that changing the legal age of retirement is effective in changing labour supply at older ages in Europe and the US (Börsch-Supan, 2000; Gruber & Wise, 2009; Lumsdaine & Vermeer, 2015; Zamarro, 2011). For example, in none of the country studies by Gruber and Wise (2009) retirement was common before the legal age of retirement. Zamarro (2011) jointly estimates grandparents' retirement and childcare decisions based on SHARE data of 10 countries in 2004. He finds age-based retirement eligibility to significantly reduce grandmothers' labour supply. It is, however, important to note that increasing the retirement age does not only reduce the rate of individuals entering retirement. A quasi-experimental study on pension reforms in Italy revealed that increasing the obstacles to retirement eligibility led to more people claiming disability- and unemployment support benefits, next to increased employment rates (Ardito, 2017). There is considerable variation in retirement behaviour among public and private employees, the social classes and employment sectors (Radl, 2013). Radl (2013) finds for instance that women retire earlier than men mostly due to their lower class positions, and calls attention to differential exposure to risks for bad health and unemployment by social class. Next to this, becoming a grandparent has been found to considerably speed up the transition to retirement for grandmothers, controlling for age, health status and other predictors of retirement (Frimmel, W., Halla, M., Schmidpeter, B., & Winter-Ebmer, R., 2017; Kridahl, 2017; Lumsdaine & Vermeer, 2015; van Bavel & Winter, 2013).

As regards determinants of grandparental childcare, previous research identifies grandparents' availability as a key factor next to the availability of part-time jobs and formal childcare opportunities (cf.: Dykstra, 2018; Saraceno & Keck, 2010). Grandparents' retirement status is crucial for their grandchild care, with those not working caring considerably more often than the employed (Hank & Buber, 2009; Igel & Szydlik, 2011; Zamarro, 2011). Thus, since the legal retirement matters for grandparents' retirement decision, it thereby also partly determines their childcare availability.

Further, the existing literature identifies socioeconomic and demographic characteristics at grandparent, mother and child level as determinants of grandparental childcare. Grandmothers especially maternal grandmothers are more likely to help with childcare than grandfathers (Di Gessa et al., 2016; Fuller-Thomson & Minkler, 2001; Hank & Buber, 2009). However, the gender gap in

grandparenting is less pronounced after retirement entry (Leopold & Skopek, 2014). In the study of Hank and Buber (2009), partnership status only makes a difference for grandfathers' childcare involvement, but other studies find that partnered grandmothers have a higher likelihood of being employed and of providing grandchild care than single grandmothers (e.g.: Ho, 2015; Di Gessa et al., 2016). Young and healthy grandparents are involved in childcare more often than older and unhealthy grandparents (e.g.: Glaser et al., 2014). Grandchild care was also found to differ along grandparents' educational attainment, higher educated grandparents are more likely to care for their grandchildren (e.g.: Di Gessa et al., 2016; Igel & Szydlik, 2011; Arpino & Bordone, 2014). Simultaneously, higher education is associated with modern attitudes towards female employment and the externalisation of childcare (Arpino et al., 2014). Geographical proximity is another factor facilitating practical help between the family members (Mulder & van der Meer, 2009). Accordingly, living close to (grand-) children is positively associated with care involvement (Ho, 2015) and mothers' employment (e.g.: Compton & Pollak, 2014; García-Morán & Kuehn, 2017). On the level of mothers' characteristics, grandparents across Europe are more likely to provide childcare when their children are young, single, or have young children (Dimova & Wolff, 2011; Hank & Buber, 2009). Similar results for mothers' characteristics were found in a study on the Netherlands, where Geurts et al. (2015) suspect that for those mothers' the main argument to use grandparental childcare is given by its relatively cheap price and temporal flexibility. The presence of siblings limits grandparental childcare help, perhaps because they are in concurrence for a grandparent's limited time (Aassve, Meroni, & Pronzato, 2012b). This interpretation is supported by Zamarro (2011) who finds that the number of grandchildren limits grandchild care involvement.

2.2.2 Grandchild care and maternal employment

Recent research on the effect of grandparent-provided childcare on maternal labour supply consistently finds that grandparent-provided childcare significantly and substantially increases mothers' employment (Aassve et al., 2012a; Arpino et al., 2014; Compton & Pollak, 2014; Dimova & Wolff, 2011; García-Morán & Kuehn, 2017; Posadas & Vidal-Fernandez, 2013). For example, Dimova and Wolff (2011), find a strong positive average effect of grandparent-provided childcare across 10 European countries on mothers' labour supply. They allow errors for maternal employment, grandparental childcare and financial transfers to be correlated to account for unobserved preferences. Additionally, they employ what Arpino et al. (2014) call an 'implicit instrumental approach', excluding some grandparent-level characteristics that could be correlated with daughters' employment decision. For West Germany, García-Morán and Kuehn (2017) simulate a model that allows decisions of residential location, fertility and labour force participation to be made jointly. They find that geographical proximity between grandparents and mothers is associated with higher labour force participation and lower wages for the mothers. Endogeneity of retirement and childcare decisions from unobservable characteristics and reverse causality (section 2.1.3) complicate the identification of a causal effect of grandparental childcare on mothers' labour supply. Nevertheless, the literature is determined of the existence and relevance of this causal relationship in many countries (for an overview, see Zanella, 2017; Del Boca, 2015).

In most of the following cases, the search for a way around the endogeneity issues motivated researchers to explicitly use factors that produce exogenous variation in grandparents' childcare availability. In their study on the US, Compton and Pollak (2014) employ geographical distance between grandparents and mothers as an instrument for grandparental childcare. This approach was criticized as problematic because grandparents' and mothers' residential choices are likely endogenous. They may be determined by unobserved work-family orientations (Arpino et al., 2014; Bratti et al., 2018). Though, when the reason of residential location can be controlled for, grandchild care was found to increase labour force participation on average by 12 percentage points for mothers of children at school entry age in the UK (Kanji, 2017). Still, the author can only control for residential mobility of mothers who moved, she does not have corresponding information on the grandparent level.

In other studies, grandchild care availability has been instrumented by a dichotomous variable of whether a grandparent is alive or not. Arpino et al. (2014) apply the instrumental variable approach in a two-stage least squares estimation⁵ with Italian data of 2003.⁶ They estimate a statistically significant average treatment effect of 32.3 % rise in partnered mothers' labour market participation for those mothers using childcare assistance by grandparents at least twice a week. The effect does not differ by full- or part-time employed mothers, thus the authors conclude that grandparent-provided care is

important for mothers' labour market participation rather than the hours worked. A similar instrument has been used with US panel data and yielded a statistically significant estimate of the effect (+9 %) of the availability of grandparents for childcare on mothers' labour supply (Posadas & Vidal-Fernandez, 2013). Still, in another paper Aassve et al. (2012a) employ bivariate probit models of maternal labour force participation, with two instruments for grandparental childcare. They have data on seven countries drawn from the Gender and Generations Survey (GGS).⁷ One instrument indicates whether the maternal grandmother is alive, the other one is the respondent's number of siblings. The authors uncover the direction of the bias from unobserved work-family preferences of mother and grandmother to differ across countries. This explains why for instance in Germany grandparents' childcare is very important to mothers' employment while it is not in the Netherlands. However, using the number of siblings entails a danger of biased results because it could be related to unobserved work-family preferences (Arpino et al., 2014). The other instrument, grandparents' death, arguably produces exogenous variation in grandchild care. Nevertheless, it likely fails to meet the exclusion restriction assumption, holding that childcare must cover the only possible path of the instruments' effect on mothers labour force participation (Aparicio-Fenoll & Vidal-Fernandez, 2015; Bratti et al., 2018). A grandparents' death, next to its impact on mothers' psychological well-being may constitute a positive shock to mothers' disposable financial resources through inheritances. At the same time, the death of the ascending tie implies reduced *inter vivos* transfers. We know that income shocks are negatively related to labour supply (Imbens, Rubin, & Sacerdote, 2001). Studies that instrument grandchild care with having grandparents' alive, thus often happen to estimate a joint effect of childcare *and* financial transfers on maternal labour supply. Thus, there is a need to disentangle the income or wealth channel and the childcare channel, in order to gain a deeper understanding of grandparents' availability to mothers' employment.

2.2.3 Grandparents' legal retirement age and maternal employment

There is another kind of instrument, which is able to take into account that grandparents alive differ in their childcare availability: Retirement legislation. In its regulative function on grandparents' labour supply, it is used in three studies on maternal labour force participation, because it creates exogenous variation in retirement behaviour and childcare availability. Firstly, Aparicio-Fenoll and Vidal-Fernandez (2015) investigate mothers' childbearing and employment decisions as a function of grandparents' labour force participation using three waves (1998, 2000, 2009) of the Italian survey Multiscopo – Famiglie e Soggetti Sociali (Families and Social Subjects). They use two-stage least-squares models where they can account for omitted variable bias from unobserved preferences and for reverse causality instrumenting grandparental labour force participation by within-country variation in minimum age-based retirement eligibility. Grandparents' labour force participation is estimated to reduce mothers' by 21.4 percentage points overall and by 14 percentage points for mothers of children younger than three. The authors state that their results fit with a model where working grandparents make higher monetary transfers but have less time for grandchild care and both negatively impacts mothers' labour supply. Aparicio-Fenoll and Vidal-Fernandez attempt to explain the weaker effect on mothers with young children assuming that grandparents must make higher financial transfers to this group, albeit they cannot explicitly test this hypothesis due to a lack of information on the mediating channels.

In the second paper, Bratti et al. (2018) exploit variation in pension eligibility produced by Italian pension reforms between 1993 and 2007. They understand their analysis of a sample of 8402 mothers aged between 20 and 49 years with a child below 15 years as an expansion of Aparicio-Fenoll and Vidal-Fernandez'. Data from the survey on Household Income and Wealth by the Bank of Italy allows Bratti and colleagues to test the mediating channel of financial transfers and inheritances, but they lack the information on grandparental childcare. Rather than employing an instrumental variable approach, they directly estimate the effect of variation in exogenously determined retirement eligibility for up to four grandparents on mothers' labour supply. They find that mothers' labour force participation is higher by 11 % if their mother is retirement eligible compared to if she is not. The authors conclude that childcare is the relevant channel since they do neither find a comparable effect for women without children, nor for men, nor do the main estimates change when the potential financial mediators are introduced.

Thirdly, Johnsen (2015) exploits firm variation in early retirement eligibility using Norwegian register data between 1967 and 2010, to estimate the causal effect of grandmothers' eligibility on her daughter's labour supply. He describes the analysis' setting as quasi-experimental because the division

of the subjects into treatment and control groups is not a result of their choice but determined by firm affiliation prior to the retirement reform. The analytical sample consists of grandmothers with at most one adult daughter who worked in firms before some of these firms started to offer early retirement schemes to their employees (N=13,229). Johnsen uses a difference-in-difference estimator to account for self-selection of firms into the early retirement scheme. Besides mother-grandmother dyad and year fixed effects to control for time-invariant differences between treatment and control groups and for potential macro shocks that affect both groups, no grandparent or mother-level controls are included because of their likely endogeneity. Johnsen directly estimates the effect of early retirement eligibility and not of its take-up, to prevent potential reverse-causality (grandmother retires early as a response to mothers' employment decision) from impeding a causal interpretation. Not every grandmother actually retires at the age of early retirement of early retirement eligibility, so the results are intention-to-treat estimates. Grandmothers' early retirement eligibility is found to increase mothers' full-time and part-time employment by +1.9 and +1.7 percentage points, respectively. Besides, early retirement eligibility is found to decrease grandmothers' labour force participation by 14 % and mothers' wages by 3.6 %. External validity is however limited because the effect of grandmothers' eligibility was only found to be significant for those mothers who are most likely to profit from grandmothers' retirement, namely those without female siblings. Johnsen cannot directly investigate the potential mediating channels with his data.

The two main advantage of using statutory retirement age in the study of maternal employment are thus (1) its exogeneity with regard to grandparents' retirement and childcare preferences and (2) its potential to produce variation in grandparents' childcare availability. A counter point is that, retirement age policies, as outcomes of democratic processes could as well be endogenous with individual-level attitudes. Yet, in most countries, citizens do not directly vote on single policies. The latter mostly come in packages and can thus more compellingly be understood as results of political compromises by the parties in power. Additionally, self-selection into countries based on retirement legislation is presumably rather a negligible issue. A single policy index, and at that one that is likely to change from time to time, is unlikely to motivate this kind of relocations. Besides, not seldom a substantive residence and work history is required to be eligible for public pensions (see i.e. 'Spain' in Appendix B). Implications of a potential exogeneity assumption are discussed in section 3.3.2.

The reviewed studies use retirement eligibility as a dichotomous variable. This thesis, by contrast, lays its focus on the legal retirement age *per se*. It is considered relevant, because if the legal retirement increases while everything else is held constant, the share of pension-eligible and hence childcare-available grandparents will decrease. The literature suggests that this in turn, should negatively impact mothers' employment chances. In order to find out how raising grandparents' retirement age affects mothers' labour supply across countries, the actual and variable level of the statutory retirement age will be examined in its function as a policy instrument to raise labour participation.

2.2.4 Heterogeneous effects by mothers' need for childcare

Previous research suggests that grandparental retirement eligibility and childcare have differential effects on labour force participation of mothers along social and demographic divisions. Single mothers are not only more likely to receive childcare help by grandparents (see section 2.2.1), some studies find that they are more likely than partnered mothers to profit from it in terms of increased labour force participation (Kanji, 2017; Posadas & Vidal-Fernandez, 2013). However, Johnsen (2015) finds a statistically significant effect of grandchild care only for married mothers. Acknowledging that single mothers do have a higher need for childcare assistance, he suggests understanding this finding saying that their labour supply could be less elastic or they could be more likely to have younger children than partnered mothers. Yet, the research reviewed by Del Boca (2015) implies greater elasticities in single mothers' labour supply. Further, employment of mothers with young children is found to respond stronger to variation in grandchild care in Northern and Central Italy, the US and the UK (Arpino et al., 2014; Compton & Pollak, 2014; Johnsen, 2015; Kanji, 2017). In addition, employment of mothers with low levels of education is more vulnerable to variation in grandparent-provided childcare than that of higher educated mothers (Arpino et al., 2014; Kanji, 2017). Estimates by Bratti et al. (2018) indicate that mothers who completed lower secondary education or less are almost 10 percentage points more likely to be economically active than higher educated mothers when their own mothers are eligible to pension benefits. The researchers agree that the lower earnings potential of less educated persons makes

their employment decisions more dependent on cheap and low key childcare opportunities. Next to these findings, studies find heterogeneous effects by mothers' age (UK) and ethnic group (US).

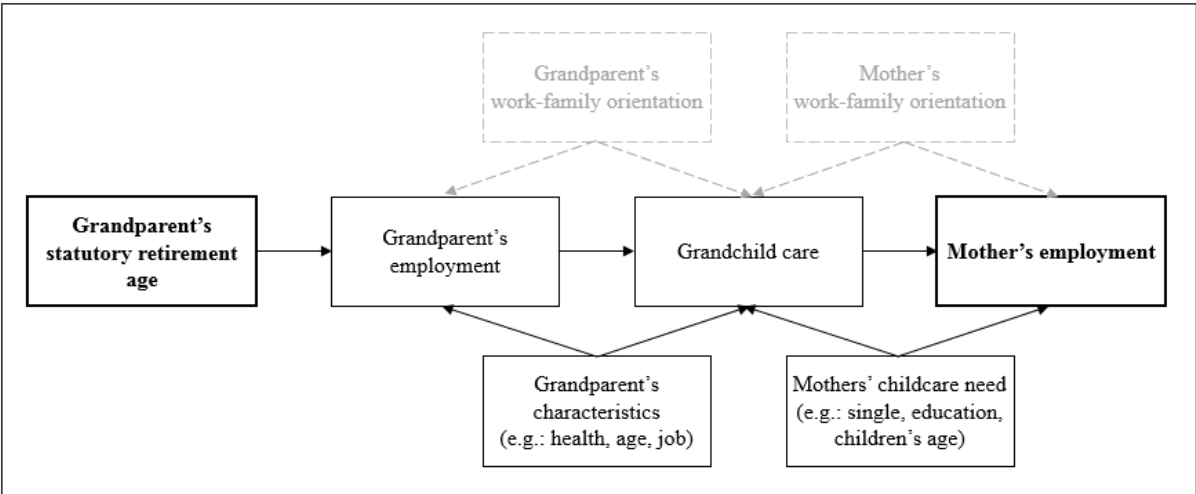
Briefly summing up, the reviewed literature suggests that legal retirement age may influence maternal employment in many contexts. Grandparents' availability to look after their grandchildren and financial transfers to descending ties were identified as two major mediation paths of retirement. Moreover, previously found differential employment responses according to mothers' need for childcare assistance require exploration of effect heterogeneity for different subgroups. This can be done using information on mothers' partnership status, educational level and number of children. Additionally, the SHARE database allows to explicitly investigate several mediation channels, adding a distinctive feature to this research. In spite of the possibility to include a large amount of individual-level controls on grandparents' and mothers' characteristics, the potential mediators remain endogenous with maternal employment decisions, since they are determined by unobservable work-family preferences of grandparent and mother.

By now, to the best knowledge of the author, the present paper is the first attempt to assess the impact of changes in retirement age on mothers' employment *across* countries. Cross-country variability in retirement legislation increases the reliability of the estimate because it adds another source of variation to within-country variability in retirement age. Previous research analysed legal retirement age and maternal employment in a single country (Aparicio-Fenoll & Vidal-Fernandez, 2015; Bratti et al., 2018; Johnsen, 2015). Mazzonna and Peracchi's (2017) research is an example where both kinds of variation in retirement age are exploited in the field of ageing and cognition using SHARE data. Different from the present research, Mazzonna and Peracchi interested in retirement ages more indirectly, in the policy's function as instrument for individuals' retirement behaviour. Lastly, differences in the level and meaning of grandchild care for maternal employment between countries generally justify separate analyses by country. Yet, the relatively small sample size per country prohibits this.

2.3 Conceptual model and hypotheses

The theoretical considerations and findings of the reviewed literature suggest a potentially important role of the retirement age for mothers' labour supply. In the underlying conceptual model of this research, legal retirement age influences the opportunity structure for maternal employment through its impact on grandparents' labour supply which determines their childcare availability. In a given setting of age distances between the generations, not only grandparents' relative distance to retirement eligibility (determined by their age) but actually, the politically determined absolute level of statutory retirement age is expected to play an important role for mothers' employment decisions. Figure 1 gives a schematic representation of the conceptual model that depicts how retirement age is supposed to affect mothers' employment, relating the most important concepts.

Figure 1 Conceptual model of grandparents' statutory retirement age and maternal employment



Source: Own representation

The main path of interest lies in the centre. Analogously to variation in the legal retirement age between countries, a reform-induced increase in retirement age within a country should decrease the

rate of grandparents entering retirement in the affected age range. Put differently, increases in retirement age raise the likelihood of a grandparent to be employed. Those grandparents who are employed instead of in retirement are less available to care for their grandchildren and therefore they are less regularly involved in grandchild care. This, in turn, should decrease mothers' labour supply.

Below the main path, you find important observable characteristics of grandparents and mothers. Grandparents' health status, age, geographical proximity, demographic and job characteristics are relevant to their work and childcare decisions. For instance, individuals living closer to their ties, more easily step in with childcare help. In public sector jobs, working hours are often more flexible and conditions for (early) retirement differ (see e.g. Italy in Appendix B). Lastly, people in different occupational categories are exposed to distinct push and pull factors of (early) retirement, like working conditions (e.g.: shiftwork, physically demanding work, psychological stress), risk of unemployment, or employer-funded early retirement schemes (Radl, 2013). These conditions that might also affect their ability to support their daughters in money and kind. As concerns mothers' characteristics, single mothers, less educated mothers or mothers with young children are in greater need of grandparents' care support than their peers with regard to their employment chances. Firstly, for single mothers vs. partnered mothers, it is nevertheless *a priori* unclear whether increases in the retirement age would decrease their labour supply stronger because singles at the same time arguably have a higher need for own labour income which means their labour supply could be less elastic than partnered mothers'. Secondly, mothers with low levels of education have less labour market resources and therefore lower earnings potentials than their highly educated counterparts. Thus, mothers with low levels of education likely have greater difficulties of substituting cheap grandparent-provided childcare through formal solutions and consequently, they depend on grandparents' childcare more than mothers with high levels of education. Thirdly, variation in grandparent's childcare involvement consistently was found to impact the employment of mothers' stronger when they have young children. Aside from younger children needing more supervision, a possible reason is that there are fewer formal childcare arrangements for very young children. Only about 35 % of children aged 0 to 2 in OECD countries were enrolled in some kind of formal care in 2014 (OECD, 2016a, p. 2) . Moreover, in most countries, it is generally less common to give young children into formal childcare Note that the conceptual model includes *characteristics* of individuals in three different generations, yet only the *actions* of grandparents and mothers are considered relevant for the outcome of interest. Data limitations impede the inclusion of further characteristics like the health of the grandchildren and other family members.

Lastly, above the main path, the unobserved work-family orientation of the grandparents and mothers is found. The dashed lines in grey colour indicate that these characteristics are not observed and thus not explicitly subject to analysis. Nevertheless, unobserved work-family orientation is important to the conceptual model, since they contextualise endogeneity of retirement and childcare behaviour. Grandparents' work-family preferences impact grandparents' likelihood to retire and to give care to their grandchildren. Moreover, through family role models and upbringing they are also likely to influence mothers' unobservable work-family orientation. The latter indirectly impacts a mother's decision to do paid work through her childcare preferences (own/kin/formal). A mother's childcare preferences are in turn relevant for her likelihood to rely on childcare from grandparents. In a nutshell, the unobserved characteristics make it difficult to establish a causal link between grandparents' retirement or childcare behaviour and mothers' labour supply but they do not directly affect the study of the total effect of retirement age.

On the basis of the theoretical framework and specifically following the conceptual model of this section, three hypotheses are formulated:

H1: Everything else constant, a higher retirement age negatively affects mothers' employment chances.

H2: The effect of higher retirement ages on maternal employment is mediated through *grandparents' employment* and the *childcare* provided by grandparents. More specifically, a higher retirement age positively affects grandparents' employment and negatively affects the intensity and/or flexibility of grandchild care they provide.

The effect of retirement age on maternal employment differs by mothers' needs for childcare support. In particular, increases in retirement age should ...

H3a: ... have a different effect on the employment of *single* mothers than of *partnered* mothers.

- H3b: ... have a stronger effect on the employment of mothers with low levels of *labour market resources*, for example, *education*.
- H3c: ... have a stronger effect on the employment of mothers with *younger children* than for mothers with older children.

3 Research design

3.1 Data sources

For the empirical analysis, individual-level data from the Survey of Health, Ageing and Retirement in Europe (SHARE) (waves 1, 2, 4, 5, 6 (Börsch-Supan); release 6.1.0 (Munich Center for the Economics of Aging, 2018, henceforth MEA, 2018)) is complemented with country-level data from the Mutual Information System on Social Protection (MISSOC).

The SHARE is of unique value to investigate the research questions at hand because it disposes of a wide range of demographic, socio-economic, social and family networks information in 27 European countries (plus Israel).⁸ The multidisciplinary, cross-national panel database of micro data on health, interviews approximately 123,000 individuals in six waves of about two-year distance between 2004 and 2015 (Börsch-Supan et al., 2013). Interviews for the first wave were conducted in 2004 and 2005, for wave 2 from the end of 2006 and throughout 2007, for wave 4 mainly in 2011 and 2012, wave 5 was conducted in 2013 and wave 6 in 2015. Wave 3 has a different questionnaire (SHARELIFE) that does not include the information needed, so it cannot be used. Some important features distinguish SHARE from alternative potential sources like the Generations and Gender Survey (GGS) or the European Social Survey (ESS). SHARE samples individuals aged 50⁹ or older and their current partner within the same household, thus the grandparent generation only. From these respondents, information on their children's (the mothers) age, employment, educational and marital status and changes therein is collected as well. Even information on the grandchild-level (age of the youngest grandchild) is collected. This allows to control for important mother-level characteristics and to analyse effect heterogeneity by mothers' childcare needs. While the GGS too, asks grandparent-respondents about their grandchild care behaviour and mothers about their use of grandchild care, it does not collect information about the respective other generation's employment status, neither does it allow to connect individual-level information across generations. Besides, SHARE has six waves (five of which provide the relevant information for this study), the GGS only offers two and the ESS is a cross-sectional survey that lacks the detailed information needed about childcare and employment.

SHARE employs a computer-assisted personal interviewing (CAPI) technique (MEA, 2018). Table A.1 (Appendix A) provides an overview about the minimum household response rates of all baseline and refreshment samples by country and wave. Bergmann et al. (2017) provide a more detailed overview about the survey participation of households and individuals by wave and country. They find that most participation rates match or exceed those of comparable surveys. Further detailed information for each wave can be found on the SHARE project's website¹⁰. The European Commission is the biggest sponsor of the project and in addition the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging and various national sources importantly contributed to the funding.¹¹

15 countries have been selected for the analysis: Austria, Belgium, Denmark, Estonia, France, Germany, Italy, Luxembourg, the Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and Switzerland. Only countries that participate in more than one wave were selected, in order to increase the potential for within country-variation of retirement age. Greece is excluded due to severe issues with the sampling¹². In the Czech Republic, women's legal retirement age varies by their number of children, a factor that is likely related to unobserved work-family preferences. Because this regulation can be seen as a kind of self-selection into treatment (retirement age), the country also had to be excluded. Israel was excluded for theoretical reasons, as it is the only non-European country and has different sociocultural and religious institutions' bearing on motherhood and employment. SHARE suffers the usual sample attrition of longitudinal surveys that could cause bias if some groups of respondents are less likely to be re-interviewed than others. Yet, the evidence for attrition bias found in earlier study is only very thin (Kneip, Malter & Sand, 2015).

Information on certain modules of the SHARE questionnaire is only available for one respondent of a couple in a co-residential household. For the analysis, this means that the answers on the mother-level variables had to be transferred to the other co-residential partner (grandparent-level) if she provided information on her/his childcare behaviour. This has been done using the shared couple-id and the interview year that were grouped to obtain a unique wave-specific couple identification variable. The Mutual Information System on Social Protection (MISSOC) offers country-level data on legal retirement ages between 2004 and 2014. Grandparents in the SHARE data who are eligible for a statutory can be assigned the applicable legal retirement age and this allows to test the hypotheses

formulated in the preceding section. MISSOC, initiated and coordinated by the European Commission, provides information on 12 areas of social protection in the 28 Member States of the EU, plus Iceland, Liechtenstein, Norway and Switzerland and is managed by the Luxembourg Institute of Socio-Economic Research (LISER) and Applica, a Brussels-based socioeconomic research company (MISSOC, 2018). It contains country-specific rules for retirement and early retirement but also data on health care, parental leave, occupational or unemployment benefits for every year between 2004 and 2018.¹³ Unfortunately, retirement ages for 2003 are not available in the MISSOC. No other data source containing the 2003 retirement ages could be found, this is why the 2002 legal retirement ages reported in OECD (2011, Tables 1.1 and 1.2, pp. 25-26) had to be employed as an auxiliary solution. MISSOC's detailed coverage of policies by year and the comprehensiveness of its information are its distinct advantages to other databases, like Multilinks.

3.2 Sample selection

On the grandparent generation's level, the population of interest consists of grandparents who are in principle eligible to retirement benefits but did not retire before the first interview and have at least one female child that is a mother herself. Only for them, the (change in) legal retirement age should make a difference in their retirement and childcare behaviour. Following the identification strategy of Bratti et al. (2018), the small fraction of grandparents (3.4 %) who never had done any paid work was excluded because not concerned by retirement legislation. Those grandparents who are at most five years younger than the minimum early retirement age and at most five years older than the maximum statutory retirement age were chosen (see section 4.3 for a robustness check). For them, the retirement legislation potentially is a factor in the retirement decision. Data on the Netherlands suggests that grandparents in between this age-range are generally in good health and their daughters are likely to benefit from childcare in terms of employment prospects (Geurts et al., 2015). Further, only grandparents who are not permanently sick or disabled are selected for the analysis, because otherwise, their health may impede them from looking after their grandchildren (Bordone et al., 2017). Even worse, some of their children (the mothers) could be inactive caring for their parent as a consequence of their parent's health status. Grandparents with undefined employment status were excluded because it is unclear how the retirement age should affect their behaviour. Moreover, grandparents with more than 4 children (4.2 %) were excluded. This has a theoretical and a data related reason. The theoretical reason is that the more children (and grandchildren) a grandparent has, the higher is the competition for grandparental resources among them and the lower the capacity of a grandparent to look after every single child's children (Ellingsaeter, Kitterod, & Lyngstad, 2017; Johnsen, 2015). The data related reason is that wave 1 and 2 of SHARE collect detailed mother-level information on a maximum of four children only. As regards geographical location, all observations where grandparents live within 100 km from their daughters are selected. Lastly, the Swedish and Danish pension eligibility requirement of 40 years of residence was met by almost all the grandparents.

On the middle generation's level, the population of interest are mothers of working age (20 to 55) with at least one child of 1 to 17 years at the time of the interview and who completed education, are not permanently sick or disabled or in early retirement. For the youngest generation, a lower age threshold of 1 year was chosen, because below that age mothers usually enjoy parental leave rights and primarily live their carer role as opposed to their worker role. Some argue that in such a situation, mothers' need for childcare support is reduced (García-Morán & Kuehn, 2017). Certainly, the role of grandparental childcare support for maternal labour supply is less clear when parental leave rights officially exempt mothers from the labour force, compared to after the leave when children are a bit older than one (Aassve et al., 2012a). The upper age threshold of 17 years is motivated by the survey's question about grandparental childcare, which applies to the 12 months preceding the interview where these children were in part still 16 years old.¹⁴ Age 16 is a common threshold in many analyses, as help with childcare should be especially important for mothers with pre-school and school-aged children (Bordone et al., 2017; Di Gessa et al., 2016; Gray, 2005; Hank & Buber, 2009).

The analytical sample used in this thesis was generated in three steps. All waves pooled, the initial sample consists of 120,047 individual grandparent respondents with 261,226 grandparent-wave observations. First, respondents from the relevant countries (Austria, Belgium, Denmark, Estonia, France, Germany, Italy, Luxembourg, the Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and

Switzerland) were selected. This restricted the sample to 215,058 grandparent-wave observations of 94,446 grandparents.

In step two, the data was reshaped to long format creating grandparent-mother-wave observations for each grandparent-mother dyad. It is important to distinguish each female child from her sisters, because of their differential characteristics and different magnitudes of childcare support from their parent. In the absence of any cross-wave mother-id variable, mothers could only be identified by their characteristics like gender and birth date, together with the grandparent-id. Some problematic cases of female twins, duplicate mothers, and some mothers where the child ‘#’ changes between the survey waves needed to be deleted.¹⁵ The selection criteria together with data limitations reduced the to a sample size to 10,100 grandparent-mother dyads with 17,393 dyad-wave observations at step two.

In the final step, cases with missing observations were dropped, in order to achieve an approximately equal sample size across the different models. Analyses of the missing values revealed that generally few cases were missing.¹⁶ The following variables have the highest number of missing cases: grandparents’ (former) job (job title (ISCO) 15.59 %) and employment type (9.07 %), financial transfers of the grandparent generation to children and grandchildren (6.43 %), distance to a child’s location (5.31 %), marital status of the grandparent (4.29 %) and mother (4.39 %), number of children of a mother (3.77 %). The resulting final sample consists of 5,673 grandparent-mother dyads (from 4,687 grandparents and 4,602 mothers) with 9,545 dyad-wave observations. Table A.2 gives an overview of the final sample size by country, interview year and grandparent gender.

3.3 Methods

3.3.1 Operationalisation

MOTHERS’ EMPLOYMENT STATUS

Mothers’ employment status is the dependent variable of the analysis. In each wave, respondents were asked to identify the employment status of each of their (Waves 1, 2: only four) children from the following list: (1) Full-time employed, (2) Part-time employed, (3) Self-employed or working for own family business, (4) Unemployed, (5) In vocational training/retraining/education, (6) Parental leave, (7) In retirement or early retirement, (8) Permanently sick or disabled, (9) Looking after home or family, (97) Other. Prior research revealed that grandparental childcare does not seem to be related to mothers’ hours worked, but only to whether she is working (see section 2.2). Thus, the categories (1) to (4), (6) and (9) have been transformed into a binary variable of mothers’ employment taking the value 1 if a mother is employed, including part-time, and 0 otherwise. Those on parental leave (6) were excluded if their youngest child was one or younger, otherwise coded as not employed. It is unclear how the retirement age should affect those who are self-employed or working in a family business (3) (N= 700 observations), this is why they have been excluded from the main analysis.¹⁷ Also, those in the category ‘other’ (97) had to be excluded, because their employment status is unclear. Mothers coded as unemployed (4), were categorised as not working. Note that, strictly speaking, the dependent variable does not measure maternal employment but her parent’s (the family respondent’s) believes about their child’s employment status. This is likely to go along with some imprecision in the measurement of the employment status and the main reason why the analysis focusses on maternal employment rather than labour market participation. Grandparents are supposedly more confident in identifying their child as employed versus distinguishing their child’s inactivity from unemployment.

LEGAL RETIREMENT AGE

Legal retirement age is the independent variable of main interest in the analysis. Given that a grandparents’ grandchild care activities during the last 12 months (see next paragraph) are likely to depend on their retirement decision at the beginning of those 12 months, in the analysis, the retirement age variable refers to the pension legislation the year before the interview.¹⁸ Grandparents who are or were participating in the labour market are eligible for a statutory pension and are assigned the corresponding country- and year-specific retirement age. Many countries have age-based and seniority-based retirement legislation. The mainly age-based statutory old age or *normal* pensionable age is used in the main analysis and defines the age at which a full pension can be drawn. It ranges between 58 and 67 across the genders, time, and countries. Appendix B provides a detailed description of the age-based retirement regulations and contribution requirements as well as issues that could not be accounted for,

by country. Retirement before that age is possible in many countries without reduction in benefits, if certain seniority criteria are met: Typically, a certain contribution duration to the old-age insurance system is to be accomplished and/or specific occupational conditions, like arduous working conditions, are to be met, in order for a person to qualify for a (full) pension at the *early* retirement age.¹⁹ In many countries, the eligibility to a full pension is not solely age-based but additionally depends on contribution years to retirement insurance or on the length of the professional career. The absolute amount of required contribution years is only taken into consideration if MISSOC explicitly lists separate retirement ages for persons who fulfil and do not fulfil the condition (i.e.: France). Contribution duration was operationalised by adding all years that a respondent contributed to any pension plan. Unfortunately, for almost half the sample the contribution duration is missing (see endnote 15). Thus, many people with sufficient contribution years cannot be assigned the correct (early) retirement age. When the normal statutory retirement age varies by contribution duration (e.g.: Slovenia) respondents with missing values are assigned the maximum normal retirement age of the given year because any person in the labour force needs to have a legal retirement age. As a consequence of this decision, the estimate of the effect of retirement age potentially suffers a downward bias.

As regards physically demanding occupations, the MISSOC does not point out which jobs exactly count as physically demanding or heavy work and each country uses their own wording. In SHARE, only wave 1 and wave 6 contain four-digit International Standard Classification of Occupations (ISCO) classified occupations. The other waves merely contain the first ISCO-digit of the respondent's current and last main job. Elementary occupations are the only category the International Labour Organization (ILO) describes as involving "in some cases considerable physical effort" (International Labour Organization [ILO], 2004). Therefore, for the analysis, elementary occupations in the following industries were classified as physically demanding: agriculture, hunting, forestry, fishing industry (ISCO digit: 92), and mining, quarrying; manufacturing; construction; transport, storage and construction (ISCO digit: 93). Note that, respondents ineligible to early retirement cannot be assigned the correct early retirement age. Neither can those who lack information on contribution duration, when the early retirement age depends on contribution duration. Hence, only 33.37 % of the grandparents could be assigned an early retirement age that is different from their normal retirement age. Together these issues reduce the accuracy and reliability of the early retirement age variable. In order to still be able to use it for a robustness check, the early retirement age has been replaced by the normal retirement age if it was missing.

In cases where the age of statutory early or normal retirement is ambiguously defined, the youngest age possible was assumed. When the early retirement age is higher than the normal retirement age, the lower age is assigned to the observation. For instance, if in Austria the normal retirement age for women is 60 in 2015, and the early retirement age is 62 for both sexes, women are assigned 60 for normal and early retirement age.²⁰ As a consequence, in some cases individuals may seem like they are eligible to retirement when they actually are not yet, making it look like they are not responding to the legal retirement age. Again, this implies a downward bias of the estimate for retirement age. This way, the retirement age operationalisation will produce a rather conservative estimate of its effect on mothers' employment. For a more meaningful interpretation of changes in legal retirement age, the variable was centred about its median in any of its operationalisations as a continuous variable (65 years for (adjusted) legal retirement age, 63 for early retirement age).

GRANDPARENTS' EMPLOYMENT STATUS

Retirement age should be crucial for a grandparent's decision to retire. Some literature (reviewed in 2.2.1) suggests that closing pathways to retirement may also increase unemployment or inactivity rates. Additionally, the employment status of grandparent and daughter may be associated due to common work-family preferences and thus it may make a difference whether a grandparent is homemaker or unemployed, looking for a job. The mediator variable was measured each wave asking respondents about their current job situation. Four categories of grandparents' employment status are distinguished: (1) retired; (2) employed or self-employed (including working for family business); (3) unemployed; and (4) homemakers (if they had ever done paid work).

GRANDCHILD CARE

The second mediation step of retirement age is grandparents' availability to help mothers with childcare. Retired grandparents should be more available to look after their grandchildren than employed grandparents. Grandchild care is defined as the average frequency a grandparent had looked after the

children of each of their children in the absence of the parents, during the 12 months before the interview. SHARE asks respondents whether they occasionally did look after their grandchildren (yes; no). If they answer 'yes' they are asked how often they did so on average (almost daily; almost every week; almost every month; less often). From this information, following the categorisation by Bordone et al. (2017), four categories are distinguished: daily, weekly, less often, never.

FINANCIAL GIFT

Financial transfers to children and grandchildren should be lower for retired than for working grandparents (Albertini et al., 2007). Decreased financial transfers could be an additional or alternative motivation for mothers to become employed that arises through grandparents' retirement, simultaneously with their greater grandchild care availability. In order to control for this second channel, financial gifts are included. Respondents are asked to indicate whether and whom they had provided financial gifts amounting to 250 euro or more during the 12 months before the interview. This information is captured in a dichotomous variable that equals 1 if the grandparent had provided such a gift to any descending tie, and 0 otherwise. Unfortunately, it is not clear from the data to which child or grandchild exactly the transfer was made. An ideal measure of financial transfers would identify the beneficiary and include a more precise indicator of the transfers' value. The variable will still be used, assuming that grandparents treat all of their (grand-) children approximately equal in terms of financial gifts.

COUNTRY AND INTERVIEW YEAR

Two macro indicators capture a respondent's country of residence and the interview year. The historical division of Germany led to an evolvement of regionally distinct cultural norms maternal labour supply and institutional differences in childcare provision. Therefore, following Bünning (2017), East and West Germany are differentiated as two countries in the analysis. Thus, the country indicator distinguishes 16 different countries (Austria, Belgium, Denmark, Estonia, France, Germany (East), Germany (West), Italy, Luxembourg, the Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and Switzerland).²¹ In the analyses, France is the country of reference because it has the second largest sample size and legal retirement ages that are better representative of the whole sample than Belgium, the country with the biggest sample. Additionally, a year indicator distinguishes the nine different interview years of the five waves of SHARE (2004, 2005, 2006, 2007, 2010, 2011, 2012, 2013, 2015) with 2004 being the reference year.

INDIVIDUAL-LEVEL CHARACTERISTICS

From the literature reviewed above the following individual-level characteristics of grandparents, mothers and grandchildren have been identified as associated with either one or both, the labour supply of grandparents and the provision of grandparental childcare. In the analysis, they are thus necessary as controls for the mediating variables' association with mothers' employment.

Gender (grandparent)

Male and Female grandparents are suspected to differ by their employment responses to legal retirement age and childcare behaviour. Grandmothers are the reference category of the dichotomous variable.

Health (grandparent)

Permanently sick or disabled respondents have already been excluded, yet, there may be some grandparents in bad health, especially among those who are retired and they may also give less childcare. Therefore, the grandparents' health status needs to be controlled for. It is measured as a dummy of self-perceived bad health that equals 1 if the respondent states to be in fair or poor health and 0 if she feels (very) good or excellent.

Age (grandparent)

A grandparent's age determines his/her retirement eligibility. Age is included since retired grandparents are on average older than employed grandparents, so controlling for age ensures that the estimated difference between the categories of the mediator is not merely an effect of the difference in age. It is measured as a discrete numerical variable counting the years between a respondent's date of birth and the interview year. Grandparents' age was centred about its median of 61 years.

Partnership status (grandparent)

Single and partnered grandparents likely exhibit different employment and childcare behaviours. Therefore, a dummy variable distinguished single from partnered grandparents. From their answers to the question “What is your marital status?”, grandparents are coded as ‘single’ if they are living separated from their spouse, were never married, are divorced or widowed or as ‘partnered’ if they are married and live together with their spouse or in a registered partnership.

Education (grandparent)

SHARE collects data on respondents’ highest achieved level of education at national educational standards and converts them to the International Standard Classification of Education (ISCED-97) scale. Following the convention in related works (e.g.: Arpino et al., 2014; Bordone et al., 2017) three educational categories are distinguished: ‘lower secondary or less’ (ISCED 0/2) ‘upper secondary +’ (ISCED 3/4) and ‘tertiary’ (ISCED 5/6). Another variable uses the same scale to capture the average education of the couple as a proxy for socioeconomic status.

Number of children (grandparent)

The number of children per grandparent is not just a determinant of especially grandmothers’ employment and availability to help each of their children with childcare, it may also reflect a grandparents’ unobserved work-family orientation. It is measured as an ordinal variable ranging from one to four children, at least one of which is a daughter.

(Last) employment type (grandparent)

Retirement conditions sometimes vary by type of employment. Above that, similarly to the number of children, it may hint at the unobserved work family-orientation of a grandparent. The type of employment of respondents’ current main job or for their last job, if they are not currently employed, was measured in three categories (employee, civil servant, self-employed).

(Last) job (grandparent)

The same applies to a respondent’s current occupation or, in case of not working, last occupation. It is measured by six different variables (three for the current job, three for the last job) throughout the waves. As mentioned before, wave 1 and 6 contain full ISCO (1988/2008) data on respondents’ occupation while waves 2, 4 and 5 only ask for the first digit. Combining information from the main ISCO categories (first digit) of a respondent’s current or last job, a variable with the following categories was created: 1. Legislator, senior official or manager; 2. Professional; 3. Technician or associate professional; 4. Clerk; 5. Service, or shop and market sales worker; 6. Skilled agricultural or fishery worker; 7. Craft and related trades worker; 8. Plant and machine operator or assembler; 9. Elementary occupation.

Distance to child

Geographical distance between grandparent and mother was measured on an ordinal scale as a respondent’s answer to the question “Where does [child name] live?”. For the analysis, the original measurement scale of nine categories²² was transformed into a variable with three categories: up to 5km; 5 to 25 km; 25 to 100 km. When the mothers share one household with their parent(s), we can expect the latter to be involved with grandchild care more often than under different circumstances, if they do not live together to facilitate elder care (Hank & Buber, 2009). However, mothers co-residing with their parents likely differ substantially in their practical and emotional support needs and other unobservable characteristics (Das, de Valk, & Merz, 2017; Dykstra et al., 2013). It is thus unclear how help with childcare will affect their labour supply. To control for this, a dummy variable is included that captures whether a mother shares the household with her parent(s) or not.

Age (mother)

Like age of the grandparent, mothers’ age is measured as a discrete numerical variable counting the years between a mother’s date of birth and the interview year. It was centred at its median, 36 years.

Partnership status (mother)

Most literature in the field excludes single mothers and concentrates on married and cohabiting mothers only, arguing that the two groups’ employment choice conditions differ substantially (Aassve et al., 2012a; Arpino et al., 2014) or because of small cells issues (Aparicio-Fenoll & Vidal-Fernandez, 2015; Bratti et al., 2018). In this analysis, the interest lies also in examining the differential impact of

retirement age on single versus partnered mothers. Therefore, instead of excluding single mothers (12 %) altogether, they are distinguished from partnered mothers. Singles' need for childcare assistance might be greater while its impact on their employment is less clear. A dummy variable 'single' was constructed analogously with the grandparent partnership status based on the family respondent's classification of their child's marital status.

Education (mother)

Mothers' education operationalises their labour market resources. It was measured and transformed in analogy with grandparents' education, based on the family respondent's statement on their daughter's highest educational level.

Number of children (mother)

A mother's number of children is an ordinal variable ranging from one to four or more children. It is based on the family respondent's statement about the number of children of her child.

Age of youngest child (grandchild)

The last characteristic relevant to a mother's need for care support and her employment chances is the age of her children. On the grandchild level, SHARE collects information about the youngest child's year of birth of each (Wave 1, 2: four) of the family respondent's children. In the analysis, grandchildren's age is used as categorical variable of four age groups: Very young children aged below 3 years (but above 1), preschool-aged children of 3 to 6 years, young school-aged children aged 7 to 11 years, and older children aged above 12 to maximum 17 years.

3.3.2 Analytical strategy

In order to estimate the effect of the statutory retirement age on maternal employment logistic regression based on maximum likelihood estimation is used.²³ Like in Dimova and Wolff (2011), Zamarro (2011) or Compton and Pollak (2014) mothers' propensity to be employed is modelled as an unobserved latent variable y_i^{M*} that manifests itself in the observed binary outcome of mothers' employment status y_i^M . y_i^M takes the value of 1 if a mother is employed ($y_i^{M*} > 0$) and 0 otherwise (see also: Baum, 2006, pp. 248–250). Following the conceptual framework, mothers' propensity to be employed is a function of the statutory retirement age applying to grandparents (R^G), grandparents' employment status (W^G), childcare help received from grandparents (C^G) and a set of characteristics at the grandparent and mother level ($X^{G,M}$). The econometric form of the model of mothers' propensity to be employed is:

$$y_i^{M*} = \beta_0 + \beta_1 R^G + \beta_2 W^G + \beta_3 C^G + \gamma X^{G,M} + u_{G,M} \quad (1)$$

β_0 is the constant. β_1 captures the estimated effect of statutory retirement age R^G , a continuous variable ranging between 58 and 67. The parameter is expected to drop in size and statistical significance (and become close to 0), once the mediation variables are introduced. β_2 and β_3 are the parameters of the mediating variables W^G and C^G , and measure the effect of grandparents' employment status and grandchild care involvement respectively. They are expected to absorb legal retirement ages' effect. $X^{G,M}$ represents a set of covariates, including country and year indicators, the grandparents' gender and their health status, as well as the grandparents' and mothers' age, partnership status, highest educational level and number of children. It also includes both grandparents' average educational level, a grandparent's (last) employment and job type, as well as the distance between grandparents and mother (3 categories) and whether they live in one household. u is an error term that is correlated at the family level but assumed to be independently and identically distributed across families. The error is assumed to follow a logistic distribution with the variance σ_u^2 (Baum, 2006, p. 249). The cumulative distribution function (CDF) of the logistic distribution is given by:

$$\Pr(y = 1 | x) = \frac{\exp(x\beta)}{1 + \exp(x\beta)} \quad (2)$$

where x represents all covariates (R , W , C and X) and β all parameters in equation (1). It follows that the covariates have a linear effect on the underlying latent propensity of a mother being employed (1), but a non-linear effect on the probability to observe $y = 1$ (2). The results are presented in terms of covariates' average of the marginal effects (AME) on the predicted probability of being employed calculated at the individual i . Technically, marginal effects are calculated by obtaining partial derivatives of the CDF in (2) by each of the covariates (see: Baum, 2006, pp. 250–251).

The legal age of retirement can be understood as continuous ‘treatment’ variable, with β_1 measuring the estimated change in the propensity of a mother being employed for a marginal change in the normal age of retirement. Where changes in the statutory retirement age occurred, SHARE’s longitudinal data structure allows exploiting within-country variation of the variable of interest, next to variation in statutory retirement age over time. If the statutory retirement age were exogenous, meaning that no unobservable characteristics influence both the legal retirement age and a mother’s employment decision, assignment to a ‘treatment dose’ would be random. Random assignment to treatment represents the best condition for research on causal effects (e.g.: Angrist & Pischke, 2009). Yet, most retirement regulations condition eligibility to pension benefits on some characteristics other than age that are unlikely to be completely exogenous (e.g.: contribution duration or job type). Therefore, a strictly causal interpretation is refrained from in this paper. To answer the research questions, first the total effect of legal retirement age on maternal employment is estimated, then it is analysed what part of the effect is mediated by grandparental childcare. Subsequently, it is tested whether the total effect of the treatment differs by some dimensions of mothers’ need for childcare.

The estimation is conducted in six stages using five different model specifications. In order to isolate the effect of retirement age from other macro-level differences between countries and from the effects changes in maternal employment by observation year, the country and year dummies are included into all models. In a first stage, to test Hypothesis 1, mothers’ employment is regressed on the legal retirement age interacted with grandparents’ gender, controlling for country and year (Model 1). No other individual grandparent- or mother-characteristics are included in the model because they might introduce bias through endogeneity which comes from their correlation with unobservable characteristics that are endogenous with a mother’s employment decision. Cluster-robust standard errors at the family-level adjust for dependence at the family level. The reason is that there may be several observations for the same mother – both of her parents may be repeatedly interviewed – and in addition, there are up to four adult children by grandparent. Thus, observations are allowed to correlate at the family level but they are assumed to be independent across families.

In four successive stages, Hypothesis 2 is tested by introducing the mediating variables one after the other and adding the other covariates at the end. First grandparents’ employment status (Model 2), then financial gifts from grandparent to child or grandchildren (Model 3) are introduced. In Model 4 grandparental childcare is added as the last mediator, before the other covariates are controlled for in Model 5. If the estimated effect of statutory retirement age becomes substantially and statistically insignificant in the presence of grandparents’ employment status and their level of childcare involvement the mediation hypothesis is supported. Model 3 that contains the financial gift variable is used to exclude a potential competing channel to grandchild care. Adding the remaining variables covering grandparents’ and mothers’ characteristics, Model 5 allows excluding potentially spurious correlations between the dependent and the mediating variables. The controls are justified by their potential effect on mothers’ labour supply and their childcare choices or grandparents’ retirement and grandchild care decisions. In addition, we see whether the estimated effects of retirement age and the mediating variables are robust to holding constant the levels of observable characteristics. While a separate analysis by grandparent gender would be justified by findings of the reviewed literature, it would result in a small sample size causing an issue of small cells and is thus not the best solution. Instead, all of the models include an interaction term between grandparent gender and legal retirement age, to allow different estimates along this dimension.

In a final stage, Hypothesis 3a, 3b and 3c are tested by replacing the gender-legal retirement interactions in Model 1 with interaction terms between the legal retirement age and the respective dimension of mothers’ need for childcare assistance. By this method, heterogeneity in the effect of retirement age by a mother’s partnership status, education, and the age of her youngest child will be assessed.

4 Empirical results

4.1 Descriptive Statistics

In the sample, on average 82 % of the mothers are employed (see Table 2). This is nearly 11 percentage points higher than the official OECD (2016b, own calculations) statistic on maternal employment for the same countries and a comparable time frame (up to 2014). Yet the OECD statistic includes younger and older mothers (aged 15-64) with at least one child aged between 0 and 14 years, who are thus in less favourable conditions for employment. This implies that the sample's employment statistics of mothers approximately match those using population data. Table 1 presents summary statistics for the dependent variable by different levels of legal retirement age, the main independent variable of interest. No clear pattern of the relationship is to be spotted: Maternal employment is at its highest (89 %) when the legal retirement age is about 61 years. When the retirement age is one year below, at age 60, the lowest maternal employment age of 72 % is observed. One factor possibly concealing the expected relationship are differences in the levels of maternal employment and legal retirement age over countries. Another could be differences in the availability of formal childcare. Also, we know that the retirement age was lowered over time in some countries (Denmark, Sweden), while maternal employment shows an upward trend almost everywhere. Figure 2 plots the trends of mothers' employment over time, which according to Hypothesis 1 could be attenuated by increases in the legal retirement age.

Table 1 Maternal employment by legal retirement age

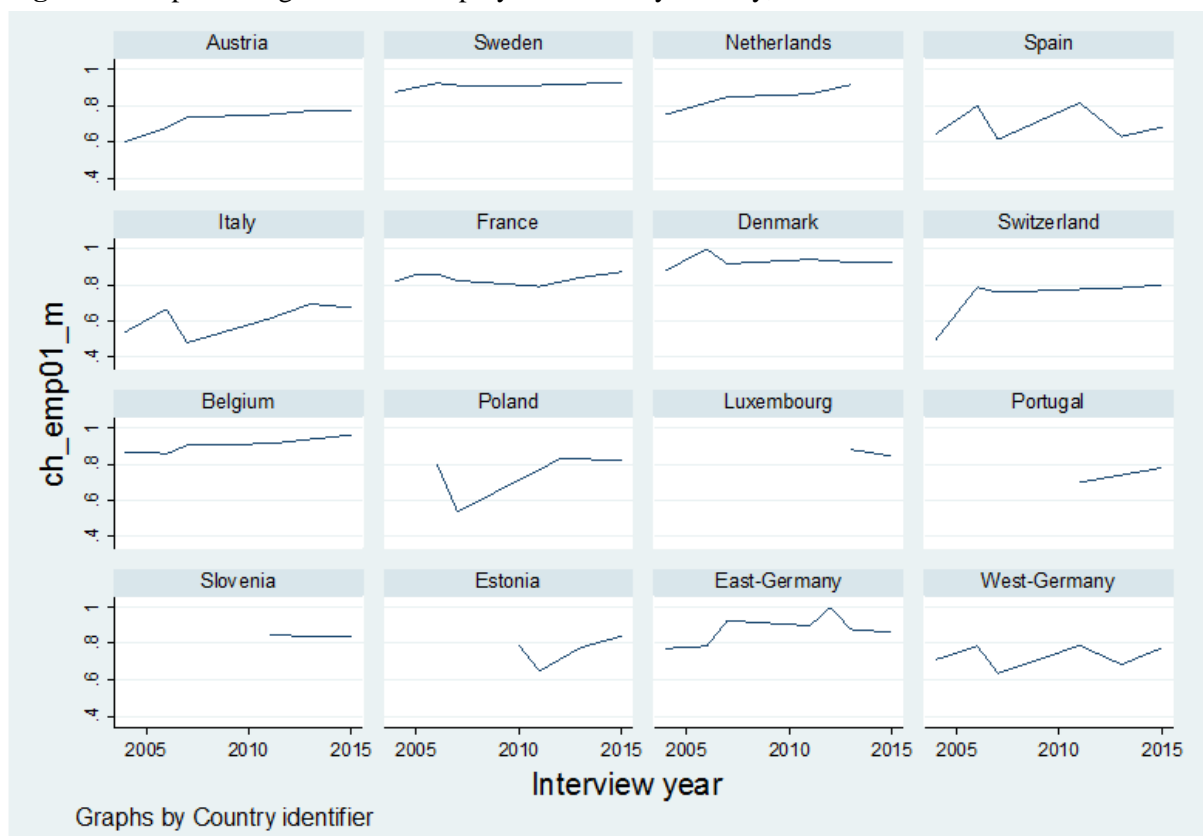
Legal retirement age (integer)	Mother employed		
	Mean	SD	N
58	0.80	0.41	20
60	0.72	0.45	792
61	0.89	0.32	877
62	0.81	0.39	405
63	0.78	0.42	569
64	0.82	0.39	404
65	0.84	0.37	5,332
66	0.75	0.44	646
67	0.83	0.37	500
Average/Total	0.80 ^(a)	0.39	9,545

Notes: Maternal employment includes full time and part time employment of mothers aged 20-55 with at least one child below the age of 17. Self-employment and working in family business excluded. Legal retirement age has been rounded to the next highest integer value for purposes of presentation. Age 59 is missing because there are no observations of this retirement age.^(a) Differences in means of maternal employment between Table 1 and Table 2 are due averaging over unweighted averages in Table 1.

Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

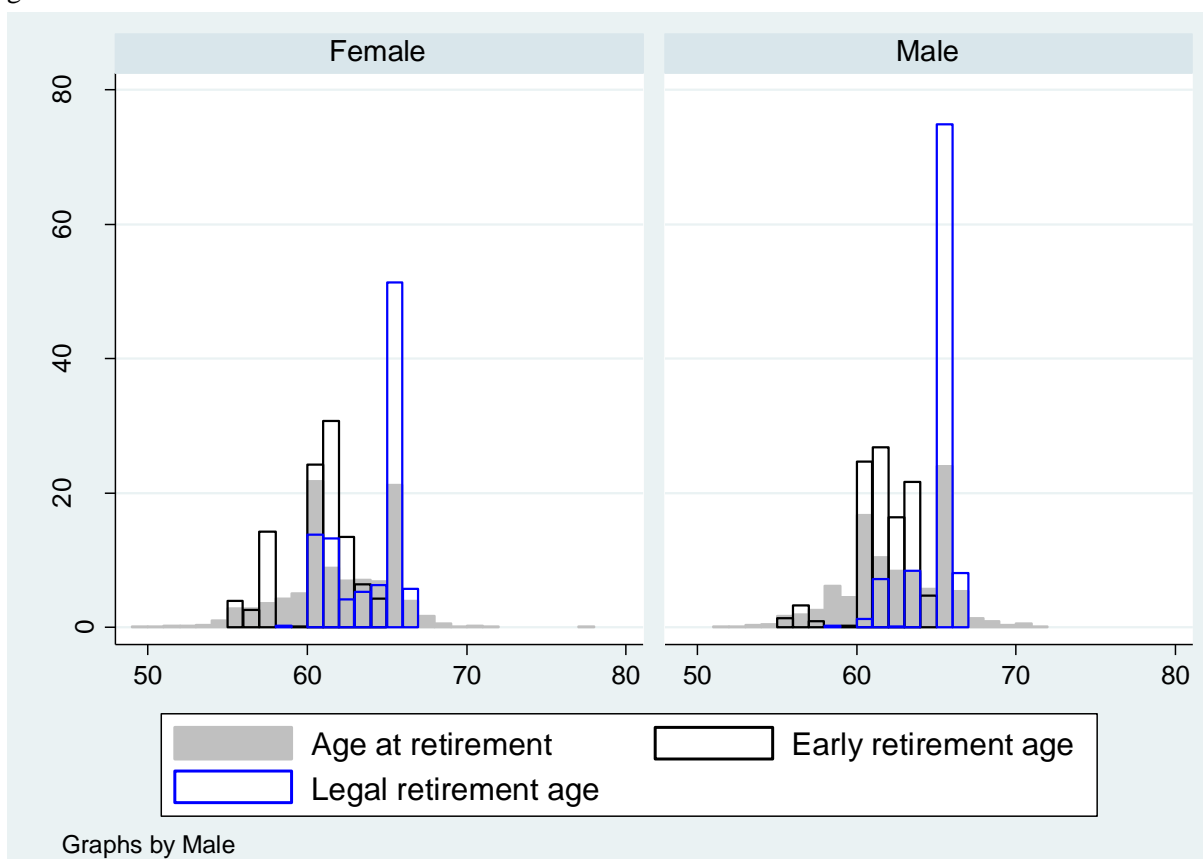
Figure 3 allows to compare the sample distribution of normal (blue) and early (black) statutory retirement ages for male and female grandparents with the actual age at retirement entry (grey bars). The most frequent legal retirement age for both women and men is age 65, thus about one year higher than the average legal retirement age reported in Table 2. Women may retire slightly earlier than men. The distribution of the early retirement peaks around ages 60 to 61 and it is more equally spread across the ages than the age of normal retirement. A more detailed overview of the country-specific distribution of statutory retirement age is given in the Appendix Figures A.1 for grandmothers and A.2 for grandfathers. Is the legal retirement age mirrored in grandparents' actual retirement behaviour? Indeed, 65 is the (second) most frequent age of retirement entry for men (women), but most grandparents retire already before that age. The distribution of actual retirement entry ages looks family similar for men and women, with slightly more women retiring at age 60. Generally, women retire at slightly younger ages than men, which mirrors the tendency of slightly younger legal retirement ages for women. It seems to be the case that retirement behaviour approximately follows but does not exactly match legal retirement ages in the sample.

Figure 2 Sample average maternal employment rates by country, 2004-2015



Source: Own elaboration based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Figure 3 Sample distribution of age at retirement, legal and early retirement ages by grandparent gender



Notes: Age at retirement between 2004 and 2015; legal and early retirement ages 2003-2014. Unweighted distributions. Countries: Austria, Belgium, Denmark, Estonia, France, Germany, Italy, Luxembourg, the Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and Switzerland.

Source: Own elaboration based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Table 2 presents descriptive statistics for all variables in the analyses. Most grandparents are either employed (48 %) or retired (35 %) and about one in ten looks after home and family. There are three almost equally sized groups of grandchild carers: One third never looks after their grandchildren, another third looks after them monthly or less frequently and another third assist their daughter on a weekly basis. 11 % give daily care to their grandchildren.²⁴ 42 % of the dyads in the sample include male grandparents. The sample is mostly composed of healthy grandparents, only one in four rates their health less than good. An average grandparent in the sample is 61 years old and lives with a partner (78 %). The highest level of education is upper secondary or less for grandparents in almost eight out of 10 dyads, while the average couple educational level is lower secondary or less for more than half of the dyads. Almost half of the grandparents have two children and one third has three. 70 % are or were employees. Of those where occupational information is available, 93 % work or worked in occupations classified as ISCO digit 7 (Craft and related trades workers) or lower. While almost half of the grandparent-daughter dyads live within a distance of fewer than 5 kilometres, only 3 % share the same household. Four out of five grandparents travel less than 25 kilometres to see their child. The mothers in the sample are on average 36 years old and live with a partner (88 %). With over 42 % achieving some tertiary education, daughters are substantially higher educated than their parents. On average, the mothers have fewer children than their parents. One third (yet) has one child only, but two remains the most frequent number of children (49 %). Half of the grandchildren are below six years old, 20 % even below three, and therefore at an age where they usually receive intensive care.

Table 2 Descriptive statistics for all variables used in the analyses

	Mean	SD	Min	Max	N
<i>Dependent Variable</i>					
Mother employed	0.82	0.38	0	1	9,545
<i>Independent variables</i>					
Legal retirement age	64.09	1.94	58	67	9,545
Legal retirement age, contribution adjusted	64.39	2.07	58	73	9,545
Early retirement age	60.82	2.09	55	65	3,600
Early retirement age (+ norm)	62.97	2.48	55	67	9,545
<i>Mediators (endogenous)</i>					
Grandparents' employment status					9,545
Retired	35.41		0	1	3,380
Employed	47.50		0	1	4,534
Unemployed	5.98		0	1	571
Homemaker	11.11		0	1	1,060
Grandchild care:					9,545
never	29.98		0	1	2,862
less often	32.33		0	1	3,086
weekly	27.12		0	1	2,589
daily	10.56		0	1	1,008
Financial gift (no)	0.26	0.44	0	1	9,545
<i>Grandparents' characteristics</i>					
Male	0.42	0.49	0	1	9,545
Health (less than good)	0.25	0.43	0	1	9,545
Age	61.10	4.51	50	77	9,545
Single	0.22	0.42	0	1	9,545
Education					9,545
lower secondary or less	36.83		0	1	3,515
upper secondary +	41.44		0	1	3,955
tertiary	21.74		0	1	2,075

Table 2, continued:

Education: couple					9,545
lower secondary or less	52.08		0	1	4,971
upper secondary +	35.79		0	1	3,416
tertiary	12.13		0	1	1,158
Number of children					9,545
1 child	10.82		0	1	1,033
2 children	47.45		0	1	4,529
3 children	30.09		0	1	2,872
4 children	11.64		0	1	1,111
(Last) employment type					9,545
Employee	0.70		0	1	6,698
Civil servant	0.17		0	1	1,577
Self-employed	0.13		0	1	1,270
(Last) job					9,545
Legislator, senior official or manager	0.09		0	1	814
Professional	0.10		0	1	986
Technician or associate professional	0.12		0	1	1,100
Clerk	0.16		0	1	1,480
Service, or shop and market sales worker	0.19		0	1	1,806
Skilled agricultural or fishery worker	0.24		0	1	2,324
Craft and related trades worker	0.04		0	1	343
Plant and machine operator or assembler	0.02		0	1	193
Elementary occupation	0.05		0	1	499
Distance to child					9,545
up to 5km	0.48		0	1	4,585
5 to 25 km	0.33		0	1	3,183
25 to 100 km	0.19		0	1	1,777
Same household	0.03	0.18	0	1	9,545
<i>Mothers' characteristics</i>					
Age	36.20	4.98	20	55	9,545
Single	0.12	0.32	0	1	9,545
Education					9,545
lower secondary or less	0.11		0	1	1,047
upper secondary +	0.47		0	1	4,450
tertiary	0.42		0	1	4,048
Number of children					9,545
1 child	0.33		0	1	3,152
2 children	0.49		0	1	4,710
3 children	0.14		0	1	1,351
4+ children	0.03		0	1	332
<i>Age youngest child</i>					
below 3	0.20		0	1	1,945
3 to 6	0.32		0	1	3,083
7 to 11	0.30		0	1	2,840
12 to 17	0.18		0	1	1,677

Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

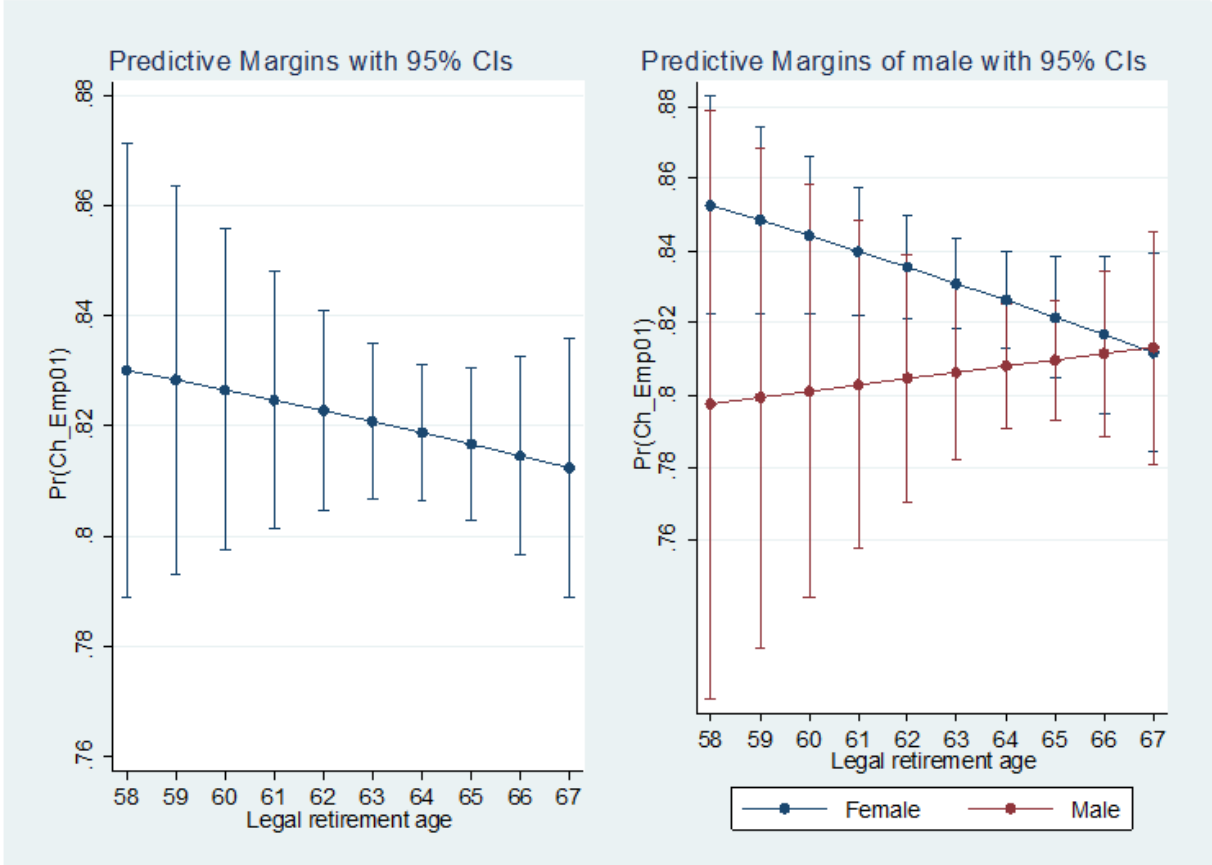
4.2 Multivariate Analyses

4.2.1 Logistic regression results of the effect of retirement age on mothers’ employment

Logistic regression results for Models 1, displayed in Table A.3, indicate that maternal employment varies very little by changes in the variable of interest. The odds ratio of grandparents’ legal retirement age is very close to 1. For each one-year increase in the legal age of retirement, on average the odds of a mother being employed decrease (they are multiplied by 0.97). This effect is net of the grandparents’ gender, the interview year and the country. Moreover, the estimate of legal retirement age is not statistically significant ($p>0.05$). Thus, the Null hypothesis, saying that mothers’ employment does not vary by legal retirement age cannot be rejected with the present data. The interaction with grandparents’ gender in Model 1 does not provide evidence that the effect of grandparents’ legal retirement age on mothers’ labour supply depends on the grandparents’ gender.

Figure 4 shows the estimated relationship of the outcome of interest at different levels of the statutory retirement age in terms of predicted probabilities based on Model 1. From the figure’s left side, we see that the predicted probability of a mother being employed is 83 % when the retirement age takes its lowest value of 58 years. When the retirement age takes its highest value, 67 years, the predicted probability decreases by nearly two percentage points which is arguably not a big change. Confidence intervals overlap for any value of normal retirement age and they become quite large when moving to the extremes of the x-axis. This means that the difference in point estimates between low and high retirement age is not statistically significant using 95 % confidence intervals. The right part of Figure 4 displays the interaction between grandparents’ gender and legal retirement age. Again, while confidence intervals are large, especially for grandfathers, and overlap between the genders and horizontally, it shows contrasting results for female and male grandparents. Surprisingly, if the grandparent is male, rises in legal retirement age show a slightly positive association with mothers’ employment. When the legal retirement age rises from 58 to 67 for grandmothers, the predicted probability for women’s employment decreases by 5 percentage points. Thus, the estimates across genders seem to be driven by grandmothers’ reactions to increases in legal retirement age.

Figure 4 Predicted probability of maternal employment across and by grandparent gender, Model 1



Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

4.2.2 Mediation analysis for the effect of retirement age on mothers' employment

Overall, Model 1 does not indicate a strong relationship between legal retirement age and maternal employment. While the estimated effect of legal retirement age has the expected sign, it is neither substantially big nor statistically significant. If it had been, following the development of the odds ratios of legal retirement age across the models in Table A.3, could have provided important insights on the mediation path of its effect. We will nevertheless have a look at the models to track changes in the estimates. First, note that all of the model chi²-tests are highly statistically significant. Moreover, the Akaike (AIC) and Bayesian (BIC) information criteria decrease in along the successive models, suggesting that the model fit is improving. The odds ratio for legal retirement age remains constant and below 1 over the models. In Model 2, where the grandparents' employment status is introduced, it increases by 0.01 and remains unchanged after the introduction of the financial gift variable in Model 3. Also when grandchild care, the main mediator, is added (Model 4) or the control variables (Model 5) the odds ratio of legal retirement barely changes but remains at 0.98. From Models 2, 3 and 4 we see that mothers are much more likely to be employed when their parents are retired than when they are still employed. The odds of maternal employment also increase when grandparents help with childcare on a weekly or daily basis rather than never, while financial gifts seem to play a minor role.

For a further examination of the regression results the AMEs displayed in Table 3 will be used, because it is questionable to compare logit estimates of different covariates within models and over models with different covariates or sample sizes (Mood, 2010).²⁵ From Table 3 we learn that the AME of increases in legal retirement age is negative but close to 0 in all five models. While the AME (and its standard error) remains constant at -0.002 over Models 1, 2 and 3, it becomes smaller (-0.001) only in Model 4 where grandparental childcare is introduced and again in the full Model 5. It is not statistically significant at common confidence measures in any model. We cannot speak of a substantive effect of legal retirement age if a one year increase from the median legal retirement age (65) is associated with a 0.2 % decrease in the probability of a mother being employed (Model 1).

Table 3 Logistic regression on mothers' employment, average marginal effects

	M1	M2	M3	M4	M5
Legal retirement age	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.001 (0.003)	-0.000 (0.003)
Male grandparent (ref.: Female)	-0.025** (0.010)	-0.025* (0.010)	-0.025** (0.010)	-0.023* (0.010)	-0.019* (0.010)
Grandparents' employment status (ref.: Employed)					
Retired	0.063*** (0.010)	0.062*** (0.010)	0.063*** (0.010)	0.061*** (0.010)	0.008 (0.011)
Unemployed	-0.073*** (0.022)	-0.074*** (0.022)	-0.073*** (0.022)	-0.074*** (0.022)	-0.060** (0.019)
Homemaker	-0.012 (0.017)	-0.012 (0.017)	-0.012 (0.017)	-0.016 (0.017)	-0.053** (0.017)
Financial gift (ref.: no)	0.018 (0.012)		0.018 (0.012)	0.014 (0.012)	0.000 (0.011)
Grandchild care (ref.: never)					
less than weekly				-0.004 (0.013)	-0.010 (0.013)
weekly				0.047*** (0.012)	0.034** (0.012)
daily				0.060*** (0.015)	0.066*** (0.015)
<i>Grandparents' characteristics</i>					
Less than good health (ref.: good health)					-0.011 (0.010)
Age					0.003 (0.002)
Single (ref.: partnered)					-0.011 (0.013)

Table 3, continued:

Education (ref.: lower secondary or less)	
upper secondary+	0.010 (0.014)
tertiary	0.013 (0.019)
Mean couple education (ref.: lower secondary or less)	
upper secondary+	0.010 (0.015)
tertiary	-0.015 (0.025)
Number of children (ref.: 2 children)	
1 child	-0.041* (0.019)
3 children	-0.007 (0.012)
4 children	-0.018 (0.016)
(Last) employment type (ref.: Employee)	
Civil servant	-0.011 (0.014)
Self-employed	-0.016 (0.015)
(Last) job (ref.: Service worker/ shop and market sales worker)	
Legislator, senior official or manager	-0.007 (0.020)
Professional	-0.021 (0.022)
Technician or associate professional	-0.022 (0.018)
Clerk	0.011 (0.015)
Skilled agricultural or fishery worker	-0.024 (0.014)
Craft and related trades worker	0.014 (0.028)
Plant and machine operator or assembler	0.052* (0.023)
Elementary occupation	-0.030 (0.024)
Distance to child (ref.: up to 5km)	
5 to 25 km	-0.012 (0.011)
25 to 100 km	-0.023 (0.015)
Same household (ref.: no)	-0.125*** (0.033)
<i>Mothers' characteristics</i>	
Age	0.007*** (0.001)
Single (ref.: partnered)	0.008 (0.015)
Education (ref.: upper secondary+)	
lower secondary or less	-0.101*** (0.021)
tertiary	0.079*** (0.011)

Table 3, continued:

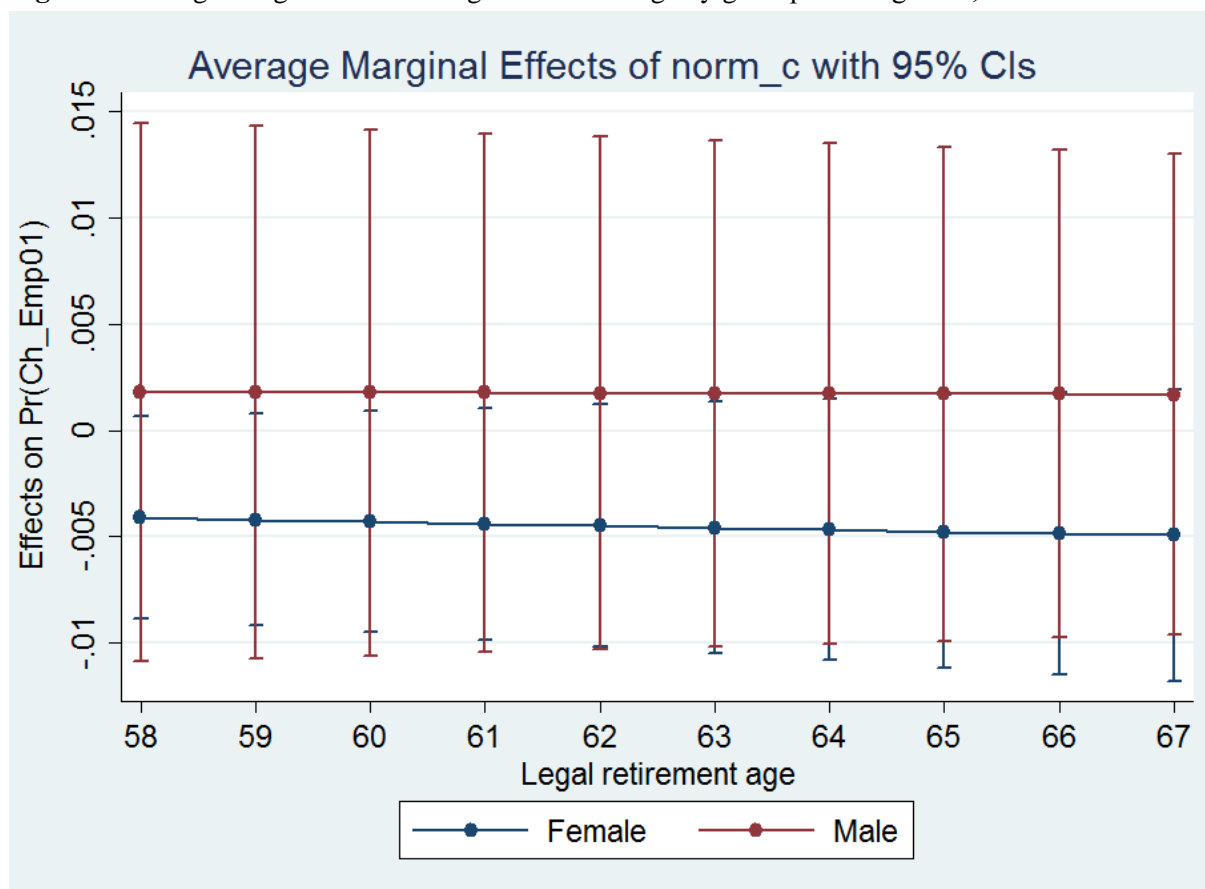
Number of children (ref.: 2 children)					
1 child					0.045*** (0.010)
3 children					-0.103*** (0.017)
4+ children					-0.205*** (0.032)
Age youngest child (ref.: 3 to 6)					
below 3					-0.063*** (0.013)
7 to 11					0.015 (0.011)
12 to 17					0.021 (0.016)
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes
N	9,545	9,545	9,545	9,545	9,545

Notes: Cluster-robust standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Looking at Figure 5 for Model 1, we can investigate differences in AMEs by grandparents' gender evaluated at different values of legal retirement age. The graph shows that the AME of legal retirement age is close to 0 and negative for grandmothers but positive for grandfathers. Especially the confidence intervals for grandfathers are large and for both genders they cross the 0-line. The message of the graphs is clear, there is no indication of a substantial or significant decrease in maternal labour supply with rising retirement age.

Figure 5 Average marginal effect of legal retirement age by grandparents' gender, Model 1



Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

The 'mediating' variables, in Models 2 to 4, deserve some more attention, albeit their endogeneity with maternal labour supply would have prohibited a causal interpretation even if normal retirement age had

turned out significant. Interestingly, on average mothers are 6 % more likely to be employed when their parent is retired compared to when their parent is employed, not controlling for grandparents' and mothers' characteristics. The estimated AME of financial gifts is very low and not statistically significant in any model. Thus, this channel does not seem to be of great importance for mothers' employment in this data, or the operationalisation is too imprecise. When grandparents help with childcare weekly or daily, compared to when they never do it, mothers are 5 or 6 % more likely to be employed in Model 4 and these differences are statistically significantly different from 0. When grandparents' and mothers' characteristics are included, in Model 5, the estimated AME of the mediators changes. In Model 5, the difference in the AME of employed versus retired grandparents becomes close to 0 and statistically insignificant while differences in the AMEs for childcare levels remain comparable in size and significance. This could suggest the importance of controlling for the characteristics. Now, daughters of homemaking parents are significantly less likely to be employed than those of economically active parents (AME -5%) which could indeed mean that work-family orientation of grandparent and mother is correlated at the family level. Overall, the fact that Hypothesis 1 was not supported means that Hypothesis 2 could not actually be tested, because if the estimated effect of legal retirement age is small and not significant, there barely is a chance of seeing it decrease in size and statistical significance.

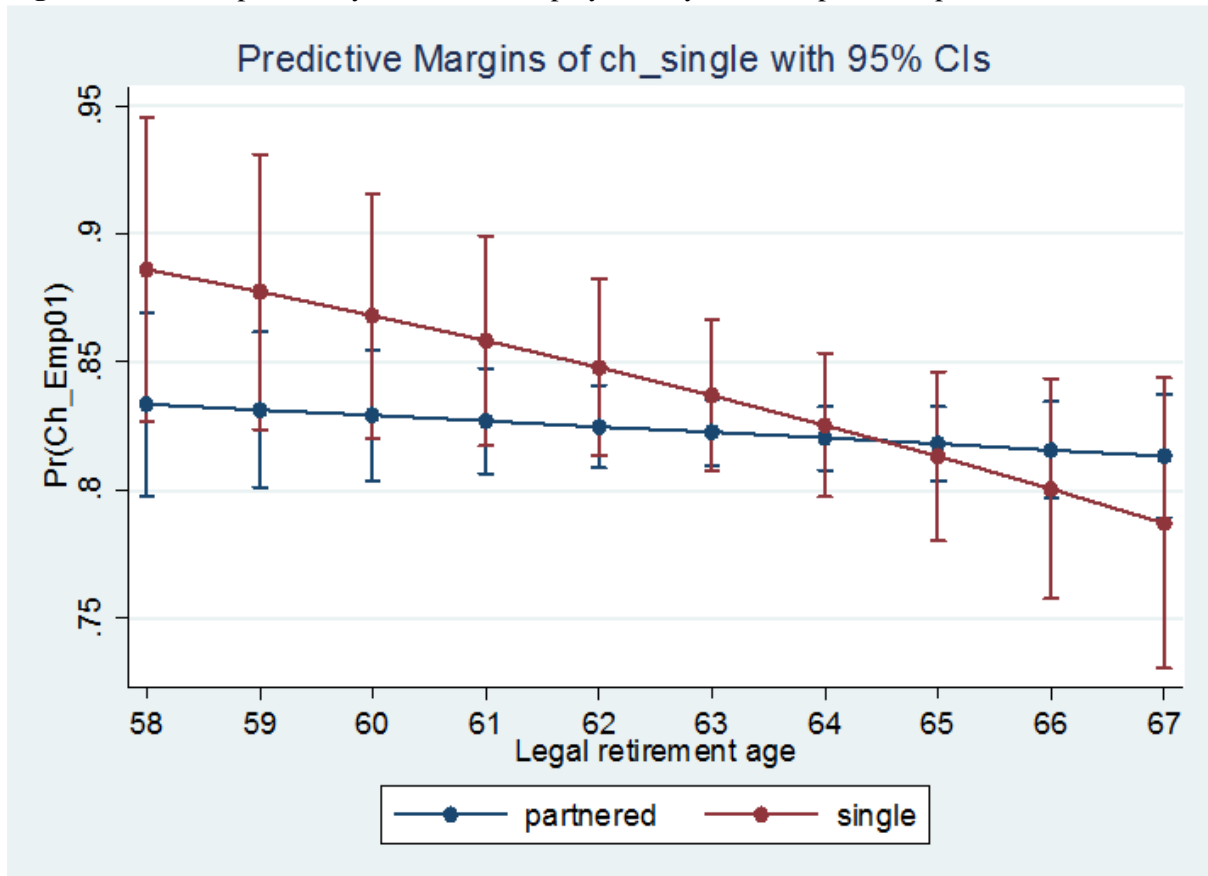
The estimated AMEs for the covariates, too, must be looked at with caution since they are likely endogenous. None of the AMEs of the individual level characteristics at the grandparent-level make a noteworthy difference for mother level employment. By contrast, mothers' likelihood of employment does vary by the levels of most covariates capturing mother-level individual characteristics. Quite clearly, we observe that when mothers share the household with their parent, they are 12.5 % less likely to be employed than when they live in separate households. This result fits with the findings of other papers, where mothers are found to coreside with their parents, often as temporary solutions in times of crises, thus not being employed could be the reason why mothers coreside with their parents (e.g.: Das et al., 2017; Dykstra et al., 2013). For each additional year of age, a mother's predicted probability of being employed rises by 0.7 % on average. The AME of being single instead of partnered is close to 0 and statistically not significant. Mothers' employment chances, however, vary substantially and significantly by their educational level: Without upper secondary education, their chances of employment are reduced by 10 percentage points, while they are increased by 8 percentage points if a mother has some tertiary degree instead of upper secondary. The number of children, too, is related significantly to maternal labour supply. Mothers who have three (four or more) children rather than two (reference category) are 10 % (21 %) less likely to be doing paid work. Mothers with only one child, by contrast, are about 5 % more likely to do paid work. As expected, having at least one child aged below three years reduces the predicted probability of employment (-6 %), compared to when the youngest child is three years or older.

4.2.3 Heterogeneity of the retirement age effect by mothers' childcare needs

Mothers' partnership status

According to Model 5, single mothers' employment chances do not differ in a statistically significant way from partnered mothers', holding constant the effect of the other covariates. Yet, hypotheses 3a and 3a' suggest that legal retirement age would impact the probability of employment differently if a mother was single instead of partnered. Introducing an interaction term between the legal retirement age and a mother's partnership status to Model 1 allows assessing this (see Figure 6). In terms of point estimates, a mother's probability to be employed is affected stronger by changes in retirement age if she is single than if she is partnered. Despite we observe that the single mothers' line is steeper, there is no statistically significant evidence for Hypothesis 3a that the effect of legal retirement age on maternal employment does vary by a mother's partnership status in the sample.

Figure 6 Predicted probability of maternal employment by mothers' partnership status

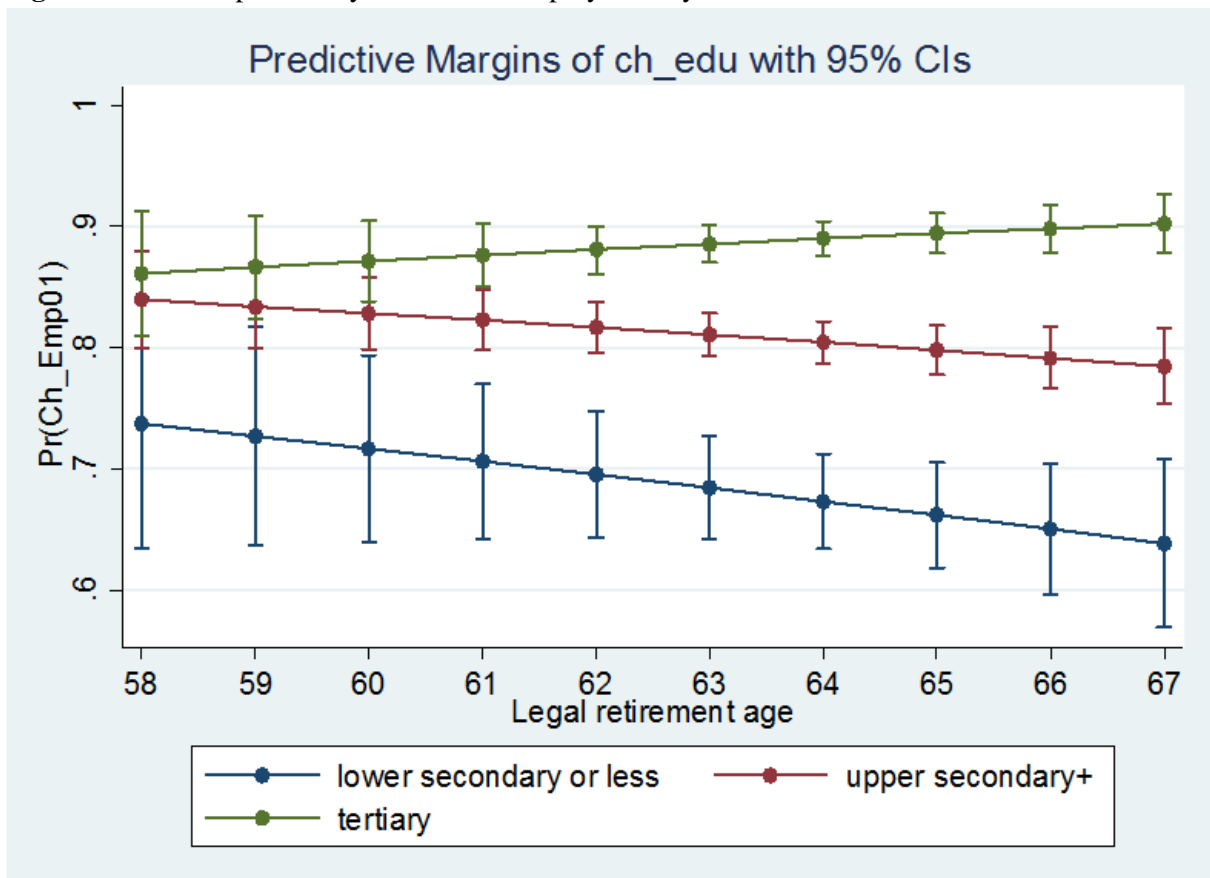


Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Mothers' education

Model 5 suggested that compared to mothers with upper secondary education, mothers with lower secondary education or less are 10 % less likely to be employed. A comparable conclusion can be drawn from Figure 7, where differences by educational level are substantial and confidence intervals do not overlap with those of the other educational categories, except for age 58, where the number of observations is small. While their confidence intervals are bigger, legal retirement age tends to affect mothers in the lowest educational category similarly than mothers with upper secondary education. Employment chances of mothers with some tertiary education do not seem to be negatively related to increases in the legal retirement age, point estimates even rise. This implies that the other two groups' relative disadvantage in terms of employment chances becomes slightly more pronounced when the legal retirement age rises. The Null hypothesis, that retirement age affects mothers of all educational levels equally is thus rejected and the alternative Hypothesis 3b preliminarily accepted.

Figure 7 Predicted probability of maternal employment by mothers' educational level

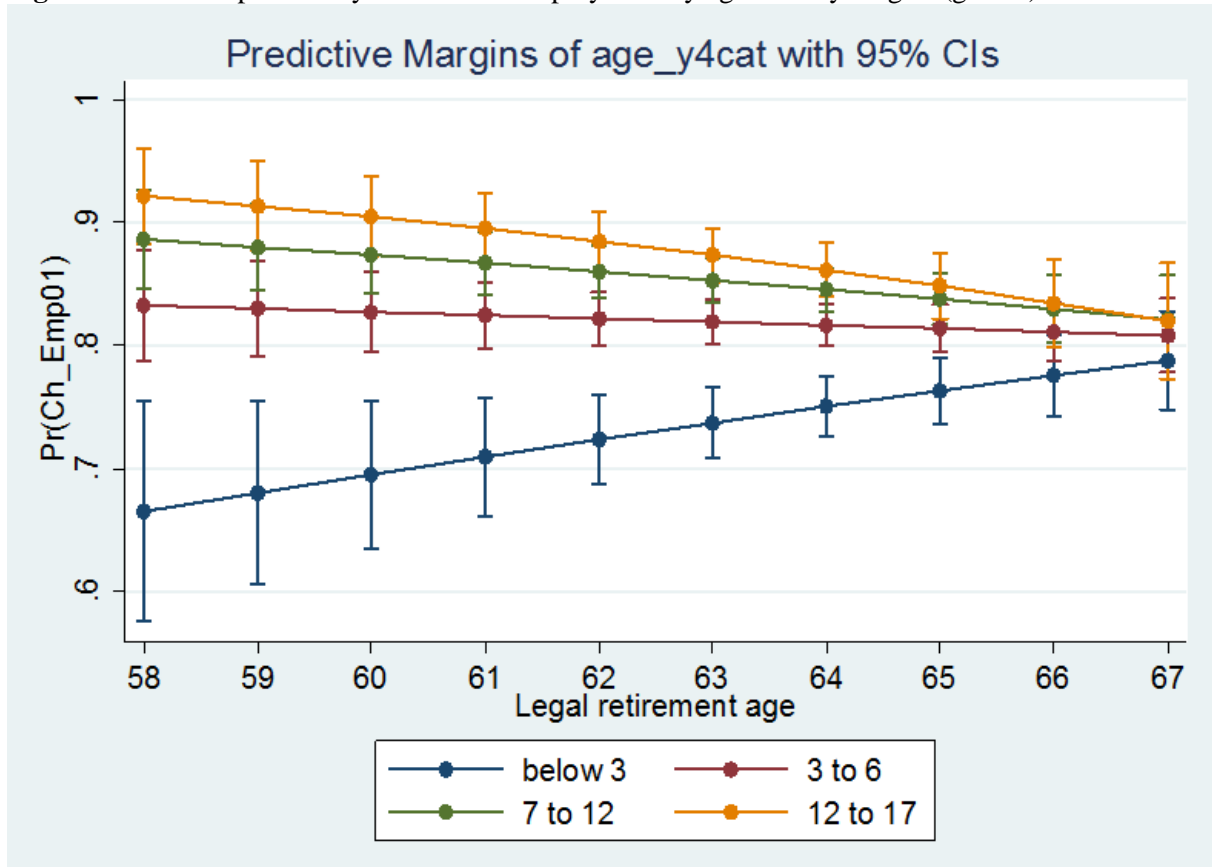


Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Number of children

From Model 5 we know that mothers with children aged below 3 years are about 6 % less likely to be employed than mothers where the youngest child is aged 3 to 6. Figure 8 adds another nuance to that finding. Increases in the legal retirement age go along with increases in the predicted probability of maternal employment if at least one of her children is younger than 3 years. For any other category of children's age, increases in legal retirement age are associated with a (slight) decrease in chances of employment, showing the expected direction of the relationship. Note that confidence intervals overlap horizontally for any children's age category. Still, Hypothesis 3c is not supported because the estimated effect of legal retirement age is not found to be stronger for mothers with very young or younger children than for mothers of older children.

Figure 8 Predicted probability of maternal employment by age of the youngest (grand-) child



Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

4.3 Sensitivity analyses

The validity of the entire analysis relies on the correct operationalisation of the legal retirement age. One potential danger for the reliability of the legal retirement age variable are changes over time in the required contribution years that are not mirrored by equally great increases in retirement age. In Belgium for example, the early retirement age was raised by only 0.5 years in 2013, while the required period of professional activity was raised by 4 years. This could lead to an underestimation of the effect of retirement age because the contribution years implicitly raise the actual age at which retirement is possible. In a robustness check an adjusted retirement age variable accounts for changes in required contribution years in the following way: Increases in contribution duration that are not accompanied by equally great increases in retirement age were translated to a 1 to 1 into contribution-change-adjusted retirement age variable. For Belgium, this means an adjustment of +3.5 years to the early retirement age in 2013. Using the contribution-years-adjusted normal retirement age variable yields results almost identical in magnitude and statistical significance than the results obtained in the main analysis for all three models (see Table A.4).

Misspecification of the retirement age variable was furthermore tested in three other ways. The first rests on the supposition that grandparents will take their earliest opportunity for retirement. This

reasoning implies that early retirement age (if applicable) rather than normal retirement age should be used in the analysis because it is a more relevant determinant of grandparents' retirement decisions. Table A.5 shows the logistic regression results (AMEs) for the three models when early instead of normal legal retirement age is used as treatment variable. Again, the results are fairly similar. Another option to operationalise legal retirement age would be as categorical variable. Two different categorisations have been applied, this time without the interaction with grandparents' gender. First, distinguishing eight groups of legal retirement ages (58-60 (otherwise the group is very small), 61, 62, ..., 67) and second building bigger and more evenly sized groups (58-60, 61-64, 65, 66-67). The results in Tables A.6 and A.7 are very much comparable to those of the main analyses: Compared to the reference retirement age category of 58-60 years, mothers in with grandparents with higher legal retirement ages categories have marginally lower employment chances, especially when they are in the highest retirement age group. In Model 2 (grandparental employment) the point estimates become smaller, stay constant to the inclusion of financial gifts (Model 3) and again decrease with grandchild care's introduction (Model 4). In sum, retirement age specification checks reveal that the results are robust to different possible operationalisations of the legal retirement age.

Moreover, the main results remain stable to important variation in the sample. In two sensitivity analyses, part-time employed mothers were first excluded from the analysis (Table A.8) and in a second vein, they were defined as not working (Table A.9). The latter grouping is also used by García-Morán and Kuehn (2017) who maintain that part-time employed mothers have a reduced need for childcare. In any model, the estimate for normal retirement age is slightly more negative than in the main analysis, while standard errors increased by 0.001, too. When part-time employed mothers are defined as not working, the estimates for legal retirement age deviate "most" from the original results, suggesting that if there was a potential effect, it would be driven by full-time employed mothers. This makes sense, since full-time employed mothers, arguably, are less flexible in their organisation of childcare and need to rely stronger on help from others.

Results remain almost unchanged, when only grandmothers are in the analysis (Table A.10) or only mothers with youngest children aged below 10 are included (Table A.11). Further robustness checks were implemented to check whether the results remain constant when single countries are excluded to avert troubles related to sampling.²⁶ For instance, in Luxembourg the 30 % minimum individual-level response rate demanded for baseline and refreshment samples was not met (Malter, Schuller, & Börsch-Supan, 2016). Respondents from single countries, like Luxembourg, Italy, or Germany could be excluded without finding noteworthy differences to the main analysis' results.

Lastly, another form of introducing the mediators, only one at the time yields the same results as the main analysis: Legal retirement ages' AME is at -0.2 % and increases to -0.1 % only when grandparental childcare is introduced. Again, interpreting changes in these small and statistically insignificant estimates is questionable. Table A.12 includes a sixth model, where grandparental health has been added as an additional potential mediator rather than as control in Model 5. The reason is that the research by Mazzonna and Peracchi (2017) provides evidence for a negative effect of retirement entry and the time spent in retirement health and cognitive abilities, for individuals who did not work in very physically demanding occupations. Raising the legal retirement age would thus actually be beneficial for the health (and thus childcare potential) of grandparents which should increase the employment chances of their daughters. When health is included as a mediator, we do however not observe a change to the AME of legal retirement age. Interestingly though, the negative AME of having an unemployed parent gets slightly smaller indicating a positive correlation between unemployment and bad health.

5 Discussion and conclusion

Where intergenerational transfers of time and money are shaped by macro-institutional arrangements, social and demographic contexts and individual preferences, policies that increase grandparents' employment and decrease their availability for grandchild care have the potential to lower mothers' employment chances. Raising the legal age of retirement is a politically increasingly popular instrument in terms of the latter policies. This thesis set out to explore the role of grandparents' statutory retirement age in mothers' employment across 15 European countries. The first aim is to assess how increases in retirement age are related to mothers' employment. This is done by exploiting variation in retirement legislation within and between the countries in logistic regressions on mothers' propensity to be employed across a range of 12 years. The second aim is to explore grandparental childcare as the mediation channel of a potential effect. To this purpose, the model successively includes potential mediating and control variables. The third subject of interest is whether the relationship between grandparents' legal retirement age and maternal employment differs for mothers with distinct needs for informal childcare assistance. In three analyses, interaction terms between retirement age and (a) mothers' partnership status, (b) their highest educational level and (c) the age of their youngest child, allow detecting heterogeneity along the three socio-demographic dimensions.

Descriptive analyses showed a common trend in rising rates of maternal employment across most countries, which could have been hampered by governments increasing the retirement age over time (e.g.: Belgium, Estonia, France, Germany, Poland, or Portugal) or it could have been supported by reductions in the legal age of retirement (Denmark, Sweden). At the same time, the bivariate descriptive analysis of retirement age and maternal employment does not indicate a clear relationship between the two. In line with previous research (e.g.: Mazzonna & Peracchi, 2017), retirement behaviour of a huge majority of grandparents was observed to largely comply with the institutional arrangements, retiring between ages 60 and 65.

Multivariate results of the logistic regressions suggest that increases in the legal retirement age barely affect mothers' employment chances. A mother's predicted probability of being employed decreases by 0.2 % on average if the legal retirement age is raised by one year. This is the estimate of the simplest model, controlling for the interview year, country and possible interactions of retirement age with grandparents' gender. It is robust to various different operationalisations of legal retirement age, for example as a categorical variable or adjusted to increases in required contribution duration or including early retirement eligibility. Hence, the analysis does not provide support for Hypothesis 1 that postulates a substantial and significant negative relationship between statutory retirement age and maternal employment.

As a consequence, Hypothesis 2 about the mediation channel of a potential effect, could not actually be tested. The estimated AME for legal retirement age, already being close to 0 before potential mediators are added, does not really offer the potential to loose further substantial or statistical significance. Only when introducing grandparent-provided childcare and subsequently the control variables, the AME gets even closer to 0 in two steps. While these marginal changes tend to underpin the idea that increases in legal retirement age affect maternal employment through grandparents' employment and the childcare provided by grandparents, a genuine interpretation should be refrained from.

Along the dimensions of mothers' childcare needs the analyses indicate that single and not partnered mothers' employment may suffer from higher legal retirement ages. Yet, the differences are not statistically significant. Therefore, the Null hypothesis of no difference in legal retirement age's impact on single and partnered mothers cannot be rejected. Further, the analyses of effect heterogeneity suggest that increases in statutory retirement age tend to worsen the relative disadvantage of mothers without tertiary education in the likelihood of being employed. This is supportive of Hypothesis 3b. Lastly, mothers with children younger than 3 seem to slightly catch up with employment rates of mothers with older children, when the legal retirement age rises. While this is in line with Hypothesis 3c, the direction of the estimate may first look counterintuitive. It could be explained by the fact that children in the youngest age group are less likely to be in formal childcare than older children, as Arpino et al. (2014) note. For older children, who are more likely to be in some form of formal care, the relationship is negative, as would be expected. If higher retirement ages removed the option of grandparental childcare, work-oriented mothers with very young children would also have to rely on formal childcare. Heterogeneity between mothers with very young children may cause the standard errors for this group

to be largest. Among them, likely only those mothers with higher labour market resources may afford formal childcare to substitute grandparental care. There could also be higher heterogeneity in mothers' preferences for the 'externalness' of care for very young children (Arpino et al., 2014). Homogenous preferences for external childcare among tertiary-educated mothers, together with their potential to afford formal childcare could also explain why highly educated mothers' employment, in particular, does not seem to be negatively affected by increases in legal retirement age. In general, the results of the heterogeneity analyses fit with the results of those studies that find the effects of grandparent-provided childcare or legal retirement age is stronger for mothers whose employment is more likely to depend on cheap and flexible grandparent-provided childcare (e.g: Arpino et al., 2014; Bratti et al., 2018). While effect heterogeneity by mothers' characteristics could possibly be a reason why the overall estimate of Model 1 is small, reasons of sample size forbid an analysis by subgroup.

The study has limitations with regard to the available information in the SHARE data and the sample size. Unfortunately, only the childcare activities of grandparents from one side, namely the mother's parents, can be analysed because SHARE samples on the grandparent level. No information on the mother's or child's relationship with the in-law family is available. This lack of information on grandparents from both sides gives rise to some potential for omitted variable bias. On the one side, if help from own parents is positively correlated with help from in-laws an upward bias of the estimate for the mediating grandparental childcare could result. This could be happening when both have strong family ties (Aassve et al., 2012a). Grandparental childcare would then also capture the impact of the in-law's childcare. On the other side, work-oriented mothers might turn to their parents in law for childcare when their own parents are still working. This is not unlikely, since the male partner usually is older, and their in-laws therefore are more likely to be older too. In that case, the mother's in-laws have higher chances to be retired than her own parents. A negative bias on the retirement age estimate's size would be the result. Albeit this risk is real, the existing literature discussed in section 2.2 finds that grandparents are more likely to give childcare to their daughters' children than to their sons'. Either way, ideally, information on the whole family structure, including retirement ages and childcare involvement of the mother and the father's parents would be used.

Perhaps the main limitations of this analysis arise from the low variability in legal retirement age coupled with a sample size of 5,673 grandparent-mother dyads (9,545 observations) from many different countries (16, when East- and West-Germany count as two countries). For an econometric analysis, the sample is rather small, especially when considering the number of covariates and the interaction of the retirement age variable with grandparent gender. Adding to this difficulty, over 75 % of the grandfathers and more than 50 % of the grandmothers are subject to the statutory retirement age of 65 years. There are rather few observations (1,146 dyad-wave) with retirement ages above 65. At the same time, female employment rates vary largely across the countries and it is clear that other institutions than the statutory age of retirement importantly shape these differences. The analysis by Aassve et al. (2012a) reminds us that estimating cross-country average effects of grandparental childcare on maternal labour force participation may be problematic. It might fail to mirror the country-specific effects and policy implications may not easily be derived. These authors find variation over countries in the direction of the bias from unobserved work-family preferences as well as the effect of grandparental childcare help. For the present analysis, this could be problematic because country heterogeneity could cancel out estimated effect sizes. Besides, the equivalence of the grandparental childcare measure is not necessarily given between Northern and Southern European countries. In Southern European countries family support often happens within the same building or household (e.g.: Dykstra, 2018). Reporting behaviour about support exchanges in surveys could be affected if such a kind of childcare help is low-key. Nevertheless, a cross-country-approach has the important advantage of making the estimate of legal retirement age more robust in terms of it measuring what it is supposed to measure.

Future analyses most likely will be able to exploit greater variation in higher legal retirement ages, given the recent developments in this policy area (see: OECD, 2017). If it is true that low variability in legal retirement age and sample size are major obstacles to the estimation, future research based on a larger sample should enhance the reliability of statements we can make about retirement age and maternal labour supply. Using a larger sample would, additionally, allow to conduct separate analyses by the subgroups of mothers according to the dimensions of their (informal) childcare needs. As a next step, the explanatory power of cross- and single-country policy studies in this area would certainly profit from including a greater variety of macro-level determinants. In the case of studies about retirement age and maternal employment, the availability, cost and quality of formal childcare, as well as the

availability of part-time jobs, could be promising candidates. We need to examine the latter variables in concert with legal retirement arrangements, in order to find out which constellations allow to avert a conflict between labour force participation of women in the grandparents' and the mothers' generation in different contexts. This would be especially useful to policymakers in countries like Italy, where higher retirement ages are identified as constitutive of this dilemma (Aparicio-Fenoll & Vidal-Fernandez, 2015; Bratti et al., 2018).

Aside from this, policymakers should bear in mind that higher retirement ages are not the only means to raise employment rates. Before urging those people who would rather retire to remain in the labour force, it may be worth considering to increase the number of people who would rather be economically active and to enable their employment. Improving the working conditions so people will not want or need to exit the labour market for reasons of ill health, as well as investing in lifelong learning to help protect people from unemployment have been suggested as key ideas in this regard (Ebbinghaus & Radl, 2015).

Notes

¹ This text distinguishes three generational groups: Grandparents, mothers, and (grand-) children. The middle generation is referred to from the perspective of the youngest generation in most cases ('mothers') but they are called 'children' when they are referred to from the grandparents' perspective. Similarly, the youngest generation is referred to as 'children' in their role as "characteristics" of their parents (the mothers) and as 'grandchildren' in relation to their grandparents.

² In the welfare state literature, these contexts are called 'supported familialism' or 'familialism by default' policy structures (Keck & Saraceno, 2012).

³ Regarding childcare help, one Continental country is the exception: In France grandparental help with childcare is less common. Yet, in the domain of female employment and family policy France fits rather with the Nordic countries, which could explain its outsider position (Bordone, Arpino, & Aassve, 2017).

⁴ Aassve, Arpino, and Goisis (2012a) explain in detail why the bias is negative, if in a country most families consist of either work or family-oriented mothers and grandmothers and why the bias is positive if most families have mixed preferences.

⁵ They additionally try and find very similar results with a bivariate probit model of grandparental childcare and maternal labour force participation, where errors are allowed to correlate.

⁶ Del Boca (2002) had already used a comparable strategy on Italian panel data from the Survey on Household Income and Wealth, where she approximated grandparents' childcare availability by having at least one grandparent alive. She finds positive effects on mothers' labour market participation and fertility.

⁷ Aassve et al. (2012a) study data on Bulgaria, France, Georgia, Germany, Hungary, Russia and the Netherlands collected between 2001 and 2006.

⁸ For an overview of country participation by wave and the questionnaire modules included in each wave see: <http://www.share-project.org/data-documentation/waves-overview.html>.

⁹ In wave 1 only people born before 1954 were interviewed, from wave 2 on only the main respondent has to be aged 50+ (MEA, 2018).

¹⁰ <http://www.share-project.org/en/data-documentation/methodology-volumes.html> [21.08.2018].

¹¹ The SHARE data collection has been primarily funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812) and FP7 (SHARE-PREP: N°211909, SHARE-LEAP: N°227822, SHARE M4: N°261982). Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see: www.share-project.org).

¹² Following other papers (e.g.: Mazzonna & Peracchi, 2017), representativeness of the Greek sample needs to be doubted because sampling was conducted based on the telephone book and completed within two months only.

¹³ See MISSOC website: <https://www.missoc.org/>. Data is biannually updated and reported for the 1st of January and from 2005 also for 1st of July. For this analysis the first reporting date was chosen.

¹⁴ See section 4.3 a robustness check with younger children.

¹⁵ Correct mother-identifiers could luckily be restored, for those mothers whose parents divorced and therefore initially had two different identifiers.

¹⁶ The variable with the highest fraction missing was contribution duration to retirement funds, where 45.46 % of the observations were missing. While it is not directly needed for the main analysis and not part of the covariates, it is an issue for the construction of the early retirement age variable which is discussed in section 3.3.1.

¹⁷ A robustness check, not included here but available on request, reveals that the results are consistent in sign and statistical significance and remain numerically almost unchanged, if self-employed and mothers working in a family business are included to the employed mothers.

¹⁸ Arguably, their childcare involvement could also depend on the legislation in between the 12 months before the interview, if they decide to retire within the last year. Yet, there is no sufficient reason to choose one specific point in this interval, so this is why the decision was made for retirement age at 12 months before the interview.

¹⁹ Sometimes, countries have special eligibility rules for certain groups that cannot be accounted for with the SHARE data or that are imprecisely formulated in MISSOC and could not be reconstructed with reasonable effort. They are subsumed under the 'Not accounted for'-sections in Appendix B.

²⁰ Admittedly, it is unclear why early retirement age would be higher in the first place. Perhaps some cohort-specific legislation, not reflected in MISSOC, explains the issue. National authorities bear the responsibility for updating the MISSOC's contents.

²¹ Aassve et al. (2012a) and García-Morán and Kuehn (2017) also treat East and West Germany as differential cases but they exclude individuals from East Germany for sample size or theoretical reasons.

²² Response categories: 1. In the same household; 2. In the same building; 3. Less than 1 kilometre away; 4. Between 1 and 5 kilometres away; 5. Between 5 and 25 kilometres away; 6. Between 25 and 100 kilometres away;

7. Between 100 and 500 kilometres away; 8. More than 500 kilometres away; 9. More than 500 kilometres away in another country.

²³ While also a probit model could have been used, Baum (2006, p. 250) maintains that logit and probit yield similar results if the distribution of the dependent variable is not very extreme.

²⁴ With the information provided by the SHARE, it is not possible to distinguish regular care from custodial care by grandparents. If the grandparent who looks after their grandchildren is the person primarily responsible for them, it is less clear how this will affect mother's employment.

²⁵ Mood (2010, p. 69) points out that any increases in explained variance in the dependent variable go along with increases of its total variance (because the residual variance is assumed to be fixed) and hence estimated coefficients represent not only effects but also the degree of unobserved heterogeneity.

²⁶ Results available upon request.

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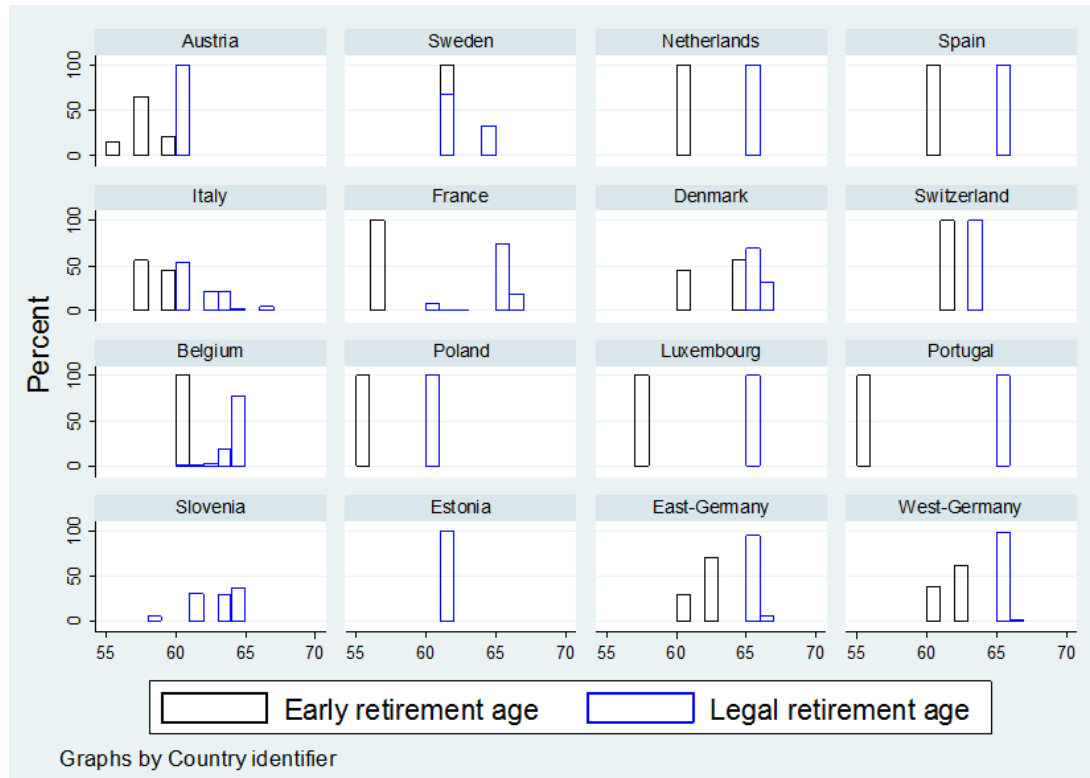
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Appendix A

Figures

Figure A.1 Distribution of legal retirement ages for women by country, 2003-2014



Notes: Unweighted distribution; early retirement age reflects only those cases where it differs from normal retirement age. Source: Own elaboration based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Figure A.2 Distribution of legal retirement ages for men by country, 2003-2014



Notes: Unweighted distribution; early retirement age reflects only those cases where it differs from normal retirement age. Source: Own elaboration based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Tables

Table A.1 Breakdown of minimum household response rates (%), all baseline/refreshment samples

Country	Wave 1	Wave 2	Wave 4	Wave 5	Wave 6
Austria	36,7		39,0		
Belgium	34,3	42,1	40,8	34,0	43,9
Croatia					34,9
Czech Republic		41,0	35,6	48,9	
Denmark	63,2	65,2	51,6	59,5	57,2
Estonia			61,0		55,8
France	58,2	53,0	54,9		33,4
Germany	57,7	48,8		34,1	
Greece	54,3	52,2			61,3
Hungary			54,5		
Israel	64,4	77,9		51,5	44,9
Italy	52,6	51,0	41,6	43,4	
Luxembourg				32,5	30,3
Netherlands	60,9	47,5	40,0	48,9	
Poland		55,2			50,0
Portugal			39,4		
Slovenia			55,0	40,8	45,1
Spain	50,2	58,4	63,1	60,4	
Sweden	53,7	35,7		39,3	
Switzerland	32,0	47,0	54,9		

Notes: Minimum response rate: “the number of complete interviews (I) divided by the number of interviews (complete (I) plus partial (P)8 plus the number of non-interviews (refusal and break-off (R) plus non-contacts (NC) plus others (O)) plus all cases of unknown eligibility (unknown if housing unit exists (UH) plus unknown, other (UO))” Bergmann et al. (2017, p.17). Source: Own representation based on Bergmann et al. (2017, p.19-21, Tables 2-6)

Table A.2 Sample size by country, interview wave and grandparent gender

Country	Wave 1		Wave 2		Wave 4		Wave 5		Wave 6		Total
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	
Austria	57	41	48	26	96	84	112	96	83	69	712
Sweden	128	106	113	96	42	27	161	117	112	88	990
Netherlands	168	79	131	97	100	63	158	115			911
Spain	44	24	22	14	29	31	41	21	33	24	283
Italy	56	25	51	36	47	28	78	50	57	45	473
France	111	69	101	60	156	85	147	87	121	83	1,020
Denmark	60	49	92	90	36	31	139	109	133	119	858
Switzerland	26	26	36	33	63	44	88	46	73	46	481
Belgium	146	98	113	113	143	116	205	178	159	139	1,410
Poland			94	51	37	21			30	27	260
Luxembourg							41	27	30	15	113
Portugal					47	40			43	25	155
Slovenia					63	52	78	51	81	66	391
Estonia					128	96	159	103	152	97	735
East-Germany	11	11	13	15	6	7	32	26	37	22	180
West-Germany	64	37	68	31	31	19	112	76	82	53	573
Total	871	565	882	662	1,024	744	1,551	1,102	1,226	918	9,545
	1,436		1,544		1,768		2,653		2,144		

Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018).

Table A.3 Logistic regression on mothers' employment, odds ratios

	M1	M2	M3	M4	M5
Legal retirement age	0.966 (0.023)	0.976 (0.023)	0.976 (0.023)	0.978 (0.023)	0.977 (0.024)
Male grandparent (ref.: Female)	0.919 (0.065)	0.860* (0.064)	0.858* (0.064)	0.870 (0.065)	0.903 (0.073)
Male* Legal retirement age	1.048 (0.046)	1.027 (0.044)	1.027 (0.044)	1.027 (0.044)	1.049 (0.044)
Grandparents' employment status (ref.: Employed)					
Retired		1.636*** (0.137)	1.640*** (0.137)	1.622*** (0.136)	1.067 (0.101)
Unemployed		0.633*** (0.078)	0.638*** (0.079)	0.632*** (0.078)	0.634*** (0.083)
Homemaker		0.922 (0.104)	0.924 (0.104)	0.900 (0.102)	0.666*** (0.082)
Financial gift (ref.: no)			1.141 (0.104)	1.108 (0.100)	1.003 (0.094)
Grandchild care (ref.: never)					
less than weekly				0.975 (0.088)	0.928 (0.089)
weekly				1.431*** (0.134)	1.323** (0.137)
daily				1.605*** (0.200)	1.802*** (0.259)
<i>Grandparents' characteristics</i>					
Less than good health (ref.: good health)					0.917 (0.073)
Age					1.023 (0.013)
Single (ref.: partnered)					0.915 (0.099)
Education (ref.: lower secondary or less)					
upper secondary+					1.084 (0.120)
tertiary					1.116 (0.177)
Mean couple education (ref.: lower secondary or less)					
upper secondary+					1.083 (0.136)
tertiary					0.891 (0.174)
Number of children (ref.: 2 children)					
1 child					0.722* (0.100)
3 children					0.941 (0.093)
4 children					0.866 (0.114)
(Last) employment type (ref.: Employee)					
Civil servant					0.911 (0.103)
Self-employed					0.878 (0.102)
(Last) job (ref.: Service worker/ shop and market sales worker)					
Legislator, senior official or manager					0.941 (0.156)
Professional					0.842 (0.147)
Technician or associate professional					0.839 (0.120)
Clerk					1.098 (0.149)

Table A.3, continued:

Skilled agricultural or fishery worker					0.824 (0.096)
Craft and related trades worker					1.128 (0.280)
Plant and machine operator or assembler					1.658* (0.401)
Elementary occupation					0.789 (0.144)
Distance to child (ref.: up to 5km)					
5 to 25 km					0.907 (0.085)
25 to 100 km					0.829 (0.097)
Same household (ref.: no)					0.424*** (0.085)
<i>Mothers' characteristics</i>					
Age					1.059*** (0.013)
Single (ref.: partnered)					1.069 (0.134)
Education (ref.: upper secondary+)					
lower secondary or less					0.526*** (0.064)
tertiary					1.997*** (0.199)
Number of children (ref.: 2 children)					
1 child					1.510*** (0.141)
3 children					0.488*** (0.054)
4+ children					0.274*** (0.049)
Age youngest child (ref.: 3 to 6)					
below 3					0.626*** (0.059)
7 to 11					1.138 (0.107)
12 to 17					1.198 (0.166)
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes
ll	-4165	-4118	-4116	-4092	-3740
ll_0	-4483	-4483	-4483	-4483	-4483
df_m	26	29	30	33	66
chi2	306.7	388.1	388.2	419.4	775.5
p	0	0	0	0	0
Pseudo R ²	0.0709	0.0814	0.0818	0.0871	0.166
AIC	8,383	8,295	8,293	8,252	7,613
BIC	8,576	8,510	8,515	8,496	8,093
N	9,545	9,545	9,545	9,545	9,545

Notes: Cluster-robust standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

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Table A.4 Logistic regression on mothers' employment, legal retirement age adjusted for contribution years, AMEs

	M1	M2	M3	M4	M5
Legal retirement age (adjusted)	-0.002 (0.003)	-0.001 (0.003)	-0.001 (0.003)	-0.000 (0.003)	0.001 (0.002)
Male grandparent (ref.: Female)	-0.019* (0.009)	-0.026** (0.009)	-0.026** (0.009)	-0.024** (0.009)	-0.020* (0.009)
Grandparents' employment status (ref.: Employed)					
Retired		0.062*** (0.010)	0.063*** (0.010)	0.061*** (0.010)	0.008 (0.011)
Unemployed		-0.075*** (0.022)	-0.073*** (0.022)	-0.074*** (0.022)	-0.061** (0.019)
Homemaker		-0.012 (0.017)	-0.012 (0.017)	-0.015 (0.017)	-0.053** (0.017)
Financial gift (ref.: no)			0.017 (0.012)	0.013 (0.012)	0.000 (0.011)
Grandchild care (ref.: never)					
less than weekly				-0.003 (0.013)	-0.009 (0.013)
weekly				0.047*** (0.012)	0.034** (0.012)
daily				0.060*** (0.015)	0.066*** (0.015)
Individual-level controls	No	No	No	No	Yes
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes
N	9,545	9,545	9,545	9,545	9,545

Note: Cluster-robust standard errors in parentheses. Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Table A.5 Logistic regression on mothers' employment, early retirement age, AMEs

	M1	M2	M3	M4	M5
Early retirement age	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.001 (0.002)
Male grandparent (ref.: Female)	-0.019* (0.008)	-0.024** (0.009)	-0.024** (0.009)	-0.022* (0.009)	-0.018 (0.009)
Grandparents' employment status (ref.: Employed)					
Retired		0.063*** (0.010)	0.064*** (0.010)	0.062*** (0.010)	0.008 (0.011)
Unemployed		-0.074*** (0.022)	-0.073*** (0.022)	-0.074*** (0.022)	-0.061** (0.019)
Homemaker		-0.011 (0.017)	-0.011 (0.017)	-0.015 (0.017)	-0.053** (0.017)
Financial gift (ref.: no)			0.017 (0.012)	0.013 (0.012)	0.000 (0.011)
Grandchild care (ref.: never)					
less than weekly				-0.004 (0.013)	-0.010 (0.013)
weekly				0.047*** (0.012)	0.034** (0.012)
daily				0.060*** (0.015)	0.066*** (0.015)
Individual-level controls	No	No	No	No	Yes
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes

Table A.5, continued:

N	9,545	9,545	9,545	9,545	9,545
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Note: Cluster-robust standard errors in parentheses. Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Table A.6 Logistic regression on mothers' employment, legal retirement age (8 cat.), AMEs

	M1	M2	M3	M4	M5
Legal retirement age (ref.: 58-60 years)					
61 years	-0.012 (0.026)	-0.007 (0.026)	-0.007 (0.026)	-0.006 (0.026)	-0.005 (0.025)
62 years	0.024 (0.025)	0.028 (0.025)	0.027 (0.025)	0.032 (0.025)	0.026 (0.025)
63 years	-0.032 (0.024)	-0.025 (0.024)	-0.025 (0.024)	-0.021 (0.024)	-0.021 (0.024)
64 years	0.020 (0.031)	0.026 (0.030)	0.025 (0.030)	0.021 (0.030)	0.026 (0.029)
65 years	-0.011 (0.016)	-0.011 (0.016)	-0.011 (0.016)	-0.009 (0.016)	-0.008 (0.016)
66 years	-0.008 (0.031)	0.005 (0.030)	0.005 (0.030)	0.009 (0.030)	0.001 (0.030)
67 years	-0.066 (0.042)	-0.048 (0.038)	-0.048 (0.038)	-0.043 (0.038)	-0.020 (0.033)
Male grandparent (ref.: Female)	-0.013 (0.010)	-0.019 (0.010)	-0.019 (0.010)	-0.017 (0.010)	-0.012 (0.010)
Grandparents' employment status (ref.: Employed)					
Retired		0.062*** (0.010)	0.063*** (0.010)	0.061*** (0.010)	0.008 (0.011)
Unemployed		-0.075*** (0.022)	-0.074*** (0.022)	-0.074*** (0.022)	-0.061** (0.019)
Homemaker		-0.012 (0.017)	-0.011 (0.017)	-0.015 (0.017)	-0.053** (0.017)
Financial gift (ref.: no)			0.017 (0.012)	0.013 (0.012)	0.000 (0.011)
Grandchild care (ref.: never)					
less than weekly				-0.004 (0.013)	-0.010 (0.013)
weekly				0.047*** (0.012)	0.033** (0.012)
daily				0.060*** (0.015)	0.066*** (0.015)
Individual-level controls	No	No	No	No	Yes
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes
N	9,545	9,545	9,545	9,545	9,545

Note: Cluster-robust standard errors in parentheses. Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Table A.7 Logistic regression on mothers' employment, legal retirement age (4 cat.), AMEs

	M1	M2	M3	M4	M5
Legal retirement age (ref.: 58-60 years)					
61-64 years	-0.005 (0.020)	0.001 (0.020)	0.001 (0.020)	0.002 (0.020)	0.003 (0.020)
65 years	-0.005 (0.016)	-0.006 (0.016)	-0.006 (0.016)	-0.004 (0.016)	-0.004 (0.016)
66-67 years	-0.031 (0.027)	-0.016 (0.026)	-0.016 (0.026)	-0.012 (0.026)	-0.007 (0.025)
Male grandparent (ref.: Female)	-0.018* (0.009)	-0.024* (0.010)	-0.024* (0.010)	-0.022* (0.010)	-0.017 (0.009)

Table A.7, continued:

Grandparents' employment status (ref.: Employed)					
Retired		0.062***	0.063***	0.061***	0.008
		(0.010)	(0.010)	(0.010)	(0.011)
Unemployed		-0.075***	-0.073***	-0.074***	-0.061**
		(0.022)	(0.022)	(0.022)	(0.019)
Homemaker		-0.013	-0.013	-0.016	-0.055**
		(0.017)	(0.017)	(0.017)	(0.017)
Financial gift (ref.: no)			0.018	0.014	0.000
			(0.012)	(0.012)	(0.011)
Grandchild care (ref.: never)					
less than weekly				-0.003	-0.010
				(0.013)	(0.013)
weekly				0.047***	0.034**
				(0.012)	(0.012)
daily				0.061***	0.066***
				(0.015)	(0.015)
Individual-level controls		No	No	No	Yes
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes
N	9,545	9,545	9,545	9,545	9,545

Note: Cluster-robust standard errors in parentheses. Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Table A.8 Logistic regression on mothers' full-time employment, part-time employed mothers excluded, AMEs

	M1	M2	M3	M4	M5
Early retirement age	-0.003	-0.004	-0.004	-0.003	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Male grandparent (ref.: Female)	-0.018	-0.029*	-0.029*	-0.028*	-0.024*
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Grandparents' employment status (ref.: Employed)					
Retired		0.076***	0.076***	0.074***	0.006
		(0.013)	(0.013)	(0.013)	(0.014)
Unemployed		-0.084***	-0.082**	-0.081**	-0.066**
		(0.025)	(0.025)	(0.025)	(0.021)
Homemaker		-0.037	-0.036	-0.040	-0.076***
		(0.024)	(0.024)	(0.024)	(0.023)
Financial gift (ref.: no)			0.021	0.017	-0.004
			(0.015)	(0.015)	(0.014)
Grandchild care (ref.: never)					
less than weekly				-0.007	-0.015
				(0.016)	(0.015)
weekly				0.041**	0.020
				(0.016)	(0.015)
daily				0.071***	0.073***
				(0.019)	(0.018)
Individual-level controls		No	No	No	Yes
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes
N	6,994	6,994	6,994	6,994	6,994

Note: Cluster-robust standard errors in parentheses. Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Table A.9 Logistic regression on mothers' full-time employment, part-time employed mothers included as not employed, AMEs

	M1	M2	M3	M4	M5
Legal retirement age	-0.005 (0.004)	-0.006 (0.004)	-0.006 (0.004)	-0.006 (0.004)	-0.005 (0.004)
Male grandparent (ref.: Female)	-0.002 (0.011)	-0.013 (0.011)	-0.013 (0.011)	-0.013 (0.011)	-0.018 (0.012)
Grandparents' employment status (ref.: Employed)					
Retired		0.040** (0.013)	0.041** (0.013)	0.039** (0.013)	-0.008 (0.015)
Unemployed		-0.048* (0.023)	-0.048* (0.023)	-0.048* (0.023)	-0.040 (0.022)
Homemaker		-0.058** (0.022)	-0.058** (0.022)	-0.061** (0.022)	-0.087*** (0.022)
Financial gift (ref.: no)			0.009 (0.014)	0.009 (0.014)	-0.011 (0.014)
Grandchild care (ref.: never)					
less than weekly				-0.018 (0.015)	-0.022 (0.015)
weekly				-0.004 (0.015)	-0.014 (0.015)
daily				0.028 (0.022)	0.044* (0.021)
Individual-level controls	No	No	No	No	Yes
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes
N	9,545	9,545	9,545	9,545	9,545

Note: Cluster-robust standard errors in parentheses. Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Table A.10 Logistic regression on mothers' employment, grandmothers only, AMEs

	M1	M2	M3	M4	M5
Legal retirement age	0.000 (0.005)	0.001 (0.005)	0.001 (0.005)	0.001 (0.005)	0.006 (0.005)
Male grandparent (ref.: Female)		0.082*** (0.015)	0.083*** (0.015)	0.080*** (0.015)	0.018 (0.015)
Grandparents' employment status (ref.: Employed)					
Retired		-0.063** (0.022)	-0.062** (0.022)	-0.062** (0.022)	-0.054* (0.021)
Unemployed		-0.005 (0.017)	-0.005 (0.017)	-0.009 (0.016)	-0.047** (0.017)
Homemaker			0.021 (0.014)	0.018 (0.014)	0.007 (0.013)
Financial gift (ref.: no)				-0.028* (0.014)	-0.024 (0.014)
Grandchild care (ref.: never)					
less than weekly				0.042** (0.015)	0.038* (0.015)
weekly				0.063*** (0.019)	0.075*** (0.020)
daily	No	No	No	No	Yes
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes
N	5,554	5,554	5,554	5,554	5,554

Note: Cluster-robust standard errors in parentheses. Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Table A.11 Logistic regression on mothers' employment, youngest child <10 years, AMEs

	M1	M2	M3	M4	M5
Legal retirement age	-0.002 (0.004)	-0.002 (0.004)	-0.002 (0.004)	-0.001 (0.004)	-0.001 (0.004)
Male grandparent (ref.: Female)	-0.010 (0.010)	-0.017 (0.011)	-0.018 (0.011)	-0.013 (0.010)	-0.011 (0.011)
Grandparents' employment status (ref.: Employed)					
Retired		0.066*** (0.012)	0.066*** (0.012)	0.062*** (0.012)	0.027* (0.013)
Unemployed		-0.072** (0.023)	-0.070** (0.023)	-0.071** (0.023)	-0.058** (0.020)
Homemaker		-0.014 (0.020)	-0.014 (0.020)	-0.021 (0.020)	-0.049* (0.020)
Financial gift (ref.: no)			0.018 (0.014)	0.011 (0.014)	-0.002 (0.013)
Grandchild care (ref.: never)					
less than weekly				0.021 (0.016)	-0.003 (0.015)
weekly				0.078*** (0.015)	0.046** (0.015)
daily				0.093*** (0.018)	0.083*** (0.017)
Individual-level controls	No	No	No	No	Yes
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes
N	7,434	7,434	7,434	7,434	7,434

Note: Cluster-robust standard errors in parentheses. Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Table A.12 Logistic regression on mothers' employment, Model 6: grandparents' health, AMEs

	M1	M2	M3	M4	M5	M6
Legal retirement age	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.001 (0.003)	-0.000 (0.003)	-0.002 (0.003)
Male grandparent (ref.: Female)	-0.019* (0.009)	-0.025* (0.010)	-0.025* (0.010)	-0.023* (0.010)	-0.019* (0.010)	-0.025** (0.010)
Grandparents' employment status (ref.: Employed)						
Retired		0.062*** (0.010)	0.062*** (0.010)	0.061*** (0.010)	0.008 (0.011)	0.064*** (0.010)
Unemployed		-0.074*** (0.022)	-0.074*** (0.022)	-0.075*** (0.022)	-0.060** (0.019)	-0.068** (0.021)
Homemaker		-0.012 (0.017)	-0.012 (0.017)	-0.016 (0.017)	-0.053** (0.017)	-0.010 (0.017)
Financial gift (ref.: no)				-0.003 (0.013)	-0.010 (0.013)	
Grandchild care (ref.: never)						
less than weekly				0.048*** (0.012)	0.034** (0.012)	
weekly				0.061*** (0.015)	0.066*** (0.015)	
daily					0.000 (0.011)	
Less than good health (ref.: good health)					-0.011 (0.010)	-0.025* (0.011)
Individual-level controls	No	No	No	No	Yes	No
Country Dummy (ref.: France)	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy (ref.: 2004)	Yes	Yes	Yes	Yes	Yes	Yes
N	9,545	9,545	9,545	9,545	9,545	9,545.000

Note: Cluster-robust standard errors in parentheses. Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: Own calculations based on SHARE waves 1, 2, 4, 5, and 6, release 6.1.0 (MEA, 2018) and MISSOC (2018).

Appendix B

Retirement Age

The retirement ages used in this paper are based on the country-specific rules for normal and early retirement in the years relevant for a country's participation in SHARE (waves 1, 2, 4, 5 and 6). Retirement ages between 2003 and 2015 are reported for countries that participated in all waves (Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Spain, Sweden and Switzerland) when a country only participated in some of the waves the corresponding retirement ages are reported. Data for the years 2004 to 2015 is drawn from the MISSOC database based on the legislation as applicant on 1 January. For 2003 the information provided in OECD (2011, Tables 1.1 and 1.2, pp. 25-26) for the year 2002 has been used and checked with Mazzonna and Peracchi (2017). The retirement age depends on the country, year, and for some countries also on sex, birth cohort, and occupation.

Austria

Statutory old age: 60 for women and 65 for men between 2003 and 2015.

Early retirement age: Starting from age 55 for women and age 60 for men in 2003, the early retirement age was raised by 1.5 years in 2004. Between 2005 and 2013, those who have been insured before 1 January 2005 were subject to a slowly increasing retirement age (up to age 57.9 for women and 62.9 for men). While from 2014 onwards, early retirement is possible from the age of 62 for all men and women. From 2005 onwards, somebody who worked heavily for at least 10 years during the preceding 20 years and has a total of 45 insurance years may retire at age 60.

Contribution years: 40 in 2004, 41 in 2005, 42 in 2006, 43 in 2007, 45 since 2010.

Not accounted for: In addition, there are, only for certain age groups, two types of early pension for persons having an extremely long insurance career or particularly hard working conditions. None of this is specified any further and most likely the eligible would not be identifiable.

Belgium

Statutory old age: 65 for men and, until 2005, 63 for women (born in or after 1941). In 2006 women's retirement age was raised to 64 and from 2009 was adjusted to men's.

Early retirement age: 60 until 2012, then 0.5 years is added every year until 2015.

Contribution years: A standard career lasts 45 years. 34 years of professional activity were required for eligibility to early pension until 2005, 35 years until 2012, 38 in 2013, 39 in 2014, and 40 in 2015.

Denmark

Statutory old age: 65, but until 2009 it was 67 for those who were born before 1.7.1939.

Early retirement age: 60 until 2006, where early retirement was abolished.

Contribution years: Full pension after 40 years of residence between the ages of 15 and 65 (67 for those who had reached the age of 60 on 1.7.1999). No changes.

Estonia

Statutory old age: 61 for women in 2010 when the country first participated in SHARE, 61.5 in 2011 and 2012, 62 in 2013 and 2014 and 62.5 in 2015.

Early retirement age: Cannot be taken into account because it depends on the number of children raised and could thus be endogenously correlated with a person's work-family preferences.

Contribution years: 15 years, no changes.

France

Statutory old age: People in the general scheme for employees (Régime général d'assurance vieillesse des travailleurs salariés, RGAVTS) may retire at age 60 between 2004 and 2010 if they have 160 insurance affiliation quarters (40 years), otherwise at age 65. As of 2011, the statutory age of retirement remains 60 only for persons born before 1 July 1951. The retirement age increases by four months per birth year to reach 62 for persons born in 1956 or later, for those who fulfil the affiliation period of 162 quarters, otherwise, the increase reaches 67 for persons born in 1956 or later.

Early retirement age: For employees (ARRCO) and managerial staff (AGIRC) with a long career (obtained the basic pension at a full rate) since the age of 56 without advance.

Contribution years: 40 for a full pension at age 60 for persons born before 1 July 1951, 0.5 additional years for every two birth years.

Germany

Statutory old age: 65 is the eligibility age for an old age pension for women until 2006, then it is raised by 1 month for every birth year after 1947 until it reached age 66 (birth year 1959) and by 2 months for every year born after 1959 until it reaches age 67 for everyone born in 1963 or later. Retirement at age 65 is still possible for persons with 45 years of employment.

Early retirement age: 60 for women with a minimum of 15 contribution years, and 63 for men with 35 contribution years until 2007. From 2010 early retirement at age 63 is possible (with deduction) only with 35 years of contributions.

Contribution years: Minimum 5 years, no changes.

Not accounted for: Child-raising periods up to the age of 10 of the child and short periods of unemployment just before retirement age also are credited to the contribution years but could not be considered in the analysis. For the affected respondents, the assigned retirement age is thus slightly above the applicable retirement age.

Italy

Statutory old age: 60 for women, 65 for men until 2011. In 2012, civil servants and men in general work until age 66 (66 and 3 months from 2014), while the retirement age is raised to age 62 (63 and 9 months from 2014) for female employees in the private sector and 63.5 (64 and 9 months from 2014) for self-employed women.

Early retirement age: 57 until 2009, in 2010 it is 59/60 for employees/self-employed and from 2012 the early retirement age was raised to 62 (without deductions).

Contribution years: Persons insured before 1.1.1996 need 20 years of contributions at minimum and 40 years for a full pension, 35 for early retirement. After 37 years of contributions, retirement is possible regardless of age. The latter regulation is abolished in 2012 and the contribution years for a full pension are raised to 41 years and 1 month for women and 42 years and 1 month for men. In 2014 another 5 months are added.

Not accounted for: Employees of companies in economic difficulties may retire 5 years before the statutory age. In 2006, there was a flexible retirement age between 57 and 65 years persons insured since 1.1.1996, but in SHARE there is no information on the start of the insurance. Already in 2004, there are “special conditions” for employees with an early start of working life, employees exposed to arduous work, for "mobile", and for manual workers that are not specified further in MISSOC and could not be reconstructed from other sources.

Luxembourg

Statutory old age: 65 between 2012 and 2015.

Early retirement age: 57 between 2012 and 2015.

Contribution years: 40 years to be eligible for early retirement, no changes.

Not accounted for: Early retirement at age 60 is possible if either effective insurance or “assimilated periods” can be proved.

Netherlands

Statutory old age: 65 until 2012. As from 2013 the retirement age is 65 and 1 month and will gradually increase to reach 66 in 2019 and 67 in 2023. As of 2024, the legal retirement age will be linked to life expectancy.

Early retirement age: Official early retirement was abolished in 2004 and was possible before that from about age 60 (assigned) to 62 with 40 years of contributions.

Contribution years: Continuous insurance for 50 years for a full pension.

Poland

Statutory old age: 60 for women and 65 for men until 2012. Since 1 January 2013, the retirement age increased by 1 month for every 3 birth months until it reaches 67 for both sexes and starting from the birth cohorts of 1953 (women) and 1949 (men).

Early retirement age: Early retirement is only possible for persons born before 01.01.1949 and subject to the following conditions: Women with 30 or more contribution years, and since 2011 also men with 35 or more contribution years may retire early at age 55. Persons working in specific occupations or in unhealthy conditions retire 5, 10, or 15 years earlier.

Contribution years: 20 for women, 25 for men born before 1949, no relevant changes.

Not accounted for: The specific occupations for which early retirement is possible at 5, 10 or 15 could not be distinguished, therefore for anyone with a physically demanding occupation (see section 2.2.3) was assigned early retirement age of 15 years earlier than normal retirement age. With only 10 respondents concerned, the suspected effect on the results is negligible.

Portugal

Statutory old age: 65 until 2013, 66 since 2014.

Early retirement age: 55 with 30 contribution years (this rule was suspended in 2013 and 2014) or in heavy or unhealthy occupations.

Contribution years: 40 with a minimum qualifying period of 15 years, no changes.

Not accounted for: Unemployed may retire at age 62 (57) if they were unemployed since age 57 (52) and had completed the qualifying period of 15 (22) years. Exceptional early retirement possible when specific measures to protect economic activities or companies apply.

Slovenia

Statutory old age: Until 2012: 63 (65) for women (men) after 15 years of contributions, 61 (63) after 20 years and 58 for women and men after 38 (40) contribution years. Since 2013, retirement age is unified at age 65 with 15 contribution years and 60 with 40 contribution years.

Early retirement age: No designated early retirement other than the above rules.

Contribution years: See above, no changes.

Not accounted for: Contribution is credited regardless of the actual payment of contributions, but “purchased periods” (pokojninska doba brez dokupa) do not count since 2013.

Spain

Statutory old age: 65 until 2012, then one more month per year until 2015, if a person has less than the necessary contribution years.

Early retirement age: No general early retirement. Age 60 for persons insured according to the system abolished on 1 January 1967 (see below). The system to which a person is insured is not registered, neither is the start of a persons’ working life, however an auxiliary solution to recover at least some respondents correct early retirement age is to assign early retirement eligibility age 60 to those who contributed more than 38 (39,...) years in 2005 (2006, ...) and thus started working before 1967.

Contribution years: 35 until 2012, 35 years and 3 months in 2013 and another 3 months in 2014.

Not accounted for: Early retirement is also possible for involuntary unemployed after a certain duration of unemployment and for persons in arduous, toxic, dangerous or unhealthy occupations after a certain period of contribution (duration and retirement age not specified).

Sweden

Statutory old age: 65 until 2006, then flexible retirement entry between 61 and 67 (61 is assigned).

Early retirement age: 61 (earnings-related old-age pension).

Contribution years: None, but 40 years of residence in Sweden for a full Guaranteed Pension (garantipension). No changes.

Not accounted for: From 2010 there is an earnings-related supplementary pension (tillägspension) for which 30 years with pensionable income are necessary.

Switzerland

Statutory old age: 65 for men and 63 for women until 2004, then 64.

Early retirement age: One or two (assigned) years early with deduction.

Contribution years: 1 year for the 1st pillar (basic scheme), none for the 2nd pillar (statutory minimum), no changes.