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Research Article

Retirement timing and grandparenthood in Sweden: Evidence from population-based register data

Linda Kridahl

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Retirement timing and grandparenthood in Sweden: Evidence from population-based register data

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Abstract

OBJECTIVES
This study addresses the importance of grandparenthood in relation to retirement timing in Sweden. It extends previous research by assessing a number of grandparental characteristics, such as being a grandparent, a grandparent's age and gender, number of years since the transition to grandparenthood, number of grandchildren, number of grandchild sets, and age of the youngest grandchild, while simultaneously controlling for other central predictors of retirement timing.

METHOD
The study uses survival analysis on Swedish population register data for cohorts born between 1935 and 1945 over the 1993–2012 period.

RESULTS
The results indicate that grandparents have a higher retirement risk than non-grandparents, even after controlling for age and other central predictors of retirement. The results also show that those who have been grandparents for more than two years have a higher risk of retirement; however, there is variation with respect to the age of the grandparent. In addition, grandparents with multiple grandchildren and grandchild sets exhibit an increased risk of retirement. The study does not find strong differences between grandmothers' and grandfathers' retirement timing.

CONCLUSION
The study finds that grandparents at different life stages have an elevated risk of retirement compared with non-grandparents, but there is also variation among grandparents, and the more complex the family situation, the higher the risk of retirement.

CONTRIBUTION
The inclusion of grandparenthood enriches the understanding of the complexity of the retirement decision and indicates that this decision is more closely linked to intergenerational family structures than the literature has previously shown.

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1. Introduction

The life stage of retirement can stretch for more than 20 years, due in part to a young retirement age and longer life expectancy, and the early years will likely be relatively healthy. Policymakers throughout the world and in Sweden encourage older workers to postpone retirement so that fewer individuals will be dependent on the pension system at a young old age. In most Western European countries, retiring and entering grandparenthood are relatively parallel events for most individuals, with grandparenthood often occurring a few years before retirement. A comparative study found that the mean age of becoming a grandparent in Sweden is 51 for women and 53 for men (Leopold and Skopek 2015). Both the timing of the transition to grandparenthood and changes in grandparental status over time (e.g., the number of grandchildren) depend on earlier life transitions, such as individuals' own fertility and their children's fertility. By investigating whether grandparents experience an elevated risk of retirement – and, if so, which grandparents retire earliest – enriches our understanding of the complexity of the retirement decision. The retirement transition is a major event not only for the soon-to-be retiree but also for his/her family and society. If grandparents retire earlier than non-grandparents their retirement behavior may have negative consequences for the labor market, individual pensions, and pension systems, but may be both positive and negative for family life, intergenerational family relations, and family policy. Grandparents' retirement preferences may also have positive outcomes for the grandparents themselves. Grandparenthood has been shown to be a very important and satisfying role for older men and women (Mann and Leeson 2010) and is positively associated with grandparents' well-being (Drew and Silverstein 2007) and life satisfaction (Boon and Brussoni 1996; Peterson 1999).

To date, no study of Sweden and only a few international and comparative studies using survey data with small samples have examined the importance of grandparenthood for retirement timing (De Preter, Van Looy, and Mortelmans 2013; Lumsdaine and Vermeer 2015; Radl 2013; Van Bavel and De Winter 2013). Most of these studies include at most two measures of grandparenthood, such as a binary measure of whether the respondent is a grandparent and has a new-born grandchild (Lumsdaine and Vermeer 2015), a time-varying binary variable for whether the individual is a grandparent (Van Bavel and De Winter 2013), the number of grandchildren as a continuous measure (Radl 2013; Van Bavel and De Winter 2013), or a binary measure of whether the respondent is looking after grandchildren (De Preter, Van Looy, and Mortelmans 2013). Applying one measure of grandparenthood, such as being or not being grandparent, does not capture the diversity of grandparenthood. It is critical to recognize multigenerational family diversity in relation to retirement timing, as this relationship is increasingly important, along with the demographic changes in

the aging population (Bengtson 2001). This study addresses the importance of grandparenthood in relation to retirement timing in Sweden by using unique, high-quality, longitudinal, multigenerational national register data that is linked with data on the labor force and pension earnings. The chosen data and modeling strategy, i.e., discrete-time survival analysis, allows this study to extend previous research by assessing a number of grandparental characteristics while taking into account the timing of events (e.g., births of new grandchildren) and simultaneously controlling for other central predictors of retirement timing. In contrast to survey data, the multigenerational register data includes vital demographic information on all individuals registered in Sweden, making it possible to include all living, Sweden-registered grandchildren of individuals. This is the first study to include a wide range of grandparental characteristics, i.e., being a grandparent, grandparent's age and gender, number of years since the transition to grandparenthood, number of grandchildren, number of grandchild sets, and age of the youngest grandchild. The study also contributes to the literature by examining whether it is the age stage or the grandparent status that influences retirement and by comparing different grandparental characteristics. For example, it compares grandparents with one grandchild to those with two, three, or more grandchildren and compares those with one grandchild set to those with two or three grandchild sets. Additionally, this is the first study to include the number of grandchild sets in relation to retirement timing.

There are at least three reasons why Sweden is an appropriate country to study the retirement transition in relation to grandparenthood. First, while in certain countries grandparents have been found to be the preferred source of childcare when parents work (Jappens and Van Bavel 2012), in Sweden the parents are the primary caregivers during the early years of a child's life, as the gender-neutral parental leave period stretches for more than one year. Moreover, Swedish policies guarantee subsidized public childcare starting at age 1 and low-cost after-school centers for children aged 6–12 on weekdays between 7 a.m. and 6 p.m. (The Education Act 2010: 800). Nonetheless, comparative studies have found that the probability of grandparents providing grandchild care is high in Sweden (Hank and Buber 2009) and that the Nordic welfare regime generates less intense but more frequent social support (including grandchild care) from parents to adult children (Albertini, Kohli, and Vogel 2007). Although the need for support varies among different groups (Luo et al. 2012), compared with other countries where parents depend more regularly on grandparents' support and caregiving, the relatively generous childcare facilities in Sweden most likely allow grandparents to engage with grandchildren based on their own preferences and self-interest or as a complement to institutional care. It is likely that the overall positive experience of being a grandparent may enhance retirement, as a positive attitude toward their private life has been shown to influence early retirement among

Swedish workers (Soidre 2005), and the presence of grandchildren has been shown to have an important influence on other major life events, such as migration (Pettersson and Malmberg 2009).

Second, less attention has been paid to women's retirement, as they have traditionally been housekeepers with smaller pensions. In Sweden, women's labor market participation rates have been relatively high since the mid-20th century (OECD 2017a; Stanfors 2014), and women have had equal pension benefit rights since 1913 (Sundén 2006). Nevertheless, women's pensions are lower than men's because they work fewer hours per week, have longer work disruptions, and more often hold low-income jobs (Statistics Sweden 2014a; Stanfors 2014). Third, Sweden has exhibited greater fluctuations in the average effective retirement age over time than many other Western European countries (OECD 2017b). Overall, studies of retirement timing require that pension systems give employees at least some flexibility in deciding when to retire. Until 2003 the mandatory pension age was 65 in Sweden, but a large proportion of employees left the labor market earlier due to generous retirement incentives (Palme and Svensson 1999). The new pension system implemented in 2003 offers employees the flexibility to decide when to retire from age 61, and they may retire either full-time or part-time. In agreement with their employer, employees may also work past age 67 (Sundén 2006). The average effective retirement age increased over the 2003–2012 period from 64 to 66.1 for men and from 61.8 to 64.3 for women (OECD 2017b).

To sum up, the study intends to contribute to the knowledge of what motivates older workers to retire by investigating whether grandparenthood is associated with an elevated risk of retirement. The results will be discussed in relation to social policy as well as individual perceptions of grandparenthood, the family situation, and labor force participation.

2. Theoretical considerations, empirical evidence, and hypotheses

The study employs the life course perspective, particularly the principle of linked lives (Elder, Johnson, and Crosnoe 2003). It takes into account various transitions (events) that occur over the life course, such as the birth of the first child or changes in employment. The life course perspective assumes that the life course is a flexible process, where it is possible to shift trajectories or have multiple trajectories without following any particular chronological order. The principle of linked lives assumes an interdependence of lives over time, whereby family members are interconnected across generations by bonds of kinship and processes of intergenerational transmission. For instance, older grandparents tend to have less frequent interactions with their

grandchildren than younger grandparents (Silverstein and Marenco 2001). It also assumes that work and family are closely interrelated (Elder, Johnson, and Crosnoe 2003; Moen 2016). The benefit of applying the life course perspective and the principle of linked lives in this study is that grandparental characteristics change over time instead of being fixed at one time point before retirement. The forthcoming hypotheses are derived from the assumption that family members are interconnected across generations by bonds of kinship and processes of intergenerational transmission that occur during the observed period but are also embedded in earlier transitions. The hypotheses also rest on previous empirical findings.

Moreover, a widely used framework in the retirement literature is the push–pull approach, which takes into consideration various factors that push or pull a worker toward either retiring or continuing to work. The factors are contextually dependent, and individuals may perceive the same factors differently (Beehr et al. 2000). This study combines the life course perspective, particularly the principle of linked lives, and the push and pull approach. The basic assumption is that the intergenerational ties between grandparents and grandchildren are important for grandparents and that the ties may be perceived differently depending on the size and characteristics of the family. Moreover, individual work careers evolve in the context of linked lives, and, as Moen (2016) argued, men and women construct their work identities within their linked lives. Another assumption in this study is that grandparents have an additional motivation (pull) to retire compared with non-grandparents.

Being a grandparent does not necessarily imply that grandparents have contact with or care for their grandchildren, as various individual, family, and contextual circumstances influence and condition intergenerational relations (Hank 2007; King and Elder 1998a; Reitzes and Mutran 2004; Uhlenberg and Hammill 1998). One of the factors that conditions and is conditioned by the grandparent–grandchild relationship is grandparents' role in the labor force (Hagestad and Burton 1986; Silverstein and Marenco 2001). For instance, working grandparents tend to engage in relations with their grandchildren less frequently (Mahne and Huxhold 2012; Oppelaar and Dykstra 2004) and are less likely to provide childcare (Hank and Buber 2009). Additionally, grandparents anticipate retirement more positively than non-grandparents (Wiese, Burk, and Jaeckel 2016). Grandparents' weaker labor market attachments are confirmed by other studies showing that grandparents prefer to retire early (e.g., Hochman and Lewin-Epstein 2013) and have a greater tendency to retire full-time than to participate in bridge employment (Dingemans, Henkens, and Solinge 2016). Similarly, using a pooled sample covering 22 European countries, Van Bavel and De Winter (2013) find a positive relationship between becoming a grandparent, particularly among women, and early retirement. They also find that in countries with high childcare coverage retirement is later among individuals who have not yet become grandparents, but that in

Sweden and Norway, for example, grandparents tend to retire earlier than non-grandparents.

There are two key, non-mutually exclusive reasons why grandparents may retire early. First, the parents of grandchildren may need the grandparents as caregivers, and the grandparents are therefore pushed out of employment (Wheelock and Jones 2002). Second, it is also possible that grandparents view spending time with their grandchildren as an attractive retirement activity (Jonsson, Kielhofner, and Borell 1997). Hence, the study's first hypothesis is that grandparents retire earlier than non-grandparents. Grandparents' choice of early retirement may also be explained by their poorer health compared with non-grandparents. However, poor health has mainly been found to influence retirement among custodial grandparents and grandparents who provide frequent care (Minkler and Fuller-Thomson 1999). Moreover, mortality has been shown to be higher among grandparents than non-grandparents, particularly among those who became grandparents at a young age (Christiansen 2014). It is likely that grandparents who became grandparents early also had an early transition to parenthood, particularly among the low-educated. Low education and early transition to parenthood have been linked to poor health and higher mortality as well as early retirement (Blekesaune and Solem 2005; Grundy and Kravdal 2008; Hank and Korbmacher 2013; Ross and Mirowsky 2010). Hence, low education and early parenthood may mediate early retirement among grandparents. Moreover, it is also possible that grandparents delay retirement because they need to provide financial support for their children and grandchildren (Attias-Donfut, Ogg, and Wolff 2005).

Because women are expected to engage in both paid labor and family life and men are more often expected to primarily engage in paid labor, these diverse trajectories shape the retirement paths of men and women differently. Family ties may motivate women to retire more than men, as women move more often between family and work obligations (Moen 2016). Indeed, caring for children has been found to motivate retirement among women (Dentinger and Clarkberg 2002; Forma 2009; Henkens and Tazelaar 1997), and grandmothers have been shown to retire earlier than grandfathers in cross-national settings (Van Bavel and De Winter 2013). Overall, grandmothers have been shown to have more frequent contact with their grandchildren and to be more engaged in grandchild care than grandfathers (Albertini, Kohli, and Vogel 2007; Gray 2005; Hank and Buber 2009; Reitzes and Mutran 2004). However, due to mothers and fathers' similar levels of engagement with their children, relatively high gender equality and labor market participation over time, and lower demand for frequent and regular grandchild care (Dribe and Stanfors 2010), in Sweden grandmothers and grandfathers might be similarly affected by grandparenthood. Certain dimensions of grandparenthood have been shown to have small or nonexistent gender differences, such as satisfaction with grandparenthood (Reitzes and Mutran 2004; Thiele and

Whelan 2006) and perceptions of grandparenthood as a means of engaging more in family relations (Szinovacz and Davey 2001). Hence, the second hypothesis is that grandmothers retire somewhat earlier than grandfathers.

In the life course theory, age and the timing of transitions are central to understanding the life course, as they influence future decisions and actions (Elder, Johnson, and Crosnoe 2003; Mortimer and Moen 2016). The meaning of grandparenthood, family contact, and caring varies with the age of the grandparent and the timing of when the individual became a grandparent. Studies have found that younger grandparents have more contact with their grandchildren, while older grandparents find the role of being a grandparent to be more important (Mahne and Huxhold 2012; Silverstein and Marenco 2001). In addition, cross-national research has revealed a higher risk of retirement among grandparents at ages 55 and 60 (Van Bavel and De Winter 2013). Because grandparenthood generally occurs around the period when retirement typically occurs, it is also likely that it is age that primarily drives older workers to retire rather than the status of being a grandparent. In an attempt to disentangle this issue the forthcoming analyses include an interaction between grandparenthood and age. Thus, the third hypothesis is that the difference between grandparents and non-grandparents in the propensity to retire decreases with age.

Moreover, prior studies have shown that becoming a grandparent at a young age increases the feeling of being 'old' compared to peers without grandchildren or to those who become grandparents at older ages (Kaufman and Elder 2003; Sherman 1994). Being a young grandparent may also imply different grandparenthood trajectories than being an older grandparent. To consider the timing of the transition to grandparenthood, this study estimates the time since becoming a grandparent for the first time. Thus, the fourth hypothesis is that the propensity to retire increases with the number of years since the transition to grandparenthood.

Grandparents' ties with their grandchildren may vary as a function of family size (Fingerman 2001; Uhlenberg and Hammill 1998). For instance, it has been found that the more grandchildren a grandparent has, the more importance the grandparent attaches to the grandparental role (Mahne and Motel-Klingebiel 2012). Others have found contradictory results, however: Grandparents with multiple grandchildren have been found to have weaker ties with their grandchildren (Meil and Rogero-García 2015; Oppelaar and Dykstra 2004). Grandparents with multiple grandchildren may not have the opportunity, time, or motivation to engage with each grandchild. A greater number of grandchildren also decreases grandparents' perception of self-efficacy, leading to less frequent contact and a lower relationship quality with their grandchildren (King and Elder 1998b). In such situations, retirement may be a solution to these time constraints. Indeed, Radl (2013) finds that having more grandchildren leads to earlier retirement in Western European countries, including Sweden. He uses a survival analysis to examine

labor market exits and social stratification in Western Europe and includes number of grandchildren as a control variable. A similar result is found by Litwin and Tur-Sinai (2015) using the same data but with regression models. Both studies report results from continuous measures, but because continuous measures are calculated as an average value for the full range of grandchildren it is possible that there is variation in the number of grandchildren. Hence, it is interesting to investigate whether diversity in the number of grandchildren affects retirement timing. This argument leads to the fifth hypothesis, which is that the more grandchildren grandparents have, the earlier they retire.

Moreover, one can speculate whether the number of grandchild sets, i.e., the number of children who themselves have children, impacts retirement timing. Including the number of grandchild sets provides further information on the diversity of the extended family than considering only the number of grandchildren. So far, no study has yet assessed the number of grandchild sets in relation to retirement timing. Nonetheless, there are two potential reasons why multiple grandchild sets could lead to early retirement. First, working grandparents with multiple grandchild sets must divide their time and attention between the grandchildren's families, which should increase the need for early retirement, and this need is likely stronger with a larger family. Second, having multiple grandchild sets has been shown to produce weaker ties overall but to increase the likelihood of contact with at least one set (Fingerman 2004; Uhlenberg and Hammill 1998). The opportunities for individuals to engage with kin in Sweden are likely high, as most Swedes live relatively close to their kin networks (Kolk 2017), and individuals with many children are more likely to live close to at least one child (Holmlund, Rainer, and Siedler 2013). Given these two reasons, the sixth formulated hypothesis is that the more grandchild sets grandparents have, the earlier they retire.

Moreover, Lumsdaine and Vermeer (2015) find a higher retirement probability among US women who are caring for newborn grandchildren. Other studies indicate that grandparents are more likely to care for younger grandchildren, as these children are more dependent than older grandchildren (Meil and Rogero-García 2015). Care by relatives has also been shown to be more valued by parents with very young children (Mason and Kuhlthau 1989). These findings suggest that the age of grandchildren is an important factor in grandparents' engagement. However, in Sweden the parents are the primary caregivers during the early years of a child's life, as the parental leave period stretches for more than one year. The opportunities for grandparents to spend time with their grandchildren increase when grandchildren start attending preschool and school. To study the 'present-day' dependency of intergenerational relations, this study addresses the association between the age of the last-born grandchild and retirement timing. Thus, the seventh hypothesis is that the age of the youngest grandchild has a nonlinear association with grandparents' retirement risk.

In sum, seven hypotheses are derived from previous research:

H1 *Grandparents retire earlier than non-grandparents.*

H2 *Grandmothers retire somewhat earlier than grandfathers.*

H3 *The difference between grandparents and non-grandparents in the propensity to retire decreases with age.*

H4 *The propensity to retire increases with the number of years since the transition to grandparenthood.*

H5 *The more grandchildren grandparents have, the earlier they retire.*

H6 *The more grandchild sets grandparents have, the earlier they retire.*

H7 *The age of the youngest grandchild has a nonlinear association with grandparents' retirement risk.*

3. Other predictors of retirement timing

An employee's retirement decision is complex and is strongly influenced by health status and economic conditions (Mein et al. 2000). Employees with low incomes and low education levels often have physically demanding occupations that influence their health. These employees may therefore retire earlier, whereas those who are active in occupations with economic and status rewards may postpone retirement (Hayward, Friedman, and Chen 1998; Hayward et al. 1989). However, individuals without economic resources may be required to continue to work in order to earn higher pension benefits (Henkens 1999). Retirement is also influenced by the cumulative number of years in the labor force. For instance, long periods of unemployment (Beehr and Bennett 2008) or long work disruptions due to childbearing may induce employees to postpone retirement to earn higher pension benefits (Henretta, O'Rand, and Chan 1993).

Partner status is also linked to retirement decisions: non-married and divorced individuals tend to retire later (Hatch and Thompson 1992), and married individuals coordinate their retirement transitions with one another, especially if they are satisfied with their marriage (Reitzes, Mutran, and Fernandez 1998). Husbands tend to postpone retirement, as they are often older than their spouses, and wives tend to retire earlier

(Ho and Raymo 2009). Moreover, caregiving roles are important in decision-making regarding retirement (Dentinger and Clarkberg 2002). For instance, having a disabled spouse may motivate an early labor force exit but may also postpone a labor force exit, as care occasionally involves economic obligations (Szinovacz and Deviney 2000). Experiencing the financial strain of having children (Reitzes, Mutran, and Fernandez 1998) and becoming a parent at a late age can postpone retirement, especially among mothers (Hank 2004). However, early parenthood has also been shown to lead to early retirement (Chung 2010).

4. Data and methods

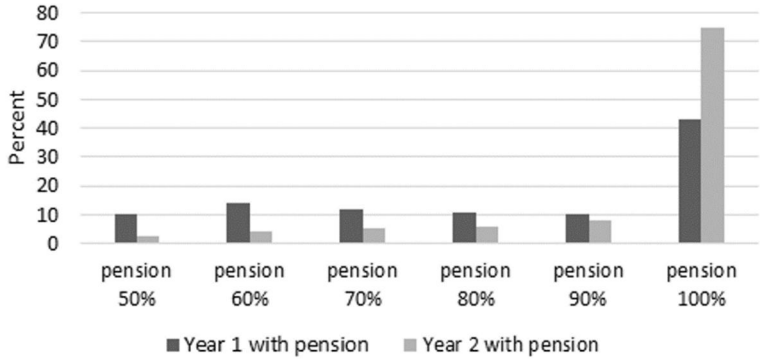
This study uses Swedish population registers, i.e., the Multi-Generation Register, the Sickness Insurance and Labor Market Studies Database, and the Annual Total Population Registers, in which individuals are linked through a unique identifying number. The data derived for this study includes information on the entire population born between 1935 and 1945 (N: 1,350,531), with a few exclusion criteria. As the study targets individuals with children, childless individuals, who represent 20% of the population and of whom 59% are men, are excluded. Another exclusion criterion is missing information for labor earnings (<0.5%). Eight percent of the studied population had no observations over the observation period due to migration or death before the observation period. After the exclusions, the population consists of slightly less than one million individuals who were born between 1935 and 1945 and were observed over the 1993–2012 period. The dependent variable imposed a few additional exclusion criteria on the population and is presented below.

4.1 Dependent variable

The study's dependent variable is the timing of retirement. The international literature (Denton and Spencer 2009) and the Swedish register data provide no harmonized definition of retirement transition. Prior studies of Swedish register data most often estimate retirement based on a reduction in employment earnings and an increase in pension benefits. For instance, Statistics Sweden (2011) defined retirement as when pension benefits equal or exceed 50% of total annual earnings using Swedish register data among cohorts born 1930 and 1940. Additionally, Palme and Svensson (2004) used a similar definition for Swedish register data but with an 80% threshold. Moreover, the Swedish pension system allows retirees to receive employment income simultaneously with their pension: thus they can be full-time retired or can shift

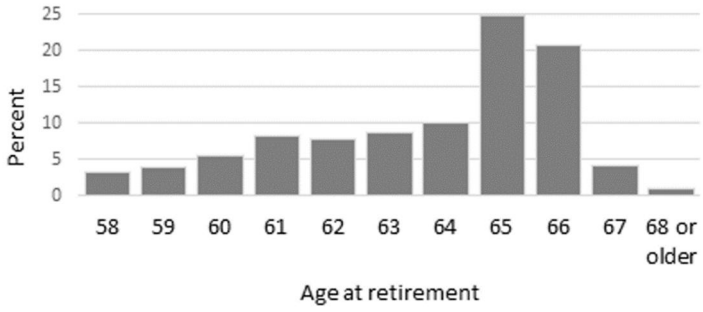
between being retired and employed over time. To determine which definition to use in this study, two main definitions were initially explored, and sensitivity analyses with other definitions are discussed below. Figure 1 displays the proportion of annual pension benefits related to annual earnings for the first two years using this study's data. Employers report employees' earnings to the National Tax Agency and the National Pension Agency or the Swedish Social Insurance Agency. Annual employment earnings include employment income, income from self-employment, and disability benefits summarized on December 31st. Annual pension benefits are the sum of all the different pension benefits, which are also summarized at the end of the calendar year. For a detailed presentation of the Swedish pension system, see Sundén (2006). As retirement can occur at any time during calendar year, in the first year of uptake most people's pension income is smaller than their earnings. The following year the vast majority receive a much larger proportion of pension income, indicating full-time or close to full-time retirement (Figure 1). The mean age of retirement for men and women in this study is 63.8 using the 50% threshold and 64.3 using the 80% threshold. The 50% threshold may therefore provide a more accurate estimate of the year of transition than the 80% threshold, which may provide a delayed estimation. Based on these findings and previous research using Swedish register data, individuals in this study are defined as retired when they receive pension benefits that equal or exceed 50% of their total yearly earnings, including annual pension benefits, annual employment earnings, and annual unemployment benefits. The variable is a time-varying dummy, and individuals are considered part of the labor force until they have a pension that equals or exceeds the threshold.

Figure 1: Share of annual uptake of pension benefits in relation to total annual earnings for the two first years



The study observes individuals beginning at age 58. This restriction is applied because the Swedish pension system allows retirement with a reduced benefit at age 58 through occupational pension schemes. Unfortunately, using this data it is not possible to estimate the share of occupational pension because all pension amounts, except early pension benefits, are combined in the records. Moreover, the study includes individuals who received early pension benefits for at least one year between the ages of 58–64; 7% received early pension benefits simultaneously with other pension benefits, and 10% received only early pension benefits. A few occupational pension schemes allow retirement beginning at age 55. However, including ages 57 and below increases the risk of including involuntary retirement through disability or early pension. Approximately 15% of the individuals in the study are excluded as they retired before age 58. After these exclusion criteria are applied, the data set consists of 817,229 individuals who were born between 1935 and 1945 and are observed from age 58 until they retired, died, or migrated or until the end of the study period in 2012. The vast majority of the individuals were observed over many years. The shortest observation period is 1 year and the longest is 17 years. The mean number of observation years is 4.4 years, and the number of observations (person–years) exceeds 5 million. Foreign-born individuals comprise 12% of the studied population. In addition, Figure 2 shows the distribution of the retirement age among those who retired. The majority retired at ages 65 and 64, but there is also a substantial proportion who retired before age 65.

Figure 2: Age of retirement (N: 776,679, only those who retired)



4.2 Independent variables

The independent variables in this study are the grandparental variables, which are time-varying. The transition to grandparenthood (variable 'Grandparent') is defined by the birth of the first-born grandchild. 'Non-grandparents' may become grandparents in subsequent unobserved years (i.e., after 2012) or may have grandchildren who are not registered in Sweden. The analyses also include 'Years since transition to grandparenthood,' which is categorized as not a grandparent, 0–2 years ago, 3–5 years ago, 6–12 years ago, and 13 years ago or more. In the category '0–2 …', 0 represents the grandchild's first year after birth. The analyses also include the categorical variables 'Number of grandchildren' and 'Number of grandchild sets.' A grandchild set consists of all children of a particular child of the grandparent. For instance, if a grandparent has two children but only one child has his or her own children, the number of grandchild sets for this specific person is 1 until the second child has his or her own children, when the grandchild set increases to 2 sets. Based on the total fertility rate for women born between 1935 and 1945, which is 1.9–2.1 (Statistics Sweden 2014b), and the descriptive statistics, which show that the majority of the grandparents in the study population had one grandchild set and a small proportion had 3 to 8 grandchild sets, the variable has separate categories for 0 to 2 grandchild sets and a grouped category for 3 or more grandchild sets. The variable 'Age of youngest grandchild' is grouped as no grandchild, age 0–2, age 3–5, age 6–12, and age 13 or older. Although preschool enrollment can start at age 1, most start around 18 months of age, and most children are enrolled in preschool at ages 3–5 (for more details on Swedish parental leave system and access to preschool see, e.g., Viklund and Duvander 2017). Pre-class schooling begins at age 6 (most children attend) and mandatory schooling begins at age 7. Variance inflation factor analysis was used to control for multicollinearity between the grandparental variables. The results revealed no worrisome multicollinearity between the variables. However, there is information overlap; for instance, the age of the youngest grandchild is identical to the years since becoming a grandparent for grandparents with one grandchild. Similarly, grandparents with one grandchild have identical information regarding the number of grandchildren and the number of grandchild sets. Table 1 displays the categorizations for all the grandparental variables.

The models also include gender, age, year of birth, highest level of education attained, relationship status, total number of children, annual disposable individual income, and sick-leave days. Gender and year of birth are time-fixed, and all the other variables are time-varying. Age and year of birth are both included because age represents the life stage and the possibility of retirement, whereas year of birth includes potential cohort effects related to the pension system. Age will also be treated as a categorical variable, especially in interactions. By including a categorical variable it is possible to detect the different ages where retirement typically occurs and to determine

whether there are some ages in interaction with grandparenthood that have a higher risk of retirement than other ages. The categorization of highest level of education attained follows the International Standard Classification of Education 1997 (ISCED 97) and is categorized as primary, secondary, and tertiary education. None of the individuals in the study changed their educational status over the period of observation. Older adults may re-enroll in higher education and obtain a tertiary degree, but because the variable categories are primary, secondary, and tertiary education, additional schooling would not change an individual's status in this study as they would need to have to have some kind of higher education degree before re-enrollment. Therefore, it does not matter whether education is time-varying for the forthcoming analyses. Relationship status is categorized into married with joint children, married without joint children, cohabiting with joint children, divorced, never married, and widow/widower. Individuals with a registered partner are considered married. Regarding cohabitation, two individuals who have joint children and share the same unique property number are considered to be living together. The property number is the lowest-level geographical identification in the registers used in this study. This method is a common and validated means of estimating cohabiting parents in Swedish register data if they have joint children (Thomson and Eriksson 2013). It is possible that divorced, never married, and widows/widowers are in a relationship or live together with a partner but not with the other parent of the child(ren), which suggests an underestimation of individuals who cohabit and those who live apart together. However, one benefit of using the relationship variable rather than the more traditional 4-category variable (married, single/unmarried, divorced, or widowed) is that it is possible to separate cohabiting couples (with joint children) from those who never married. Moreover, 76% are either married or cohabiting at age 58 with a person with whom they have children. However, in the Swedish pension system, pension benefits are individual. Thus, for this study, it is not crucial if a minor proportion of never married, divorced, or widowed people are cohabiting or in a relationship (without joint children), although these relationships may be relevant to various nonfinancial retirement motivations.

Moreover, 'annual disposable individual income' (in SEK) measures individuals' socioeconomic status. It is calculated based on the consumer price index in 1993. It measures only the individual's disposable income, not the household's, and includes many resources such as employment income (including self-employment), social insurance benefits, house allowance, pension benefits, and capital profits. Disposable individual income was positively skewed; consequently it has been logarithmized. Additionally, disposable individual income has been lagged one year because it is more likely that past income affects retirement.

For a health indicator this study relies on sick-leave days, which have been shown to be a valid proxy for self-reported health (Josephson et al. 2008). In the register data

used, sick-leave days are accumulated over a given calendar year. Therefore, the models include 'annual sick days,' which are grouped as no sick leave, 1–14 days/year, 15–30 days/year, 31–60 days/year, 61–90 days/year, and 91 or more days/year. These are the total number of days paid out by the Social Insurance Agency, which are counted after the first 14 sick days of every period that are paid by the employer. The structure of the sick-leave payments implies that individuals have been on leave from employment before the period when they first start to claim sick-leave benefits from the Social Insurance Agency. As it is possible to continue to be on sick leave from the previous year, sick-leave days vary from 1–365. All Swedish citizens who are employed are entitled to sick-leave benefits (Social Insurance Code 2010: 110).

4.3 Method of analysis

This study employs discrete-time survival analysis using complementary log–log functions. This method is appropriate because the data is organized to estimate variables in discrete, continuous time periods during events that occurred within one year. This strategy is also beneficial, as the study's objective is to explore the retirement risk over time. Complementary log–log functions provide proportional hazard models and hazard ratios (Allison 2010), and here they estimate the risk of retirement during the observed period. Hazard ratios are interpreted as a reduction or increase in the risk (hazard) of a specific event occurring. For instance, if the estimated hazard ratio for group A is 0.90, then there is a 10% reduction in the risk that the event occurs for group A compared with reference group B. Moreover, as the entire population is studied, the hazard ratios are presented in the models with confidence intervals (in parentheses) instead of significance levels.

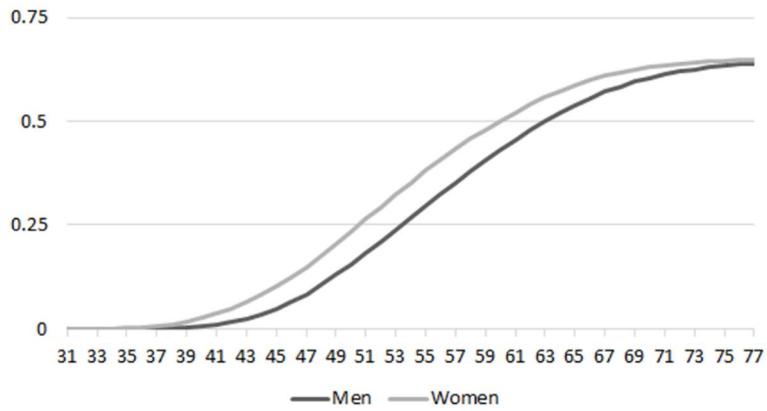
Moreover, to test the seven hypotheses derived from earlier research the study employs a step-wise approach to the survival analyses on retirement timing, first with models including the dichotomous measure of being a grandparent followed by models including years since the transition to grandparenthood, both pooled for men and women and separated by gender. Finally, the results for the other dimensions of grandparenthood are analyzed both separately and together.

5. Results

5.1 Descriptive results of grandparental characteristics

The Kaplan–Meier curve in Figure 3, which is used for descriptive purposes, displays the propensity to become a grandparent for the first time among men and women born between 1935 and 1945 who have at least one child. The first grandchildren were born in 1967, and the data covers the period until the end of 2012. The curve indicates that women tend to become grandparents at younger ages than men, which is expected based on the age at parenthood. By age 50, 25% of all mothers have become grandmothers, and by age 54, 25% of all fathers have become grandfathers. Most parents become grandparents years before or close to the period when retirement typically occurs. At age 65, close to 54% of all men and 59% of all women have become grandparents. At age 77, 65% of all fathers and mothers are grandparents.

Figure 3: Kaplan–Meier failure estimates of age of becoming a grandparent among women and men in cohorts 1935–1945 who have at least one child



The individuals in this study enter the window of observation when they turn 58, which may occur any time over the 1993–2012 period. Table 1 presents the descriptive statistics for the grandparental variables at the age when the individuals enter the study. The results indicate that 38% of all men and 45% of all women were grandparents at age 58. This finding suggests that there are individuals in the data who became grandparents before the observation period. However, they remain included in the

analyses and at risk of retirement as their grandparent status continues beyond age 58. This study focuses on the entire experience of grandparenthood until retirement or censoring; thus, it is rational to retain them. Excluding this large group of grandparents would mean that the study would observe only individuals who became grandparents for the first time at a later age. Moreover, the vast majority of the grandparents had fewer than four grandchildren, and 57% of the men and 51% of the women had one grandchild. Eighty percent of the grandfathers and 76% of the grandmothers had one grandchild set at age 58, and 18% and 20%, respectively, had two grandchild sets. Additionally, 60% of the grandfathers and 54% of the grandmothers had a grandchild younger than five years of age.

Table 1: Descriptive results of grandparental characteristics at age 58 among women and men born 1935–1945 who have at least one child

Variable	Category	Men (%)	Women (%)
Grandparent at age 58	Not grandparent	62	55
	Grandparent to at least one grandchild	38	45
Years since transition to grandparenthood at age 58[a)]	0–2 years of age	22	17
	3–5 years of age	23	19
	6–12 years of age	42	43
	13 years of age or older	13	21
Number of grandchildren at age 58 [a)]	One grandchild	57	51
	Two–three grandchildren	36	38
	Four or more grandchildren	7	10
Number of grandchild sets at age 58 [a)]	One grandchild set	80	76
	Two grandchild sets	18	20
	Three or more grandchild sets	2	4
Age of youngest grandchild at age 58 [a)]	0–2 years of age	29	25
	3–5 years of age	30	28
	6–12 years of age	35	38
	13 years of age or older	6	9
	N:	408,109	409,120

Note: [a)] Of those who were grandparents with at least one grandchild at age 58.

5.2 Analyses of the effect of grandparenthood on retirement timing

The results presented in Model 1, Table 2 show that grandparents are more likely than non-grandparents to retire earlier. For men and women pooled, there is a 29% increased risk when no additional controls are added. Grandparents have a 10% increased risk of

retirement compared with non-grandparents when controlling for socioeconomic and demographic factors in Model 2, thus supporting the hypothesis that grandparents retire earlier than non-grandparents. Step-wise models (not shown) indicate that age is mainly responsible for this reduction in risk. The hazard ratios are small, but when comparing the hazard ratios across all variables the risk of retirement among non-grandparents is similar to the retirement risk by education level and that between married and divorced statuses. The results of the models separated by gender reveal no difference between grandmothers and grandfathers in retirement timing (Models 3–4). Hence, the results are not supportive of the hypothesis on gender differences, i.e., that grandmothers retire somewhat earlier than grandfathers.

Because it is likely that non-grandparents are younger than grandparents, the results presented in Models 1–4 may differ by age. To disentangle this observation, the analysis continues by exploring the interaction between age and grandparental status (Figure 4). To understand how grandparenthood and retirement timings differ by age, the age indicator is treated as a categorical variable: 1) 58–60; 2) 61–64; 3) 65; 5) 66–67; and 6) 68 and older. The specific age of 65 reflects the age at which most individuals retire in Sweden. Hazard ratios are computed such that the category 'not grandparent' is the reference category for all age categories separately. The models include all the covariates presented in Table 2. The findings show that the retirement risk is higher among grandparents aged 58–60 and 66 or older than among grandparents aged 61–64, indicating a u-shaped pattern where the highest risk of retirement is concentrated at very early or late retirement. For instance, grandmothers aged 58–60 have a 14% increased risk of retirement compared with non-grandmothers in this age category, but grandmothers at age 65 have a 6% increased risk of retirement. In sum, the results do not support the hypothesis that the difference between grandparents and non-grandparents in the propensity to retire decreases with age. In an attempt to discover cohort effects, these analyses were also stratified by cohort, but the results did not display any clear cohort patterns and are therefore not presented here.

Table 2: Discrete-time survival analysis of grandparenthood on retirement transition among birth cohorts 1935–1945, complementary log–log models (hazard ratios)

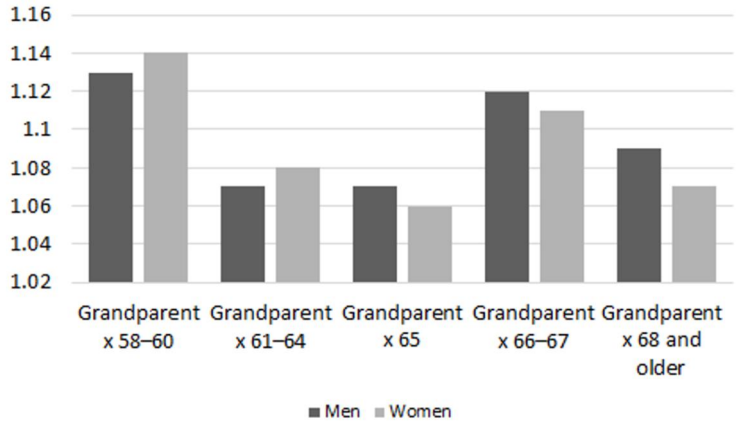
Variable		Model 1 All	Model 2 All	Model 3 Men	Model 4 Women	Model 5 Men	Model 6 Women
Grandparent (no)	Yes	1.29 (1.287–1.296)	1.10 (1.084–1.095)	1.09 (1.083–1.098)	1.09 (1.083–1.097)		
Years since transition to grandparenthood	0–2 years earlier					1.03 (1.015–1.042)	1.04 (1.030–1.054)
(not grandparent)	3–5 years earlier					1.07 (1.055–1.079)	1.08 (1.069–1.089)
	6–12 years earlier					1.11 (1.092–1.113)	1.10 (1.085–1.103)
	13 or more years earlier					1.14 (1.118–1.141)	1.13 (1.116–1.133)
Age (65)	58–60		0.06 (0.064–0.065)	0.07 (0.071–0.073)	0.06 (0.057–0.059)	0.07 (0.071–1.073)	0.16 (1.024–1.059)
	61–64		0.18 (0.180–0.182)	0.19 (0.192–0.196)	0.17 (0.168–0.171)	0.19 (0.193–1.196)	0.17 (1.024–1.171)
	66–67		2.19 (2.183–2.214)	2.09 (2.072–2.111)	2.04 (2.020–2.061)	2.09 (2.071–2.111)	2.34 (1.024–1.367)
	68 or older		1.33 (1.308–1.346)	1.28 (1.263–1.312)	1.39 (1.364–1.424)	1.28 (1.259–1.308)	1.39 (1.024–1.419)
Gender (male)	Female		1.03 (0.984–1.105)				
Year of birth (continuous)			0.97 (0.966–0.968)	0.96 (0.963–0.966)	0.97 (0.968–0.970)	0.96 (0.963–0.966)	0.97 (0.968–0.970)
Relationship status (married with joint children)	Cohabiting with joint children		0.86 (0.861–0.889)	0.89 (0.938–0.914)	0.86 (0.836–0.881)	0.89 (0.877–0.915)	0.86 (0.836–0.881)
	Never married		0.87 (0.862–0.882)	0.95 (0.913–0.972)	0.80 (0.794–0.818)	0.95 (0.939–0.972)	0.81 (0.793–0.818)
	Married without joint children		0.86 (0.843–0.885)	0.94 (0.913–0.976)	0.77 (0.751–0.806)	0.94 (0.912–0.975)	0.78 (0.751–0.805)
	Divorced		0.91 (0.910–0.922)	1.01 (1.001–1.018)	0.83 (0.827–0.842)	1.01 (0.998–1.016)	0.83 (0.825–0.839)
	Widow/widower		1.08 (1.074–1.096)	1.15 (1.128–1.174)	1.03 (0.021–1.044)	1.14 (1.125–1.171)	1.03 (1.018–0.042)

Table 2: (Continued)

Variable		Model 1 All	Model 2 All	Model 3 Men	Model 4 Women	Model 5 Men	Model 6 Women
Number of children (one child)	2 children		0.99 (0.979–0.992)	0.99 (0.986–1.005)	0.97 (0.994–0.982)	0.99 (0.986–1.005)	0.97 (0.963–0.981)
	3 children		0.92 (0.915–0.929)	0.93 (0.922–0.941)	0.91 (0.899–0.919)	0.93 (0.919–0.938)	0.91 (0.896–0.916)
	4 or more children		0.85 (0.840–0.856)	0.85 (0.838–0.861)	0.84 (0.832–0.855)	0.84 (0.832–0.854)	0.84 (0.825–0.848)
Education level (primary education)	Secondary education		1.07 (1.061–1.072)	1.09 (1.082–1.099)	1.04 (1.032–1.049)	1.09 (1.085–1.102)	0.96 (0.951–0.966)
	Tertiary education		0.93 (0.922–0.934)	0.99 (0.978–0.997)	0.87 (0.866–0.882)	0.99 (0.986–1.005)	0.85 (0.838–0.852)
Disposable personal income, logged and lagged	Continuous		0.83 (0.829–0.834)	0.85 (0.841–0.850)	0.83 (0.824–0.831)	0.85 (0.842–0.850)	0.83 (0.824–0.831)
Sick leave, lagged (no sick leave)	1–14 days		0.92 (0.907–0.933)	0.89 (0.872–0.911)	0.95 (0.936–0.972)	0.89 (0.872–0.910)	0.95 (0.935–0.971)
	15–30 days		1.00 (0.981–1.017)	0.99 (0.962–1.015)	1.02 (0.995–1.043)	0.98 (0.962–1.014)	1.02 (0.994–0.042)
	31–60 days		1.17 (1.152–1.189)	1.18 (1.157–1.212)	1.17 (1.148–1.198)	1.18 (1.156–1.211)	1.17 (1.147–0.197)
	61–90 days		1.42 (1.390–1.444)	1.44 (1.397–1.478)	1.42 (1.382–1.457)	1.43 (1.395–1.476)	1.42 (1.382–0.456)
	91–365(366) days		3.92 (3.899–3.946)	3.94 (3.390–3.981)	3.98 (3.944–4.010)	3.93 (3.904–3.974)	3.97 (3.939–4.001)
Non-zero outcomes:		757,978	757,978	375,141	382,837	375,141	382,837
Number of observations:		5,371,107	5,371,107	2,686,410	2,684,697	2,686,410	2,684,697

Note: 95% confidence interval in parentheses in cells with hazard ratios. Reference categories in parentheses in the far-left column.

Figure 4: Hazard ratios of retirement transition by interaction between age and grandparenthood, complementary log–log model



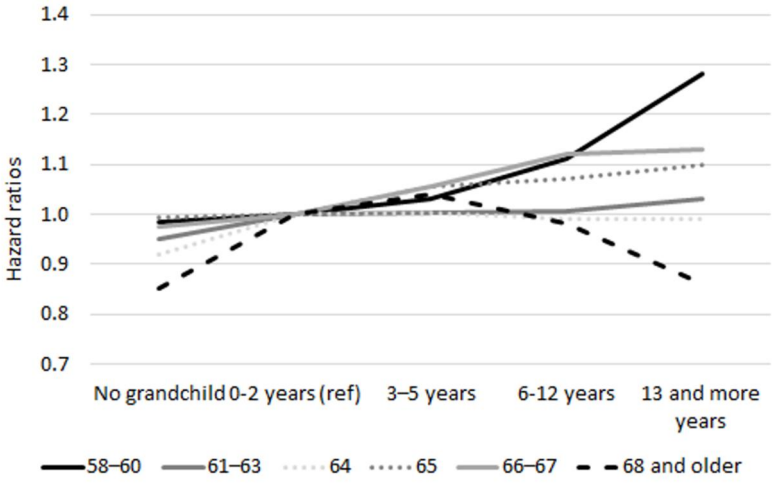
Note: The category 'not grandparent' is the reference category for all age categories separately. The models controlled for gender, year of birth, education level, disposable income, civil status, sick-leave days, and number of children.

The experience of grandparenthood changes over time; thus, it is important to include years since becoming a grandparent in the analyses. This variable represents a more nuanced dimension than the grandparent/not grandparent dichotomy presented earlier. The separate displayed models (Models 5–6, Table 2) for men and women include not only the years since transition to grandparenthood but also all covariates. The results suggest that there is a gradual increase in retirement risk for both men and women with the number of years since the transition to grandparenthood. Moreover, the difference between men and women is very small. The correlations indicate that men and women have a 3% and 4% increased risk of retirement, respectively, when the transition to grandparenthood occurred within the past two years. Women have a somewhat higher risk of retiring than men when they transitioned to grandparenthood 3–5 years earlier: women have an 8% increased risk, and men a have 7% increased retirement risk. Moreover, men and women who became grandparents 6–12 years earlier have an 11% and 10% increased risk of retirement, respectively. The highest risk of retirement is among those who transitioned to grandparenthood more than 12 years earlier, at 14% and 13% increased risk of retirement, respectively. Because there are no apparent gender differences in retirement timing by grandparental status, men and women are pooled in the forthcoming analyses.

Because there is a risk that the results in Models 5–6 might differ by age, the analyses continue by exploring the interaction between age and years since the

transition to grandparenthood (Figure 5). Hazard ratios are computed such that the category '0–2 years since the transition to grandparenthood' is the reference category for all age categories separately. The models include all the covariates presented in Table 2. As expected from Table 2, the results in Figure 5 indicate that non-grandparents overall have a lower risk of retiring across all age groups; in particular, the risk is lowest among ages 61–64 and 68 or older. Among grandparents aged 58–60 the highest risk of retiring is among those who became grandparents more than 5 years earlier. Remarkably, those who transitioned to grandparenthood at least 13 years earlier have a much higher increased retirement risk at ages 58–60. The descriptive analysis indicates that this group is small and that large majority of the group has low education. The results show that there is no difference in retirement risk by the time since becoming a grandparent among ages 61–64, except for a 3% increased retirement risk among grandparents aged 61–63 who transitioned more than 12 years earlier. Moreover, there is no difference in the retirement risk among non-grandparents aged 65 and grandparents aged 65 who very recently became grandparents. For those who transitioned more than 2 years earlier there is a small but increasing risk of retirement. Grandparents aged 65 who transitioned 13 years or more ago have a 10% increased risk of retirement. Among grandparents aged 66–67 there is a 5% increased risk among those who became grandparents 3–5 years earlier and a 10% increased risk among those who became grandparents more than 6 years previously. The opposite relationship is observed among those aged 68 and older: Individuals who became grandparents more than 5 years earlier have a lower risk of retiring. In summary, the data shows a few noteworthy patterns. First, grandparents of all ages who transitioned to grandparenthood at most 2 years earlier have a lower risk of retirement than those who transitioned much earlier. This finding indicates that there is a lag in the influence of grandparenthood on retirement timing that begins when the individual has been a grandparent for at least a few years. Overall, there is a gradual increase in retirement risk at ages 58–60 and 65–67 for those who have been grandparents for more than 2 years. However, this is not the case for grandparents aged 61–64, for whom the time since becoming a grandparent is not associated with either a decreased or increased risk of retirement, although grandparents continue to have a higher risk of retiring than non-grandparents. Second, at ages 58–60 and 65 there is no difference in the retirement risk between those who have recently become grandparents and non-grandparents. These results partly support the hypothesis that the propensity to retire increases with the number of years since the transition to the grandparenthood. While the results indicate an increasing risk in the main effect presented in Models 5–6 in Table 2, the pattern is not linear in the interaction (Figure 5).

Figure 5: Hazard ratios of retirement transition by interaction between years since transition to grandparenthood and age, complementary log–log model



Note: The category "0–2 years since transition to grandparenthood" is the reference category for all age categories separately. The models controlled for gender, year of birth, education level, disposable income, civil status, sick-leave days, and number of children.

To further explore the heterogeneity of grandparents, Table 3 demonstrates the association between retirement and the number of grandchildren, the number of grandchild sets, and the age of the youngest grandchild. These indicators are first analyzed separately and are then included in a final model together with the years since the transition to grandparenthood. All models in Table 3 include the covariates presented in Table 2.

The results of Model 1 show there is a gradual but very small increase in the risk of retirement as the number of grandchildren increases, which supports the hypothesis that the more grandchildren grandparents have, the earlier they retire. Furthermore, there is support for the hypothesis regarding number of grandchild sets. The results in Model 2 indicate that grandparents with multiple grandchild sets have a higher risk of retiring than grandparents with one set, particularly those with three or more sets. Grandparents with three or more grandchild sets have a 7% elevated risk of retiring compared with those with one grandchild set, and an even higher risk compared with those who do not have any grandchildren at all. The difference between having two and three or more grandchild sets is not very substantial. Additionally, there is a small, gradual association between retirement and the increasing age of the youngest

grandchild (Model 3), which does not support the hypothesis that expected a non-linear association with grandparents' retirement risk. In Model 4, where all grandparental variables are included, the results reveal a similar pattern to that observed in Models 1–3, but the effect sizes disappear for number of grandchildren. The full model shows that when controlling for all demographic and socioeconomic factors, there is an independent association between the retirement timing and the number of grandchild sets and the age of the youngest grandchild, but not with the number of grandchildren.

In summary, the results show that grandparents are not a homogenous group with regard to retirement timing. Overall, the more complex the family structure is, the higher the risk of retirement. For instance, grandparents who have more than three grandchildren and grandparents who have a multiple number of grandchild sets retire earlier. Regarding the age of the youngest grandchild, having older grandchildren is associated with a higher risk of retirement, but there is a small difference between having a youngest grandchild aged 6–12 or older than 12 when controlling for the other grandparental variables.

Table 3: Discrete-time survival analysis of retirement transition by grandparental characteristics among birth cohorts 1935–1945, complementary log–log models (hazard ratios)

Variable		Model 1	Model 2	Model 3	Model 4
Number of grandchildren	Not grandparent	0.91 (0.901–0.912)			0.96 (0.952–0.969)
(1 grandchild)	2–3 grandchildren	1.02 (1.008–1.022			0.99 (0.989–1.005)
	4 or more grandchildren	1.05 (1.003–1.053)			1.01 (0.997–1.025)
Number of grandchild sets	Not grandparent		0.92 (0.912 – 0.921)		–
(1 grandchild set)	2 grandchild sets		1.05 (1.034–1.050)		1.05 (1.039–1.059)
	3 or more grandchild sets		1.07 (1.049–1.085)		1.08 (1.057–1.097)
Age of youngest grandchild	Not grandparent			0.94 (0.938–0.954)	–
(0–2 years of age)	3–5 years of age			1.03 (1.016–1.037)	1.03 (1.018–1.039)
	6–12 years of age			1.05 (1.045–1.064)	1.06 (1.051–1.071)
	13 years of age or older			1.07 (1.056–1.077)	1.08 (1.069–1.091)
Non-zero outcomes 757,978					
Number of observations: 5,371,107					

Notes: 95% confidence interval in parentheses in cells with hazard ratios. Reference categories in parentheses in the far-left column. The models controlled for gender, age, year of birth, education level, disposable income, civil status, sick-leave days, and number of children.

5.3 Sensitivity analyses

Other definitions of retirement transition were also tested, such as using the first year that old-age pension benefits exceed employment income. Similar definitions have been applied in Swedish register-based studies (Stenberg, de Luna, and Westerlund 2012; Svensson et al. 2015). Definitions with thresholds at 20%, 80%, and 90% were also tested. The results of these analyses indicate that the impacts of the grandparental variables and the covariates on retirement risk are highly similar to the results presented here. The results of other sensitivity analyses, in which individuals with very high annual incomes and individuals who received early pension benefits (23%) were excluded in separate analyses, do not differ substantially from the presented results. Moreover, as the propensity to retire may be influenced by various specific occurrences in a given year (i.e., retirement may differ by calendar year), models including dummies for calendar year were analyzed (models not shown here). The results indicated a strongly decreasing retirement risk from around the turn of the century. Other models (not shown here) included a dummy for period by dividing the observation period into 'the old pension system' (before 2000) and 'the new pension system' (introduced 1999–2000). This measure can be used as an approximation of the possibility of early retirement and other characteristics of the pension systems. The results indicated that the risk of retiring is lower in the new pension system than in the old pension system; which is unsurprising, because in the former system it was generally common to retire early with several early retirement incentives. In addition, the new pension system encourages retirement postponement, and many Swedish studies show that retirement timing has been postponed in the 21st century. The results from an additional interaction term between grandparenthood and period show that grandparents who retired in the old system have the highest risk of retirement, but grandparents overall have a higher risk of retiring in both periods than non-grandparents. Analyses stratified on year of birth did not reveal any cohort effects.

6. Discussion

This study focuses on retirement timing in relation to grandparenthood in Sweden, in particular on being a grandparent, age and gender of the grandparent, years since transition to grandparenthood, number of grandchildren, number of grandchild sets, and age of the youngest grandchild. Consistent with Van Bavel and De Winter (2013), who found a significant association between being a grandparent and early retirement timing in Sweden, this study finds that grandparents retire earlier than non-grandparents. The results hold even after controlling for well-known predictors of retirement timing, such

as age, disposable individual income, education, and relationship status. The magnitude of the results of being versus not being a grandparent is small but is similar to the results of being divorced versus being married; this finding is a distinction that has often been portrayed as one of the most influential predictors of retirement timing (e.g., Henkens and Tazelaar 1994).

This study found no strong evidence that grandmothers exhibit different retirement behavior than grandfathers, as was expected in the hypothesis on gender differences. A possible explanation for this result is that in Sweden both mothers and fathers engage similarly in their children's lives, which is an argument that accords with Bengtson's (1985) expectation that gender differences may disappear over time. It is also possible that when the grandparents, mainly the grandmother, are not the primary caregivers for their grandchildren, the perception and meaning of the grandparental roles of grandmothers and grandfathers may be similar. Other studies have also found no gender differences in satisfaction with the grandparent role (Reitzes and Mutran 2004) and the perceived responsibilities in relation to grandchildren (Thomas 1989).

This study finds that grandparenthood has an independent association with retirement risk and is not merely a reflection of age. However, the results do not support the hypothesis that the difference between grandparents and non-grandparents in the propensity to retire decreases with age. Instead, the results are partly in accordance with Van Bavel and De Winter's (2013) finding that grandparenthood influences retirement among those younger than 61, but this study also finds that grandparenthood more strongly influences retirement among those older than 65. The reason that grandparenthood matters more for individuals 65 or older could be that individuals who continue to work to these ages can more freely decide on their retirement timing, whereas a labor market exit at ages 61–64 may be largely influenced by occupational status and health. Hence, activities such as caring for grandchildren may not influence the retirement decision as much.

The fourth hypothesis, which states that the retirement risk increases with the number of years since the transition to grandparenthood, is partly supported. While the results indicate an increasing gradual risk in the main effects, the interaction with age did not produce a linear pattern. Instead, the results show that grandparenthood influences very early (58–60) and late (65–67) retirement for those who have been grandparents for at least a few years but not for those retiring at ages 61–64. The longer a grandparent has been a grandparent, the more complex the grandparental role can become, such as with the birth of multiple grandchildren, which may enhance the risk of retirement. Two extreme patterns were detected. First, those aged 58–60 who had been grandparents for more than 12 years had a much higher retirement risk. Second, those aged 68 and older who had also been grandparents for more than 12 years had a

much lower retirement risk. The first group most likely had children at a young age, and the latter most likely are very work-oriented, as they continue to work at this high age.

Moreover, the study hypothesizes that there may be a difference in retirement timing based on the number of grandchildren, as diverse family structures may influence retirement differently. In accordance with previous research, the number of grandchildren tends to increase the propensity to retire, but this study also reveals a higher risk among grandparents with four or more grandchildren. It is possible that fewer grandchildren have the same parents (due to spacing between children), and a larger number of grandchildren indicates a more complex family structure. Another explanation may be an expanded meaning of grandparenthood based on the number of grandchildren and that many grandchildren form a multiple attraction. Furthermore, an increasing number of grandchild sets was expected to have a gradual association with earlier retirement. This hypothesis was confirmed. The explanation for this finding is not necessarily that grandparents with multiple grandchild sets have multiple children, as the results reveal a decreasing retirement risk with the number of children. Instead, it is possible that with a greater number of grandchild sets, grandparents are more likely to have sets that they can spend time with or care for. In addition, the combination of various characteristics of the middle generation and the grandchildren increases with multiple grandchild sets, consequently enhancing earlier retirement. This finding could explain why grandchild sets absorbed the findings for the family constellations measured by the number of grandchildren in the final model. Moreover, the findings show that the older the youngest grandchild is, the earlier the grandparent retires. This finding partly confirms the hypothesis regarding the age of the youngest grandchild and the expectation of a non-linear pattern. Although the results do not show a large difference by age, grandparents with a grandchild younger than six years of age, and in particular younger than three, are less likely to retire earlier than those with older grandchildren. Unsurprisingly, prior studies have found that grandparents are often not needed during the first years of a grandchild's life because at least one of the parents is on parental leave or working part-time (Igel and Szydlik 2011). Grandparents have been shown to engage more in leisure activities with their grandchildren when the grandchildren are older. These results signal that grandparents in Sweden likely engage mainly in other types of activity than caring for baby grandchildren.

The study finds evidence that grandparents at different life stages have an elevated risk of retiring compared with non-grandparents, but is also variation among grandparents, and the more complex the family situation, the higher the risk of retiring. The motivation of grandparents to retire does not seem to be primarily driven by care needs; rather, it is driven more by their own needs to engage with grandchildren and their perceptions of time constraints. Being a grandparent is for many a highly valued social role and is beneficial to grandparents' well-being, self-esteem, and life

satisfaction as well as to the intergenerational transmission of knowledge. Although grandparents may undergo financial losses when retiring earlier, the benefits of grandparenthood may be stronger and more valued than the financial gain from continuing to work.

Regardless of the reasons, grandparents' early retirement may negatively impact the labor market and the pension system. When individuals, in this case grandparents, exit the labor market early, the labor market is deprived of potential workers and the pension system is constrained by individuals who are dependent on the system for a longer period of time. If grandparents continue their labor force participation they will contribute with income taxes and to their own pension, as delaying their labor force exit has a positive effect on pensions. Swedish policymakers want to delay labor market exits, and groups that might retire earlier are central targets. Previous efforts have included introducing flexible retirement, such as part-time work and part-time retirement. Although policy recommendations are beyond the aim of this study, a few potential policy implications should be mentioned. A more grandparent-friendly labor market might encourage grandparents, particularly grandparents with grandchildren older than two years of age, to postpone their full withdrawal from the labor force, giving those grandparents who also want to engage in care or to spend time with their grandchildren the opportunity to do so. A grandparent-friendly labor market is not only beneficial for grandparents' economic resources: work itself promotes health and well-being. Grandparents might assist during the hours when preschools and schools are closed. Policymakers could acknowledge grandparents' potential availability with family policies that not only encourage grandparents' labor force participation but also justify the participation of parents in the labor force, particularly mothers of young children.

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