Retirement, intergenerational time transfers, and fertility

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Abstract

Retired parents might invest time into their adult children by providing childcare. Such intergenerational time transfers can have important implications for family policies. This paper estimates the effects of parental retirement on adult children's fertility. We use representative panel data from Germany to link observations on parents and adult children. We exploit eligibility ages for early retirement for identification. The results show that early paternal retirement significantly increases the probability of childbirth for their adult children. Time use data suggests that this effect is driven by time transfers. Consequently, early retirement policies can have important spillover effects on younger generations.

Keywords: retirement, fertility, intergenerational transfer, time use

JEL Codes: J13, J14, J22, J26

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1 Introduction

Intergenerational time transfers can have important implications for health, human capital and labor market outcomes. The literature mainly focuses on two types of transfers–time investments of parents into their young children, and time investments of adult children into their elderly parents for the provision of support and informal care. In the first case, mothers might reduce their working hours or withdraw from the labor market in order to provide care for their children in the hope that they might benefit from this investment. In line with this argument, empirical studies find that maternal employment has a negative effect on children's cognitive skills (Ruhm, 2004), body mass index (Ruhm, 2008), and educational attainment (Ermisch and Francesconi, 2000). Adult children who provide care for their elderly parents reduce their working time and, consequently, forego earnings (Bolin et al., 2008; Van Houtven et al., 2013). Moreover, there is evidence that informal care provision has detrimental effects on the caregiver's mental health (Schmitz and Westphal, 2015) and well-being (van den Berg et al., 2014).

These examples show that the direction of the intergenerational time transfers varies throughout the life course. Another event in life that could affect intergenerational time transfers is retirement. The transition from employment to retirement enables the elderly to invest more time into other activities. The literature, for example, shows that retirees invest more time into home production (Stancanelli and Van Soest, 2012) and healthy behavior (Coe and Zamarro, 2011; Eibich, 2015; Insler, 2014; Kämpfen and Maurer, 2016). Given these findings, it seems plausible that retired parents might also invest some of their time into their adult children, by assisting them with childcare or housework. In fact, grandparent provided childcare is shown to be an important part of intergenerational family support in the United States (Vandell et al., 2003) and Europe (Hank and Buber, 2009). Formally, retirement reduces the opportunity costs of time investments of the retired parents, while, at the same time, their adult children's time out of work might come at a very high cost in terms of foregone lifetime earnings and wealth accumulation. Consequently, if children's and parents' utility are linked,[1] retired parents might help with childcare, thereby having the potential to influence the fertility behavior of adult children.

The existing literature mostly focuses on the determinants of grandparent provided childcare and the effects on the parent generation. Cardia and Ng (2003) model time and monetary

[1] This could be the case, e.g., if individuals maximize the joint utility of their family members, or if they are altruistic, i.e., an increase in their family members' utility increases their own utility as well.

transfers in an overlapping generations model and find that time transfers of the elderly increase labor supply of the second generation. Moreover, they report that subsidizing the time of grandparents spent on providing childcare is the most effective form of childcare subsidy. Ho (2015) examines how the need for childcare affects the time and monetary transfers of grandparents and their labor supply. She finds that the birth of a new grandchild and geographical proximity between generations increases the time that grandparents spend with their grandchildren. A comprehensive demographic and sociological literature also examines grandparents' engagement in childcare and its relationships with fertility and the employment decisions of the second generation (Hank and Kreyenfeld, 2003; Gray, 2005; Hank and Buber, 2009; Thomese and Liefbroer, 2013). These studies all assume that the employment status of the grandparents is either constant (i.e., they are assumed to be retired), or that their labor supply is affected by the presence of grandchildren.

There is almost no evidence in the academic literature on the effects of elderly parents' labor supply on their (adult) children's fertility. Eibich (2015) reports that retirement increases the amount of time devoted to childcare, which likely reflects that grandparents provide childcare to their grandchildren once retired. The only study providing direct evidence for an effect of parents' retirement on their (adult) children is a paper by Battistin et al. (2014). The authors use a pension reform in Italy for identification and find that an increase in the statutory retirement age negatively affected fertility.

This paper uses a regression discontinuity design (RDD) to estimate the impact of parents' retirement on their adult children's fertility.[2] We use data from the German Socio-Economic Panel Study (SOEP), a representative household panel study, to link information on older parents to their adult children. We exploit discontinuous increases in the retirement probability at the early retirement age thresholds for identification.[3] The RDD estimates suggest that paternal (but not maternal) retirement has a significant and large impact on his adult children's fertility, which is larger if families are geographically close and parents have higher capacities and less time constraints. However, our analysis of the long-run effects suggests that paternal retirement affects the timing of adult children's fertility rather than

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[2] Throughout the study, we mainly refer to the three-generation family in terms of elderly parents' (first generation), (adult) children (second generation), and grandchildren (third generation).

[3] As such, our study is in line with a comprehensive empirical literature studying causal effects of retirement by exploiting discontinuous incentives in early and normal retirement (or social security) schemes on various outcomes such as health, cognitive functioning, and obesity (Coe and Zamarro, 2011; Bonsang et al., 2012; Eibich, 2015; Godard, 2016; Kämpfen and Maurer, 2016), consumption (Battistin et al., 2009), and home production (Stancanelli and Van Soest, 2012).

their total fertility. The short-term increase in the probability of childbirth after parental retirement seems to be offset by a lower birth probability 4-6 years before retirement. Looking at the grandparent generation, we find that retired parents spend more time on childcare and on housework. For example, retired mothers report nearly one more hour on childcare activities per weekday upon retirement, on average. Moreover, fathers also provide significantly more childcare upon retirement, but only if the mother is not yet retired. These results suggest that retired parents support their adult children by providing childcare, which in turn leads their children to plan their fertility around their parents' early retirement.

This study contributes to the literature by providing direct evidence on how parental labor market decisions affect their adult children's fertility. Similar to Battistin et al. (2014), we address potential endogeneity of the parents' retirement decision. However, in contrast to Battistin et al., we observe both parents and their adult children in our dataset and can directly link these observations. This allows us to make use of more detailed information about the parental generation in terms of socio-economic characteristics and their time use behavior. Moreover, the pension reform exploited by Battistin et al. increased the retirement age from 50 to 55. In contrast, we exploit the threshold for early retirement at age 60, which highlights that the fertility effects are present even for older parents. Finally, we also provide evidence on the effects of parental retirement on the labor supply of the adult children, and we use detailed time use data for elderly parents to directly examine intergenerational time transfers.

The remainder of the paper is structured as follows: In section 2, we discuss relevant theoretical approaches that could explain the link between parents' retirement and their adult children's fertility. We also provide a short overview over the German pension system. In section 3, we review the data used for the empirical analysis. Section 4 describes our empirical strategy. Section 5 presents the results, and in section 6 we provide a number of robustness checks and placebo analyses. Section 7 concludes the paper.

2 Theoretical Considerations and Institutional Background

2.1 The Potential Impact of Retirement on Adult Children's Fertility

Several theoretical models of fertility are relevant for deriving predictions about a possible intergenerational effect of parental retirement on adult children's fertility. In this section, we briefly discuss these theories and review the related empirical literature. Thereafter, we describe our empirical estimation methods.

Economic models of decision making can be used to investigate how the retirement of elderly parents might influence fertility of the second generation (Becker, 1993; Joseph Hotz et al., 1997; Ermisch, 2016, 2015). These theoretical contributions assume that fertility behavior follows a rational decision-making process: fertility decisions depend on expected benefits and costs, building on previous work by Becker and Lewis (1973) and Becker and Tomes (1976). Starting with the predictions from static models of fertility behavior (Becker and Lewis, 1973; Willis, 1973), in the present context, we argue that parental retirement—together with a potential increase in family childcare support—imply a reduction in expected (monetary and non-monetary) costs of birth and childcare. Indeed, several empirical studies point out that grandparent provided childcare plays an important role. Around 50 percent of grandparents in the U.S. and Europe provide some type of childcare assistance (Hank and Buber, 2009; Thomese and Liefbroer, 2013).[4] Moreover, Cardia and Ng (2003) report that the majority of households make more time than monetary transfers from the old to the young. Hence, lower expected costs in form of (grand)parental support upon retirement might influence adult children's fertility behavior. Expected costs, in turn, are likely to be lower the higher the probability and intensity of (grand)parental support. Intergenerational time transfers are likely to depend on the geographic proximity between parents and adult children (Hank and Buber, 2009; Chan and Ermisch, 2011; Compton, 2015; Compton and Pollak, 2014) and on parental capacities and time constraints (e.g., health status, other caring responsibilities, number of grandchildren). In contrast, the net impact of retirement on fertility might be zero if adult children expect that they need to support their parents after retirement. Overall, assuming that childrearing is time intensive, the opportunity costs of children tend to decline with older parents' support, which is likely to depend on parents' capacities and time constraints.

Closely related to our work is the theoretical work by Cardia and Ng (2003). The authors develop a two-period overlapping generation model with altruistic agents allowing for both time and monetary time transfers. A key finding of their study is that a transfer from older parents to adult children has, "two effects: it relieves the time constraint of the working

[4] SOEP data from the 2002-2013 waves also suggest that grandparents' childcare plays an important role in Germany: 42 percent of mothers with children younger than 13 years report that grandparents provide childcare in a typical week, with a conditional average of nearly 12 hours per week.

generation by allowing them to devote more time to market work, and it relaxes the budget constraint by reducing the demand for purchased child inputs such as day cares and nannies" (Cardia and Ng, 2003, pp. 432–433).

To summarize, the related literature suggests that the intergenerational effect of parental retirement on adult children's fertility is likely to depend on the extent of grandparental capacities and support. To explore this, we start our analysis by investigating potential short-term effects on fertility. In the light of previous work, we then analyze heterogeneous effects with respect to older parents' capacities and time constraints (i.e., geographic distance to adult children, health status, number of grandchildren, other caring responsibilities) and adult children's characteristics (i.e., family income, family size). Thereafter, we study the timing of childbirth and explore longer-term fertility effects, as well as examine potential anticipation effects. We then investigate whether grandparents provide more childcare after being retired, which constitutes an important intergenerational time transfer mechanism from the old to the young. Finally, we also shed light on the impact of parental retirement on the labor market behavior of adult children.

2.2 Early and Official Retirement Rules in Germany

Germany's pension system is based on three pillars: *(i)* state pensions; *(ii)* employer-based pensions; and *(iii)* private pensions. State pensions are, by far, the most important source of retirement income, amounting to an average of 64% of the total retirement income of the population aged 65 and above in 2011. "Other pension income" (i.e., mostly employer-based pensions) contributes 21% to the total retirement income, while private pensions amounted only to 9% (DRV, 2015a). Therefore, in this section, we focus on the state pension system. The pension system in Germany is a pay-as-you-go system. Contributions are based on the gross monthly wage and are equally split between employers and employees. In 2015, the contribution rate was 18.7% of the gross monthly wage up to an earnings cap (€6,050/5,200 in West/East Germany, respectively). Labor earnings above this cap, as well as most non-wage earnings, are exempt from pension contributions.[5]

Once an individual is eligible for a state pension, she has to apply to the German pension fund (DRV) to claim her pension. Payments are made monthly, with the payment amount

[5] For example, certain groups of self-employed (e.g., craftsmen, fishermen or artists) are mandatorily insured in the German pension fund and have to pay contributions based on their self-employed income.

depending on the amassed earnings points and the current pension value. The current pension value is the monetary value of one earnings point (€29.21/27.05 for West/East Germany in 2015). It is based on the development of earnings in the previous year, the current contribution rate as well as a sustainability factor. Earnings points are gained for contribution years and are based on the relation between an employee's annual income (up to the earnings cap) and the median annual income, i.e., an employee earning exactly the median annual income would gain one earnings point. Finally, the pension amount is adjusted by an age factor. The pension increases by 0.5% for every month that the pension claim is deferred after reaching the official retirement age. Similarly, if a pension is claimed before the official retirement age, the pension decreases by 0.3% for each month.

The German pension fund offers several different pension schemes. While the contributions and benefits are fixed, these schemes differ in their eligibility criteria as well as their retirement ages, i.e., they effectively offer early retirement options to specific subgroups of the population. The standard old age pension is available to anyone with at least five contribution years. Historically, the official retirement age for this scheme was 65. A reform passed in 2006 increased the official retirement age to 67. However, this change only affects retirees from 2012 onwards, and the change is implemented stepwise, so that the official retirement age will only reach 67 for individuals retiring in 2029. In 2016, the official retirement age was 65 years and 4 months. This scheme does not offer an early retirement option.

The pension for women[6] is available to women born before 1952 with at least 15 contribution years, and who have paid social security contributions for at least 10 years after reaching the age of 40. Before 1999, the official retirement age under this scheme was 60. From 2000, this was raised stepwise to 65 (i.e., the same age as the standard old age pension). However, women born before 1952 can still retire from age 60 onwards, but they have to accept deductions of 0.3% for each month of early retirement (i.e., the pension would be up to 18% lower for women for whom the official retirement age was 65, but who chose to retire at age 60). The pension for long-term insured is available to individuals with at least 35 contribution years. As for the standard old age pension, the official retirement age was 65. The official retirement age is being raised stepwise from 65 in 2014 to 67 in 2031. However, in contrast

[6] This is the only gender-specific pension scheme in the German state pension system. All other pension schemes discussed are open to both men and women. While the official name of the scheme is "old age pension for women", it is only available to a subset of women that fulfil the additional inclusion criteria.

to the standard old age pension, this pension scheme offers the option of early retirement at age 63, albeit with deductions.

The pension for the especially long-term insured is available to individuals with at least 45 contribution years. This scheme offers the opportunity to officially retire (i.e., without deductions) at age 63. This scheme was introduced in 2012, and from 2016 onwards the official retirement age will be raised stepwise to 65 in 2029. The pension for severely disabled[7] people offers individuals with a severe disability the opportunity to retire before the official retirement age without deductions from their pension. Before 2012, the official retirement age under this scheme was 63 and early retirement with deductions was possible from age 60 onwards. These retirement ages are being raised stepwise to 65 (official retirement) and 62 (early retirement) in 2029. The pension due to unemployment or partial retirement offered individuals born before 1952 the opportunity to retire early if they were unemployed or partially retired. While the official retirement age is 65, individuals can retire early with deductions from their pension. The early retirement age was raised from 60 to 63, but with a number of grandfathering rules.

In summary, until 2012 the official retirement age in Germany was 65 for most individuals. However, individuals with at least 35 contribution years could retire from 63 onwards, and women, unemployed, partially retired or severely disabled individuals could retire from age 60 onwards (DRV, 2015b). In this paper, we use age 60 as the threshold for early retirement and age 65 as the threshold for official retirement. While some individuals might retire on a scheme that allows early retirement (pension for long-term insured) or official retirement (pension for severely disabled people) from age 63 onwards, this age threshold is less important than the threshold at ages 60 and 65. Between 1995 and 2010, only 12-15% of the men and 2-3% of the women retired on a pension for long-term insured (where the earliest retirement age is 63), while all others retired on a scheme that allows retirement at either age 60 or age 65 only (DRV, 2015a). In line with these administrative numbers, our graphical analysis (see section 5) indicates that the threshold at age 63 is not predictive of retirement.

[7] "Severely disabled" refers to a specific degree of disability. However, it should be noted that individuals born before 1951 are also eligible under this scheme if they are recognized as "incapable of work" or "occupationally disabled." An occupational disability implies that an individual is not fit to work in their normal occupation, while incapable to work implies that they are not able to work at least three hours per day under normal employment conditions in any occupation. In contrast, the degree of disability is defined with respect to a person's usual activities (including non-occupational activities).

3 Data

We use data from the German Socio-Economic Panel Study (SOEP), a large representative panel study of private households in Germany. Starting in 1984, respondents annually answer about 150 questions covering a broad range of topics, including fertility, labor market participation, and time use. For further information, see Wagner et al. (2007).

The SOEP surveys all members of participating households aged 17 and above. Moreover, if members of participating households move out (e.g., children leaving their parents' home), they are followed over time and their new household also becomes part of the panel. This allows us to directly link comprehensive data on adult children to the employment status of their elderly parents and parents-in-law.[8] While this limits our analysis to child-parent dyads that lived in the same household at some point, the long duration of the panel ensures that our sample is not restricted to adult children living with their parents.

Our main outcome of interest is adult children's fertility. We define the outcome as the probability of a child being born in a given year. Since we hypothesize that parental retirement affects children's fertility through an intergenerational transfer of time, we also investigate the effects of retirement on elderly parents' time use. For these variables, respondents are asked how many hours they spend on a set of activities on a normal weekday/Saturday/Sunday, e.g., paid work, running errands, housework, childcare, education,[9] repairs and gardening, as well as leisure. Finally, if parental retirement affects their children's fertility, we would also expect changes in their labor market behavior. Therefore we analyze the employment status of the second generation, which is captured by three binary variables that indicate whether *(i)* the adult child works full-time; *(ii)* the adult child works part-time; or *(iii)* he/she is not working (this includes unemployment, parental leave, and retirement) at the time of the interview.

Our sample period spans the years from 1984 through 2012. We link age, retirement status, and gender of fathers and mothers separately to their adult children's data using the respective identifiers. In the SOEP, year and month of birth are available, which enables us to measure age continuously in months and to identify older parents very close to the age thresholds of early retirement (age 60) and official retirement (age 65). Parents are defined as retired at the time of the interview, if *(a)* they report being retired and they are not working

[8] We merge our data on adult children with data on both their parents and their partner's parents. For the remainder of the study, when referring to parents, this includes both actual parents and parents-in-law.

[9] This includes school and university attendance as well as further training and learning.

full-time, or *(b)* if they are not working and, in the following year, report a retirement date (i.e., year and month of retirement) prior to the interview date in the current year.[10]

The upper left panel in Figure 1 shows the probability of childbirth by age for the second generation. A birth is most common between ages 25 and 37, whereas the probability of childbirth is lower than 4% for adult children under 23 or above 38. The upper right and lower left panel show the share of fathers and mothers above the retirement age thresholds of 60 and 65 by adult children's age, respectively. We note that less than 20% of the parents have reached the relevant age thresholds before their child's 25th birthday and that by age 40, almost all parents have passed the age threshold for early retirement. Therefore, we limit the sample to adult children aged between 25 and 40, since outside this age range both childbirth and parental retirement are rare events.[11]

<Figure 1 around here>

Table A1 in the Appendix presents summary statistics for all variables. About 8% of adult children in the sample report a birth in a given year. The majority of adult children are working full-time, although about 22% are not working at all.[12] The average age of adult children in the sample is 32 years, while the parents' age is on average 59 (mothers) and 62 years (fathers). The last column of Table A1 shows the difference between adult children with at least one retired parent and those without. Adult children with at least one retired parent have a lower probability of childbirth and are less likely to work full-time. However, Table A1 also shows that adult children with a retired parent are on average 2 years older, indicating that these simple descriptive statistics cannot be interpreted as causal effects. Moreover, the age difference is even larger among the parents themselves. Retired parents in the sample are, on average, 5-6 years older than non-retired parents. Consequently, we have to adjust for differences in the ages of children and parents in our econometric models.

[10] The question on retirement status refers to the previous survey year. In the robustness section, we alternatively explore definitions of retirement based on working hours (less than 4 hours per day) or receipt of an old age/ disability pension.
[11] In the robustness section, we also present estimates for samples of adult children aged 17 (20) and above. These alternative sample selections yield very similar results.
[12] The omitted employment categories include vocational training, marginal employment, and sheltered workshops.

4. Empirical Methodology

Parental retirement is likely to be endogenous with respect to adult children's fertility. The birth of a grandchild is known well in advance and might cause older parents to retire voluntarily in order to assist their children with childcare or household chores. In this scenario, the adult children's fertility affects parental retirement. Hence, reverse causality is quite likely. Confounding factors are another challenge for identifying a causal effect as family characteristics, peer effects, and neighborhood characteristics could all be correlated with parental retirement and adult children's fertility behavior. We address potential endogeneity by using the age thresholds for early and statutory retirement in Germany (at ages 60 and 65) as exogenous variation for parental retirement. This identification strategy is based on the assumption that older parents prefer to retire only once they are eligible for a state pension, which is likely to be the most important source of their retirement income. While their adult children can of course, anticipate this decision, this variation in their parents' propensity to retire is still independent of their children's fertility, and instead induced by financial incentives. Therefore, any significant estimates would indicate that children take into account their parents' employment status when planning their fertility.

Parents above these age thresholds are, *ceteris paribus*, more likely to have older children than parents below the threshold. Since fertility varies over the life course, we control for children's age to avoid omitted variable bias. Moreover, holding adult children's age constant, children of older parents (e.g. second- or third children, children of parents with a higher educational background) are more likely to experience retirement of parents than adult children with younger parents. This might introduce a bias if their reproductive behavior also differs. As a result, we also control for parental age in the model.

We estimate our main specification as a fuzzy regression discontinuity design with bandwidths of five and ten years around each threshold, together with quadratic age-trends and piecewise linear age trends for elderly parents, respectively.[13] We choose these two specifications based on a visual inspection of the data (see Figure A.1 in the Appendix) as well as comparisons of the Akaike Information Criterion (AIC) for the first-stage regression. Quadratic age trends are commonly used in studies on retirement and health (Coe and Zamarro, 2011; Insler, 2014). A piecewise linear age trend (i.e., different linear age trends on both sides of the discontinuity) is equivalent to a nonparametric local linear regression based

[13] We also considered cubic age trends, however, based on the AIC, we concluded that a cubic term does not substantially improve model fit in the first- and second-stage. The results are available upon request.

on a rectangular kernel. This specification is recommended in the RDD literature (Lee and Lemieux, 2010).

Further, our models include a linear trend in child's age when analyzing the effect of father's retirement and a quadratic trend for the analysis of maternal retirement. These trends are chosen based on plots of the parental retirement probability against their children's age (see Figure A.2 in the appendix). Finally, we account for the longitudinal dimension of our data by estimating fixed-effects models with dummy variables for year and month of the interview.

The model can be written as follows:

(1) First-stage:

$$pr_{it} = \zeta + f(age_{it}) + g(page_{it}) + \pi D_{it} + \omega_i + \kappa_t + \nu_{it}$$

(2) Second-stage:

$$y_{it} = \beta + f(age_{it}) + g(page_{it}) + \lambda \widehat{pr}_{it} + \alpha_i + \tau_t + \varepsilon_{it}$$

Here, y_{it} is the outcome of adult child *i* at time *t*, age_{it} is the age of child *i* at time *t*, $page_{it}$ the age of the parent of child *i* at time *t*, and pr_{it} indicates the retirement status of child *i*'s parent at time *t*. α_i and ω_i are child-fixed effects, and τ_t and κ_t are a set of month- and year-fixed effects to control for secular and seasonal trends, respectively. ε_{it} and ν_{it} are the idiosyncratic errors of the second- and first-stage, respectively. $f(age_{it})$ is a parametric function of the child's age (linear when analyzing fathers and quadratic when focusing on mothers). $g(page_{it})$ is a parametric function of parental age, i.e. for our main specification we use both $g(page_{it}) = \beta_1 page_{it} + \beta_2 page_{it}^2$ (i.e. a quadratic trend) and $g(page_{it}) = \beta_1 page_{it} + \beta_2 page_{it} D_{it}$ (i.e., different linear trends on both sides of the threshold). D_{it} is a dummy variable indicating whether the parent of child *i* in year *t* is above or below the age threshold for early or official retirement. In the first stage, the parameter π estimates the effect of crossing the age threshold on the retirement probability of the parent. In the second-stage, λ is the treatment effect of parent's retirement on their children's fertility (and labor market behavior). We estimate separate models for each threshold and combination of parental and child gender. In a second step, we investigate whether the effects differ across subgroups (child-parent geographic distance, number of grandchildren, education, and adult children's household income before parents' retirement). Furthermore, we study heterogeneous effects by parents' health and by whether the older parents have a living parent themselves. We also investigate whether there are heterogeneous effects by adult children's age as the biological clock matters and a previous literature also suggests that childcare provided by grandparents is more common if mothers are young. In the robustness section, we analyze whether the restriction on children's age affects our results by using a sample of adult children aged 17 (20) and above, and we also present the results from a number of placebo regressions.

5 Results

5.1 First-stage results

Before estimating the effects of parental retirement on their children's outcomes, we start by examining the first-stage regression in equation (1) to ensure that our instrument is sufficiently strong. Figure 2 displays the propensity of parental retirement by the age of fathers (upper panel) and mothers (lower panel). The dots show the share of retired fathers in the sample for age bins of 6 months. The vertical lines mark the thresholds for early and official retirement age. The figure shows that the retirement probability increases slowly between age 50 and age 60, and almost linearly between age 60 and age 65, after which it levels off at around 95%. Most importantly, the retirement probability increases sharply at age 60–the threshold for early retirement. The figure also shows a discontinuity at the official retirement age of 65.

<*Figure 2 around here*>

The first-stage regression in equation (1) allows us to derive precise estimates for the increase in the retirement probability at the age 60 threshold. Comparing a parent who is slightly younger than age 60 to a parent who is slightly older, we find that crossing the age threshold for early retirement increases the parent's propensity to be retired by 18.2 percentage points for fathers and 15.9 percentage points for mothers. The results for the official retirement age threshold are quite similar–fathers (mothers) who are slightly older than 65 have a 12.3 (20.3) percentage points higher propensity to be retired. This indicates that the age thresholds are sufficiently strong instruments for parental retirement status, with F-statistics of 56 and above (see Table 1), which are considerably larger than the rule of thumb F-statistic of 10-12 (Staiger and Stock, 1997). Moreover, the discontinuities in the propensity to retire of around 12-19 percentage points are quite comparable to previous findings for Europe (Eibich, 2015; Godard, 2016). For example, studying the impact of retirement on body mass in ten European countries, Godard (2016) reports that the likelihood of retiring increases by 21 (28) percentage points for men (women) when reaching the country-specific retirement age. In contrast, the effect sizes of being above the early (normal) retirement age on the probability of being retired are lower in the U.S (Kämpfen and Maurer, 2016).

5.2 Parental Retirement and Short-Term Fertility

Table 1 provides the estimates of the effect of early parental retirement on their adult children's fertility. We present findings for both a quadratic and a local linear age trend for elderly parents and for bandwidths of five and ten years, respectively. Panel A shows the effects of father's retirement, while the effects of mother's retirement are presented in panel B. First, we note that the F-statistics for the excluded instrument in the first-stage are well above 12, the rule-of-thumb value for weak instruments (Staiger and Stock, 1997). Second, we find that a father's retirement significantly increases the probability of childbirth for both sons and daughters. The estimates in the first row of Table 1 suggest that early retirement of the father increases the probability of their having a grandchild born by around 12 to 24 percentage points. The magnitude of early paternal retirement on the fertility of the second generation is very similar for daughters and sons. The point estimates of early paternal retirement on childbirth for daughters vary between 13 and 24 percentage points, and are in the range of 8-25 percentage points for sons. Third, we find no statistically significant effect of maternal retirement on the probability of their having a grandchild born. This finding holds for both model specifications (quadratic and local linear age trends) and bandwidths.

<Table 1 around here>

5.3 Heterogeneous Effects

Older parents' retirement and involvement in providing childcare to their grandchildren is likely to depend on their own capacities and time constraints. We now analyze whether the effect differs by the geographic distance between parents and adult children, parents' health, the number of (living) grandchildren, and whether parents still have a living mother or father themselves. We estimate separate models for each of these groups.[14]

If time transfers from parents to adult children are the mechanism through which parental retirement affects adult children's fertility, we would expect that the effect of parental retirement is stronger if both generations live in close geographic proximity. Chan and Ermisch (2011), for example, report a decline of intergenerational exchange with travelling distance in the United Kingdom. Similarly, Hank and Buber (2009: 65) study the role of grandparents in providing childcare in ten European countries, pointing out that, "the likelihood of caring decreases unambiguously with increasing geographic distance between the older and the younger generations, particularly so if regular grandchild care is considered."[15] Compton and Pollak (2014) and Compton (2015) find that geographical proximity to a mother or mother-in-law increases labor market participation of young mothers in the U.S.

Second, the expected intergenerational support might be lower if the parents have health limitations (Hank and Buber, 2009). SOEP respondents regularly report their subjective health status on a 5-point Likert scale ("bad, poor, satisfactory, good, very good"). This allows us to distinguish between elderly parents with good ("satisfactory, good, very good") and bad health ("bad, poor").

Is the intergenerational effect of retirement stronger if there are no existing (or fewer) grandchildren, since otherwise the parents might already provide childcare to other grandchildren? To answer this question, we distinguish whether there were none, one, or more grandchildren present in the year before parents' early retirement. Fourth, with an increasing life expectancy, more elderly parents also have at least one living parent. In fact, around 40 percent of all elderly parents in our sample report that they have a living mother and/or father. Time transfers to (grand)children might be lower due to competing family responsibilities, since older parents might be "sandwiched" between downward and upward

[14] This approach allows for different treatment effects as well as differential age trends across these groups. Group membership is defined based on the time constraints of the parents in a respective year, since their time constraints may change over time and these changes might influence their children's fertility planning. In contrast, we define group membership for the analysis by number of living grandchildren based on the number of grandchildren in the year before parent's retirement (i.e., group membership is constant over time for each parent-child dyad), since this variable is clearly influenced by our outcome variable.

[15] For empirical evidence on a positive relationship between geographic proximity and the propensity of grandparents' childcare in the United States, see, for example, Vandell et al. (2003).

caregiving. Hence, we examine whether the intergenerational effect differs by whether older parents have at least one living parent.[16]

Table 2 reports the heterogeneous effects. We report estimates for the specification with a quadratic age trend and a bandwidth of ten years (specification (1) in Table 1). This is our preferred specification because it provides conservative lower bounds and the estimates are less sensitive to the choice of the bandwidth. Moreover, a bandwidth of ten years yields a larger sample size and more precise estimates. The first two columns in Table 2 distinguish by whether parents and adult children live in close geographic proximity, which is defined as a travel time of less than one hour.[17] Overall, around 80 percent of adult children and their parents live less than one hour away from each other. The results show that the positive effect of early paternal retirement on the birth of a grandchild is stronger if both generations live close to each other. For example, the intergenerational point estimate of father's retirement on adult children's fertility is 22 percentage points if both live in close geographic proximity, compared to 9 percentage points in case both generations live more than one hour of travel time away from each other. The first point estimate is statistically significant at the 1 percent level, whereas the latter is not statistically different from zero at conventional significance levels.[18] Moving on to the heterogeneous effects by parental health shows that the impact of parental retirement is strongest if the father is in good health. The effects of maternal retirement on adult children's fertility in columns 1-4 in Table 2 are never precisely estimated.

The next three columns in Table 2 show the estimated intergenerational effects on fertility separately by the number of living grandchildren in the year before parents' retirement. The

[16] Previous literature suggests that childcare provided by grandparents is more common if mothers are young (Hank and Buber, 2009; Thomese and Liefbroer, 2013; Vandell et al., 2003) and it is well documented that the likelihood of childbirth decreases with age (Iacovou and Tavares, 2010; Bauernschuster et al., 2016). In unreported regressions, we also studied potential heterogeneous effects by the age of adult children, with the median age of 26.5 years as the threshold. The results show that the effect of paternal retirement on fertility is driven by children above 26. This result only seemingly contradicts the earlier literature. In Germany, both childbirth and parental retirement are relatively rare between ages 17 to 24 (see Figure 1). Therefore, we would expect that our effects are driven by relatively older children. Moreover, older children might face greater time constraints than younger children, who might still be in education. In this case, parental time transfers will have a larger impact on the expected costs of fertility.

[17] In selected years, SOEP respondents are asked about the residential distance to their relatives. See Rainer and Siedler (2009) for further information. To minimize the loss of statistical power, we imputed missing values in years where the question was not asked with the closest observed value in either past or future years.

[18] Research suggests that grandparent childcare is more common if the generations live in the same house or household (Vandell et al., 2003; Hank and Buber, 2009). In unreported regressions, we also distinguished by whether adult children and their parent(s) live in the same house or household. The findings suggest that the differences in Table 2, columns 1 and 2, are not driven by whether generations live under the same roof, since the positive intergenerational effects are mainly driven by those families living in close geographic proximity, but not in the same house or household.

results show that father's retirement has a quite similar effect regardless of the number of existing grandchildren. While the effect size is largest for grandparents with two or more existing grandchildren, the differences between groups are small and not statistically significant. In contrast, mother's retirement significantly increases the probability of childbirth for families with only one existing grandchild. The last two columns in Table 2 analyze whether the intergenerational effects are weaker if elderly parents are "sandwiched" between upward and downward caregiving responsibilities.[19] The point estimates for fathers in panel A suggest that grandparents' capacities do play a role. For example, the effect of fathers' retirement on fertility behavior of the second generation is stronger in magnitude (0.183 vs. 0.153) and more precisely estimated if elderly fathers do not have a living mother or father present. Note, however, that fathers and sons mainly drive this effect.

Overall, the findings in Table 2 suggest that grandparents' capacities play an important role. We find that the effect of father's retirement on the fertility behavior of the second generation is strongest if constraints of the parents—in terms of travelling time, health limitations, or other possible caring responsibilities—are lower. In the next subsection, we examine whether adult children's characteristics are also relevant.

<Table 2 around here>

One might expect a stronger effect of early parental retirement on adult children's fertility behavior if the latter have lower levels of household income, as paid childcare services might be less affordable for them (Gray, 2005). The altruism model of Becker (1974) hypothesizes that individuals care about the well-being of the potential recipient. Thus, we would expect that adult children's income is negatively related to parents' time transfers, with elderly parents mainly supporting less affluent children. Alternatively, according to the exchange model, the amount of time transfers could be positively or negatively related to adult children's income, depending on the elasticity of supply and demand of services (Cox, 1987). Adult children's household income might also relate to fertility decisions as, for example, unforeseen changes or shocks to family income may result in families revising their fertility intentions. Therefore, we distinguish by whether adult children's household income in the year prior to parents' early retirement age is below or above the median. The results in

[19] Similar to child-parent geographic distance, the information is not available for all years. To maximize statistical power, we impute the values for this variable with the value of the closest observed year.

columns 1-2 in Table 3 are quite similar in magnitude and significance for both groups, indicating that children's household income does not play an important role.

Are the intergenerational effects stronger at the extensive (i.e., entry into parenthood) or the intensive margin (i.e., the number of children)? Columns 3-5 in Table 3 report the impact of parental retirement on the probability of adult children's first, second, or higher-order birth. The estimates point to important heterogeneous effects. The fertility effects are strongest and most precisely estimated for the second birth (column 4 in Table 3). Moreover, this applies to both paternal and maternal retirement. For instance, a father's retirement significantly increases the incidence of a second birth among their daughters by around 40 percentage points, and mother's retirement increases their daughters' fertility of a second child by 24 percentage points. Both point estimates are significantly different from zero at the 5 percent level. Overall, the effects at the extensive margin are smaller in magnitude, and only precisely estimated in two out of six regressions.

Taken together, these findings suggest that the estimates in Table 1 are mainly driven by a positive intergenerational effect at the second birth, rather than at the extensive margin. These results are somehow to be expected, given the average age of adult children at the time of parental retirement. Figure 1 shows that when adult children are aged 30, on average, around 40 percent of fathers are above the early retirement age threshold. At age 35, nearly 80 percent of fathers are older than 60 years. In Germany, the mother's average age at first birth is 29.5 years, and 31.8 years at the second birth. At the third birth, mothers are on average 33 years old (Destatis, 2016).[20] Hence, the strongest positive intergenerational effect on the incidence of second birth is in line with these statistics, since most adult children have already entered parenthood prior to their parents' retirement.

<*Table 3 around here*>

Before studying parental time transfers as a potential mechanism behind these effects, we provide evidence on the timing of childbirth around parents' retirement.

[20] The figures refer to the average age for biological mothers who gave (a living) birth in Germany in 2014.

5.4 Parents' Retirement, Timing of Fertility and Longer-Term Fertility

The immediate increase in fertility in response to parental retirement does not necessarily imply that women have more children overall. They could simply decide to either bring forward or delay births that would have occurred regardless of parental retirement. If the births that did occur in the treatment group would have happened at an earlier or later age in the control group, family support through grandparent provided childcare would not result in a net increase in completed fertility. Is the increase in short-run fertility permanent or are births rather timed earlier or later? Moreover, while children might anticipate their parents' retirement, it is unlikely that they are able to plan their fertility perfectly. Therefore, we investigate whether parental retirement affects childbirth in a 15-year window around retirement, i.e. in the seven years before retirement, in the year of retirement itself, and in the seven years after retirement. This allows us to examine potential anticipation effects and longer-term fertility behavior. Figure 3 displays the results. Panel A reports the point estimates together with 95%-confidence intervals of paternal retirement on the probability of childbirth for adult daughters and sons, and panel B shows the respective estimates for maternal retirement.[21] Panel A displays an inverted u-shaped relationship in the probability of a grandchild being born over time. The likelihood is negative and marginally significant four to six years prior to father's early retirement. The probability of childbirth becomes positive and statistically significant in the year of father's retirement, and remains positive and precisely estimated up to two years following paternal retirement. Panel A in Figure 3 also shows that the point estimates of paternal retirement are very similar for daughters and sons. The estimates for mother's early retirement in panel B show a very similar development over time, however, the estimates are only significant at the 95% level 1-2 years before mother's retirement. These results indicate that parental retirement does not lead to a long-term increase in the number of grandchildren. Instead, adult children seem to postpone births that would have happened at an earlier age to coincide with their parents' retirement.

<Figure 3 around here>

Taken together, the results in Tables 1 and 2 and Figure 3 suggest that paternal retirement leads to a significant and large increase in their adult children's fertility in the short-run,

[21] In line with Table 2, we report point estimates from our preferred model specification with quadratic age trend and a bandwidth of 10 years.

which is offset by a lower birth probability in the years before paternal retirement. While the average effects of maternal retirement are also positive, but imprecisely estimated, the heterogeneous effects in Table 2 point toward positive intergenerational effects of maternal retirement on the birth of a grandchild if elderly parents already have one grandchild. Since retirement typically leads to a decrease in parental income, but increases their leisure time, it seems plausible that these fertility effects might partly result from intergenerational time transfer from retired parents to their adult children. This might help the second generation to better cope with the time costs of raising another child. We now study these potential mechanisms.

5.5 Parents' Time Use

Retired parents might choose to invest some of their leisure time into their adult children by providing childcare, which might partly explain the positive intergenerational relationship between early retirement and the birth of a grandchild. Indeed, grandparent-provided childcare constitutes an important type of family support and intergenerational exchange. In both the U.S. and Europe, around 50 percent of grandparents provide some type of childcare assistance (Hank and Buber, 2009; Thomese and Liefbroer, 2013). Hank and Buber (2009) study the prevalence and intensity of childcare provided by grandparents in ten continental European countries. For Germany, the authors report that around 56 (51) of grandmothers (grandfathers) provided any childcare in the past 12 months, and 30 percent of grandparents report providing childcare almost weekly or more often in the preceding year.[22] Hank and Buber (2009) also report that working grandparents are significantly less likely to provide regular childcare (almost weekly or more often). Descriptive findings from the SOEP also suggest that grandparent provided childcare plays an important role in Germany: 42 percent of mothers with children aged 0-13 years report that grandparents provide childcare in a typical week, with a conditional average of nearly 12 hours per week.[23] Grandparent-provided childcare is most common and time intensive when children are aged 4 years or younger.[24]

[22] These figures are for the years 2003-2004.
[23] These figures are derived from the SOEP "Mother and Child" Questionnaire (years 2003-2013). In these questionnaires, mothers of newborns are interviewed on various outcomes of their newborn child. Follow-up interviews are conducted when the children are 2-3, 5-6, 7-8, and 9-10 years old. Overall, the mother-child data set contains 6,565 child-year observations.
[24] In a typical week, 47 percent of grandparents provide childcare if children are aged ≤ 48 months, with a conditional average of 7.5 hours. The corresponding figures for children aged 4-12 years are 38 percent and 6.8 hours, respectively.

However, whether these associations are mirrored by a causal relationship of retirement on time transfers to younger generations is an open question that we aim to investigate next.

In the SOEP questionnaire, respondents are asked how many hours they spend on a set of activities on a normal weekday, such as childcare, housework, running errands, as well as repairs and gardening. Table 4 reports the results of RDD regressions of early retirement on father's and mother's time use, in particular the number of hours they spend on childcare, housework, running errands, as well as repairs and gardening on a typical weekday. Both fathers and mothers spend more time on childcare following retirement, although the effect is only statistically significant for mothers. Fathers spent on average 0.21 more hours on childcare upon retirement, and mothers report 0.7 more hour of childcare provision per weekday, on average. This is a large effect since 0.7 more hours of childcare among retired mothers corresponds to an increase in childcare of around 130 percent.[25] We interpret these findings as important, since parents usually report that childcare assistance provided by the grandparents is more convenient, trustworthy, and beneficial for the child than support from other childminders (Fergusson et al., 2008; Geurts et al., 2012). Retirement also increases the amount of time spend on housework, as well as repairs and gardening. Moreover, fathers report spending more time on running errands, with an increase of roughly half an hour per workday. Note that both the direction and magnitude of the effects on time spent on childcare, running errands, as well as repairs and gardening are in line with the findings on fertility reported in Tables 1 and 2. In unreported regressions, we also estimated the effect of parental retirement on their time use at weekends. The estimates show an increase in childcare upon retirement among mothers (by half an hour), but not among fathers. This suggests that an increase in childcare during weekdays does not coincide with a reduction of grandparental childcare provisions at weekends. Overall, this supports the notion that parental retirement leads to an increase in intergenerational time transfers from the retired parents to their adult children.

<Table 4 around here>

5.6. Joint parental retirement

So far, we studied parents' retirement decisions in isolation. In this sub-section, we distinguish between maternal and paternal retirement decisions both individually and jointly.

[25] Elderly mothers report spending 0.53 hours on weekdays on childcare. See Table A1 in the Appendix.

Figure A3 in the Appendix displays the distribution of the age difference between fathers and mothers in our sample. The figure shows that in the majority of elderly couples, men are older than women, with the mass of the density of around 1-5 years age difference. Table A2 in the Appendix presents estimates of parents' joint retirement decisions. Using our preferred specification, we estimate the effect of maternal and paternal retirement on the probability that both partners are retired,[26] respectively. The results from the two linear probability models clearly show that father's retirement is not positively related to joint retirement, with a point estimate of -0.058. In contrast, mothers' retirement significantly increases the likelihood that both parents are retired, with an increase of around 60 percentage points. This association is precisely estimated and significantly different from zero at the 1 percent level. Hence, these findings suggest that *(1)* fathers tend to retire first, and *(2)* that maternal (but not paternal) retirement increases the likelihood of joint retirement.

Table 5 presents estimates of paternal, maternal and joint retirement on adult children's fertility behavior, and Table 6 contains similar estimates for parents' time use. In both tables, we present estimates from our preferred specification (quadratic age trends and a bandwidth of 10 years). In contrast to Tables 1 and 4, the models in Tables 5 and 6 include three endogenous regressors–a dummy variable for father's retirement, a dummy variable for mother's retirement, and an interaction effect of both. Similarly, we use three instruments: *(i)* whether the father is above the age threshold for early retirement; *(ii)* whether the mother is older than 60; and *(iii)* whether both father and mother are above age 60. The models include age trends for both father's age and mother's age, and the bandwidth is also restricted with respect to both father's and mother's age.

Consequently, the results should be interpreted as follows: The first row, "retired father," shows the effect of father's retirement if the mother is not (yet) retired. The second row, "retired mother," shows the effect of mother's retirement if the father is not yet retired. The third row, "both retired," shows the interaction effect between father's retirement and mother's retirement. If the effects of retirement on fertility and time use are driven by joint retirement decisions, we would expect that the estimates in this third row are significant, which would indicate that joint retirement has an effect over and above the effects of father's and mother's retirement when analyzed separately. Conversely, if the effect of joint retirement can be entirely explained by analyzing father's and mother's retirement separately, we would expect the interaction effect to be close to zero and not statistically significant.

[26] The outcome is equal to one if both parents are retired, and zero otherwise.

Finally, if joint retirement occurs very rarely, the effect will be imprecisely estimated. In all three of these cases, the full effect of joint retirement (i.e., both the father and mother are retired) can be derived by adding up the point estimates in all three rows.

The estimates in Table 5 show that the effects of parents' retirement on their children's fertility are indeed driven by fathers. The point estimates on the joint retirement variable are close to zero and not statistically significant at conventional levels. Moreover, the standard errors on the interaction effect are relatively large, indicating that joint retirement (at the same age) might not play a major role in our sample.

<Table 5 around here>

The estimates in Table 6, panel A, show that a father's early retirement significantly increases the time he spends on childcare, repairs and gardening, housework and on running errands. In particular, it is worth noting that the effect of retirement on childcare is larger than in Table 4 and it is now statistically significant at the 10% level. However, this only holds if the mother is not (yet) retired. The point estimate of the full effect of joint retirement is -0.066, which suggests that in cases where both parents retire together, the father does not provide more childcare than he did before retirement. Nevertheless, while the point estimate of the interaction effect is large and negative, it is not significant. This is likely due to the fact that there are not many elderly couples who retired together at the same time in the sample.[27] In stark contrast, maternal retirement shows no spillover effects on her husband's time use. The effects on her own time use are similar in magnitude to those in Table 4, but not precisely estimated. Taken together, the findings in Tables 5 and 6 indicate that—although the findings in Table 4 suggest that retired mothers spend more time on childcare than retired fathers—the effects on fertility reported in Table 1 are indeed driven by paternal retirement. Men tend to retire before their wives due to the average age difference, and fathers significantly increase their childcare provision while the mother is still working. Once the mother retires, she seems to take over some of the father's childcare commitments, which would explain the patterns observed in Tables 4 and 6. This interpretation is supported by qualitative research conducted by Rutter and Evans for the Daycare Trust (Rutter and Evans, 2011). Their report of grandparent provided childcare in the UK highlights that 40% of all grandparent provided

[27] It is worth noting that our LATE estimator only takes into account couples that retire in the same year and at the same age (i.e., age 60). Couples retiring in the same year but at different ages will not be treated as jointly retired, since at least one of the partners is not a complier.

childcare originates with grandfathers. One of the participating grandmothers particularly pointed out that her husband retired earlier and, therefore, looked after their grandchild (Rutter and Evans, 2011, p. 25).

<Table 6 around here>

5.7 Adult Children's Labor Market Participation

If parental retirement affects their children's fertility, this might also lead to changes in labor market participation, e.g., because adult children reduce their working hours or take parental leave. Therefore, we estimate the effect of early parental retirement on the employment status of the second generation. Specifically, we focus on whether adult children report to be in full-time work, part-time work, or if they are not working.[28] The results are shown in Table 7. Similar to the previous tables, we report estimates for our preferred specification with a quadratic age trend and a bandwidth of ten years

Table 7 shows that paternal retirement increases the probability of being in full-time work by 11 percentage points and decreases the probability of part-time work by 7 percentage points (Panel A, row 1). However, we also note that the effects differ substantially between daughters and sons. The effects of paternal retirement on his daughter's employment status are not significantly estimated. The point estimate on full-time work is close to zero, and the estimated effect on not working even has the opposite sign than the pooled estimate for all adult children. In contrast, early retirement of the father significantly increases the probability that his son is working full-time, and it reduces the probability that sons work part-time or are not working by 7 and 16 percentage points, respectively.

The results in panel B of Table 7 suggest that maternal retirement reduces the probability of full-time work for her adult child and increases the probability of not working at all. In contrast to paternal retirement, these effects seem to be driven by daughters instead of sons. Taken together, these estimates suggest that parental retirement leads to a reduction in female labor supply, which is in line with our findings on fertility. At the same time, the increase in son's labor supply indicates that adult children smooth their household income by maintaining the household's aggregate labor supply. This differential labor supply response

[28] This includes unemployment as well as parental leave.

suggests that the effect of parental retirement on fertility is unlikely to be driven by monetary transfers.

<Table 7 around here>

6 Robustness checks

West Germany. More than 25 years after German reunification, there are still pronounced differences between the former East and West in terms of fertility, public childcare, and the labor market (Hank et al., 2004; Hunt, 2008; Felfe and Lalive, 2012; Bauernschuster et al., 2016). Studies also document that East and West Germans differ in terms of preferences and gender-role attitudes (Alesina and Fuchs-Schündeln, 2007; Bauernschuster and Rainer, 2011). Ideally, we would therefore like to present separate RDD estimations for East and West Germany, but data limitations allow us to conduct separate regressions only for West Germany.[29] Column 1 in Table 8 presents the findings for West Germany.[30] The estimates for parental retirement are very similar in magnitude and significance to the main estimates in Table 1. Similarly, the point estimates for maternal retirement are all positive, but not significantly different from zero at conventional significance levels.[31]

Adult children aged 17 (20) and older In the main analysis, we restricted the sample to adult children aged 25-40 years, because outside this age range, the likelihood of a birth is low and few parents have reached the early retirement threshold before children's 25th birthday. To further assess the robustness of the results, we re-estimate our models using observations where the children are aged 17 (20) years and older. The results are shown in columns 2 and 3 of Table 8. A retired father increases the probability of childbirth by around 11 percentage points. As before, the effects for maternal retirement are imprecisely estimated. Taken as a whole, we conclude that these robustness checks confirm our main findings.

Alternative definitions of early retirement. We now examine the sensitivity of our analysis with regard to the measurement of parental retirement. There exist several potential definitions of retirement in the literature, based on individuals self-assessed labor market status, the receipt of pension benefits, and reported hours of paid work (Kämpfen and

[29] For East Germany, we simply have too few observations around the early retirement threshold for meaningful RDD regressions.
[30] The sample includes all families whose parents lived in a western federal state in 1989.
[31] Note, however, that all point estimates for maternal retirement on adult children's fertility are larger in magnitude than the corresponding estimates in Table 1.

Maurer, 2016). First, we alternatively define being retired if parents report fewer than four hours of paid work on a typical working day.[32] Second, we define retirement as exploiting the receipt of pension benefits, defining parents as being retired the moment they report receiving an old-age or disability pension. The estimates in the last two columns of Table 8 show that the main findings are robust to these alternative definitions of early retirement.

< Table 8 around here >

Official retirement age. The results in section 4 are estimated using the threshold at age 60 as an instrument for parental retirement, i.e. they provide the effect of early parental retirement. In unreported regressions, we also estimated the models using the official retirement age threshold of 65. For both paternal and maternal retirement, we find no positive intergenerational effects on their adult children's fertility. These findings are not surprising. In our sample, adult children of mothers close to the age threshold for early retirement (aged 59-61) are on average 30 to 31 years old, while adult children of mothers aged 64 to 66 are on average 35 years old. At age 35 and above, giving birth to a child becomes an increasingly rare event and the decision to have another child is, therefore, less likely to be driven by the intergenerational time transfer of the parents.

Placebo outcomes. Assuming that the underlying assumptions hold, our fuzzy regression discontinuity design should ensure that the results are neither affected by selection bias nor by omitted variable bias. We provide further evidence for this by conducting a number of placebo regressions. We estimate our main specification using variables that should not be affected by parental retirement. In particular, we look at *(i)* whether adult children have a high school degree; *(ii)* whether they live in an urban or rural area; and *(iii)* whether they are strongly interested in politics. The results are shown in column 1-3 of Table 9. With one exception, all coefficients are close to zero and not statistically significant. While maternal retirement seems to negatively influence their daughter's political interest, the coefficient is only marginally significant. Moreover, since we report the results of 18 different regressions, we would expect 1-2 coefficients to be significant at the 10 percent level.

[32] In unreported regressions, we also used fewer than three (two) hours of paid work on a typical working day as alternative definitions for early parental retirement. The findings were in line with our results in Table 1 and are available upon request.

Finally, we conduct a placebo test using a randomly generated birth variable. For this purpose, we use a fixed-effects model to predict an individual's probability of childbirth conditional on their own age as well as their parent's age, but without controlling for parental retirement. Then, we construct a "birth placebo" by using a random draw from a Bernoulli distribution and the predicted probability of childbirth. Finally, we run our main specification using the birth placebo as an outcome. Given that retirement mostly occurs in a five-year window between age 60 and 65, while childbirth is most likely between age 24 and age 37, it could be that both windows simply coincide in our sample. In this case, we would expect that the effect of retirement on the birth placebo is significant, since the birth placebo follows the same age distribution as our actual childbirth outcome. However, column 4 in Table 9 indicates that this is not the case, which further increases our confidence that the estimates reported in Table 1 are very likely to be causal.

<Table 9 around here>

7 Conclusions

Intergenerational time transfers caused by retirement might have important implications for policy design. Since the early 2000s, statutory retirement ages have been raised in many developed countries. If adult children benefit from their parents' retirement through support and childcare, later retirement entry due to these reforms might have implications for the family planning and fertility decisions of the second generation. However, the public debate about intergenerational effects of retirement policies mostly focuses on two aspects. First, declining fertility rates and increasing life expectancy imply that both the number of retirees and the time spent in retirement will likely increase. Therefore, later generations face an increasing financial burden to sustain pay-as-you-go pension systems. Second, retirement also increases the number of jobs released, which might help younger generations in their labor market entry and career progression (Vestad, 2013).

This paper provides new evidence regarding the effects of parental retirement on their adult children's fertility using a regression discontinuity design. We use a representative household panel study from Germany to link data on parents and their adult children. In RDD, we exploit the eligibility age for early retirement in Germany for identification. The results indicate that early parental retirement increases their children's probability of childbirth, while decreasing the labor supply of daughters, but not of sons. In particular, the estimates suggest that paternal retirement increases the likelihood of a grandchild being born by approximately 12-23 percentage points, while maternal retirement has no significant effect on the likelihood of their children giving birth. These effects are driven by families living in close geographical proximities, and by parents with fewer time constraints and greater capacities (e.g., better health status and no other caring responsibilities). The analysis of the long-run effects shows that paternal retirement does not increase children's total fertility. Instead, adult children delay childbirth by 4-6 years to occur when their parents have the opportunity to retire.

Looking at detailed time use data, we document that 42 percent of mothers with children aged up to 13 years report that grandparents provide childcare in a typical week, with a conditional average of nearly 12 hours per week. Moreover, we find that retired parents spend more time on childcare, housework, and repairs and gardening. Most importantly, our analysis of joint retirement reveals that retired fathers provide significantly more childcare if their wife is not yet retired, which explains why children's fertility is affected by their father's, but not their mother's, retirement. Taken in conjunction, these findings suggest that retirement induces intergenerational time transfers from retired parents to their adult children. These findings only hold for early retirement. We argue that this is likely caused by the difference in their children's age, i.e. the majority of the children's generation will have completed their family planning by the time their parents are close to the official retirement age.

Over the past decade, policymakers in most developed countries have passed reforms increasing the official retirement age, while simultaneously reducing the opportunities and incentives for early retirement. While these reforms may be necessary to ensure the sustainability of public pension systems, policymakers should be aware of potential negative externalities. While our results indicate that retirement is unlikely to negatively affect total fertility, the results also imply that intergenerational time transfers (and, in particularly, care of grandchildren) are of such importance that adult children are willing to (partly) time their fertility around their parents' retirement opportunities. Therefore, raising the official retirement age and removing early retirement opportunities is likely to have negative consequences for these families, e.g., by lowering mother's labor supply. These negative externalities could be offset, e.g., by an increase in affordable formal childcare or by offering partial retirement options to grandparents.

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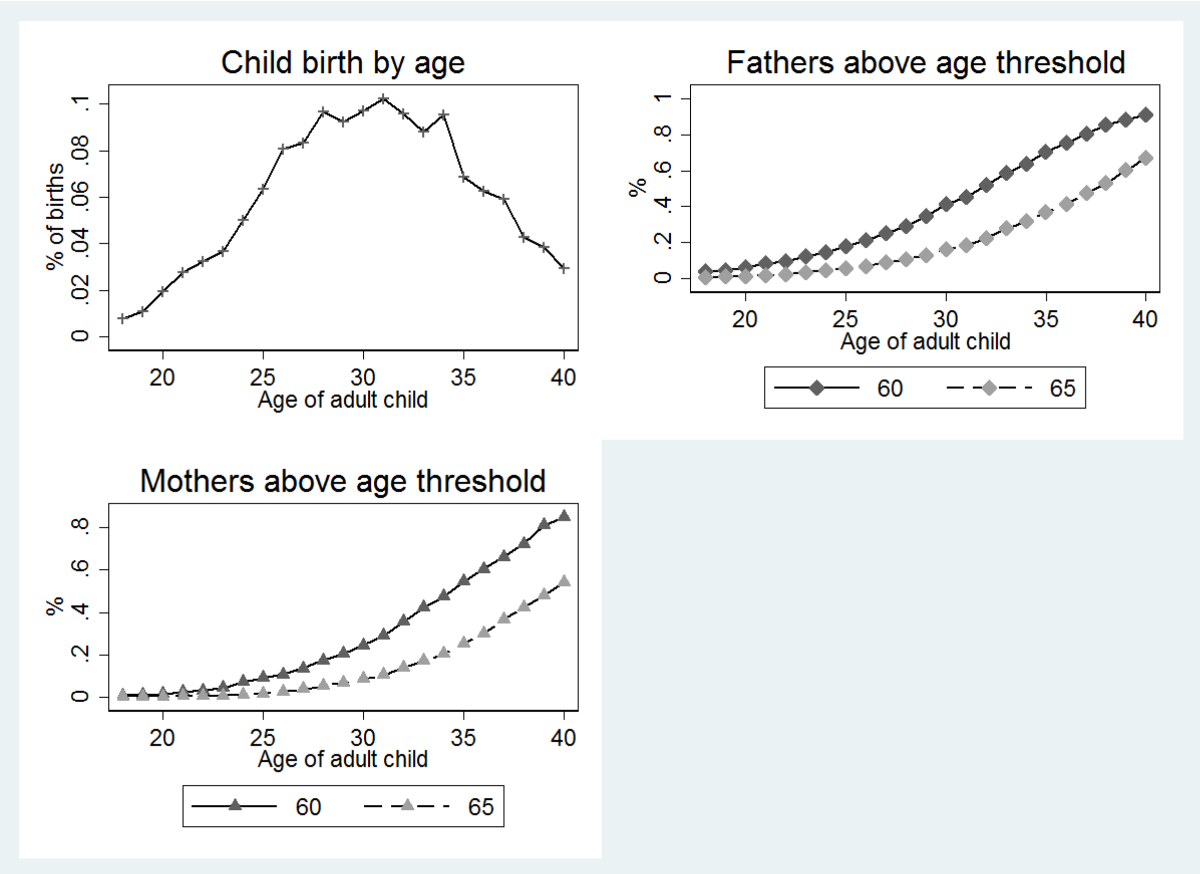
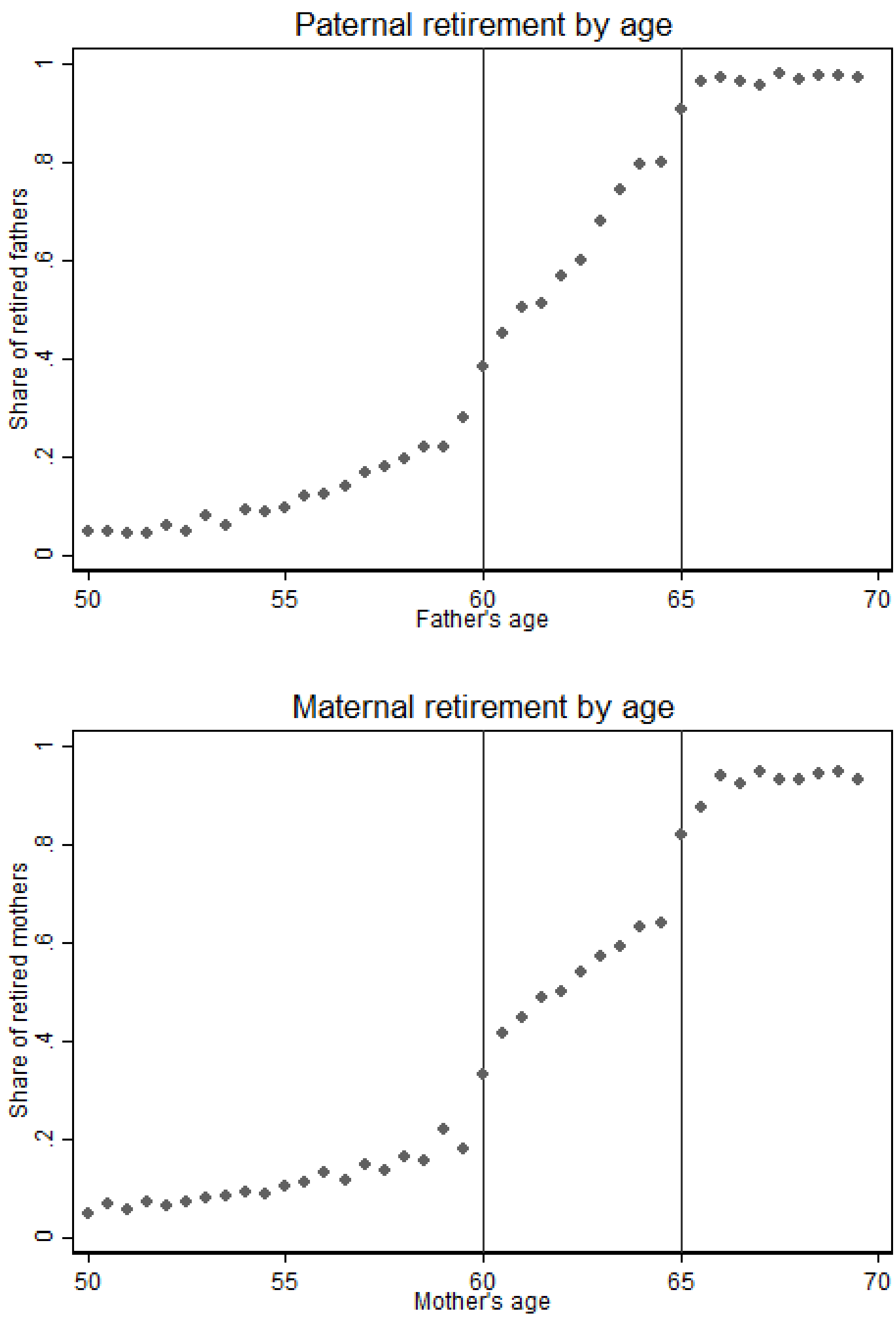
Figures and Tables

Figure 1: Childbirth and parental eligibility by adult children's age



Source: SOEPv30. The upper left panel shows the share of children with a child birth in a given year by age. The upper right and lower left panel show the share of fathers/mothers above the age threshold at age 60 and 65 by children's age.

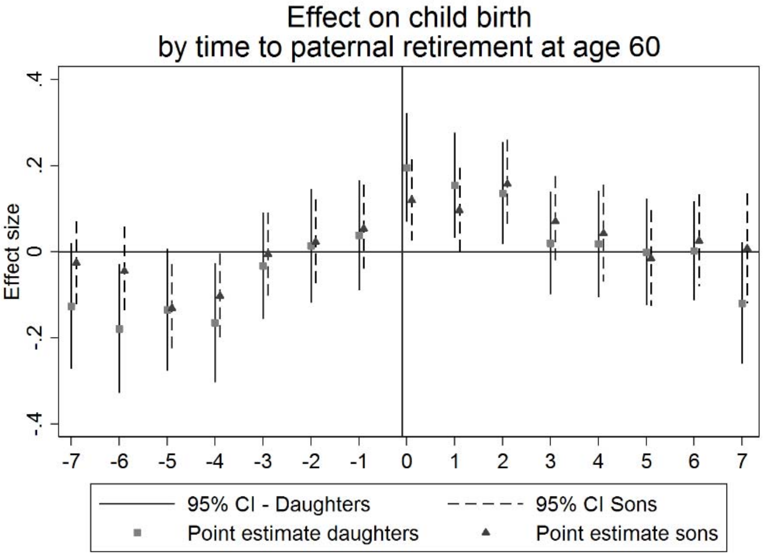
Figure 2: Parents' propensity to retire by age



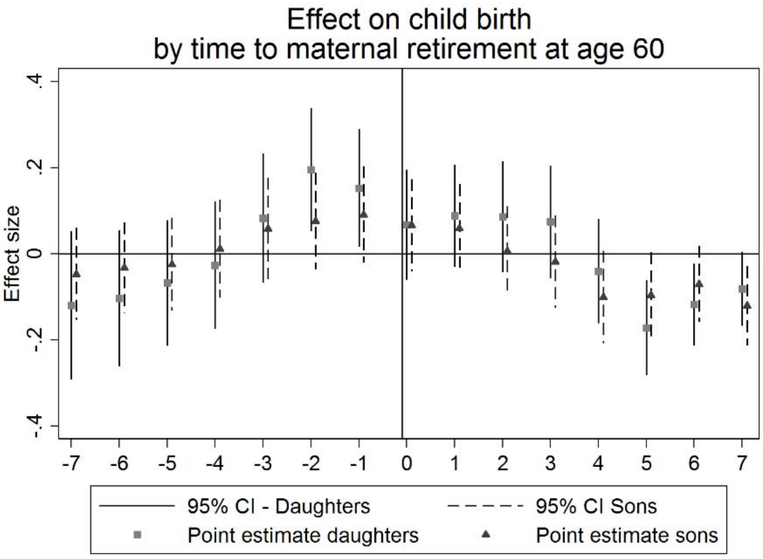
Source: SOEPv30, own calculations. The dots show the share of retired parents in the working sample over bins of 6 months. The vertical lines mark the thresholds for early and official retirement in Germany.

Figure 3: Parents' retirement at age 60 and the timing of childbirth

A. Paternal retirement



B. Maternal retirement



Source: SOEPv30, own calculations. Figure 3 shows the effect of parental retirement in year *t* on the probability of childbirth in each year between *t-7* to *t+7*. The models include a quadratic trend for parental age. Models for paternal retirement include a linear trend in children's age, models for maternal retirement include a quadratic trend in children's age. Children are aged 25 to 40, parents are aged 50 to 70. Squares/triangles show the point estimates for daughters/sons and the lines provide 95% confidence intervals.

Table 1: Parents' early retirement and adult children's fertility

Dependent variable: Childbirth of second generation				
	Quadratic age trend		Local linear age trend	
Older parents‘ age	50-70	55-65	50-70	55-65
Panel A				
Father-child	0.154***	0.160**	0.122**	0.239***
	(0.039)	(0.080)	(0.052)	(0.079)
Wald F	224.305	76.672	115.021	80.04
N	24,233	14,514	24,233	14,514
Father-daughter	0.196***	0.245*	0.132	0.237*
	(0.065)	(0.129)	(0.081)	(0.128)
Wald F	93.132	34.255	48.213	30.597
N	11,172	6,720	11,172	6,720
Father-son	0.121**	0.082	0.132*	0.249**
	(0.048)	(0.103)	(0.068)	(0.102)
Wald F	130.523	41.78	65.936	49.318
N	13,061	7,794	13,061	7,794
Panel B				
Mother-child	0.064	-0.09	-0.027	0.008
	(0.042)	(0.056)	(0.028)	(0.074)
Wald F	159.062	192.634	342.069	110.986
N	27,537	15,282	27,537	15,282
Mother-daughter	0.068	-0.096	-0.059	0.034
	(0.065)	(0.086)	(0.039)	(0.112)
Wald F	69.054	92.937	166.349	52.715
N	13,039	7,319	13,039	7,319
Mother-son	0.066	-0.079	0.015	-0.01
	(0.054)	(0.074)	(0.039)	(0.099)
Wald F	89.622	98.868	174.225	56.202
N	14,498	7,963	14,498	7,963

Source: SOEPv30, own calculations. Clustered standard errors in parentheses. Wald F provides the Kleibergen-Paap Wald F statistic for the first-stage regression. All models include child-fixed effects. Children are aged 25 to 40. The models for fathers include a linear trend for child's age, models for mothers include a quadratic trend. Significance: * p<0.1, ** p<0.05, *** p<0.01.

Table 2: Parents' early retirement and adult children's fertility–Heterogeneous effects by child-parent geographic distance, parents' health, and parents' other caring responsibilities

	Dependent variable: Childbirth of second generation								
	Child-parent geographic distance		Parents' health		Number of grandchildren in the year before parents' retirement			Parent(s) of elderly mother or father still alive?	
	≤ 1 hour	> 1 hour	good	bad	0	1	2+	no	yes
Panel A									
Father-child	0.219***	0.093	0.166***	0.111	0.179**	0.189*	0.225***	0.183***	0.153
	(0.063)	(0.140)	(0.052)	(0.069)	(0.081)	(0.111)	(0.078)	(0.054)	(0.093)
Wald F	96.317	18.393	137.993	72.876	49.729	20.197	57.023	133.686	40.217
N	12,831	2,677	17,351	4,914	5,941	1,543	4,883	17,260	6,764
Father-daughter	0.279***	0.23	0.191**	0.122	0.200*	0.183	0.289**	0.215**	0.286*
	(0.091)	(0.285)	(0.087)	(0.095)	(0.121)	(0.166)	(0.146)	(0.093)	(0.165)
Wald F	50.112	5.479	55.292	38.943	24.505	9.23	18.095	48.832	17.659
N	6,131	1,377	8,094	2,284	2,582	740	2,417	7,946	3,120
Father-son	0.155*	0.013	0.140**	0.105	0.158	0.189	0.180**	0.161**	0.045
	(0.088)	(0.159)	(0.064)	(0.102)	(0.111)	(0.148)	(0.090)	(0.065)	(0.106)
Wald F	46.014	12.196	82.902	33.391	24.11	10.767	40.769	84.915	22.57
N	6,700	1,300	9,257	2,630	3,359	803	2,466	9,314	3,644
Panel B									
Mother-child	0.047	-0.232	0.052	0.331	0.054	0.251**	0.108	0.039	0.076
	(0.067)	(0.187)	(0.046)	(0.222)	(0.053)	(0.100)	(0.080)	(0.046)	(0.300)
Wald F	71.396	16.369	144.045	11.018	69.365	22.138	42.675	149.202	4.282
N	15,258	3,097	18,849	6,163	5,204	1,422	5,194	18,673	8,604
Mother-daughter	0.093	-0.411	0.072	0.314	0.061	0.356*	0.081	0.047	-0.15
	(0.098)	(0.309)	(0.074)	(0.264)	(0.085)	(0.184)	(0.118)	(0.073)	(0.409)
Wald F	32.654	8.575	61.159	7.82	29.251	8.916	20.227	64.357	2.363
N	7,553	1,641	8,942	3,075	2,280	689	2,627	8,781	4,130
Mother-son	0.011	-0.062	0.041	0.383	0.041	0.182	0.145	0.037	0.321
	(0.092)	(0.250)	(0.058)	(0.407)	(0.068)	(0.116)	(0.112)	(0.059)	(0.531)
Wald F	38.689	7.364	82.541	3.455	39.174	12.909	21.967	84.716	1.817
N	7,705	1,456	9,907	3,088	2,924	733	2,567	9,892	4,474

Sources: SOEPv30, own calculations. Clustered standard errors in parentheses. Wald F provides the Kleibergen-Paap Wald F statistic for the first-stage regression. All models include child-fixed effects. Children are aged 25 to 40. Parents are aged 50 to 70. The models for fathers include a linear trend for child's age, models for mothers include a quadratic trend. Significance: * p<0.1, ** p<0.05, *** p<0.01.

Table 3: Parents' early retirement and adult children's fertility–Heterogeneous effects by adult children's household income and family size

	Dependent variable: Childbirth of second generation				
	Adult children's household income before parent's early retirement		Adult children's family size before parent's early retirement		
	≤ median	> median	0	1	2+
Panel A					
Father-child	0.161**	0.189***	0.106**	0.445***	0.278
	(0.072)	(0.057)	(0.042)	(0.160)	(0.173)
Wald F	57.773	102.678	101.547	22.822	15.974
N	6,705	7,258	6,840	2,872	3,678
Father-daughter	0.201*	0.279***	0.154*	0.398**	0.326
	(0.113)	(0.105)	(0.084)	(0.175)	(0.246)
Wald F	26.871	35.111	30.415	16.594	8.111
N	3,219	3,159	2,778	1,543	1,879
Father-son	0.124	0.131**	0.072	0.501	0.251
	(0.094)	(0.066)	(0.047)	(0.306)	(0.264)
Wald F	29.794	68.089	70.776	7.046	6.916
N	3,486	4,099	4,062	1,329	1,799
Panel B					
Mother-child	0.085	0.085	0.053	0.242**	0.135
	(0.054)	(0.052)	(0.039)	(0.097)	(0.120)
Wald F	80.028	81.651	86.735	30.514	28.589
N	6,168	7,051	5,949	2,902	3,547
Mother-daughter	0.095	0.115	0.055	0.288**	0.057
	(0.088)	(0.078)	(0.069)	(0.132)	(0.143)
Wald F	28.826	43.801	34.051	16.01	18.436
N	3,006	3,263	2,476	1,596	1,899
Mother-son	0.077	0.068	0.05	0.184	0.242
	(0.067)	(0.071)	(0.046)	(0.145)	(0.224)
Wald F	53.582	37.817	54.026	14.436	9.521
N	3,162	3,788	3,473	1,306	1,648

Sources: SOEPv30, own calculations. Clustered standard errors in parentheses. Wald F provides the Kleibergen-Paap Wald F statistic for the first-stage regression. All models include child-fixed effects. Children are aged 25 to 40. Parents are aged 50 to 70. The models for fathers include a linear trend for child's age, models for mothers include a quadratic trend. Significance: * p<0.1, ** p<0.05, *** p<0.01.

Table 4: Early retirement and elderly parents' time use

	Dependent variable: parent's time use (average hours on a weekday) spend on …			
	Childcare	Housework	Running errands	Repairs and gardening
Retired father	0.209	0.604***	0.416***	0.959***
	(0.145)	(0.181)	(0.149)	(0.229)
Wald F	106.833	106.833	106.833	106.833
N	11,465	11,465	11,465	11,465
Retired mother	0.712**	0.724**	-0.051	0.320**
	(0.285)	(0.283)	(0.141)	(0.162)
Wald F	95.586	95.586	95.586	95.586
N	12,777	12,777	12,777	12,777

Source: SOEPv30, own calculations. Clustered standard errors in parentheses. Wald F provides the Kleibergen-Paap Wald F statistic for the first-stage regression. All models include quadratic age trend for parental age. Parents are aged 50 to 70. Significance: * p<0.1, ** p<0.05, *** p<0.01.

Table 5: Maternal, paternal and joint retirement and adult children's fertility

	Dependent variable: Childbirth		
	All children	Daughters	Sons
Retired father	0.170***	0.289***	0.088
	(0.050)	(0.095)	(0.058)
Retired mother	0.059	0.122	0.064
	(0.087)	(0.153)	(0.139)
Both retired	-0.078	0.042	-0.07
	(0.131)	(0.206)	(0.190)
N	13,491	6,120	7,371

Source: SOEPv30, own calculations. Clustered standard errors in parentheses. All models include child-fixed effects. Children are aged 25 to 40. The models include a quadratic trend for child's age, father's age as well as mother's age. Parents are aged 50 to 70. Significance: * p<0.1, ** p<0.05, *** p<0.01.

Table 6: Cross-effects of retirement at age 60 on parents' time use

	Dependent variable: Parent's time use (average hours on a weekday) spent on …			
Dependent variable:	Childcare	Housework	Running errands	Repairs and gardening
	Panel A: Father's time use			
Retired father	0.310*	0.654***	0.378**	0.889***
	(0.178)	(0.219)	(0.183)	(0.273)
Retired mother	0.152	-0.249	0.05	0.617
	(0.300)	(0.381)	(0.296)	(0.498)
Both retired	-0.528	-0.032	-0.248	-0.516
	(0.429)	(0.552)	(0.414)	(0.713)
N	8,563	8,563	8,563	8,563
	Panel A: Mother's time use			
Retired father	0.112	0.489	0.11	0.005
	(0.315)	(0.324)	(0.158)	(0.192)
Retired mother	0.664	0.993	0.484	0.728*
	(0.488)	(0.631)	(0.327)	(0.407)
Both retired	-0.038	-0.139	-0.55	-0.676
	(0.743)	(0.880)	(0.468)	(0.582)
N	8,550	8,550	8,550	8,550

Source: SOEPv30, own calculations. Clustered standard errors in parentheses. All models include quadratic age trend for father's and mother's age as well as individual-fixed effects (i.e., father-fixed effects or mother-fixed effects). Parents are aged 50 to 70. Significance: * p<0.1, ** p<0.05, *** p<0.01.

Table 7: Parents' early retirement and adult children's labor market behavior

Dependent variable: Adult children's employment	Full-time Work	Part-time work	Not working
Panel A			
Father-child	0.108*	-0.072*	-0.057
	(0.059)	(0.042)	(0.057)
Wald F	224.203	224.203	224.203
N	24,232	24,232	24,232
Father-daughter	-0.029	-0.075	0.085
	(0.101)	(0.084)	(0.106)
Wald F	93.132	93.132	93.132
N	11,172	11,172	11,172
Father-son	0.209***	-0.072**	-0.159***
	(0.068)	(0.033)	(0.061)
Wald F	130.418	130.418	130.418
N	13,060	13,060	13,060
Panel B			
Mother-child	-0.065	-0.024	0.139**
	(0.064)	(0.047)	(0.063)
Wald F	159.578	159.578	159.578
N	27,534	27,534	27,534
Mother-daughter	-0.076	-0.079	0.249**
	(0.109)	(0.094)	(0.118)
Wald F	69.429	69.429	69.429
N	13,037	13,037	13,037
Mother-son	-0.015	-0.014	0.053
	(0.071)	(0.032)	(0.062)
Wald F	89.705	89.705	89.705
N	14,497	14,497	14,497

Source: SOEPv30, own calculations. Clustered standard errors in parentheses. Wald F provides the Kleibergen-Paap Wald F statistic for the first-stage regression. All models include child-fixed effects. Children are aged 25 to 40. The models for fathers include a linear trend for child's age, models for mothers include a quadratic trend. Significance: * p<0.1, ** p<0.05, *** p<0.01.

Table 8: Parents' early retirement and adult children's fertility—Robustness checks

Dependent variable: Childbirth of the second generation					
				Alternative definitions of early parental retirement	
Robustness check	West Germany	Adult children aged 17+	Adult children aged 20+	Retired if working less than four hours[a]	Retirement pension receipt
Panel A					
Father-child	0.143***	0.105***	0.109***	0.216***	0.114***
	(0.045)	(0.029)	(0.031)	(0.065)	(0.033)
Wald F	157.362	307.128	302.08	92.195	274.789
N	17,730	39,585	36,459	20,748	22,220
Father-daughter	0.192**	0.128***	0.130***	0.272**	0.133***
	(0.077)	(0.047)	(0.048)	(0.110)	(0.051)
Wald F	61.893	137.02	135.632	36.464	127.726
N	8,199	18,501	16,984	9,588	10,422
Father-son	0.107*	0.086**	0.093**	0.172**	0.097**
	(0.055)	(0.037)	(0.039)	(0.079)	(0.043)
Wald F	95.667	170.997	166.991	55.842	146.325
N	9,531	21,084	19,475	11,160	11,798
Panel B					
Mother-child	0.12	0.02	0.02	0.071	0.054
	(0.078)	(0.033)	(0.034)	(0.057)	(0.044)
Wald F	52.949	202.882	199.88	138.941	142.458
N	20,629	40,798	38,704	23,270	24,880
Mother-daughter	0.175	0.019	0.019	0.065	0.056
	(0.135)	(0.052)	(0.053)	(0.091)	(0.066)
Wald F	20.01	87.287	86.76	55.493	67.371
N	9,747	19,258	18,250	11,078	12,019
Mother-son	0.093	0.025	0.023	0.081	0.058
	(0.093)	(0.042)	(0.044)	(0.071)	(0.059)
Wald F	33.062	115.168	112.321	86.216	74.549
N	10,882	21,540	20,454	12,192	12,861

Source: SOEPv30, own calculations. Clustered standard errors in parentheses. Wald F provides the Kleibergen-Paap Wald F statistic for the first-stage regression. All models include child-fixed effects. * p<0.1, ** p<0.05, *** p<0.01. [a] Early retirement is being defined as working less than 4 hours on a typical working day.

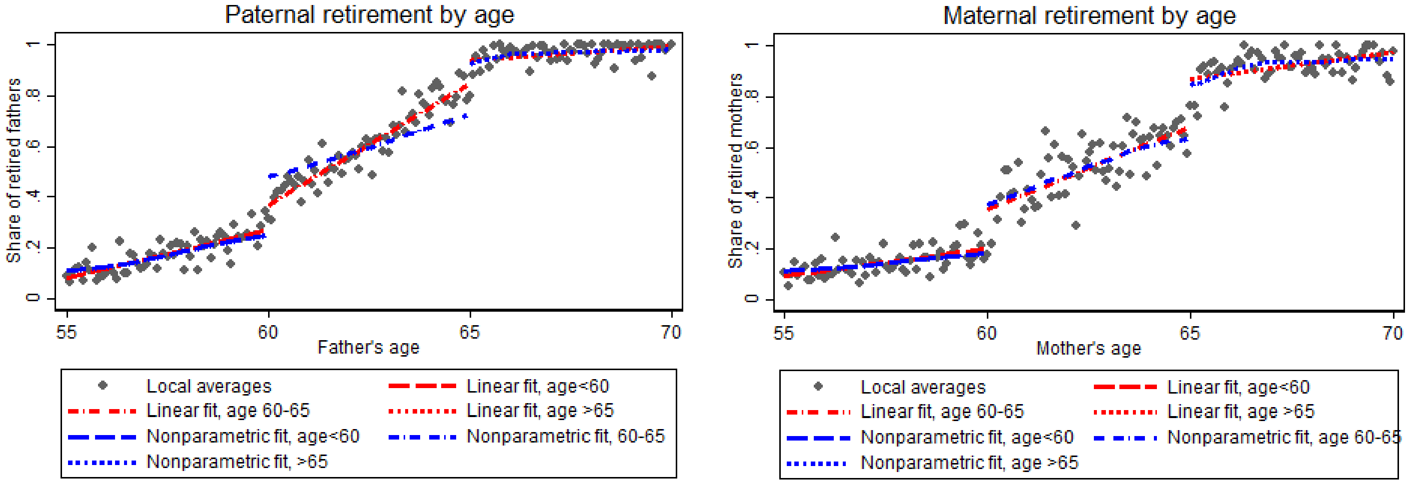
Table 9: Parents' early retirement and child outcomes—Placebo regressions

Placebo outcome	High school degree	Urban area	Strong political interest	Birth placebo [a]
Panel A				
Father-child	0.032	0.019	0.002	0.021
	(0.020)	(0.028)	(0.046)	(0.066)
Wald F	223.195	224.657	224.741	153.343
N	23,490	24,202	24,125	16,186
Father-daughter	0.028	0.016	0.043	0.044
	(0.032)	(0.040)	(0.061)	(0.097)
Wald F	94.042	93.174	92.842	71.079
N	10,799	11,164	11,126	7,922
Father-son	0.032	0.022	-0.033	0.013
	(0.027)	(0.038)	(0.066)	(0.090)
Wald F	128.177	130.858	131.347	82.284
N	12,691	13,038	12,999	8,264
Panel B				
Mother-child	0.026	0.012	-0.081	0.014
	(0.025)	(0.030)	(0.050)	(0.060)
Wald F	152.343	157.97	158.851	136.159
N	26,766	27,494	27,405	19,805
Mother-daughter	0.014	0.044	-0.116 *	-0.032
	(0.034)	(0.044)	(0.066)	(0.093)
Wald F	65.083	69.102	69.529	55.197
N	12,641	13,026	12,985	9,886
Mother-son	0.034	-0.012	-0.05	0.051
	(0.035)	(0.042)	(0.074)	(0.080)
Wald F	86.941	88.521	89.021	81.254
N	14,125	14,468	14,420	9,919

Source: SOEPv30, own calculations. Clustered standard errors in parentheses. Wald F provides the Kleibergen-Paap Wald F statistic for the first-stage regression. All models include child-fixed effects. * p<0.1, ** p<0.05, *** p<0.01. [a] Random variable drawn from a Bernoulli distribution based on the predicted probability of childbirth. These predicted probabilities are derived from a regression of childbirth on age and parental age, and are independent of parental retirement.

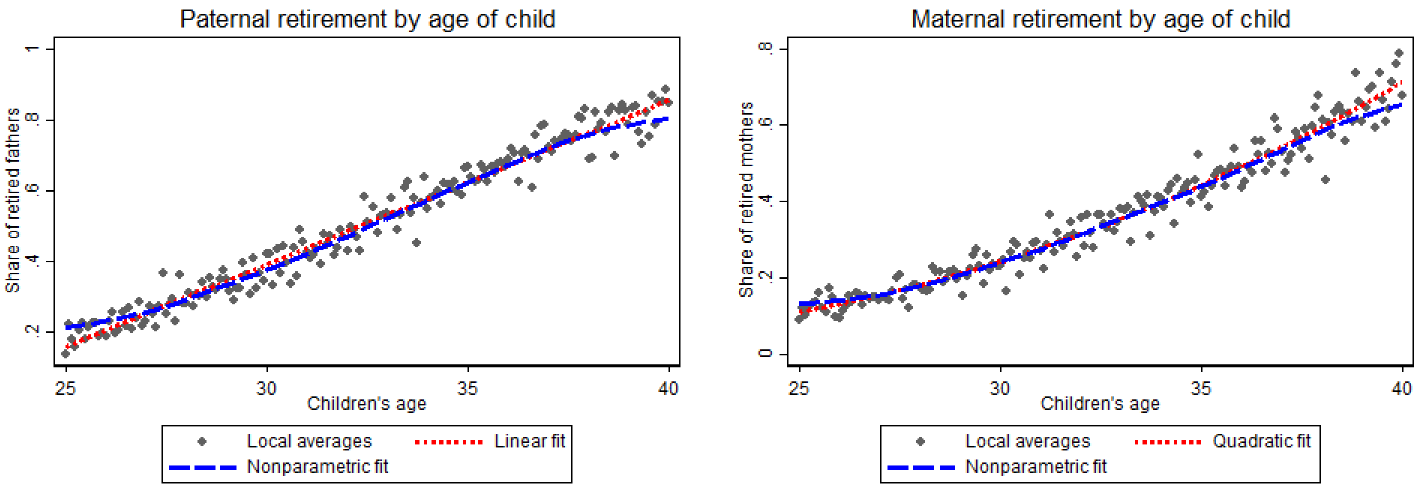
Appendix

Figure A1: Parental retirement by age



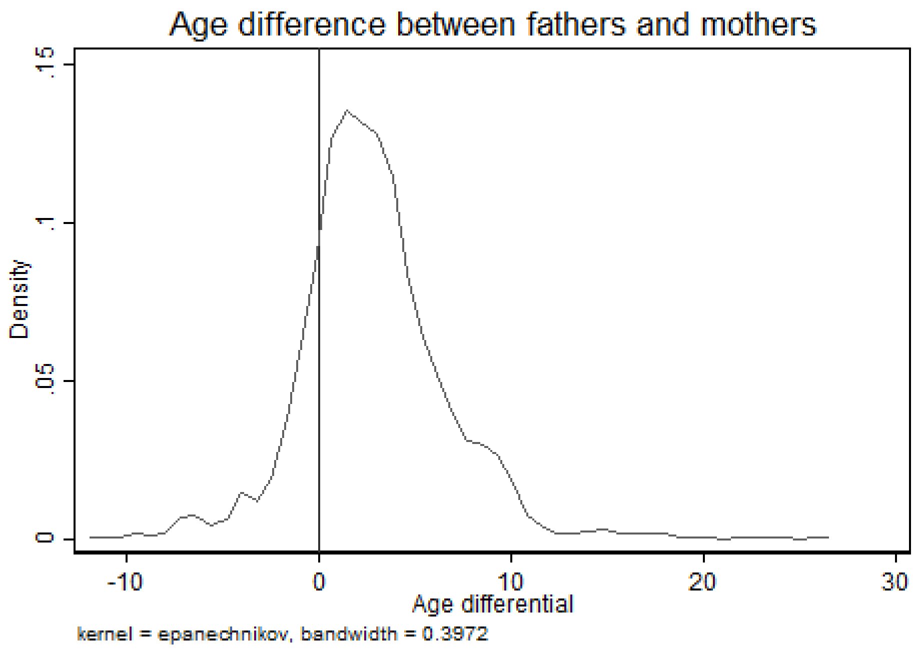
Source: SOEPv30. The dots mark local averages by months of age. The red lines show linear fits over the specified age range, the blue lines show local polynomial fits.

Figure A2: Parental retirement by age of child



Source: SOEPv30. The dots mark local averages by months of age. The red lines show parametric fits, the blue lines show local polynomial fits.

Figure A3: Age difference between fathers and mothers



Source: SOEPv30, own calculations. Kernel density estimation of the distribution of age differences between linked fathers and mothers in the sample.

Table A1: Summary statistics

Variables		Mean	SD	Min	Max	N	Difference by parental retirement	
A. Adult children								
Fertility								
Childbirth		0.078	0.268	0	1	25,746	-0.010	***
Employment[a]								
Full-time work		0.623	0.485	0	1	25,743	-0.023	***
Part-time work		0.103	0.304	0	1	25,743	0.023	***
Not working		0.221	0.415	0	1	25,743	-0.004	
Explanatory variables								
Age		31.820	4.027	25	40	25,746	2.174	***
Male gender		0.529	0.499	0	1	25,746	-0.026	***
Education (years)		12.542	2.732	7	18	24,986	-0.466	***
Monthly net household income		2,809.050	1,586.507	0	40,000	25,064	-93.396	***
B. Elderly parents								
Father		**Mean**	**SD**	**Min**	**Max**	**N**	**Difference by parental retirement**	
Age		61.908	4.933	44	84	20,980	5.740	***
Retired		0.538	0.499	0	1	21,041	0.907	***
Time use: work								
	-weekdays	3.767	4.692	0	16	18,194	-6.876	***
Time use: Running errands								
	-weekdays	0.960	0.810	0	11	18,194	0.413	***
	-weekends	0.587	0.634	0	8	9,529	-0.165	***
Time use: House work								
	-weekdays	0.844	1.053	0	10	18,194	0.421	***
	-weekends	0.776	0.976	0	10	9,390	0.024	
Time use: Childcare								
	-weekdays	0.216	0.820	0	12	18,194	0.160	***
	-weekends	0.247	1.045	0	24	9,159	0.002	
Time use: Education								
	-weekdays	0.102	0.410	0	9	18,194	-0.070	***
	-weekends	0.103	0.407	0	5	9,155	-0.092	***
Time use: Repairs and gardening								
	-weekdays	1.534	1.468	0	12	18,194	0.643	***
	-weekends	1.339	1.371	0	10	9,665	-0.501	***
Time use: Leisure								
	-weekdays	2.769	2.429	0	17	18,194	1.619	***
Education (years)		11.543	2.743	7	18	20,651	-0.758	***
Monthly net household income		2,894.958	1,906.022	192	42,667	20,365	-653.954	***
Total number of children		0.976	1.175	0	8	21,042	-0.293	***

Mother		Mean	SD	Min	Max	N	Difference by parental retirement	
Age		59.368	5.097	35	76	24,076	5.220	***
Retired		0.346	0.476	0	1	24,157	0.580	***
Time use: work								
	-weekdays	2.560	3.721	0	16	20,579	-3.014	***
Time use: Running errands								
	-weekdays	1.329	0.786	0	8	20,579	0.090	***
	-weekends	0.649	0.651	0	6	10,872	-0.113	***
Time use: House work								
	-weekdays	3.295	1.774	0	14	20,579	0.177	***
	-weekends	2.770	1.526	0	14	11,129	-0.382	***
Time use: Childcare								
	-weekdays	0.535	1.467	0	24	20,579	0.137	***
	-weekends	0.420	1.372	0	24	10,343	-0.040	
Time use: Education								
	-weekdays	0.074	0.431	0	11	20,579	-0.052	***
	-weekends	0.047	0.269	0	6	10,293	-0.052	***
Time use: Repairs and gardening								
	-weekdays	0.841	1.006	0	10	20,579	0.010	
	-weekends	0.697	0.983	0	10	10,714	-0.272	***
Time use: Leisure								
	-weekdays	2.368	2.017	0	16	20,579	0.760	***
Education (years)		10.680	2.311	7	18	23,586	-0.675	***
Monthly net household income		2,712.194	1,863.083	0	42,667	23,406	-691.584	***
Total number of children		2.728	1.684	0	12	24,160	0.204	***

Source: SOEPv30, own calculations. The last column provides the difference in means between observations with at least one retired parents and observations without retired parents. [a]: Measured at the time of the interview. [b]: Hours on a typical weekday.

Table A2: Elderly parents' joint retirement

	Dependent variable: Both parents retired
Retired father	-0.058
	(0.072)
Wald F	106.089
N	11,500
Retired mother	0.631***
	(0.073)
Wald F	63.743
N	10,858

Source: SOEPv30, own calculations. Clustered standard errors in parentheses. Wald F provides the Kleibergen-Paap Wald F statistic for the first-stage regression. All models include father- or mother-fixed effects as well as a quadratic age trend for fathers' or mothers age', respectively. Parents are aged 50 to 70. * p<0.1, ** p<0.05, *** p<0.01