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Inter-Generational Spillovers in Labor Supply: Evidence from a Danish Retirement Reform*

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Abstract

In this paper, I study how the labor supply of one generation affects the next. Utilizing longitudinal Danish register data and a large retirement reform, I document that parents' retirement significantly affects the labor supply of their adult children. This inter-generational link is driven solely by mothers. Concretely, mothers' retirement permanently increases their adult children's income rank by 7 income rank points, driven by increased hours worked, participation in the labor force, improved occupational rank, and wage increases. I find that the inter-generational link is strongest among mothers who have grandchildren, and that the child penalty for adult daughters is 17% lower for those whose mothers can retire earlier, suggesting an important role of informal childcare as a driving mechanism. Survey data confirm that retirement affects informal childcare provision, even in a country with universal access to highly subsidized formal childcare.

Keywords: Inter-generational Links, Labor Supply, Retirement, Informal Childcare, Child Penalty

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1 Introduction

Life expectancy has improved greatly, and it challenges the sustainability of most pension systems in developed countries. Many countries across the OECD have increased the statutory retirement age as a consequence since 1990 (OECD (2011)). While the primary focus for governments have been on increasing the labor supply of the elderly generation, the impact of retirement can extend beyond that, and likely leads to spillover effects on family members, including adult children.

The spillover effects of parental retirement on adult children's labor supply are less understood and can have broad consequences for the labor market. For instance, prolonged periods of inactivity in the labor market during youth can lead to substantial long-term costs in terms of foregone human capital accumulation and savings. In this paper, I contribute to our understanding of inter-generational labor supply spillovers from parents' retirement to their adult children and assess how these spillovers affect their labor supply in the long term. I document large and permanent labor market spillover effects from retirement to labor market behavior of adult children.

I examine the causal impact of parental retirement on the labor supply of adult children by exploring a Danish retirement reform from 1994. The reform increased the retirement eligibility age discontinuously across different birth cohorts. Concretely, individuals born in 1946 were eligible for pension benefits at age 50, whereas individuals born in 1947, one year later, were eligible for pension benefits at age 60, 10 years later.

I show that the reform affected retirement behavior. The share of mothers receiving pension benefits increased by 7 percentage points (116%), and the share of mothers working decreased by 4 percentage points (26%). I find similar yet significantly smaller responses for fathers, who are 3 percentage points more likely to receive pension benefits after the reform. Exploring these differences in retirement behavior, I provide three main results.

First, I identify a significant spillover effect of mothers' retirement on their adult children's labor supply. By comparing the income rank of adult children whose mothers are eligible for pension benefits at age 50 with those whose mothers are eligible at age 60, I estimate that the reform led to a gradual increase in the income rank of adult children by approximately 1.5 income rank points between 1993 and 2002, following the reform,

corresponding to an income increase of approximately 2 %.[1] This translates to an income rank increase of approximately 7 income rank points for the group whose mothers retire due to the reform. I document that the effect persists in the long run, and the effect is of similar magnitude in 2017 as in 2002. While I show that the labor supply effect of mothers' eligibility for retirement is roughly similar for adult daughters and adult sons, I do not find an inter-generational link in labor supply between fathers and their adult children.

The inter-generational link runs through several channels. I find that adult children are more likely to participate in the labor market, have longer working hours, and are more likely to occupy higher occupational positions. I also find that maternal retirement has a positive impact on the length of education and the birth rate.

Second, I investigate the mechanisms driving the inter-generational labor market effects, and I provide suggestive evidence that informal childcare is important. Retirement may increase inter-generational time transfers and reduce money transfers. These time and money transfers can affect children's trade-off between work, housework and leisure. Specifically, I find that the positive impact of mothers' retirement is solely driven by those adult children who have a child in the period, whereas mothers' retirement has no impact on their income for those who have children after 2003. I confirm these results using SHARE data, where I show a positive correlation between mothers' retirement and their engagement in informal childcare. I find no systematic difference in the treatment effect depending on the mothers' income, indicating a smaller role for money transfers.

Third, I explore how mothers' eligibility for retirement impacts the child penalty, inspired by Kleven et al. (2019b). For those whose mothers could retire early, the motherhood penalty is three income rank points lower five years after the first childbirth, representing a 17% reduction in the motherhood penalty. I also find that mothers' retirement impacts the "fatherhood penalty" for adult sons. I find a small fatherhood penalty for those whose mother is ineligible for early retirement, and it is zero for those whose mother is eligible for early retirement. These findings are consistent with the fact that children are important in shaping the labor supply link between adult children and their mothers.

My results carry important implications for policymakers who wish to increase the

[1] Income rank is defined within gender, year, and cohort

retirement age. The impact of altering retirement age is nuanced and it is crucial that policy makers are aware of the costs borne by the younger generation. This analysis conducted in Denmark, a country with universal access to childcare, demonstrates that universal access to childcare may not be enough to eliminate the inter-generational link in labor supply between generations.

Only a few other papers investigate the effect of mothers' retirement on the adult children's labor supply. This paper is mostly related to Aparicio-Fenoll and Vidal-Fernandez (2015), Bratti et al. (2018), Wu and Gao (2020) and Kaufmann et al. (2022), all of which employ pension reforms and variations in pension age to explore the impact of informal childcare accessibility on adult daughters' labor supply.[2] I make three main contributions to this literature. First, I investigate the permanent nature of the effect. This can be done because the reform provides an unaffected control group, allowing a comparison of the outcome over time between those treated with a lower retirement age for their mothers in a specific period and those who are not treated with a lower retirement age. Second, in contrast to the existing literature, I find that mothers' retirement affects adult sons, and I find suggestive evidence that the effect on adult sons depends on the magnitude of the treatment. In my primary analysis, I employ a retirement reform that influences the retirement age by 10 years, setting it apart from the smaller interventions examined in the existing literature. Utilizing an alternative reform in 2011 that changes the retirement age by two years, I document that sons are unaffected by the change in maternal retirement age. This suggests that maternal retirement only affects adult sons after a massive intervention, whereas maternal retirement also affects adult daughters after a smaller intervention.[3] Third, I demonstrate that even universal access to formal childcare does not eliminate the spillover effect from mothers to adult children. I show that mothers' retirement has a positive impact on their children's labor market outcome, even in a Danish setting with universal and highly subsidized formal childcare availability.

[2]I also relate to studies that have used death as an instrument for having access to informal childcare and geographic proximity e.g. Posadas and Vidal-Fernandez (2013), Compton and Pollak (2014), Compton (2015), Arpino et al. (2014), Yu et al. (2019). Other studies have investigated the effect of parental retirement in different country types: e.g. Dimova and Wolff (2011), Aassve et al. (2012), Aparicio-Fenoll (2020). And other studies have investigated the effect of maternal retirement on other outcomes such as fertility, e.g. Eibich and Siedler (2020) and Ilciukas (2023)

[3]The alternative retirement reform was implemented in 2011, increasing the early retirement age from 60 to 62. Here, I interpret the difference in the results from the differences in the size of the intervention. Another distinction between the two reforms is the age of adult children. The difference in results may also stem from maternal retirement for adult sons only has an effect in their early careers, whereas maternal retirement has an effect throughout the entire career for adult daughters.

I also contribute to the literature on the cost of children. Extensive research has documented the cost associated with motherhood in various settings (e.g. Bronars and Grogger (1994); Angrist and Evans (1998); Waldfogel (1998); Bertrand et al. (2010); Ejrnœs and Kunze (2013); Adda et al. (2017); Albrecht et al. (2018); Bütikofer et al. (2018); Kleven et al. (2019b); Kleven et al. (2019a); Lucifora et al. (2021); Kleven et al. (2022); Cortés and Pan (2020)). My study extends this literature by demonstrating how a specific intervention, the availability of informal childcare through a mother's retirement, can mitigate the 'child penalty.' I show that adult daughters experience a smaller penalty when their mothers are retired and can provide informal childcare.

The rest of this paper is structured as follows. Section 2 describes the Danish institutions. Section 3 describes the data, and section 4 the empirical strategy. The main results are presented in section 5. Section 6 investigates the mechanism, and section 7 shows the child penalty. Finally, section 8 concludes.

2 Institution

2.1 The Danish retirement system in 1990s

The Danish retirement system consisted of four types of pensions in the 1990s: old age pension, disability pension, early retirement pension, and transition early retirement pension. The disability pension was designed for people with low working capacity, and eligibility for this pension was determined by local authorities. Old age pension, early retirement pension, and transition pension did not require an assessment of working capacity. Individuals who reached a retirement age threshold was eligible for these pension plans. The retirement age threshold for an early retirement pension was 60 years, and participation in the early retirement system was required. A detailed description of the pension system can be found in Appendix A.

In this project, I investigate variations in the retirement age of the transition pension. The transition pension was a temporary retirement plan designed for individuals participating in the early retirement system, who was available for the labor market and had been unemployed for approximately one year. A recipient of the transition pension benefit received the same income as he got in unemployment insurance until the entitlement to unemployment insurance cash benefits stopped, and then got approximately 80% of the

maximum unemployment insurance benefit, which was around 400 dollars (2936 kr.) per week in 1994. The recipient was not required to be available to the labor market, and any labor income was deducted from the pension benefit. This implied that the recipient had no financial incentive to work. Table C.1 in the Appendix provides information on the number of participants in the transition pension program, showing that the highest number of recipients was in 1995 when approximately 45,000 individuals received transition retirement benefits.

The transition pension was a temporary retirement plan in the 1990s, and in figure 2.1, I illustrate the timeline of the transition retirement system. The government initially introduced this temporary plan in 1992, targeting unemployed insured individuals between the ages of 55 and 59. The retirement scheme was temporary and planned to conclude in 1995. Consequently, no new individuals could enroll in the retirement scheme after 1995. However, those who had already enrolled would continue on the transition pension until they transition into early retirement.

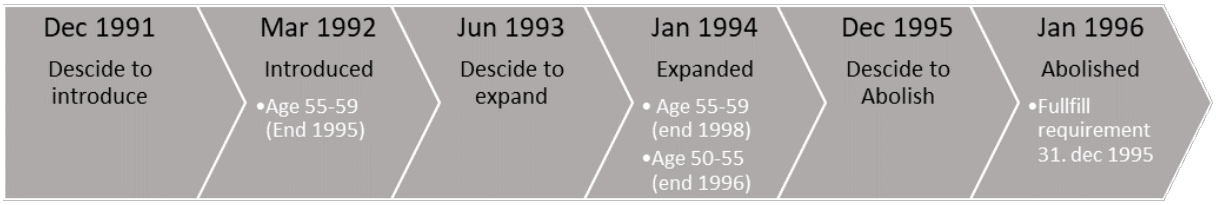
In 1994, however, the government implemented two significant expansions to the system. The plan was extended to expire in 1998, and retirement between the ages of 50 and 55 became permissible until 1996. This meant that individuals could retire at age 50 if they did so before the end of 1996. Subsequently, they could stay on the retirement scheme until transitioning into early retirement at age 60.

In 1995, the government abolished the system for new recipients, starting in January 1996. During the transition period, individuals were eligible if they met the criteria in 1995 and applied for a pension before the end of January 1996. Additionally, individuals who turned 50 years old in 1996 were also eligible, provided they applied for permission to transition before the end of January 1996 and qualified with approximately one year of unemployment by the end of 1995.

The pension scheme was only abolished for new recipients, meaning individuals already receiving the transition pension could remain on assistance until they turned 60 years old and transitioned to early retirement. The last person to receive the transition pension left the program in 2006.

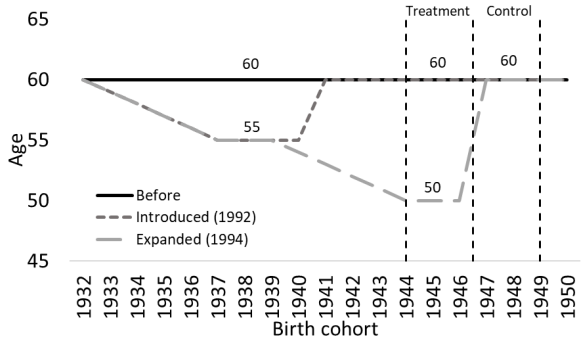
Figure 2.2 illustrates the variations in the pension scheme resulting from the introduction, extension, and abolition of the transition retirement system. It shows the variations in pension age for different birth cohorts affected by the transition pension reforms. For

Figure 2.1: Timeline



Notes: The figure shows the timing of the decision of the introduction, expansion, and abolishment of the transition retirement system.

Figure 2.2: Expected retirement age under different retirement rules



Notes: The figure illustrates the reforms in the transition retirement system. It shows the expected retirement age for different cohorts under different retirement schemes. "Before" means before the introduction of the system. "Introduced" means the retirement age after the system's opening, and "Expanded" shows the expected retirement age after the system's expansion.

instance, a person born in 1935 can retire at the age of 57 in 1992, which was the year of the system's introduction. On the other hand, a person born in 1944 would turn 50 in 1994 and initially did not anticipate retirement under the transition pension scheme. However, following the system's expansion in 1994, they could retire at the age of 50. On the contrary, a person born in 1947 could never retire under the transition retirement scheme, as they turned 55 after the transition retirement was set to end, and 50 after the temporary lower retirement age was set to end.

I will consider cohorts 1944-1946 as treatment cohorts and cohorts 1947-1949 as control cohorts. The expected retirement age of these cohorts is affected differently by the expanded right to retire in 1994. The abolition only affects cohort 1946. Cohort 1946 initially expected to retire in 1996, but with the system's expansion in 1994, they anticipated fulfilling the requirements in 1996. However, the system's abolishment requires them to satisfy the conditions by December 31, 1995.

2.2 The Danish Formal childcare system in the 1990s

Denmark has been characterized by universal access to childcare since the 1960s, with the aim of providing families with equal opportunities to access high quality childcare services, regardless of their socioeconomic background. The emphasis was not only on accessibility but also on ensuring affordability and quality. Childcare is subsidies, with parents contributing approximately a third of the childcare cost. The childcare facilities prioritize both quality, through trained staff, and quantity. In 1999, the norm was that one adult was responsible for 4.7 children below the age of 3 and 8.8 children aged 3-5 (Glavind and Pade (2019)).

The enrollment rates in formal childcare is high, the level is even high compared to the Nordic countries. In 1995, 82% of 3-5-year-olds were enrolled, and by 2000, the enrollment rate reached 93% (Nordic Statistics (2021)). Even for the younger age group (0-2 years old), around 46% and 56 % were enrolled in daycare in 1995 and 2000 (Nordic Statistics (2021)).

3 Data

I base my analysis on data collected by Statistics Denmark who provides a unique personal identification number for each individual. This enables me to link data from adult children with their parents, children, and relevant characteristics. I have access to information on the labor market status and income of the adult children, as well as the labor market status and income of their parents.

My main outcomes are defined as follows:

Income rank: Income is defined as the individual's taxable annual labor income. The rank ranges from 0 to 1, where a value of 1 indicates that the person has the highest income within gender, cohort, and year.

Working: I classify individuals as "working" if they are employed in November in the year of interest.

Full-time employment: I classify individuals as working full-time if they are working full-time in November in the year of interest. The value is equal to one if the individual works more than 27 hours per week. It is zero if the individual works less than 27 hours.

Occupational group: Occupational group is measured in November for individuals

working. It is a six-digit code that provides information on the work function of employees. I aggregate the code to the one-digit level, resulting in five different values. I define a dummy variable that is equal to 1 if the individual is working as a top manager or is a white-collar worker at a high level, corresponding to the two highest levels. The value is zero if the person works but in a lower occupational group, corresponding to the three lowest levels. Occupational information was first available in 1994 and onwards.

Hourly wage rank: I define the hourly wage as the income in the year divided by the number of hours. Hours are determined based on the mandated pension scheme (ATP). The scheme requires all employers to contribute to the pension on behalf of their employees, and the contribution depends on the number of hours worked. It is capped such that individuals working more than 27 hours per week are considered full-time workers, and therefore, the measure does not distinguish between the hours people work for those who work close to full time. After determining the hourly wage, I find the hourly wage rank. The rank ranges from 0 to 1, where a value of 1 indicates that the person has the highest wage within their gender, cohort, and year.

Years of education: I define years of education as the length of the highest completed education.

Parents' retirement: I classify a parent of individuals as receiving a pension benefit if the parent receives a pension benefit in November in the year of interest.

3.1 Sample selection

I use the variation in the retirement age of the parents generation, so I will restrict the sample to parents born between 1944 and 1949. These cohorts are chosen as they are affected differently by the abolishment of the transition retirement scheme. Additionally, I conduct a separate analysis where I utilize both the introduction and the extension of the retirement scheme. The results of this analysis can be found in Appendix B, and they show similar magnitudes. I restrict the sample to adult children born between 1960 and 1976 to be able to observe their outcomes as adults. This restriction implies that the adult children were between 14 and 30 years old in 1990, and between 26 and 42 years old in 2002. Appendix, Figure D.1 displays the distribution of the adult children's cohorts divided by the cohorts of their mothers. The results are robust to change in this sample selection criteria (see figure D.8). The final sample consists of approximately 353,000

Table 3.1: Summary Statistics: Mother

	Population	Selected sample	Trans.ret	Not Trans. ret.	Diff.
Demographics					
Living Copenhagen	0.31	0.30	0.24	0.31	0.07***
	(0.46)	(0.46)	(0.43)	(0.46)	(0.01)
Age at birth	25.9	24.1	23.8	24.6	0.76***
	(5.0)	(3.4)	(3.6)	(3.6)	(0.05)
Age	46.6	46.7	48.2	48.0	-0.22***
	(1.7)	(1.7)	(0.8)	(0.8)	(0.01)
Income rank, 1985					
Rank: 0-25	0.25	0.24	0.23	0.24	0.01
Rank: 25-50	0.25	0.26	0.37	0.25	-0.12***
Rank: 50-75	0.25	0.26	0.26	0.25	-0.01
Rank: 75-100	0.25	0.24	0.13	0.25	0.12***
Number of individuals	480,334	352,598	11,719	187,652	

Notes: The table reports the mean and the standard deviations in parenthesis of relevant variables for the mother. Demographics are measured in 1992. The (1) column corresponds to the overall population. Column (2) the selected sample, and column (3) shows the average for the sub-sample, who receives transition retirement at least one time in November. Column (4) shows the average for those who do not receive transition retirement and is born between 1944 and 1946. (5) compare the mean of those who receive transition retirement with those who do not receive transition retirement. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

adult children.

Table 3.1 reports the summary statistics for the entire sample, encompassing both the selected sample and the division based on whether the mother is a transition pension receiver. Overall, the selected sample and the overall population are similar, except that for the selected sample, mothers are younger at the time of giving birth. Additionally, the table compares individuals who receive transition retirement with those who do not. While it is not necessary for those receiving transition retirement to be similar to those who do not for the empirical strategy to be valid, it is worth noting that the effects I identify pertain to individuals who are more likely to share these characteristics. Those receiving transition retirement are less likely to reside in Copenhagen, tend to be younger when they have their first child, and are more likely to fall into the second quartile of the income distribution in 1985, and less likely to fall into the fourth income quartile. This evidence supports the generalizability of the reform's effects to the broader population, particularly within the second income quartile.

Tables C.2 and C.3 in the Appendix present the summary statistics for adult daughters and adult sons. Generally, the overall population and the selected sample are similar, and the characteristics of the adult children are the same regardless of whether the mother can retire or not. The only exception is age, where the selected sample, on average, is older than the overall population, and the treatment group is, on average, older than the control group.

3.2 SHARE data

I supplement the main analysis with *SHARE* data, which contain information about self-reported time use, money transfers, and retirement status. I use this to investigate the mechanisms and to show how retirement correlates with grandmothers providing informal childcare and money transfers.

The *SHARE* data is a survey collected in 2004 and approximately every second years.[4] It covers a subsample in 28 European countries, focusing on the population aged 50 and above. Among other information, respondents are asked about their demographics, their children's demographics, labor market attachment, and time use. I use information on arround 4000 Danish women.

In this analysis, I define a mother as living near an adult children if she resides within 25 km of at least one of her adult children. Additionally, I categorize a mother as retired if she answers that she is retired in the survey.

My outcomes of interest for informal childcare provision are measures of providing informal childcare on the extensive and intensive margins. For the extensive margin, the outcome is based on the question: *"During the last twelve months, have you regularly or occasionally looked after [your grandchild/your grandchildren] without the presence of the parents?"*. Respondents who answer "yes" are coded as 1 in providing informal childcare, and 0 otherwise. For the intensive margin, the measure is derived from the question: *"On average, how often did you look after the child(ren) of [child X] in the last twelve months? Was it..."* Respondents who respond "weakly" or more often are coded as 1, while those who occasionally provide informal childcare but less than weekly are coded as 0.

The outcome of interest for money transfers are again measured on two margins. The

[4]This paper use data from SHARE wave 1 to 7 (Börsch-Supan (2022a), Börsch-Supan (2022b), Börsch-Supan (2022c), Börsch-Supan (2022d), Börsch-Supan (2022e), Börsch-Supan (2022f), Börsch-Supan (2022g))

likelihood of sending few money and the likelihood of sending much money. I employ the following question from the SHARE survey: *"Now think of the last 12 months, have you given any financial or material gift or support to any person inside or outside this household amounting to 250 euros or more?"* If respondents answer yes and specify their children as the recipients, they are coded as providing financial support of at least 250 euros yearly. I also utilize a question that inquires whether they provide financial support of at least 5,300 euros yearly.[5]

4 Empirical strategy

The goal is to identify the dynamic causal effect of parents' retirement on their adult children's labor supply. The ideal experiment is to randomize who retires across different families and track the responses in the adult children's labor supply over time. Such an experiment will compare the reaction to retirement between the affected adult children to a counterfactual behavior of adult children whose parent was not randomly selected for retirement. The random assignment of retirement implies that the two groups' ex-ante are similar, so the difference in outcome is the causal effect of retirement on adult children.

To approximate the ideal experiment, I utilize a quasi-experimental research design, where I exploit the transition retirement reform. As discussed in the former section, I construct the counterfactual by comparing individuals whose parents are similar, except for the fact that they are on different sides of a cohort threshold. My research design divides the sample into two groups: Those whose parents are above the retirement-cohort threshold and those whose parents are below the retirement-cohort threshold. The temporary transition pension allows people born before 1946 to retire at age 50 and receive retirement benefit. People born after 1946 can receive retirement benefit at age 60. I have to decide how many parent's cohorts I want to use before and after the 1946 threshold. The choice is a trade-off between similarity in the treatment and control group and the power. I chose to use three cohorts on each side of the threshold. I compare parents born between 1944 and 1946 with parents born between 1947 and 1949. I have chosen three years of both sides, as those born before 1944 retirement age is above age 50.

[5]For the first wave, this question is structured slightly differently, the respondents are asked for the amount of money they give. I categorize a person as giving at least 5,300 euros if they report an amount above 5,300 euros, or if their response falls within the range of 3,360 to 6,721 euros, or above.

The results are robsut to using one or two birth cohorts years on each side of the reform cuttof (see figure D.8). Further, I exploit the entire history of the transition retirement reforms. I use both the introduction, expansion, and the abolition of the reform, where I compare mothers born between 1931 and 1949. I describe the strategy and the results in appendix B. The results are robust.

Formally, I estimate the following dynamic Difference-in-Difference specification:

$$y_{it} = \sum_{\substack{j=1990, \\ j\neq 1993}}^{2002} \delta_j D_{t=j} \cdot T_i + \alpha_i + \nu_t + X_{it}\beta + \varepsilon_{it} \tag{4.1}$$

where y_{it} denotes the labor supply outcome for person i in year t. D_t is a dummy that equals 1 when the year equals t. T_i is a dummy that equals 1 when the individual is in the treatment group (the parent is born between 1944 and 1946). α_i is individual fixed effects, ν_t is year fixed effects. X_{it} is a vector of individual-level variables that may affect the adult children's labor supply. It includes whether individual i's other parent is born before or after 1946 interacted with year. The Difference-in-Difference coefficient, $\hat{\delta}_j$, captures the intention to treatment effect of the parents' entitlement to retirement on her adult children's labor supply in year t relative to the pre-reform year, 1993. I report robust standard errors clustered at the individual level.

The identifying assumption is that the two groups follow a similar trend in the absence of treatment. I cannot test the assumption directly, but instead, I test the validity indirectly by inspecting the difference in trends in the pre-period. Equal trends in the pre-period show that the two groups follow a similar trend before the reform. Assuming that the two groups in the absence of treatment follow the same trend before and after the reform, the pre-period can validate the parallel trend assumption. Second, to claim the effect on the adult children comes from the parents' retirement, no contemporaneous shocks should occur that affect the adult children whose parents are under different retirement schemes differently. I test the assumption indirectly by running two placebo tests. I run the same regression for fathers and mothers-in-law who are not mothers-in-law yet. Second, I investigate the effect in a Regression Discontuinity Design, to ensure that the effect is not driven by the age of adult children and the age of first birth for the parens is different between the control and treatment group. The Regression Discontuinity Design focusing on the critical juncture, this corresponds to mother born before and after 1. Jan-

uary 1947. The key identifying assumption is smoothness in other outcomes around the discontinuity in birth date. This design enables me to attribute any observed differences in labor market outcomes to the reform itself, as opposed to other factors that might have affected these outcomes in a more continuous or gradual manner. And as Regression Discontunity Design utilizes the discontunity, the adult childrens' age are equal at that point.

Given these assumptions, the estimate of $\hat{\delta}_j$ gives the effect of the retirement reform on the adult children's labor supply. The coefficient does not consider how many parents change retirement behavior because of the reform. Therefore, I run an IV regression to investigate how the adult children's labor supply behavior change for those whose parents change retirement behavior. Concretely, I will run the 2sls regression, where I use the reform as an instrument. The first step is to run the first stages:

$$\begin{aligned}
P_{1990} &= \sum_{\substack{j=1990,\\ j\neq 1993}}^{2002} \delta_j D_{t=j} \cdot T_i + \alpha_i + \nu_t + X_{it}\beta + \varepsilon_{it} \\
P_{1991} &= \sum_{\substack{j=1990,\\ j\neq 1993}}^{2002} \delta_j D_{t=j} \cdot T_i + \alpha_i + \nu_t + X_{it}\beta + \varepsilon_{it} \\
&\ldots \\
P_{2002} &= \sum_{\substack{j=1990,\\ j\neq 1993}}^{2002} \delta_j D_{t=j} \cdot T_i + \alpha_i + \nu_t + X_{it}\beta + \varepsilon_{it}
\end{aligned} \tag{4.2}$$

Where P_t is an indicator for the parents in the treatment group recieves retirement benefit in year t. The next step is to insert the predicted value from the first stages in the second stage regression:

$$\mathrm{y}_{it} = \sum_{\substack{j=1990,\\ j\neq 1993}}^{2002} \theta_j \hat{\mathrm{P}}_j + \alpha_i + \nu_t + X_{it}\beta + \epsilon_{it} \tag{4.3}$$

The goal is to estimate the parameters $\hat{\theta}_j$. It measures the adult children's labor supply response in year t for those whose parents retire because of the retirement reform in year t relative to 1993. For the estimate to be valid, the retirement reform must directly affect the different parents' cohorts' retirement behavior differently, and the effect has to be strong. It is tested directly by running equations 4.2, investigating the estimate of the

coefficients, and investigating the F values. Second, the instrument must not affect the outcome variable directly. In my setting, the retirement reform is not allowed to affect the adult children directly, but the effect has to go through the parents' retirement. It is likely to hold, since I use a temporary retirement scheme, so their retirement expectation is likely not affected, given the adult children do not expect that the temporary scheme is prologue until their retirement.

With heterogeneous treatment effects, the method requires the monotonicity restriction. It violates the monotonicity assumption if a person retires on a disability pension when the system ends, and the same person keeps working if the system is in place. Since there is no change in the rules of disability pension, and disability pension requires an assessment of working capacity, the monotonicity restriction is unlikely to be violated. The two-stage least square estimates will give the Local Average Treatment Effect, which captures the effect for the compliers. In my setting, the retirement effect on adult children refers to adult children whose parents only retire when transition retirement is possible and who will not retire if transition retirement is not possible.

5 Results

5.1 The effect of increasing retirement age on own labor supply

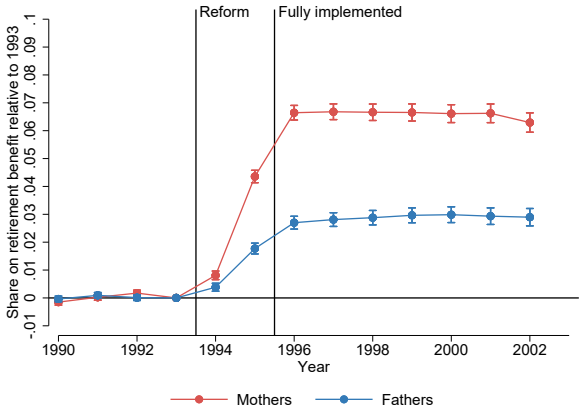
I first show that the retirement reform significantly affects both parental retirement behavior and work behavior. Figure 5.1 illustrates these effects, with panel (a) showing the impact on parents' retirement behavior, and panel (b) on their work behavior. To estimate these effects, I employ regression (4.1), with the dependent variable y_{it} indicating whether the parent of individual i is retired in November of year t. The red line represents the estimated treatment effect, comparing parents of individual i in year t who can retire at age 50 to those whose parents can retire at age 60.

In 1996, mothers eligible to retire at age 50 were 7 percentage points more likely to be retired compared to those eligible at age 60, representing a 116% increase in the share that is retired.[6] This retirement response is equal across those who have adult daughters and adult sons, indicating that parents' retirement behavior does not depend on the gender

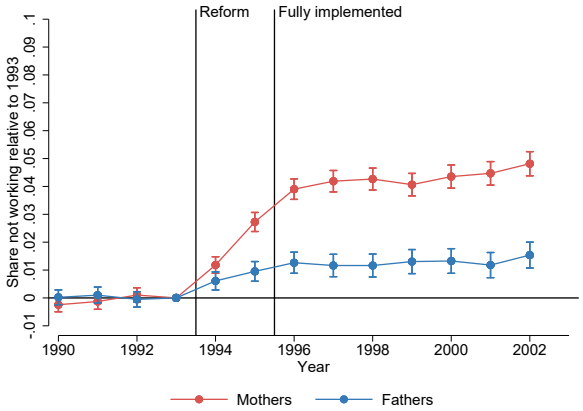
[6]Retirement benefit receivers include those on transition retirement pension, early retirement pension, old-age retirement pension, and disability retirement pension. Those who have already retired in 1993 receive a disability retirement pension.

Figure 5.1: Direct effect

(a) Retirement



(b) Not working



Notes: The figure shows the effect of transition retirement reform on parents' labor supply. The line is the direct effect, and it comes from equation 4.1. It displays δ_j, which captures the dynamic impact of retirement reform on people who can retire at age 50 compared to those who can retire at age 60. Panel (a) shows the effect on retirement. The baseline probability of retiring in 1993 for mother is 6 %, and for fathers it is 3.5 %. Panel (b) shows the impact of not working, and the baseline probability for mothers is 26 %, and for fathers it is 20 %. The 95% confidence intervals are based on robust standard errors clustered at the individual level.

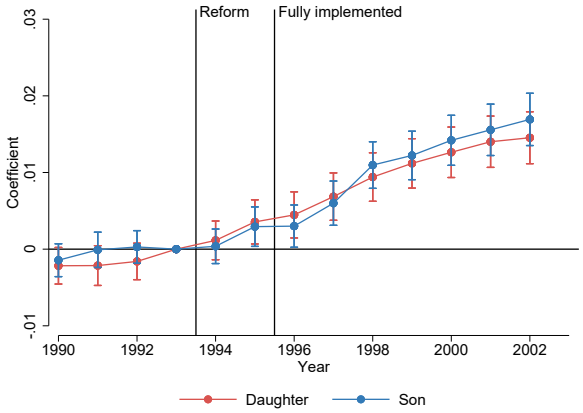
of their adult children (see figure D.2). Figure 5.1 also shows a significant but smaller effect on fathers' retirement due to the reform. Fathers eligible for transition retirement benefits are 3 percentage points more likely to be be retired, representing an 85% increase in the share that is retired.

The results may suggest that some parents substituted unemployment for retirement. However, I find that the reform also impacts parents' work behavior. Panel (b) of figure 5.1 demonstrates that mothers eligible for retirement at age 50 were 4 percentage points (15%) more likely to cease working in 1996 compared to their counterparts eligible at age 60. In the appendix, Figure D.5 reports how different cohorts reacted to the reform, revealing varying intensities of treatment. The effect on mothers' retirement ranges between 4 and 9 percentage points across cohorts.

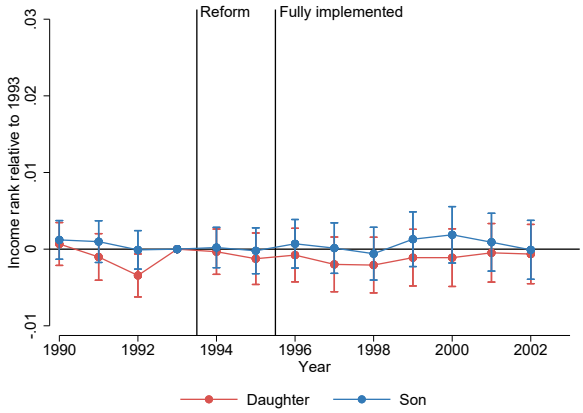
These findings resonate with the results in Staubli and Zweimüller (2013), who find that an increase in the retirement age in Austria led to an 11 percentage point increase in employment for women and an increase of 0.45 percentage points in employment when considering those who were unemployed before the reform. The reform I study requires one year of unemployment before transition, making the composition of my sample fall between the compositions of their two samples, and my results fall within the interval of their two results.

Figure 5.2: Spillover effect on adult children's income rank

(a) Mother



(b) Father



Notes: The figure shows the effect of transition retirement reform on different labor supply outcomes. The lines are the dynamic intention-to-treat estimates and it is based on running the reduced form estimate stated in equation 4.1. It displays δ_j which captures the dynamic effect of parents retiring at age 50 compared to those who retire at age 60. Panel (a) shows the effect on the fathers' retirement. The 95% confidence intervals are based on robust standard errors clustered at the individual level.

5.2 The effect of increasing retirement age on adult children's labor supply

To estimate the effect of parents' retirement on their adult children's labor supply, I employ regression (4.1), with the dependent variable being the labor income rank of adult children. The results are presented in Figure 5.2. The red line represents the estimated coefficient for the change in labor income rank of adult daughters when parents can retire at age 50 compared to those whose parents can retire at age 60, while the blue line shows the same for adult sons.

The figure shows that adult daughters' income rank is 1.6 income rank points higher in 2002 compared to 1993, corresponding to an income increase of approximately 2.0%.[7] This gradually increase is consistent with a story of human capital accumulation, where individuals whose mothers can retire accumulate more human capital, leading to increased income over time.

This effect could be attributed to either an increase in income rank for adult daughters whose mothers can retire at age 50 or a decrease in income rank for those whose mothers can retire at age 60. Appendix Figure D.6 displays the change in income rank, segmented

[7]If the income rank in 2002 remains the same as the income rank in 1994, it corresponds to an income of 194,000 kr. With the new income rank, it corresponds to an income of approximately 198,000 kr, which corresponds to an income increase of approximately 2.0%.

by the treatment and control group, and it reveals that the effect primarily arises from an increase in income rank for those whose mothers can retire at age 50, rather than a decline in income rank for those whose mothers can retire at age 60.

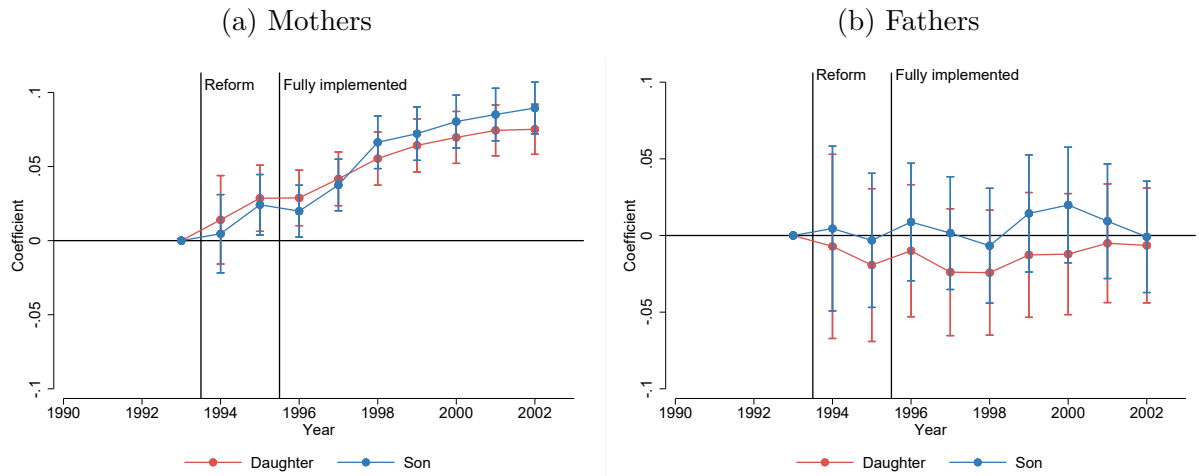
Figure 5.2 includes two vertical lines: one in 1993 when the reform is announced and another in 1996 when the reform is fully implemented. It is not clear whether we should expect the adult daughter to react when her mother actually retires or when it is announced that her mother can retire more easily. To distinguish between these possibilities, I divide the sample based on the mothers' cohorts. Mothers born in 1944 can retire in 1994, and the reform is announced in the same year. Conversely, mothers born in 1946 can retire in 1996, while the reform is announced in 1994. In Appendix Figure D.5, the effect on the daughters' income rank, categorized by the mothers' cohorts, is presented. The figure illustrates an immediate increase in income rank for those whose mothers eligible for retirement in 1944, while those whose mothers eligible for retirement in 1946 experienced a gradual increase starting in 1996. This suggests that the crucial factor is when the mother is eligible for retirement rather than when it is announced that she is eligible for retirement benefits at age 50.

Figure 5.2 also demonstrates the effect on adult sons' labor supply after their mothers can retire, and the results mirror the pattern for adult daughters. Adult sons' income rank is 1.6 income rank points higher in 2002 compared to 1993. Panel b of figure 5.2 shows that their is no effect of the father's retirement on his adult children's income. I further investigate how the mother-in-law affects the adult children's income. I present the results in Appendix Figure D.7. I find that for adult sons, both their own mother and their mother-in-law are equally important. In contrast, for adult daughters, both their own mother and mother-in-law affect their income, but their own mother is more influential.

5.2.1 Quantify the size of the effect

These are intention-to-treat effects and do not consider the retirement take up of the parents. To account for this, I run a 2SLS regression using the reform as an instrument for retirement. First I run the first stages. This serves two purposes: assessing which instrument is informative about each parameter and providing the F statistics of the first stages. There are 13 first stages, and the coefficients are displayed in the appendix

Figure 5.3: Spillover effect on adult children's income rank, IV



Notes: The figure shows the effect of the transition retirement reform on different adult children's income rank. The lines are Local average treatment effect, and itis based on running the 2sls regression stated in equation 4.3. It displays θ_j which captures the scaled effect. The effect of the parents retiring at age 50 compared to those who retire at age 60 for those who comply with the reform. Panel (a) shows the effect of mothers retirement. Panel (b) shows the effect of fathers retirement. The 95% confidence intervals are based on robust standard errors clustered at the individual level.

figure D.3. These figures reveal that each instrument provides information about its corresponding parameter. For instance, the parameter γ_{1992}, which is 1 if the year is 1992 and the mother is in the treatment group, informs us whether the mother is retired and it is 1992. This applies to all first stage results.

I report the F statistic for all first stages in appendix figure D.4. All first stages F-statistics are above 200, indicating relatively strong instruments. As a rule of thumb, Staiger and Stock (1997) suggests that the F statistics should be at least 10. And, Lee et al. (2020) describe standard error adjustments depending on the F-statistic and critical level. With a critical level of 5%, no correction is required if the F-statistic is above 104.68.

I estimate equation (4.3), and the results are presented in figure 5.3, showing that for the group that complies with the reform, adult children experience an increase in income rank of 7 income rank points in 2002. This increase is approximately equivalent to an income increase of 8.1% for adult daughters and 7.6% for adult sons. Figure 5.3 shows no pretend, because I use the reform as an instrument, and the reform lacks informativeness before 1993, leading to considerable standard errors during that period.

The estimated spillover effect from mothers to adult children is for the group of mothers who retire due to the reform. To make this transition, one year of unemployment is necessary. Therefore, I investigate how the complying group differs from the general

population and perform a complier analysis. I show the results in the Appendix table C.4. It shows the relative proportion of compliers with these characteristics compared to the general population. A value above one indicates that a larger share of compliers possesses these characteristics compared to the general population, and a value below one implies that a smaller share of compliers has these characteristics in comparison to the general population. The closer the value is to one, the more similar the general population and compliers are. In general, the two groups are relatively similar in terms of the characteristics of the mother labor market in 1985. However, the mothers income are less likely to be in the 4th quartile, and more likely to be in the 2nd and 3rd quartile.

5.2.2 Additional outcomes

I have shown a gradual increase in the income of adult daughters and adult sons when their mothers have the option to retire earlier. This effect can be attributed to several factors, including changes in labor market participation, full-time employment, wages, and occupational groups, which are depicted in Figure 5.4.

Adult children whose mothers can retire at age 50, as opposed to age 60, experience a 0.8 percentage point (baseline is 78 %) increase in their probability of employment and a 2.0 percentage points (baseline is 70 %) increase in full-time employment given they work. Furthermore, their wage rank increases by 2.2 hourly wage rank points, and they are 1.7 percentage points (baseline is 2.1 %) more likely to work in higher occupational rank positions.[8]

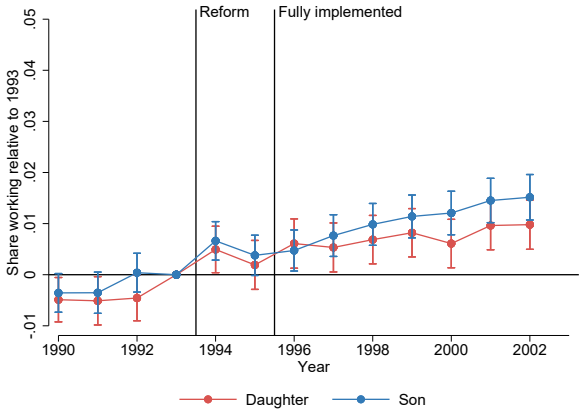
These findings suggest that the reform impacted both labor supply and the returns to hours of labor supply. It is consistent with these adult children gaining access to higher-paying job opportunities and experience more rapid wage growth compared to those whose mothers who are eligible for retirement at age 60. This indicates that early maternal retirement can significantly contribute to upward mobility in their careers.

Additionaly I investigate related outcome such as years of education and fertility decision, and indeed both outcomes are affected by the maternal retirement such that the highest achieved education is on average 0.15 years longer, and the birth rate goes up by 0.8 and 1.6 percentage point for adult sons and adult daughters (see figure 5.4).

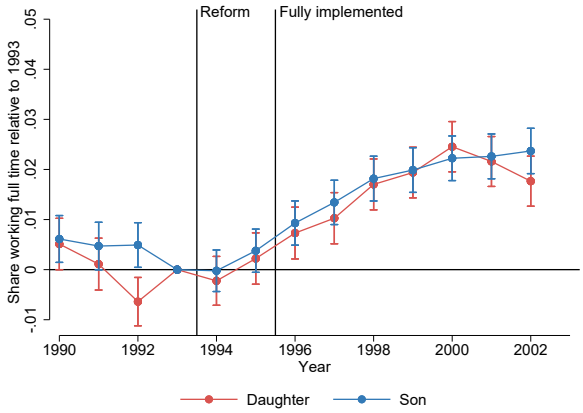
[8]The figure does not display the pre-trend for higher occupational rank positions as the occupational data is available from 1994 onward.

Figure 5.4: Spillover effect on adult children's labor supply: Additional outcomes

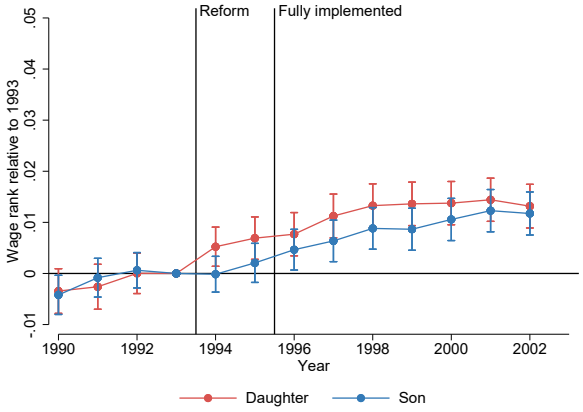
(a) Work



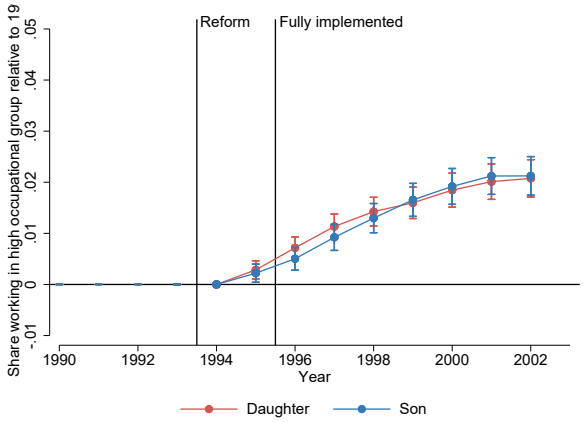
(b) Full time



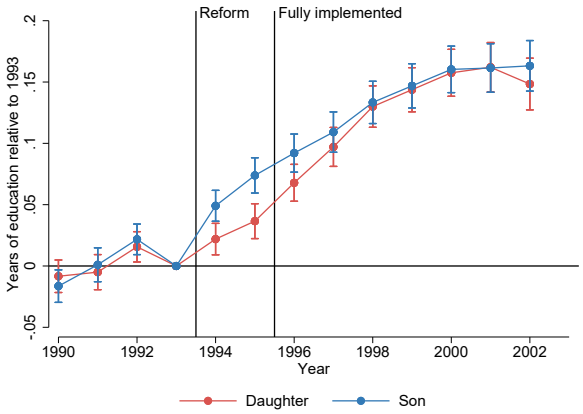
(c) Hourly wage rank



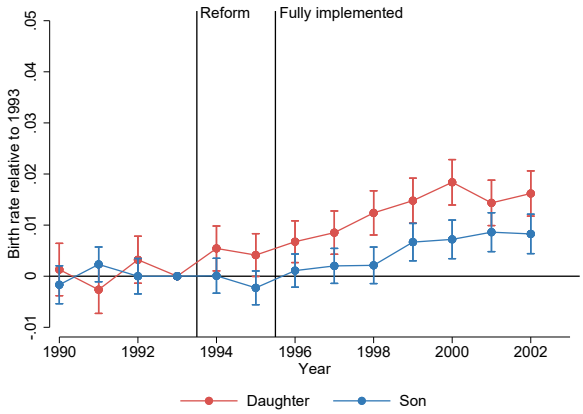
(d) High Occupational rank



(e) Years of education



(f) Birth rate



Notes: The figure shows the effect of transition retirement reform on different labor supply outcomes. The lines are the dynamic intention-to-treat estimates and it is based on running the reduced form estimate stated in equation 4.1. It displays δ_j which captures the dynamic effect of mothers retiring at age 50 compared to those who retire at age 60. The different panels show different labor supply outcomes. Panel (a) shows the effect on working. Panel (b) shows the effect of full time. Panel (c) shows the effect on wage. Panel (d) shows the effect on occupational group. Panel (e) years of education. And panel (f) shows the birth rate. The 95% confidence intervals are based on robust standard errors clustered at the individual level.

5.2.3 Long run effect

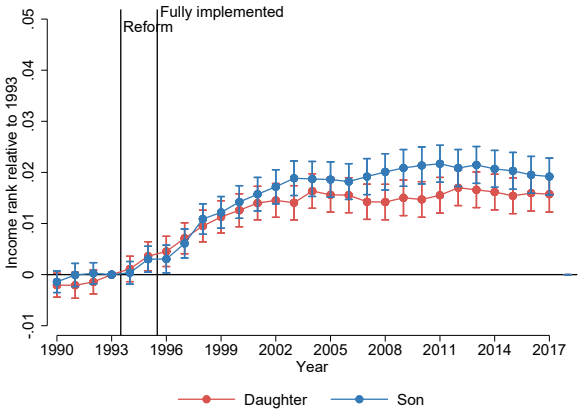
Until now, I have investigated the effect of mothers' retirement on their adult children's labor supply during the period when the mothers are subject to different retirement rules. However, this analysis does not reveal whether the observed effect is temporary, persistent, or permanent even after the control group can retire too. A crucial question is whether a mother's early retirement, especially during the early stages of her adult children's careers, exerts a lasting influence on their adult children's income or if income disparities between those whose mothers retire early and those whose mothers do not eventually diminish.

To investigate the long run nature of this effect, I extend the sample and examine the impact of mothers' retirement on their children's income ranks up to 2017. The results are presented in Figure 5.5. The figure shows that the income rank gradually increases until 2004. Subsequently, it maintains a stable level for those whose mothers are eligible for retirement at age 50 compared to those whose mothers are eligible for retirement at age 60. This evidence aligns with the notion that an earlier retirement has a lasting impact on adult children's income rank.

This effect can be explained by three distinct factors. Firstly, during the initial period, adult children accumulate more human capital, leading to increased returns on their labor supply. Secondly, within the initial period, adult children tend to accumulate fewer savings due to reduced transfers, which contributes to a decrease in their overall savings, thus motivating them to work more. Thirdly, over several years, adult children become more inclined to work full-time, suggesting a transformation in their work preferences.

I will investigate these mechanisms one at a time. Figure D.15 in the appendix shows that wages are permanently higher for those whose mothers are eligible for retirement at age 50; their wages are 2.1 wage rank point higher in 2017. I use wages as a proxy for human capital accumulation, indicating an important role for human capital development. The figure further illustrates a temporary effect on savings, as those whose mothers retired early accumulated less savings, but this effect does not persist, and in 2017, there is no discernible impact on savings. Lastly, the figure shows a permanent increase in the share of full-time employment. This increase may stem from changes in the adult child's preference for working full-time or from increased earnings potential. With higher human capital and consequently higher wages, the return on additional hours of work is higher, motivating the child to work more. To rule out the latter factor, I control for wage in 2002, and the

Figure 5.5: Long run effect: income rank



Notes: The figure shows the effect of transition retirement reform on different labor supply outcomes. The different panels show different labor supply outcomes. Panel (a) shows the effect on income rank.

effect is almost the same (See figure D.16 appendix). This suggests that a parent's early retirement potentially influences their child's preference for working full time.

In summary, I find evidence of a lasting effect stemming from a mother's retirement, leading to her adult children having a higher income. This suggests that a lower retirement age positively impacts the labor supply of adult children, and this effect persists beyond the period during which mothers are subject to varying retirement regulations.

5.2.4 Robustness

I do several robustness checks and show all estimates of the treatment effect on children's income rank in 2002 in the appendix figure D.8. First, the selected cohorts for mothers' retirement are somewhat arbitrarily chosen to include three cohorts on each side of the threshold. The choice is a trade-off between similarity in the treatment and control group and the power. The robustness of the results is examined with different criteria. I utilize mothers' cohorts spanning one, two, and four years on each side of the threshold, and the findings remain consistent across these variations. In addition, I take advantage of the entire history of the transition retirement reforms. I use both the introduction, expansion and the abolition of the reform, where I compare mothers born between 1931 and 1949. I describe the strategy and the results in appendix B. The results are robust.

Second, the cohort restriction for adult children is somehow arbitrary. In the main specification, the adult children are between the ages of 17 and 33 in 1993. These are chosen so I can observe their outcomes as an adult. It implies, however, that I focus on

mothers who have children relatively young. To ensure that the result is not driven by young mothers, I use all children as a robustness. Another issue is that by definition the age of the adult children is different in the control and treatment group, in order to take this into account I use income rank. Further, I also check whether the result is driven by this by using one cohort, adult children born in 1970. The finding that mothers' retirement positively influences the labor supply of adult children remain with different cohort restrictions. However, there is a tendency for a stronger treatment effect when focusing specifically on children born in 1970. In other words, when the sample is restricted to adult children who are more similar in age, the impact of mothers' retirement appears to be more pronounced, however the estimates also becomes less precise, as the sample size is reduced.

Third, I also check whether my results are robust against the chosen controls: In my main specification, I control for person-fixed effect. As a robustness check, I run a regression where I remove Fixed Effect. The results are robust, thus the results do not seem to be driven by the Fixed Effect specification. Moreover, adult children are influenced by both their own parents' retirement and the retirement of their parents-in-law. Consequently, those who are untreated can be treated by the retirement of their parents-in-law. To address this, I control for the cohort of parents-in-law, and the results are robust.

In my primary specification, I utilize the transition retirement reform and conduct a dynamic difference-in-difference (DID) regression. A traditional DID analysis uses the variation between a baseline year and subsequent years, capturing the impact of a specific intervention or treatment. However, to mitigate the potential influence of a particular low value in the baseline year and to rule out that the effect is driven by adult children in the control and treatment groups having different ages, I implement a Regression Discontinuity Design (RDD). The core concept of RDD is to examine the effects of a treatment at the precise point where there is a discontinuity. In the context of my research, this threshold corresponds to mothers born before and after 1. January 1947. I show the result in table C.5, and the RDD result confirms the finding that mothers' retirement positively influences the labor supply of adult children.

I also do a placebo test to verify whether the observed effects on the labor supply of adult children are indeed a result of their own mothers' retirement decisions due to the

reform, rather than a coincidental trend or some other external factor. If the results of the placebo test indicate no significant effect from the retirement, it lends support to the idea that the observed effects in the main analysis are likely due to the reform itself and not influenced by unrelated factors. I use the grandmother to the children, who is not the adult children's own mother, her mother-in-law. For those who have their first child after 2002. I expect no effect from their retirement on the adult children. The result is presented in the appendix figure D.9, and indeed these in-laws have no effect on their adult children's labor supply.

5.2.5 Relation to existing studies

Aparicio-Fenoll and Vidal-Fernandez (2015) and Bratti et al. (2018) investigate how mothers' retirement impacts the extensive margin, showing that mothers who can retire, compared to those who cannot, have daughters who are respectively 5.1 percentage points and 7.1 percentage points more likely to work in Italy, respectively. The effect is larger than the effect I find for adult daughters (0.8 percentage point). Their larger effects could stem from at least three potential sources: they use another reform that affects more people, they use another sample, and the culture of the country is different. Indeed, Aparicio-Fenoll (2020) finds that the culture of the country is important for the intergenerational link in labor supply. She employs a Regression Discontinuity framework around the early retirement cutoff at age 60, and finds that mothers retirement increases their daughters' employment only in countries with limited family policies and strong family ties. Italy has limited family policy and strong family ties, whereas Denmark is the opposite.

The results for adult daughters are also similar to the results in Kaufmann et al. (2022), who investigate the intensive margin and find that a one-hour increase in grandmother's time implies a half-hour increase in the adult daughters labor supply.

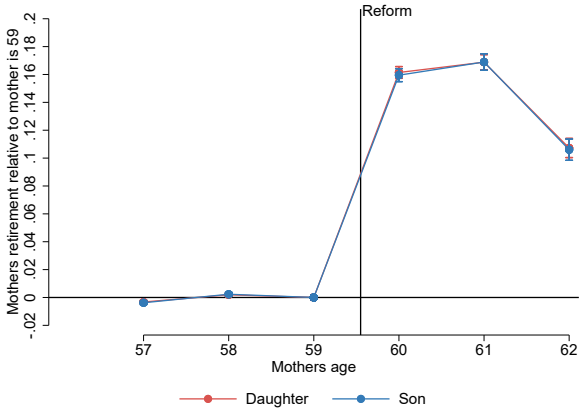
In contrast to those studies, I find that maternal retirement also affects adult sons. They examined smaller variation in retirement age, while I study an intervention that changes the retirement age with ten years. Further they examined variation in mothers' retirement around age 55 and 60 and consequently, the average age of the adult children in their samples are older.

To explore the potential influence of size of treatment on these results, I utilize an alternative retirement reform. Specifically, in 2011, the government decided to raise the

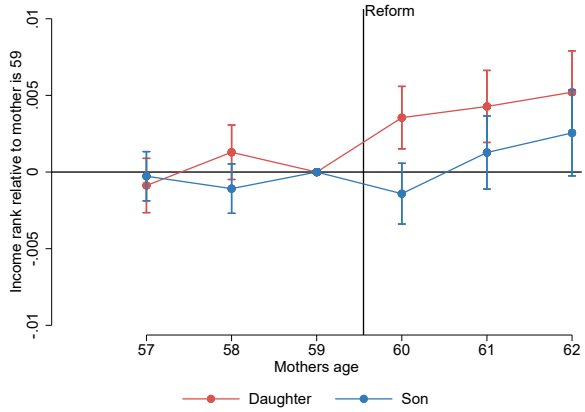
early retirement age from 60 to 62 between 2014 and 2017. I leverage this variation. In figure 5.6 I show the result. In this case, I find no significant effect of maternal retirement on her adult sons, but I find a positive effect of maternal retirement on the income rank of her adult daughters. These results align with the findings of Kaufmann et al. (2022), Bratti et al. (2018), and Aparicio-Fenoll and Vidal-Fernandez (2015), indicating that maternal retirement does not impact sons after a small change in maternal retirement.

Figure 5.6: Direct effect and spillover effect on adult children's income utilizing an alternative retirement reform

(a) Mothers retirement



(b) Income rank



Notes: The figure presents the impact of the early retirement reform that increased the retirement age from 60 to 62 on the mother's retirement behavior (panel a) and her adult children's income rank (panel b).

6 Mechanisms

I have established that maternal retirement has a spillover effect on the labor supply of their adult children. There are several channels through which this link can be explained. I will briefly describe five different mechanisms before analysing two:

Informal Childcare: When a mother retires, her available time increases, allowing her to provide informal childcare to her grandchildren. Consequently, adult children can then increase their labor supply.

Financial Support: When a mother retires, her income decreases, potentially affecting her ability to provide financial support to her adult children. As a result, adult children may need to increase their labor supply to maintain their level of consumption.

Informal Eldercare: When a mother's retirement increases her need for care, it might prompt adult children to assume some caregiving responsibilities, subsequently in-

fluencing their labor supply. The mother's retirement may lead to an increased allocation of time by the children toward informal eldercare duties, resulting in a reduction of their labor supply.

Work-Related Networks: At retirement, mothers may experience a decrease in their social and professional connections, potentially affecting their ability to provide job-related assistance to their adult children. For instance, Corak and Piraino (2011) find that 40% of adult sons has been employed by the same employers as their fathers. Consequently, retirement can indirectly influence adult child labor supply decisions by affecting the availability of job-related support from their retired parents, possibly leading to a reduction of their labor supply.

Norms and Attitudes: When mothers retire, it may be perceived as acceptable for their adult children to also refrain from working. For example, Dahl et al. (2014), using random assignment of judges, find that parents who enroll in disability insurance increased the likelihood that their adult children will participate in the same program. They also find suggestive evidence that parental allowances altered children's attitudes toward participating in the disability insurance program and the associated social stigma. Norms can impact the labor supply decisions of adult children, potentially leading to a reduction in their labor supply.

The last three mechanisms suggest that a mother's retirement negatively impacts her children's labor supply, which would lead to a decrease in the children's income. However, my, and others, results suggest a positive effect – that a mother's retirement is associated with her children having a higher income. As a result, these mechanisms cannot be the primary explanations for the observed outcomes in my study. Therefore, I will focus on the first two mechanisms in the following sections: Informal childcare and financial support.

6.1 Informal childcare and financial support

In order to investigate these two mechanisms, I split the sample based on two key factors: adult children's family responsibilities and mothers' pre-reform income.

First, I split the sample based on whether the adult child has children during the considered period. To make this division, I define an adult child as having children if they

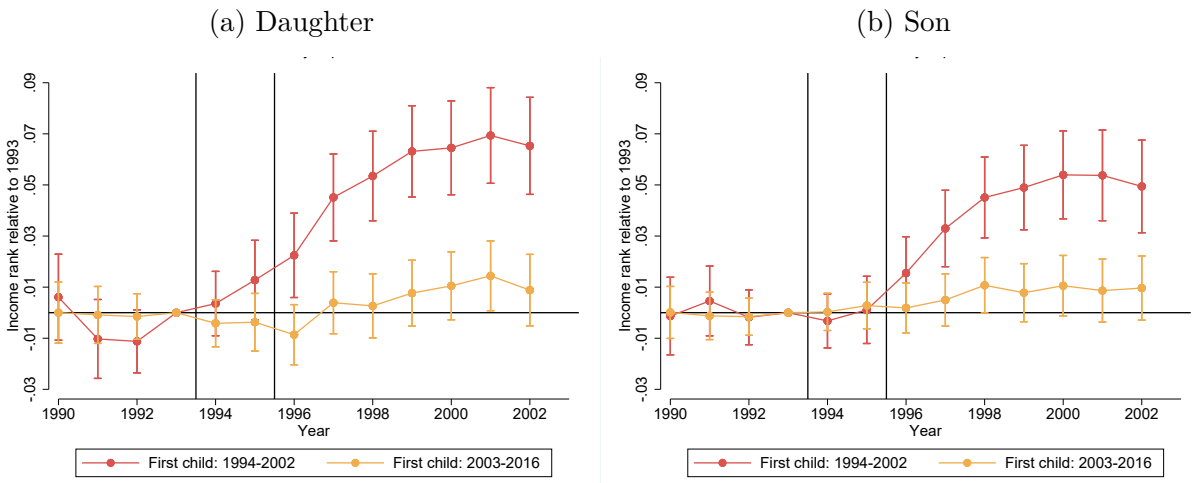
get their first child between 1994 and 2002. Those with their first child between 2003 and 2016 are categorized as not having children during that period. This approach allows me to compare adult children with small children during the period to those who do not have children, thus isolating the impact of mothers' retirement on individuals with differing family responsibilities. I expect that the effect of mothers retirement of the adult children income is smaller or not existing for those without children if informal childcare is the dominating mechanisms.

Second, I further split the sample based on mothers' pre-reform income, specifically their income in 1985. I split the data based on whether the mother's income is below or above the median income. This approach allows me to compare mothers with different income levels and, therefore, different likelihoods of transfer money and varying capacities to transfer money. Lower income, on one hand, implies a smaller drop in income upon retirement, potentially leading to a lower effect of retirement on the financial support provided to adult children. On the other hand, lower income implies a lower baseline probability of transfering money, and therefore the likelihood of transfering any money decreases. Consequently, the intergenerational link should be most pronounced for those with low income if financial support is the dominating mechanism.

Informal childcare: The results, depicted in Figure 6.1, indicate that children play a crucial role in driving the link between mothers retirement and the labor supply of their adult children. Specifically, I find that adult daughters who experienced the birth of their first child during the period exhibit an increase in income by approximately 7.0 income rank points after the retirement reform, compared to their income in 1993. I do not find an effect from adult daughters who do not have children in the period, indicating that the presence of children is important for the positive impact of maternal retirement on the labor market outcomes of adult daughters. The results are similar for adult sons.

I have split the data based on an endogenous decision, namely when individuals decide to have their first child, which itself can be influenced by the retirement reform. To address this, I employ an alternative criterion for determining whether someone has children, specifically by considering whether the individual had a partner in 1993 prior to the reform. Having a partner in 1993 is associated with a higher likelihood of having children and is not influenced by the retirement reform. The result of this alternative

Figure 6.1: The effect of mother's retirement on the adult children's income rank, split by family responsibility



Notes: The figure depicts the effects of the transition retirement reform on the income rank of the adult children, categorized based on whether the adult children became a parent between 1994 and 2002, or became parents between 2003 and 2016, and based on whether mothers income in 1985 is below or above the median. The lines represent the difference in difference estimates, that captures the average effect of mothers retiring at age 50 compared to those retiring at age 60. Panels (a) present the effect for adult daughters, while panel (b) present the effect for adult sons. The 95% confidence intervals are calculated using robust standard errors, clustered at the individual level.

definition is presented in Appendix Figure D.10. Likewise I use completed fertility, that is I compare those who get at least one child before they turn 45 with those who do not get a child, hereby it is robust against if the reform affects the timing of children, but not the likelihood of getting one child. The results are robust to both alternative definitions of family responsibilities.

Financial support: In the appendix figure D.11 I find that the intergenerational link in income rank does not vary across mothers with both above and below median pre-reform income. This suggests that financial support is not an important factor for the intergenerational link. To ensure the robustness of this finding, I conduct additional checks by examining other splits in mothers' pre reform income. The results, presented in Figure D.12 in the appendix, indicate no systematic variation in the intergenerational link in income based on different mothers pre-reform income levels.

Collectively, these findings suggest that the presence of children plays a role in the inter-generational link in labor supply, whereas financial support is less important.

6.1.1 Actual provision of informal childcare and financial support for retired

I have presented evidence consistent with the role of informal childcare and no role of financial support. To deepen the analysis, I utilize *SHARE* data, which contains self-reported information on time use, money transfers, and retirement status. Specifically, I conduct the following regression:

$$y_{it} = \alpha + \beta_1 \mathbf{1}\{close_{it} = 1, ret_{it} = 1\} + \beta_2 \mathbf{1}\{close_{it} = 0, ret_{it} = 1\} + \beta_3 \mathbf{1}\{close_{it} = 1, ret_{it} = 0\} + \nu_t + \text{mom\_age}_{it} + \epsilon_{it} \tag{6.1}$$

In this equation, y_{it} represents the measure of providing informal childcare or financial support. α is a constant, ν_t denotes the year of the survey, and mom_age_{it} is the age of the mother. The parameters of interest are β_1, β_2, and β_3. Specifically, β_1 captures the effect of living close and the mother being retired on providing informal childcare, compared to those mothers who are working and do not live nearby. I define a mother as living near if she resides within 25 km of at least one of her children. Additionally, I categorize a mother as retired if she answers that she is retired in the survey, and working if she answers that she is working in the survey.

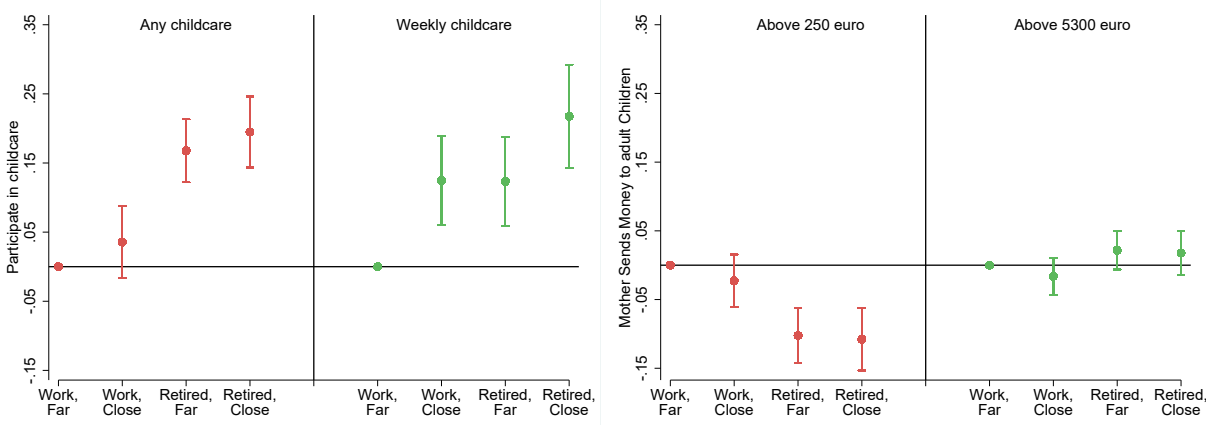
Informal childcare: Figure 6.2a displays the estimates of β_1, β_2 and β_3, showing a positive correlation between retirement and the likelihood of providing informal childcare. Retired mothers are significantly more likely to engage in informal childcare with their grandchildren with an increase of 20 percentage points compared to working mothers, where 76 percent of working mothers provide some form of informal childcare. Retired mothers are also more likely to provide intensive informal childcare, meaning they are more likely to provide it at least every week. A retired mother who lives in close proximity is 22 percentage points more likely to provide informal childcare every week, given that she provides any form of informal childcare. In contrast, working mothers who do not live in close proximity have an 11 percent probability of providing informal childcare. Overall, this figure shows a positive correlation between retirement, close proximity, and the provision of informal childcare.

Financial support: Figure 6.2b presents the effect of retirement on providing financial support. The figure demonstrates a negative correlation between retirement and the likelihood of transfer a small amount of money in financial support (at least 250 euros

Figure 6.2: Mothers likelihood of providing informal childcare and financial support to her adult children split by proximity and retirement status

(a) Informal childcare

(b) Providing financial support



Notes: The figure illustrates the time allocation of mothers to informal childcare activities and providing financial support. It presents the β_i coefficients obtained from regression 6.1, displaying mothers who are retired and reside close to the adult children engaged in informal childcare and financial support in comparison to those mothers who are employed and do not reside in close proximity. I define close proximity as the mother and grandmother living within 25 km. Panel (a) shows the effect on providing informal childcare. First, it shows the extensive margin: whether the mothers provides any childcare (baseline probability is 0.76), and second, it shows the intensive margin: given they provide informal childcare, whether they do it weekly (baseline probability is 0.11). Panel (b) shows the effect on providing financial support. First, it shows the effect on providing at least 250 euros yearly (baseline probability is 0.23), and second, it shows the effect of providing a financial transfer of at least 5,300 euros yearly (baseline probability is 0.07). The 95% confidence intervals are calculated using robust standard errors.

yearly). On average, a retired mother is 10 percentage points less likely to transfer at least 250 euros in financial support. In contrast, working mothers have, on average, a 23 percent likelihood of transfer at least 250 euros yearly. Simultaneously, the analysis shows that retirement does not have a significant impact on the likelihood of transfer a big amount of financial support (at least 5,300 euros yearly). The lack of correlation between transferring large amounts of money and retirement is consistent with the suggestive evidence that financial support is not the driving mechanism behind the inter-generational link in labor supply.

7 Child penalty

An alternative approach to demonstrate the role of grandchildren is to present the "child"-penalty graph. This graph illustrates the decline in the parent's income after giving birth relative to the preceding year. I investigate the child-penalty for two distinct groups of adult children. The control group consists of adult children whose mothers were born

between 1947 and 1949, while the treatment group comprises those born between 1944 and 1946. I focus on those adult children who experienced their first childbirth between 1994 and 2002, thereby their mother being subject to different retirement regulations. Concretely, I run the regression inspired by the child penalty regression in Kleven et al. (2019b):

$$y_{it} = C_i + \sum_{c=0}^{1} \sum_{j \neq -1}^{T_c} \delta_{cj}(D_{t=j} \cdot C_{i=c}) + X_{it}\beta + \epsilon_{it} \tag{7.1}$$

where y_{it} denotes the income rank, and C_i indicates the treatment group and the control group, while D_t captures the time distance to the first birth. The vector X_{it} contains the controls: age fixed effects and year fixed effects, where age fixed effect interacts with the retirement group.

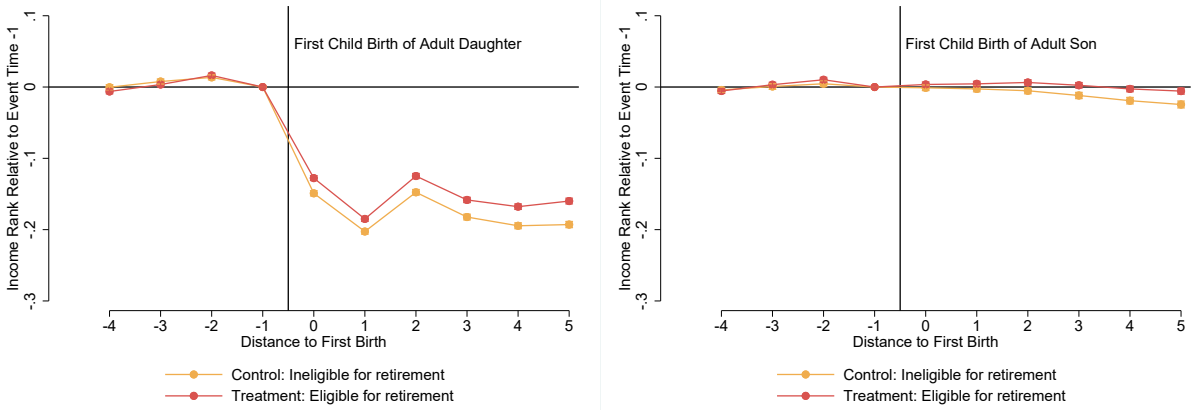
The results, as illustrated in Figure 7.1, reveal a significant relationship between a mother's retirement and the child penalty for adult daughters. Adult daughters whose mothers have the option to retire experience a reduced child penalty. Specifically, in the fifth year following the birth of their first child, the child penalty is 3 income rank points lower, which equates to a 17% reduction in the overall child penalty. The figure also demonstrates the fatherhood penalty. In general, fathers experience a very slight penalty for being fathers, with their income rank being only 0.2 points lower five years after the birth of the first child for those whose mothers cannot retire. However, for those whose mothers potentially can retire, this penalty is non-existent, effectively eliminating the fatherhood penalty. In the appendix figure D.14, I show the child penalty graph, where I split the sample based on the mother-in-law. The mother-in-law has an effect on the motherhood penalty and fatherhood penalty, but the impact of the mother-in-law is less important compared to their own mother.

Note, the retirement group tends to experience parenthood at an older age. This raises the question of whether the observed effect is influenced by the age at which the first birth occurs. To address this concern, I control for age in the regression and conduct two placebo tests. In the first placebo test, I compare adult children who gave birth to their first child between 2007 and 2012, and in the second, I compare adult children who gave birth to their first child between 1985-1988. In both cases, the mothers were under

Figure 7.1: Parenthood penalty in income rank split by whether the grandmother is eligible for retirement

(a) Adult daughters

(b) Adult sons



Notes: The figure displays event time coefficients estimated from Equation 7.1 for different birth years of the grandmother. The treatment group, eligible for retirement, consists of individuals born in 1944-1946, while the control group, ineligible for retirement, comprises those born in 1947-1949. The 95% confidence intervals are calculated using robust standard errors, clustered at the individual level.

the same retirement rules when the first child was born, indicating that there should be no difference in the child penalty of the adult children. The findings, presented in the appendix in Figure D.13 show that the child penalty for both groups is the same when the mother was under the same retirement rules at the time of the first child's birth. This suggest that the difference in child penalty between the treatment and control group is driven by mothers different retirement age.

Again this evidence indicates that children are important in shaping the labor supply link between adult children and their mothers.

8 Conclusion

In this paper, I explore the impact of parents' retirement on their adult children's labor supply in Denmark. I focus on Denmark for two reasons. First the country is characterized by universal access to highly subsidized childcare, which provides a valuable setting to investigate the inter-generational link in labor supply. Second, eligibility for retirement benefits has undergone some major reforms, thus providing exogenous variation in retirement age across different cohorts of parents.

My findings reveal a significant influence of a mother's retirement on her adult children's income rank, resulting in a stable increase of 7 income rank points for those whose

mothers who retire at age 50 instead of age 60. Moreover, the evidence supports the hypothesis that this effect is linked to enhanced access to informal childcare, and improved human capital accumulation.

These results carry important implications for policymakers contemplating increasing in the retirement age. The study underscores that universal access to childcare may not be sufficient to remove the inter-generational link in labor supply. While this project does not delve into specific strategies to break the observed link, it highlights the necessity for policymakers to proactively consider the consequences of changes in retirement age on subsequent generations. Future research and policy discussions may further explore effective interventions to mitigate the impact on adult children's labor supply.

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A Retirement system

The transition retirement system links to the early retirement pension and the unemployment insurance system. I will therefore describe all three plans below.

A.1 Early pension

It is a pension plan for individuals who are members of the unemployment insurance scheme. To qualify, the individual has to fulfill four requirements. First, the individual has to be older than 60 years. Second, the individual must participate in the unemployment insurance system for several years. The number of years of membership depends on the birth cohort. It is 20 years out of the last 25 years for those born after the 1. March 1952. And it is 10 years out of the last 15 years and continuous membership in the fund from 31. March 1992 until transition for those born before 1952. Third, the person has to be entitled to unemployment insurance or receive transition retirement when the person transits to the early pension system. Forth the person has to live in Denmark. In 2000 approximately 50 % of the 66 years old received an early pension (see table C.1).

A.2 The unemployment insurance system

Unemployed people who are members of the unemployment insurance system are entitled to unemployment insurance if they have worked a half year out of the last three years. After one year of unemployment, they qualify for a fair job offer. This "job offer" counts equally with regular employment when counting how much a person has worked. People above age 50 are entitled to multiple "job offers", and those under 50 are allowed up to two "job offers". The "job offer" must have a minimum length of 9 months. The offer should be in the private sector to the extent possible. If it is not possible to offer a job in the private sector, the job offer will come from the state or the municipality. The employment is subsidized such that the unemployment insurance system pays the salary for three months, and the private company pays the salary for six months.

The rules changed in 1994. An unemployed person can receive unemployment insurance for a maximum of seven years, and a "job offer" does not count as ordinary employment when measuring whether people are entitled to unemployment insurance benefits.

The requirement to reclaim unemployment insurance is half years of ordinary work within three years.

The unemployment insurance system is very generous in giving benefits. Unemployed insured people receive up to 90 % in replacement rate of their earnings, and they receive a maximum of 350 USD (2545 DKK) per week. The average replacement rate was approximately 60 % in 1994 (DØRS (2014)). Unemployed people are entitled to unemployment benefits if they are available to the labor market. The unemployment fund controls whether a person is available to the labor market. An available person cannot refuse a fair "job offer" after 12 months of unemployment.

A.3 Transition pension

It is a temporary pension plan in the nineties that targets unemployed individuals who are members of the unemployment insurance scheme. The government introduced the program in 1992 because of the high unemployment rate. Persons qualify for early retirement if they are working or receiving unemployment insurance. The temporary pension scheme should help those who are long-term unemployed. The government decided on it in December 1991, and it started in March 1992 and terminated by the end of 1995.

To receive a transition pension, they have to fulfill four requirements. First, it is for people between 55 and 59. Second, the person has to be a member of an unemployment fund, and when the person turns 60 years, he needs to have enough tenure to receive an early pension. Third, the person has to live permanently in Denmark, the person is allowed to visit other countries temporarily for up to 3 months, but he is not allowed to move to another country. Fourth the person can first transit after receiving a "job offer" from the municipality. The "job offer" typically comes after one year of unemployment. Long-term unemployed members of the unemployment insurance system are entitled to a fair "job offer".

The unemployed person has to declare he wants to transit to transition pension within one month after he is entitled to a "job offer". If the person does not claim he intends to transit, he will receive a concrete "job offer". After receiving a concrete "job offer", the person again has one month to declare he wants to transition to a transition pension.

A transition pension gives the receiver the same amount as he gets in unemployment

insurance cash benefit until the member's entitlement to unemployment insurance cash benefit stops. After the entitlement to unemployment insurance cash benefit, the member receives 80 pct. of the maximum cash benefit. A transition retirement receiver is not allowed to be self-employed, but he is allowed to work. However, the salary deducts the transfer, and the receiver has no monetary incentive to work.

The government decided to expand the system in June 1993. The expansion starts 1. January 1994 with multiple changes. First, the system will not terminate in 1995. Instead, it will close in 1998. Second, it is temporarily possible to retire between 50 and 55 years old until 1996. The extension of the system also includes a minor change in the eligibility criteria. Eligibility does not depend on a "job offer" from the municipality. Instead, eligibility depends on whether the person had been unemployed for 12 months in the last 15 months. The pension scheme gives the receiver 82 pct. of unemployment insurance cash benefit after the entitlement to unemployment insurance cast benefit stops.

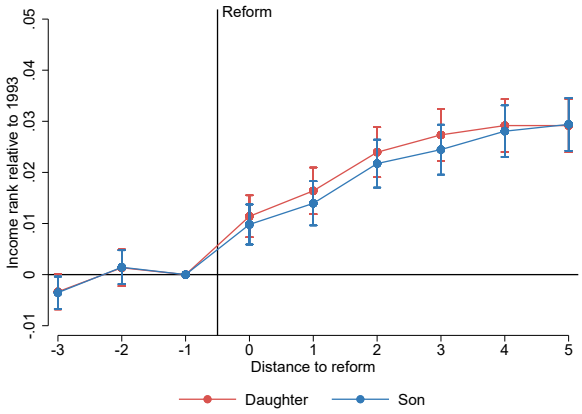
In December 1995, the government decided to abolish the system for admission of new receivers at the end of 1995. The abolishment has a one-year transition period for those who turn 50 in 1996. The individual must be eligible at the end of 1995, apply before January 1996, and be qualified when he turns 50 to transit to the pension scheme. The pension scheme is only abolished for new admission, so individuals receiving transition pension will remain on the assistance until they turn 60.

B Utilizing entire history of reforms in transition retirement pension

This paper studies the causal impact of a mother's retirement on the adult children's labor supply. It is endogenous determine who chooses to retire I therefore instrumenting the retirement decision with a reform in the retirement system. In the main analysis I use the abolition of the system, but Here I redo the main analysis, where I use the introduction, expansion, and abolition of the temporary transition pension system in Denmark. I use cohort 1931-1950 and compare the labor supply outcome of their adult children around event time.

The reduced form evidence, will when be a dynamic difference in difference regression. Papers such as Borusyak and Jaravel (2018), Sun and Abraham (2021), Callaway and

Figure B.1: Spillover effect on adult children: Income rank



Notes: The figure shows the effect of transition retirement reform on adult childrens income rank. The lines are the dynamic intention-to-treat estimates and it is based on running the reduced form estimate stated in equation B.1, and when taking the average over the different cohorts. It displays δ_j which captures the dynamic effect of mothers retiring between ages 50-59 compared to those who retire at age 60. The different panels show different labor supply outcomes. The 95% confidence intervals are based on robust standard errors clustered at the individual level.

Sant'Anna (2021), and de Chaisemartin and D'Haultfœuille (2020) have shown that a combined difference in difference will potentially put negative weights on some groups and some time period, and therefore the joint estimate potentially will be outside the convex hull of the individual average treatment effect. I will instead run a dynamic difference in difference as suggested in Wooldridge (2021). The idea is to find the group-specific treatment effect of the treated by running the following regression:

$$y_{it} = \sum_{c=1933}^{1946} \sum_{j \neq -1}^{T_c} \delta_{jc} D_{t=j} \cdot C_{i=c} + X_{it}\beta + \alpha_i + \nu_t + X_{it}\beta + \varepsilon_{it} \tag{B.1}$$

where y_{it} is the outcome of interest, income rank, D_t is the distance to treatment, C_i is mothers cohort, ν_t is year fixed effect, α_i is person fixed effect, X_{it} are controls, and it contains the fathers cohort interacted with year. I omit cohorts 1931, 1932, 1947, 1948, 1949, and use them as control cohorts. δ_{jc} is the coefficient of interest. It captures the effect of the mother potentially being on pension on her adult children's income in year t relative to the year -1.

B.1 The effect of increasing retirement age on adult children's income

Figure B.1 shows the effect of mothers' retirement on the adult children's income rank. I run regression B.1. The red line shows the average effect on the labor supply for those whose mothers can retire between age 50-59 compared to those whose mothers retire at age 60. The mother's retirement has a positive effect on adult children's income.

C Tables

Table C.1: Number of person on early retirement and transition retirement in different years

	Early retirement			Transition retirement
	Amount	Share between age 60-66	Share age 66	Amount
1994	113,734	0.30	0.40	12,780
1995	116,947	0.31	0.41	39,145
1996	125,150	0.33	0.43	44,891
1997	130,330	0.34	0.45	39,380
1998	142,073	0.37	0.47	33,691
1999	151,647	0.38	0.49	28,292
2000	156,260	0.39	0.51	23,307
2001	160,301	0.39	0.53	18,215
2002	163,498	0.38	0.52	13,438
2003	175,477	0.39	0.56	9,264
2004	172,881	0.37	0.58	5,483

Notes: The table reports the number of persons on Early retirement and transition retirement in 1994-2004. The (1) column correspond to the full number of person on early retirement. The (2) column correspond to the share of the full population between age 60 and 66, who is on early retirement pension. Column 3 correspond to the share of the full population age 66, who is on early retirement. Column (4) correspond to the number of person who receives transition retirement. All number correspond to the status in November.

Table C.2: Summary Statistics: Adult daughter

	Full sample	Selected sample	Treatment	Control	Diff.
Demographics					
Living Copenhagen	0.34	0.35	0.36	0.33	-0.03***
	(0.47)	(0.48)	(0.48)	(0.47)	(0.00)
Age	20.6	22.6	23.4	21.5	-1.94***
	(5.8)	(2.7)	(3.7)	(3.0)	(0.02)
Income rank, 1993					
Rank: 0-25	0.20	0.22	0.22	0.22	0.00
Rank: 25-50	0.32	0.26	0.26	0.25	-0.01*
Rank: 50-75	0.24	0.26	0.26	0.27	0.00
Rank: 75-100	0.24	0.26	0.25	0.26	0.01*
Observations	235,073	173,564	98,202	75,362	

Notes: The table reports the mean and the standard deviations in parenthesis of relevant variables for the adult daughter. Demographics are measured in 1993. The (1) column corresponds to the full sample. Column (2) the selected sample, and column (3) shows the average for the treatment group. Column (4) shows the average for the control group. (5) compare the mean between the control and treatment group. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table C.3: Summary Statistics: Adult sons

	Full sample	Selected sample	Treatment	Control	Diff.
Demographics					
Living Copenhagen	0.34	0.34	0.36	0.32	-0.03***
	(0.47)	(0.47)	(0.48)	(0.47)	(0.00)
Age	20.6	22.6	23.4	21.5	-1.90***
	(5.3)	(3.5)	(3.6)	(3.0)	(0.02)
Income rank, 1993					
Rank: 0-25	0.22	0.23	0.22	0.22	-0.00*
Rank: 25-50	0.31	0.25	0.26	0.25	-0.00
Rank: 50-75	0.24	0.26	0.26	0.26	0.00
Rank: 75-100	0.24	0.26	0.25	0.26	0.01*
Observations	246,148	182,240	103,137	79,103	

Notes: The table reports the mean and the standard deviations in parenthesis of relevant variables for the adult son. Demographics are measured in 1993, and high skilled is if the person ever gets at least a bachelor's degree. The (1) column corresponds to the full sample. Column (2) the selected sample, and column (3) shows the average for the treatment group. Column (4) shows the average for the control group. (5) compare the mean between the control and treatment group. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table C.4: Complier

	Relative Share
Mother, 1985	
Income: 1. quartile	1.058
Income: 2. quartile	1.200
Income: 3. quartile	1.141
Income 4. quartile	0.648
Working	0.955
Live in Copenhagen	0.820
Education: Less than long cycle	1.008
Education: Long cycle	0.341
Daughter, 1993	
Income: 1. quartile	1.250
Income: 2. quartile	0.937
Income: 3. quartile	0.977
Income 4. quartile	0.878
Working	0.934
Live in Copenhagen	0.794
Education: Less than long cycle	0.975
Education: Long cycle	0.296
Son, 1993	
Income: 1. quartile	1.054
Income: 2. quartile	0.991
Income: 3. quartile	0.998
Income 4. quartile	0.963
Working	0.987
Live in Copenhagen	0.831
Education: Less than long cycle	0.974
Education: Long cycle	0.276

Notes: The table reports the relative share of compliers with specific characteristics in comparison to the general population. The closer the value is to one, the more similar the general population and compliers are. A value above one implies that more compliers have the characteristics compared to the general population, and a value below implies that a lower share of the compliers has the characteristics compared to the general population.

Table C.5: RDD

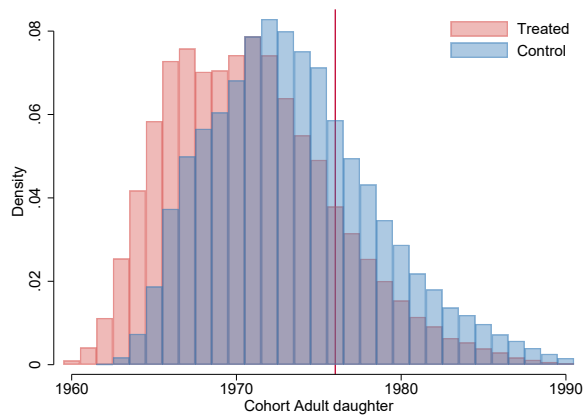
	Income rank		Mothers retirement	
	Daughter	Son	Daughter	Son
Treat	0.003***	0.002**	0.029***	0.028***
	(0.001)	(0.001)	(0.001)	(0.001)
Mean	0.522	0.519	0.104	0.101
N	1,477,554	1,545,010	1,477,554	1,545,010

Notes: The table reports the main estimate from an RDD regression. I utilize the period where the mothers of adult children are potentially treated with different retirement ages: Years 1996 to 2002. I estimate the change in the "outcome" at the discontinuity on January 1, 1947. I control for the year and the child cohort.

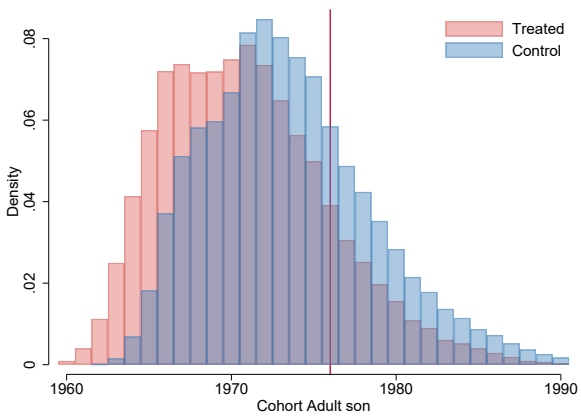
D Figures

Figure D.1: The distribution of the adult children's cohort split by the mothers' cohort

(a) Adult daughters cohort



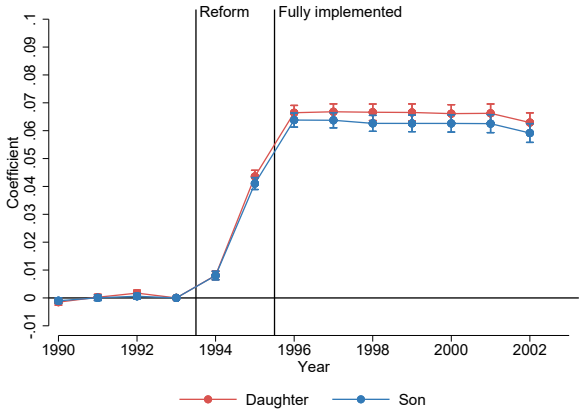
(b) Adult sons cohort



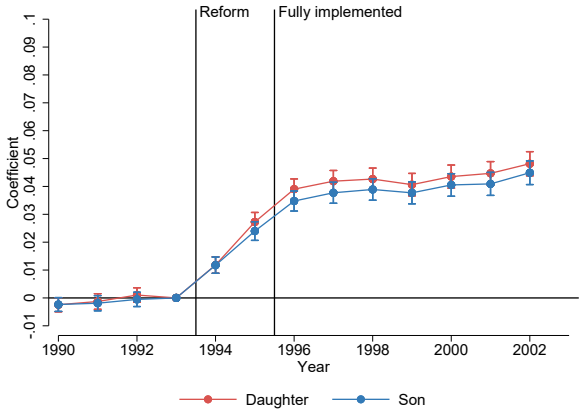
Notes: The figure shows the cohort of the adult children in the full sample split by the mothers' cohort. The blue histogram shows the frequency for the mothers born in 1947 and 1949. The red histogram shows the frequency for the mothers born in 1944 to 1946. The red line indicates that I do not use the data to the right of the red line.

Figure D.2: Direct effect, split by parents gender and adult children's gender

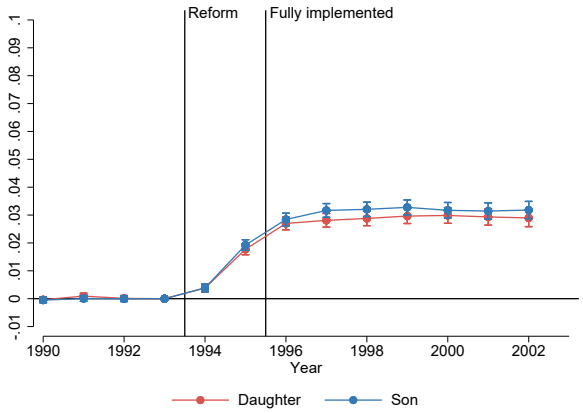
(a) Retirement, mother



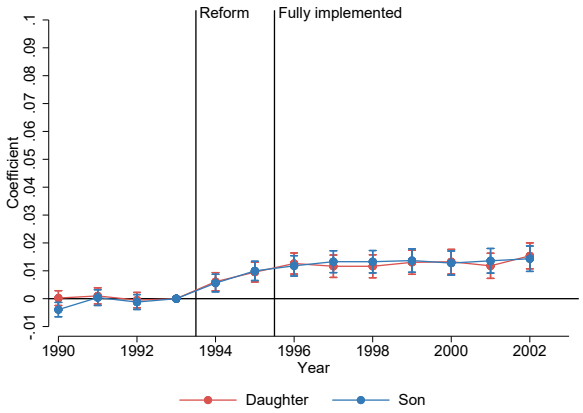
(b) Not working, mother



(c) Retirement, father



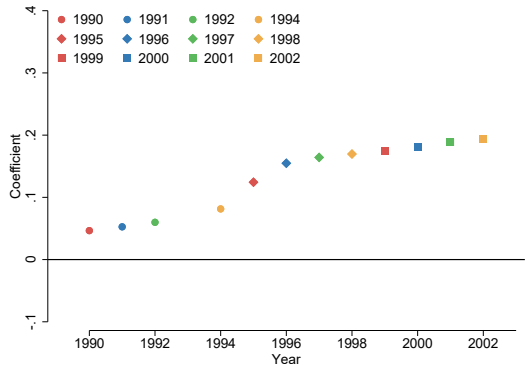
(d) Not working, father



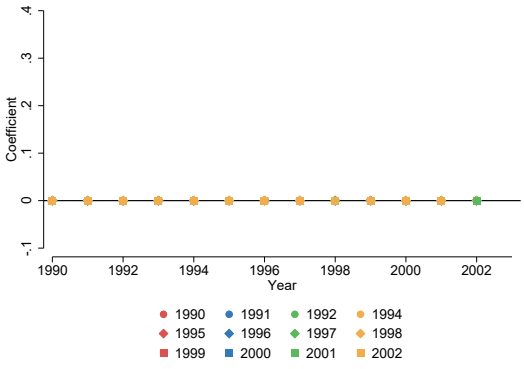
Notes: The figure shows the effect of transition retirement reform on mothers' labor supply. The line is the direct effect. It displays δ_j, which captures the dynamic impact of the retirement reform on people who can retire at age 50 compared to those who can retire at age 60. Panel (a) shows the effect on mothers retirement. Panel (b) shows the effect of mothers not working. Panel (c) and (d) show the same for fathers. The 95% confidence intervals are based on robust standard errors clustered at the individual level.

Figure D.3: First stage regressions, parameters

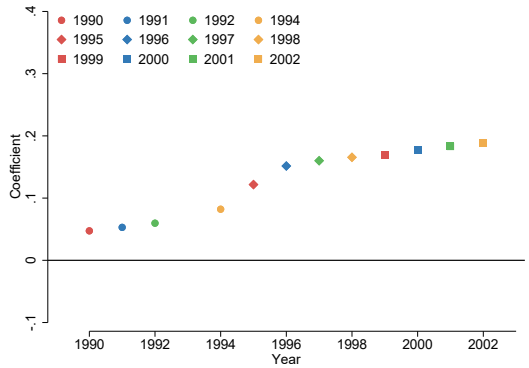
(a) Important, mother-daughter



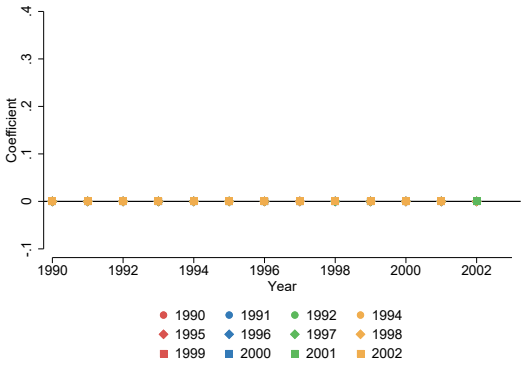
(b) Unimportant, mother-daughter



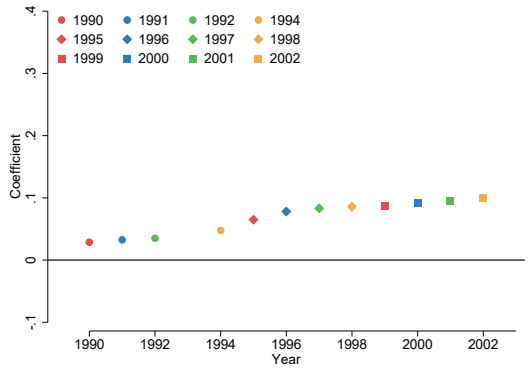
(c) Important, mother-son



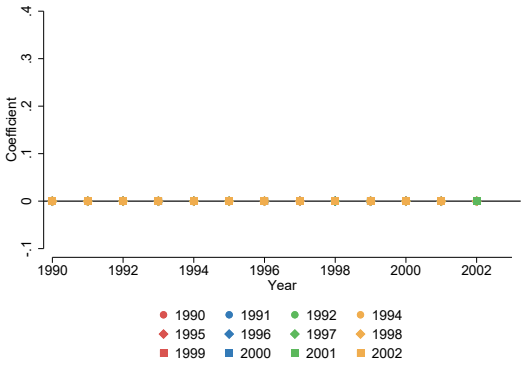
(d) Unimportant, mother-son



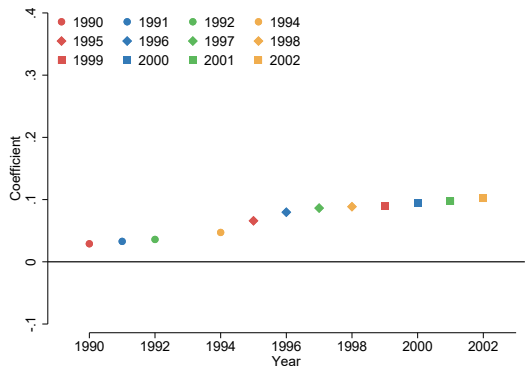
(e) Important, father-daughter



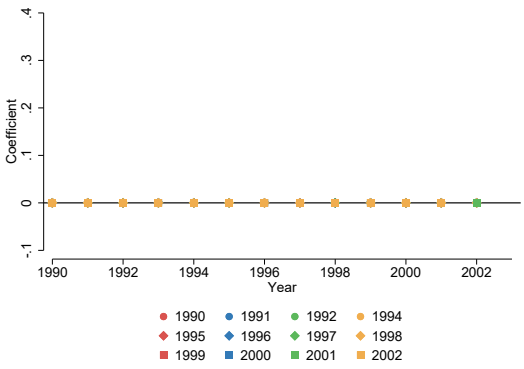
(f) Unimportant, father-daughter



(g) Important, father-son

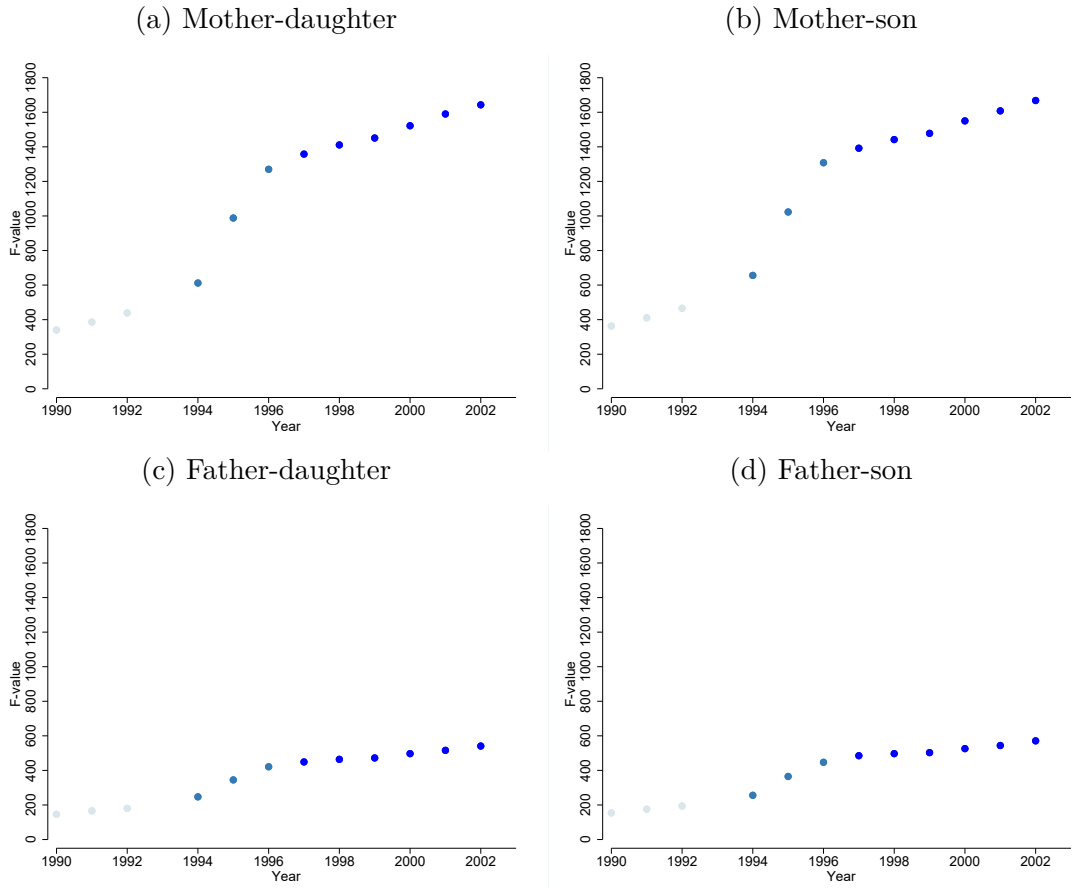


(h) Unimportant, father-son



Notes: The figure shows the coefficient from all the first stage regressions in order to show which coefficient is important about each prediction. The first column shows the parameters that is important about predicting the outcome. It shows γ_{jc}, and the second column shows the parameter that is not important

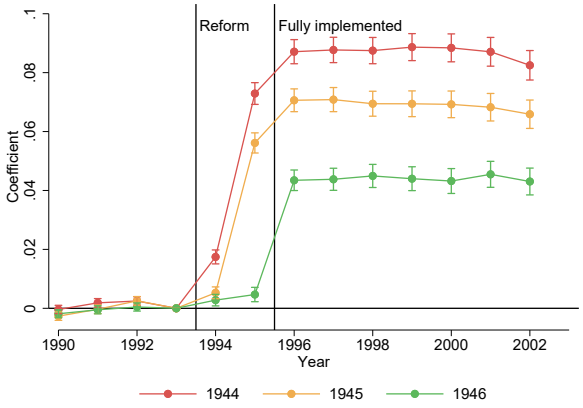
Figure D.4: F statistic from first stages



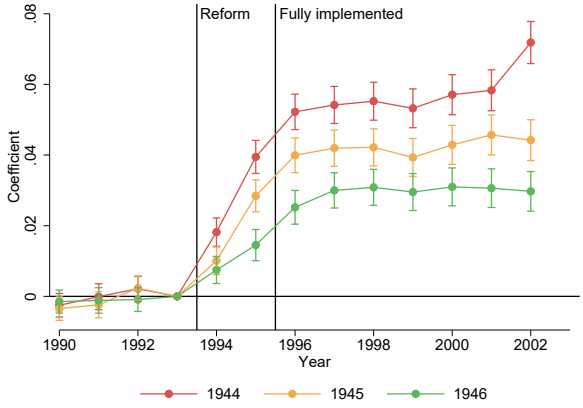
Notes: The figure shows the F statistics from all the first-stage regressions. The light blue color corresponds to before the reform. The medium blue color corresponds to the introduction period. The dark blue color corresponds to after the reform is fully implemented

Figure D.5: Direct effect and spillover effect split by mothers cohort

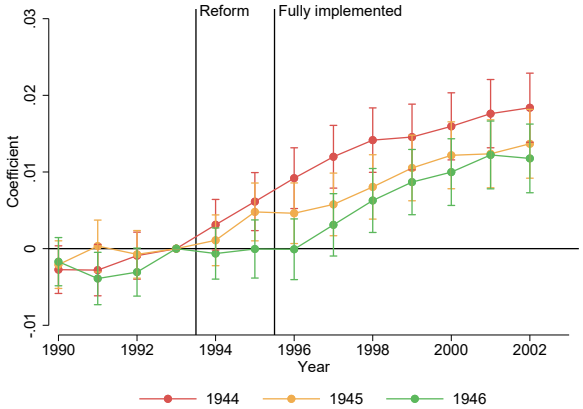
(a) Mothers Retirement



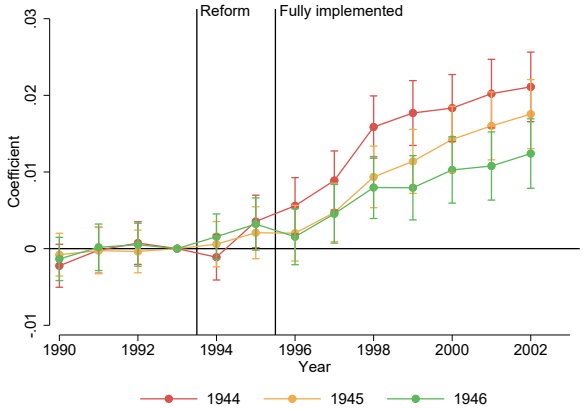
(b) Mother not Working



(c) Daughters Income rank

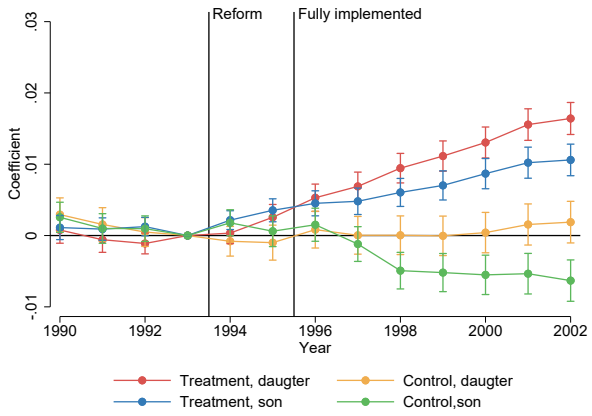


(d) Sons Income rank



Notes: The figure shows the effect of transition retirement reform on mothers' own labor supply and the spillover effect split by the mothers cohort. Panel (a) shows the effect on mothers retirement. Panel (b) shows the effect on not working. Panel (c) shows the effect on the daughters income rank. And panel (d) shows the effect on the sons income rank. The 95% confidence intervals are based on robust standard errors clustered at the individual level.

Figure D.6: Spillover effect on adult childrens income rank split by treatment and control group

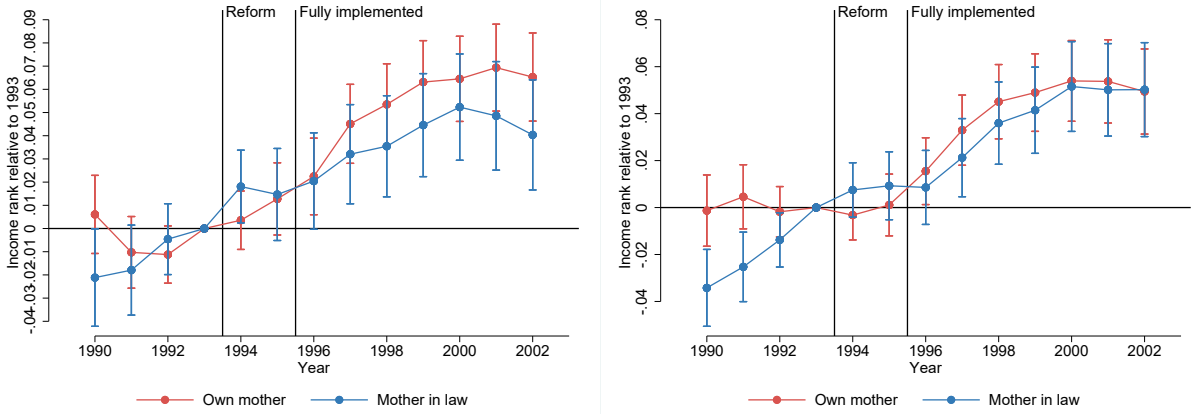


Notes: The figure shows the effect of transition retirement reform on adult childrens income rank split by whether the adult child is in the treatment- or control group. The 95% confidence intervals are based on robust standard errors clustered at the individual level.

Figure D.7: Impact of mother's retirement on the adult Children's Income rank for those with children in the period

(a) Daughter

(b) Son

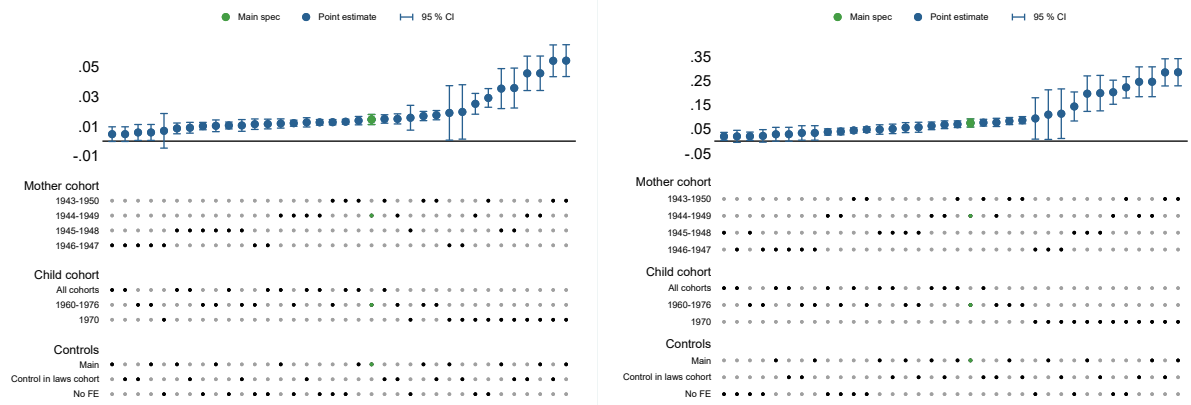


Notes: The figure depicts the effects of the transition retirement reform on adult children income. The lines represent the intention-to-treat estimates, illustrating δ_j, which captures the dynamic impact of mothers retiring at age 50 compared to those retiring at age 60. The figure is made based on those who had their first child between 1994 and 2002. The 95% confidence intervals are calculated using robust standard errors, clustered at the individual level.

Figure D.8: Effect of mother's retirement on the adult Children's Income rank in 2002, robustness

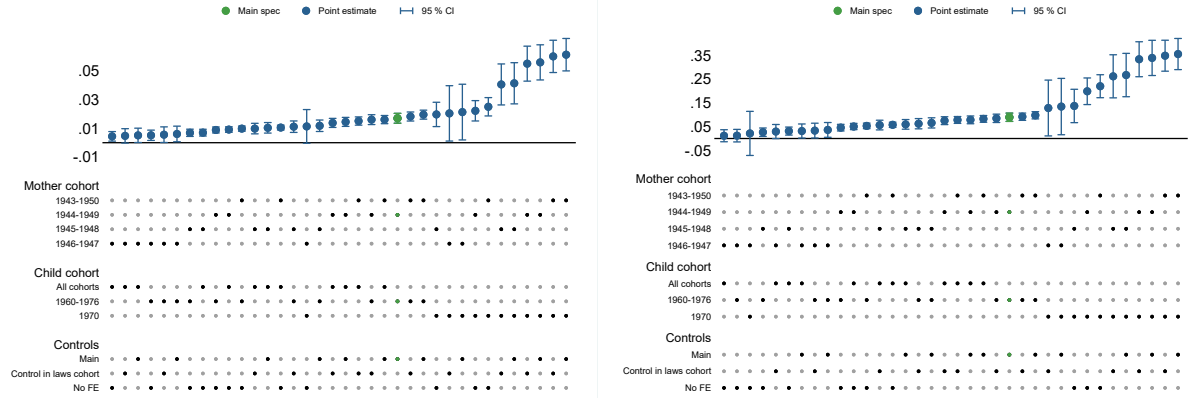
(a) Daughter, Reduced form

(b) Daughter, IV



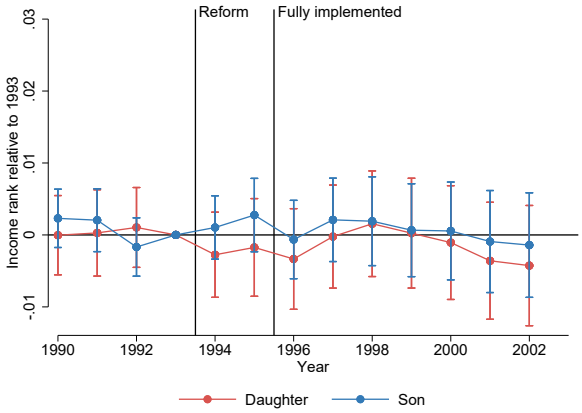
(c) Son, Reduced form

(d) Son, IV



Notes: The figure illustrates the effect of the transition retirement reform on the adult children's income rank, considering various sample selection criteria and controls. The dots represent either the IV estimates or the reduced form estimates in 2002. Panels (a) and (b) present the effect for adult daughters, while panels (c) and (d) show the effect for adult sons. The 95% confidence intervals are derived from robust standard errors clustered at the individual level.

Figure D.9: Placebo: Not in-laws in period, Income rank

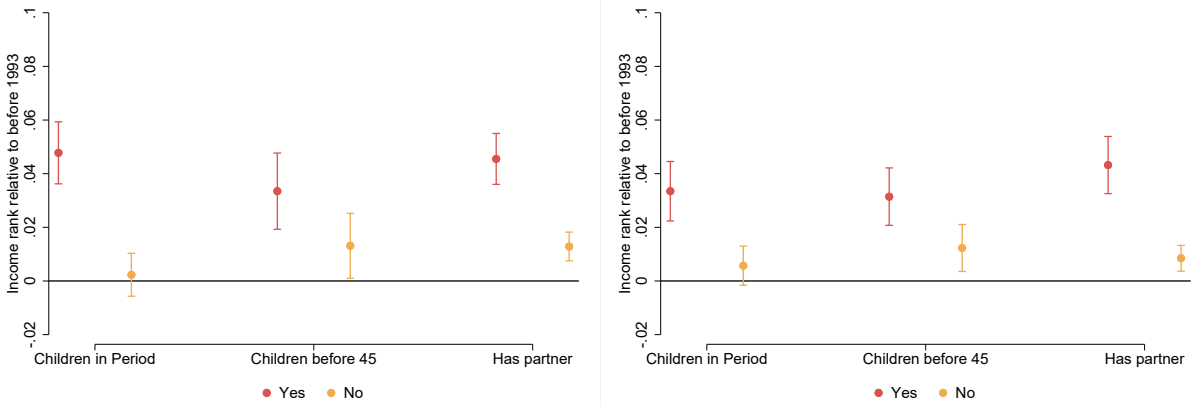


Notes: The figure presents the impact of the transition retirement reform on the adult children's income rank. The lines depict the dynamic intention-to-treat estimates, derived from the reduced form estimate. It showcases δ_j, capturing the dynamic effect of mothers retiring between ages 50 compared to those retiring at age 60. This figure explores the effect using mothers-in-law instead of mothers, specifically those mothers-in-law who do not have a grandchild during the period. The 95% confidence intervals are computed based on robust standard errors clustered at the individual level.

Figure D.10: Impact of mother's retirement on the adult Children's Income rank, robustness to different definition of children

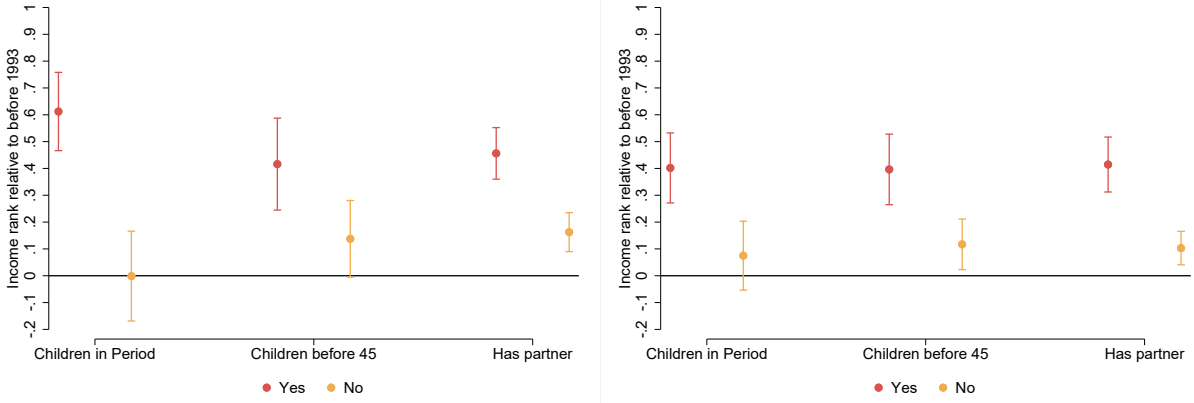
(a) Daughter, reduced form

(b) Son, reduced form



(c) Daughter, IV

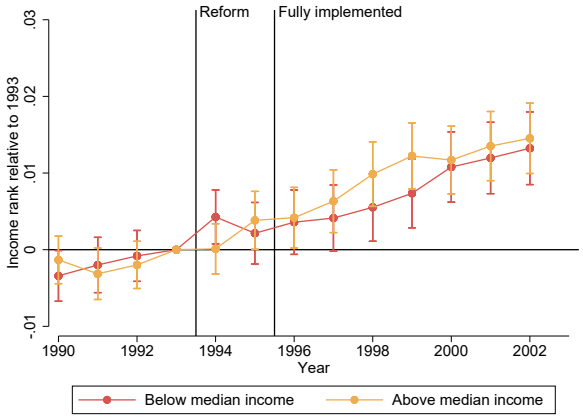
(d) Son, IV



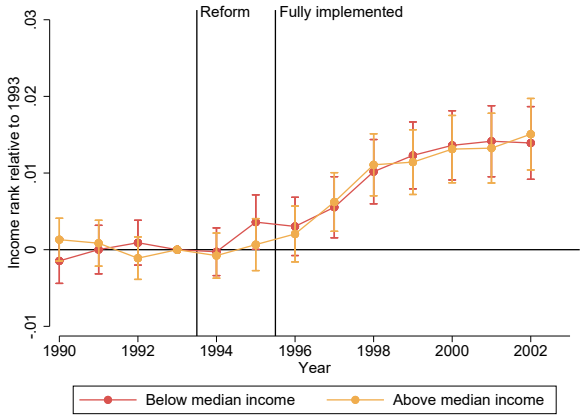
Notes: The figure depicts the effects of the transition retirement reform on labor income rank, categorized based on different family responsibilities. The lines represent the coefficient from a difference in difference regression, which captures the impact of mothers retiring at age 50 compared to those retiring at age 60. Panels (a) and (c) present the effect adult daughter, while panels (b) and (d) present the effect on adult sons. The 95% confidence intervals are calculated using robust standard errors, clustered at the individual level.

Figure D.11: Impact of mother's retirement on the adult Children's Income rank, split by mothers prereform income

(a) Daughter



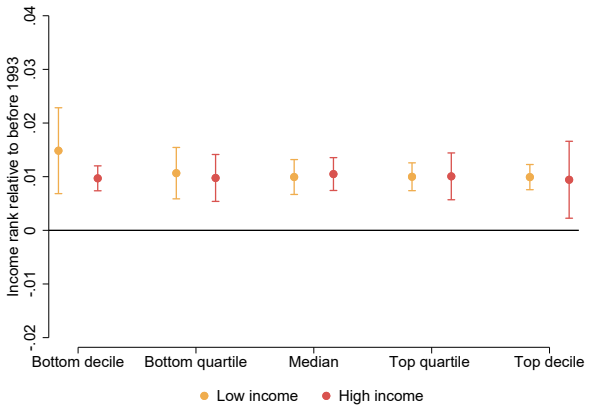
(b) Son



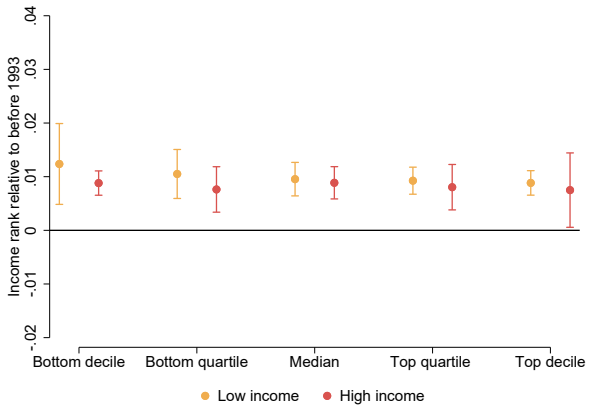
Notes: The figure depicts the effects of the transition retirement reform on labor income rank, categorized based on whether the adult childrens mothers income is above or below the median income in 1985. The lines represent the dynamic intention-to-treat estimates, illustrating δ_j, which captures the dynamic impact of mothers retiring at age 50 compared to those retiring at age 60. Panels (a) shows the effect for adult daughter, while panels (b) shows the effect for adult sons. The 95% confidence intervals are calculated using robust standard errors, clustered at the individual level.

Figure D.12: Impact of mother's retirement on the adult children's Income rank, robustness to different split in mothers pre reform income

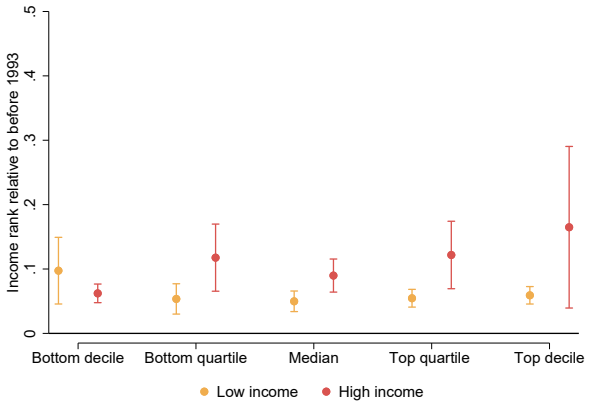
(a) Daughter, reduced form



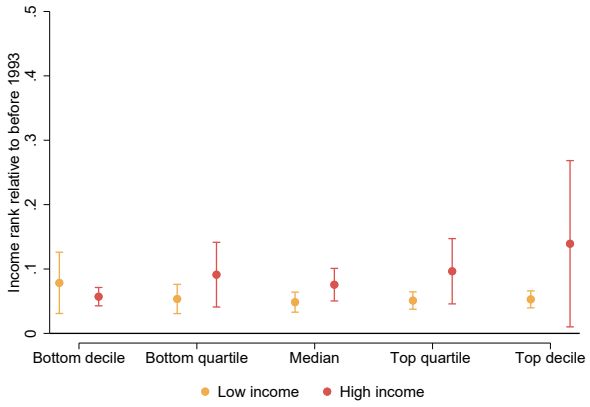
(b) Son, reduced form



(c) Daughter, IV



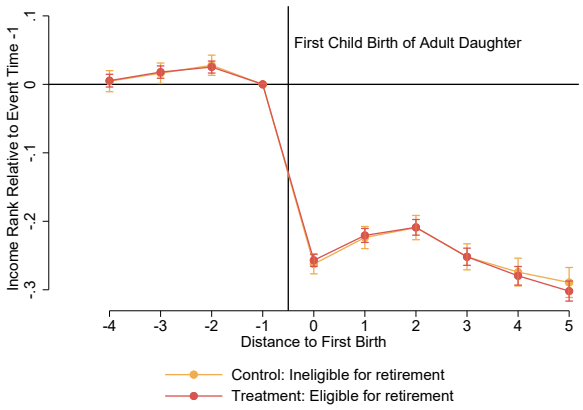
(d) Son, IV



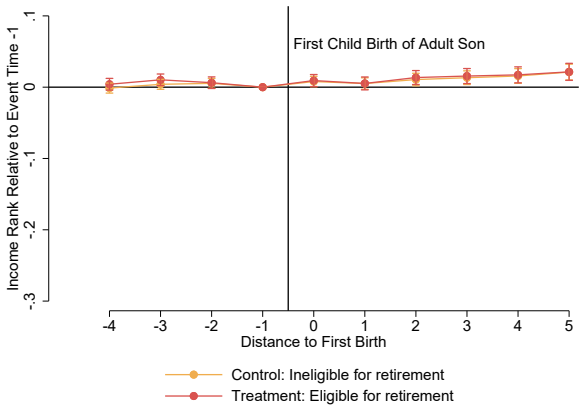
Notes: The figure depicts the effects of the transition retirement reform on labor income rank, categorized based on different split in mothers income in 1985. The lines represent the coefficient from a difference in difference regression, which captures the impact of mothers retiring at age 50 compared to those retiring at age 60. Panels (a) and (c) present the effect adult daughter, while panels (b) and (d) present the effect on adult sons. The 95% confidence intervals are calculated using robust standard errors, clustered at the individual level.

Figure D.13: Placebo: Parenthood penalty in income rank split by whether the grandmother is eligible for retirement

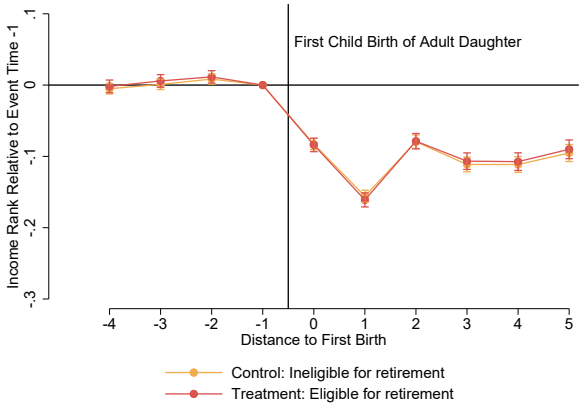
(a) Both groups eligible for retirement, Daughter



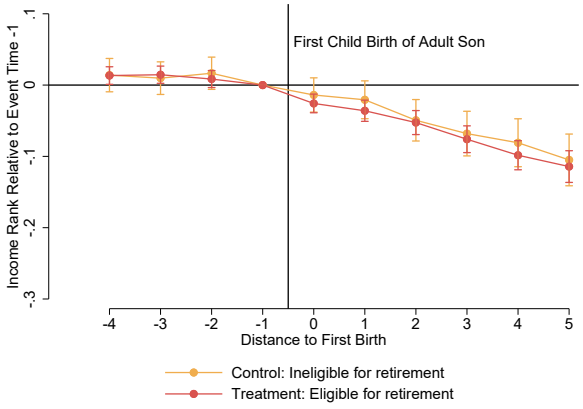
(b) Both groups eligible for retirement, Son



(c) No groups eligible for retirement, Daughter

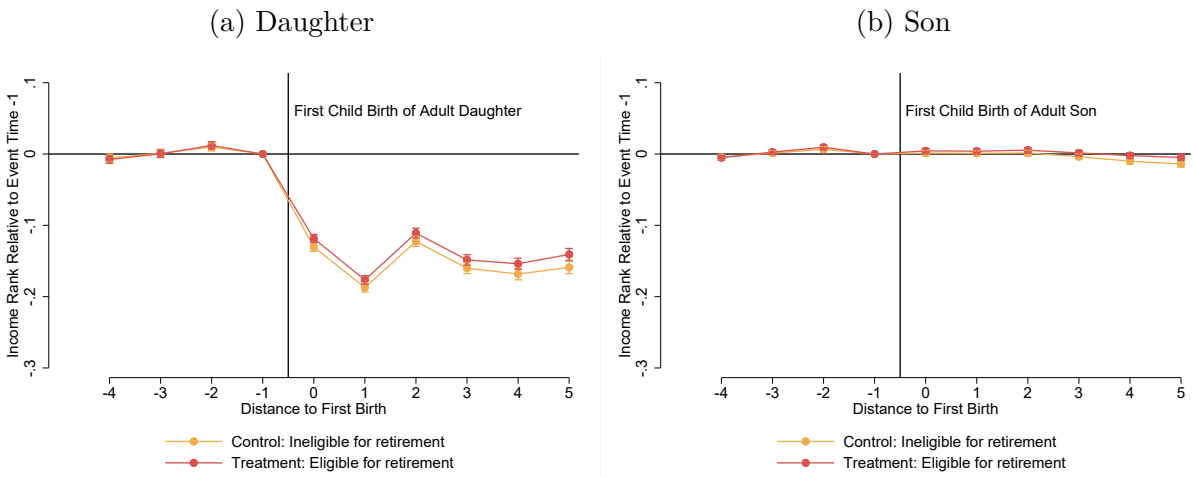


(d) No groups eligible for retirement, Son



Notes: The figure displays event time coefficients for different birth years of the grandmother. The treatment group, eligible for retirement, consists of individuals born in 1944-1946, while the control group, ineligible for retirement, comprises those born in 1947-1949. Panels (a) and (c) present the effect on adult daughter, while panels (b) and (d) present the effect for adult sons. Specifically, in panels (a) and (b) present the effect for those adult children who get their first child after 2009 and 2012, and panel (c) and (d) present the effect for those adult children who get their first child between 1985 and 1988. The 95% confidence intervals are calculated using robust standard errors, clustered at the individual level.

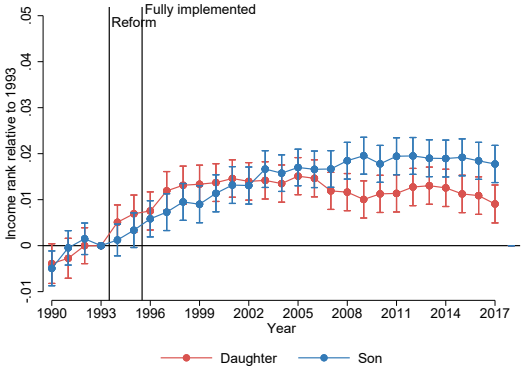
Figure D.14: Parenthood penalty in income rank split by whether the mother-in-law is eligible for retirement



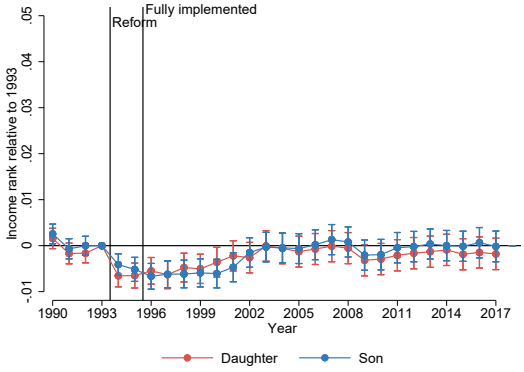
Notes: The figure displays event time coefficients for different birth years of the grandmother. The treatment group, eligible for retirement, consists of individuals born in 1944-1946, while the control group, ineligible for retirement, comprises those born in 1947-1949. The 95% confidence intervals are calculated using robust standard errors, clustered at the individual level.

Figure D.15: Long run effect

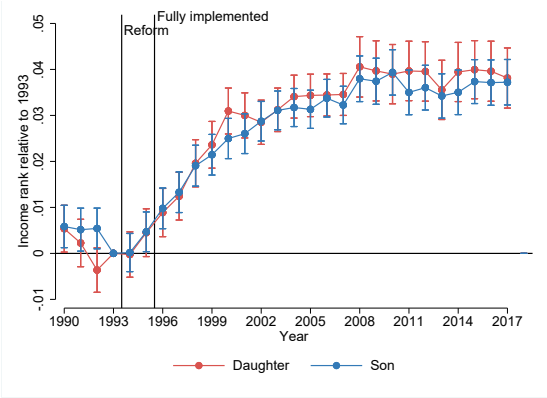
(a) Hourly wage rank



(b) Saving



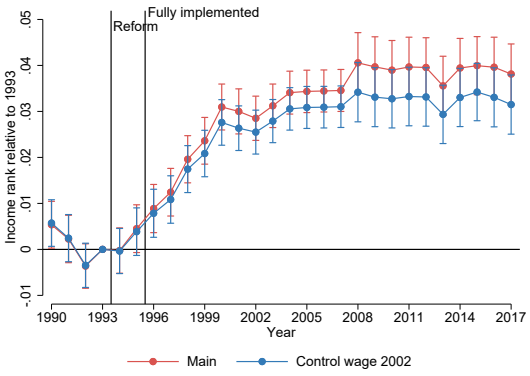
(c) Full time



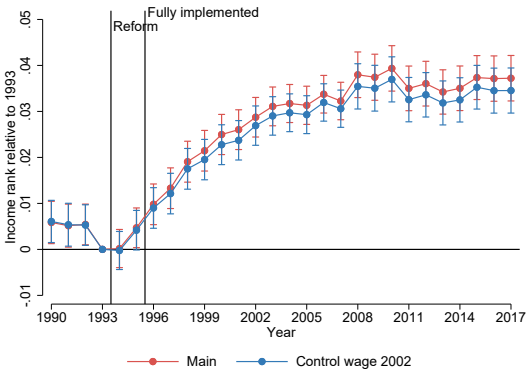
Notes: The figure shows the effect of transition retirement reform on different labor supply outcomes. The different panels show different labor supply outcomes. Panel (a) shows the effect of hourly wage rank. Panel (b) shows the effect on saving. And panel (c) shows the effect on working full time. The 95% confidence intervals are based on robust standard errors clustered at the individual level.

Figure D.16: Long run effect on full time employment, control for wage in 2002

(a) Daughter



(b) Son



Notes: The figure shows the effect of transition retirement reform on the probability to work full time, both in my main specification, and where I control for the wage in 2002. Panel (a) shows the effect for adult daughter, while panel (b) shows the effect for adult sons. The 95% confidence intervals are based on robust standard errors clustered at the individual level.