

Pension Caregiver Credits and the Gender Gap in Old-Age Income

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Large Gender Disparities in Old-Age Income

- Gender gap in pensions: 28% in OECD, 45% in Germany
- In most countries, pension income depends on lifetime earnings
- Women's earnings are lower due to
 - 1 Fewer hours worked (e.g., career breaks: Bertrand et al. 2010)
 - 2 Lower wage per hour worked (e.g., role of flexible jobs: Goldin and Katz 2016)
- Family caregiver responsibilities can affect both 1 and 2 (Kleven et al. 2018)

Policy Instrument: Caregiver Credits

- Assign a value to caregiving work used as part of pension benefit calculations
- Objective: Improve old-age benefits for caregivers (little evidence)
- Well-established component of public pension programs in OECD (Germany, UK, France, Sweden)
- Limited evidence on the impact of these policies Artmann et al. (2023), Becker et al. (2022)
 - Generally, literature focuses on close-to-retirement and retired individuals, less so on prime-age workers and mothers Chetty et al. (2014), Lalive and Stabuli (2015) + many others

This paper

Research Questions: how does pension caregiver credits

- affect mothers' pension income and pre-retirement labor market outcomes?
- compare to non-retirement-focused policies for promoting mothers' employment?

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Quasi-experimental evidence: 2001 pension reform in Germany

- DiD design comparing eligible to ineligible mothers of older children before and after reform: 50% ↑ in pension contributions

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Quasi-experimental evidence: 2001 pension reform in Germany

- DiD design comparing eligible to ineligible mothers of older children before and after reform: 50% \uparrow in pension contributions

Structural lifecycle model:

- predict the long-run effects of the reform (e.g., old-age gender gap)
- labor elasticity: sensible to current income, less so to future retirement income
→ more efficient to cut taxes than provide caregiver credits

Background

German Pension Insurance Scheme

- 85% use mandatory state pension system, pay-as-you-go scheme
 - Around two-thirds of gross household income of retirees
- Paid equally by employer and employees (18.6% total)
 - Exempted: marginal employment “minijobs” < €520 per month

gender gaps

German Pension Insurance Scheme

- Pension amount depends on 1) pension points, 2) retirement age, 3) current pension value
- Each year, pension points are accumulated based on individual earnings
 - 1 pension point corresponds to national average earnings (can earn up to 2)
 - In 2015, one pension point was worth €348 per year in pension income
 - Working 40 years at the average earnings level → $€348 \times 40 = €13,920$
- Retirement age: 65 year old (or 63 + 45 years of contributions)

German Pension Insurance Scheme

- If married:
 - Pension rights belong to spouse who acquired them
 - No spousal pension
 - Widow(er)'s pension: 25-55% of pension of spouse

gender gaps

2001 Pension Caregiver Credits Reform

Introduction of caregiver credits for mothers of child aged 3 to 10 in 2001

- If working, credits increased by 50 percent
 - if 0.6 points without reform \rightarrow 0.9 ($= 0.6 \times 1.5$) points with reform
- However, limit of 1 pension point in total (\approx national average earnings)
 - if 0.8 points without reform \rightarrow 1 ($< 0.8 \times 1.5$) point with reform
- If two or more children, one of which under the age of 10, then she receives an additional one-third of a pension point if she does not work

Data

Data: BASiD

BASiD: Biographical Data of Social Insurance Agencies in Germany, years 1951 - 2009:

- 1% (600,000) random sample of the population of the German Pension Insurance
- Entire work history linked to pension accounts
- Yearly panel of pension contributions
- Includes children's date of birth
- Cannot observe couples

Summary statistics

Difference-in-Differences Design

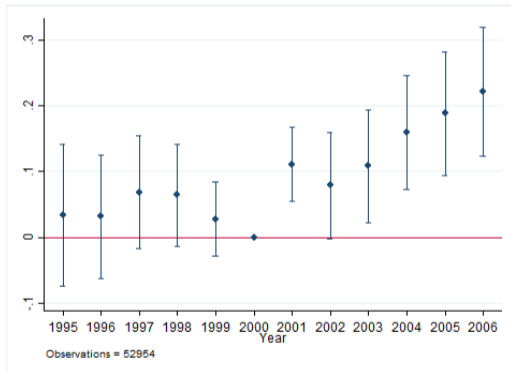
$$y_{it} = \sum_{j \neq 2000} \alpha_j \text{Year}_{t=j} + \beta \text{Age3to10}_i + \sum_{j \neq 2000} \gamma_j \cdot \text{Year}_{t=j} \cdot \text{Age3to10}_i + X_i \phi + \epsilon_{it} \quad (1)$$

- Age3to10_i takes value 1 for mothers i with a child between 3 and 10 years old and 0 for “rich” mothers with a child between 15 and 20 years
 - Credits are provided *retroactively* for eligible caregiving periods of all mothers with children after 1992
 - Retroactive crediting may have affected treatment group as well (lower bound)
- X_i is the set of demographic controls: age of child, age of mother, region of birth, employment characteristics of mother prior to childbirth
- **Identifying Assumption:** Parallel trends in employment outcomes assumptions

Results

Effect on Pension Contributions

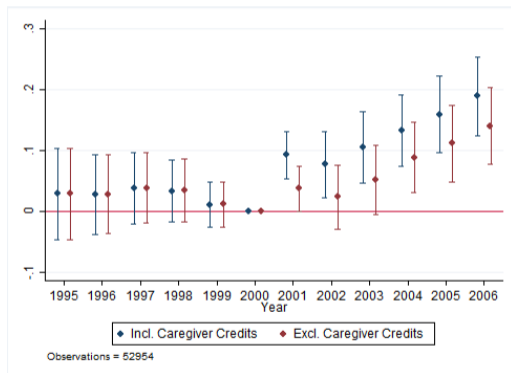
Figure: Total Pension Earning Points (Incl. Caregiver Credits)



- 65%↑ in total pension points including caregiver credits
- Baseline mean = .26

Decomposition of the Effect: Mechanical vs. Behavioral

Figure: Total Pension Contributions



- 66% of the total effect can be explained by changes in employment earnings

Decomposition of Increase in Earnings

Increase in total employment earnings:

- 1 Earnings conditional on working
 - No change in earnings if working **intensive**
 - Limited change in hours worked **hours**

Decomposition of Increase in Earnings

Increase in total employment earnings:

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- No change in earnings if working **intensive**
- Limited change in hours worked **hours**

2 Increase in employment and pension insurance participation

- 7.15pp increase in all employment **employment**
- 8.8pp decline in marginal employment conditional on working **minijob**

heterogeneity

Model

Life-cycle model: investigate long-run effects of caregiver credits

Model overview:

- Choices: consumption, savings, (discrete) labor supply
- States: age, assets, pension credits, wages (heterogeneous profiles), pension rules
- Utility: value consumption and leisure
- Retirement age and death: deterministic and exogenous

Missing:

- Marginal employment (mini-jobs): to be added
- Human capital accumulation, wage uncertainty, fertility

model details

Estimation of the structural model: two-step procedure

- 1 Set parameters directly from the data or from the literature
- 2 Remaining parameters: match short-term empirical effects + average labor supply measures
 - Indirect inference method: minimize square distance between simulations and data

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Table: Model parameters and fit

Parameter	Value	Target statistics		
		Name	Data	Model
Discount rate (δ)	1.67%	Effect of reform on employment	0.07	0.07
Fixed cost of working (q)	0.09	Employment rate	0.65	0.65
Weight on leisure (β)	0.48	Work full time	0.31	0.31

Results of the structural model

Table: Elasticities of labor supply using different experiments

	Change in gross wages	Change in income tax rate
Marshallian elasticity of labor supply	0.815	0.702

NOTES: All the elasticities are computed for the same change in net wages.

Results of the structural model

Table: Elasticities of labor supply using different experiments

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Table: Lifecycle model: counterfactual experiments

	Pension gender gap	Women's labor participation	Welfare gains wrt baseline (euros)
Baseline	0.459	0.649	0.0
Caregiver credits	0.426	0.721	4364
Lower income taxes	0.451	0.755	6545

NOTES: The experiments in the last two rows imply the same government deficit of 225 euros. Welfare gains = equivalent transfer in baseline model at age 30.

Conclusions

- We study the effects of pension caregiver credits on mothers' retirement income and employment outcomes
- 65% increase in annual pension points earned while child is 3-10
- Over 2/3 of the increase comes from an increase in employment earnings
 - Extensive margin: increase in regular employment through new entry and upgrading from marginal jobs
- Model suggests (preliminary):
 - 7% decrease in gender pay gap in old-age
 - Income tax cut would have been more effective

Gender Gap in Pensions in Germany

- In Germany, women receive around half the pension income as men do
- Due to gaps in labor force and lower contributions
 - In 2018, nearly 47% of women work part-time
 - 21% lower gross hourly wages relative to men
 - Women lose as much as 60% of their pre-child birth earnings and this effect is persistent up to 20 years after the birth of the child

Kleven et al. (2019)

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Non-targeted moments

Table: Non-targeted moments

	Source	Data	Model
● Wealth effect on earnings	Artmann et al. (2023)	-5.1	-2.30
Pension points	Data	0.15	0.19
Work full time	Data	0.045	0.06

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Model

Individual maximizes lifetime utility:

$$V_t(A_t, EP_t, t|\alpha) = \max_{c_t, h_t, EP_{t+1}, A_{t+1} \geq 0} \left\{ u(c_t, h_t) + \frac{1}{1 + \delta} V_{t+1}(A_{t+1}, EP_{t+1}, t + 1|\alpha) \right\} \quad (2)$$

where period utility is

$$u(c_t, h_t) = \frac{c_t^{1-\gamma_c}}{1-\gamma_c} - \beta \frac{h_t^{1+\frac{1}{\gamma_h}}}{1+\frac{1}{\gamma_h}} - q\mathcal{I}(h_t > 0) \quad (3)$$

- Choice variables: consumption c_t and hours worked $h_t \in \{0.0, 0.5, 1.0\}$
- State variables: assets A_t , pension earning points EP_t , and child of age t .
- Fixed effect α determines earnings.

Model: Pre-Retirement Budget Constraint

Prior to retirement ($t \leq T_{ret}$):

$$A_{t+1} = (1 + r)A_t + w(\alpha)h_t - c_t + Y_t \quad (4)$$

- r is the interest rate
- Y_t is unearned income (e.g. spouse's income)

Law of motion for pension earning points:

$$EP_{t+1} = EP_t + f_t(w(\alpha)h_t) \quad (5)$$

$$f_t(x) = \frac{1}{w(\alpha)\bar{h}} \begin{cases} \max\{\min\{1.5x, 1\}, x\} & \text{if } t \in [3, 10] \text{ and reform} \\ x & \text{else} \end{cases} \quad (6)$$

Model: Retirement Budget Constraint

During retirement ($t > T_{ret}$):

$$A_{t+1} = (1 + r)A_t + \rho EP_{T_{ret}} - c_t + Y_t \quad (7)$$

- $EP_{T_{ret}} = \sum_{t=0}^{T_{ret}} EP_t$ pension benefits
- ρ monetary value of pension points (€348)
- Individuals die deterministically at $t = T$

Identifying Assumption

Parallel trends in employment outcomes of treated and control mothers

- Policy change occurred as part of “Riester Reform”
 - Introduced private funded pensions and strengthened occupational pensions
 - However, adopted nationally and did not depend on the ages of children
- Childcare reforms
 - In 1996 law mandated right to attend a pre-school for all 3-6 year olds
 - Only affected 3-year-old children as older children were already attending pre-school
- Maternity leave reforms
 - In 1992: 24 months of paid leave and extended to 36 months of job protection
 - Would observe diverging pretrends as early as 1996
 - No change during our sample period

Summary Statistics

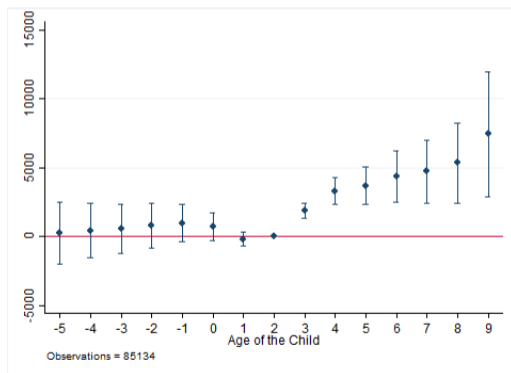
Table: Summary Statistics of Mothers with Child Aged 3-10, 2000

	Mean	SD	Observations
Age	35.22	5.37	4583
Lifetime Earning Points	5.44	5.57	4583
Annual Earning Points	0.26	0.43	4583
Total Earnings	6108.98	9978.38	4583
Total Earnings (>0)	15819.30	10209.26	1659
Any Employment (Incl. Marginal)	0.64	0.48	4583
Regular Employment	0.39	0.49	4583
Marginal	0.40	0.49	2966
Fulltime	0.31	0.46	2943

When Do Mothers Respond?

Exploit panel structure to estimate event-study based on when child turns 3: [details](#)

Figure: Dynamic Effects on Employment Earnings



Who Are the Most Affected Mothers?

- Access to childcare
- Marital Status
- Pre-Birth Earnings

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Who Are the Most Affected Mothers?

- Access to childcare
 - No differential effect by childcare availability [Childcare](#) [Additional Adult](#)
- Marital Status
- Pre-Birth Earnings

[back](#)

Who Are the Most Affected Mothers?

- ~~Access to childcare~~
- Marital Status
 - No differential effect by marital status Marital Status
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[back](#)

Who Are the Most Affected Mothers?

- Access to childcare
- Marital Status
- Pre-Birth Earnings
 - Results driven by mothers above the median in pre-birth earnings distribution:
 - ↑ Earning points and total earnings Points and Earnings
 - ↑ Employment Employment
 - ↓ Marginal and also ↑ full-time Marginal and Full-time
 - Mechanism: ↑ Same firm as prior to birth Same Firm and Occupation

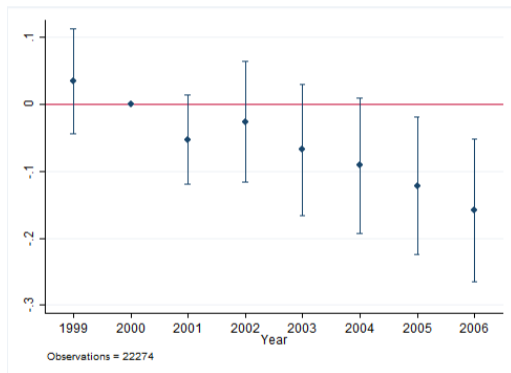
Marginal Employment

Marginal Employment (“Minijobs”)

- Special part-time position max of 520 euros per month
- Workers are exempt from social insurance contributions (health, pension, UI)
- Married women account for 60% of marginal employment
 - Health insurance from spouse
- Wide variety of jobs including salesperson, administrative support, physical therapists, cleaning staff, etc.

Marginal Employment

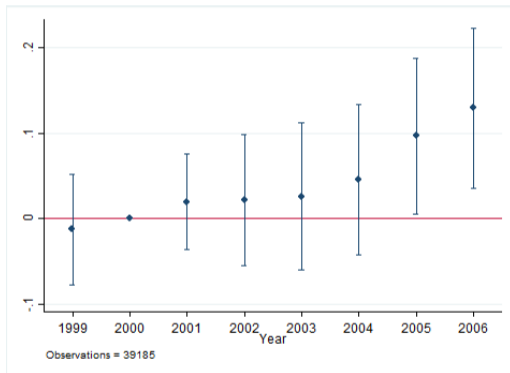
Figure: Marginal Employment (Cond. on Working)



- 8.8pp or 22% decline in marginal employment (baseline mean 40%) [back](#)

Employment

Figure: Employment



- 7.15pp or 11% increase in any employment (baseline mean 65%)

Alternative Empirical Strategy: Within-Person Event Study Analysis

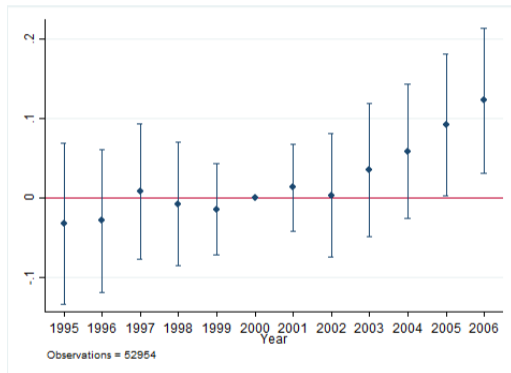
Within-person analysis and exploit differences in timing of when the child turns three:

$$y_{it} = \sum_{j \neq 2} \alpha_j \cdot \text{TimeSinceAge3}_{t=j} + \sum_{j \neq 2} \beta_j \cdot \text{TimeSinceAge3}_{t=j} \cdot \text{Treat}_i + \delta_i + \psi_t + X_{it}\phi + \epsilon_{it} \quad (8)$$

- TimeSinceAge3_t denotes years relative to when child turns three
- Treat takes value 1 for mothers of children born between 1998 and 2002 (age 3 or younger in 2001), and 0 for mothers of children born between 1981 and 1990 (age 11 or older in 2001)
 - No issue with retroactive crediting because announcement occurred in 2001
- X_i is the set of demographic controls
- δ_i individual FE
- ψ_t year FE

Effect on Labor Supply

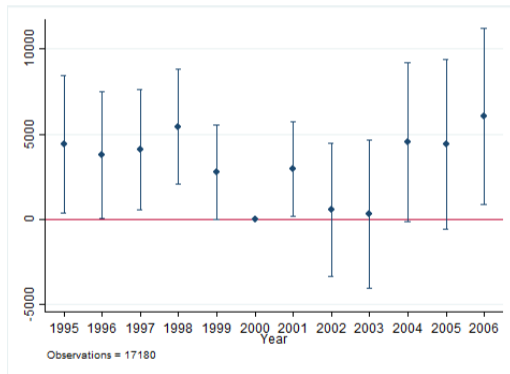
Figure: Regular Employment



- 6.63pp or 17% increase in employment (baseline mean = 39%)

1. Effect on Total Employment Earnings Conditional on Working

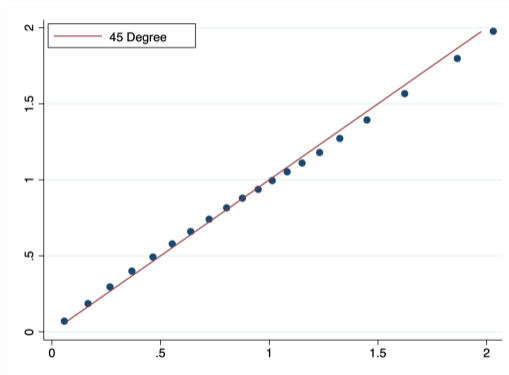
Figure: Total Conditional Employment Earnings



back

Imputed vs Actual Earning Points

Figure: Imputed vs. Actual Earning Points



Notes: Estimated earning points are calculated by dividing total annual earnings by average total annual earnings across all workers in the BASiD. Actual earning points are reported total earning points associated with employment spells.

2. Effect on Labor Supply

Figure: Full-Time (Conditioned on Working)

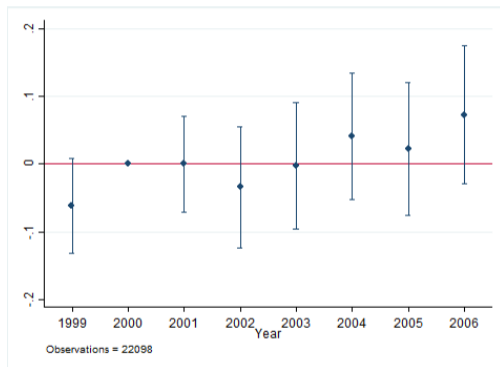


Figure: Working at Same Firm as Prior to Birth

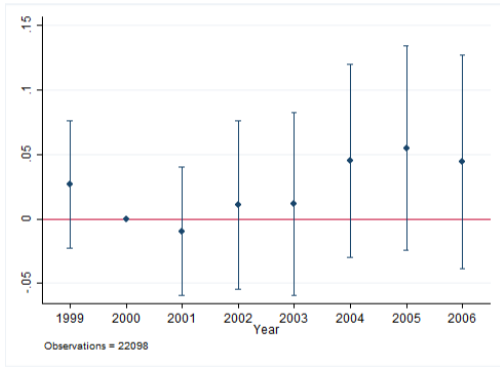
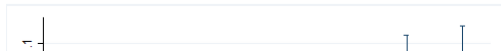


Figure: Working in Same Occupation as Prior to Birth



Heterogeneity by Pre-Birth Earnings

Figure: Total Earning Points

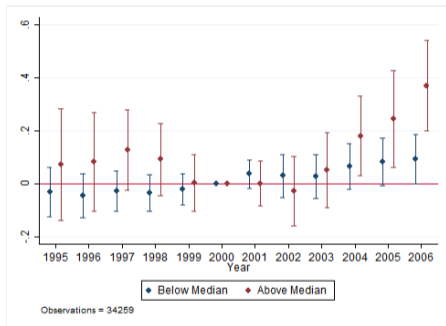
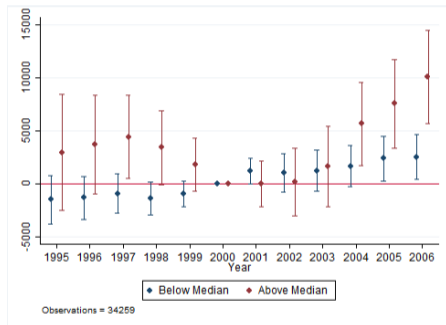


Figure: Total Non-Marginal Employment Earnings



For high income mothers:

- \approx 50% increase in total earning points and employment earnings for high wage women

Heterogeneity by Pre-Birth Earnings: Employment

Figure: Non-Marginal Employment

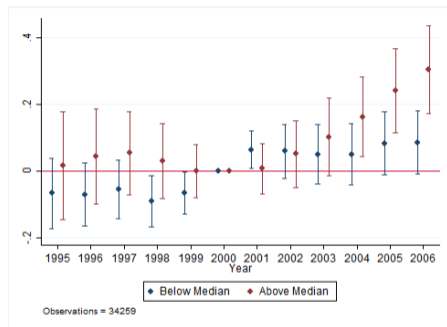
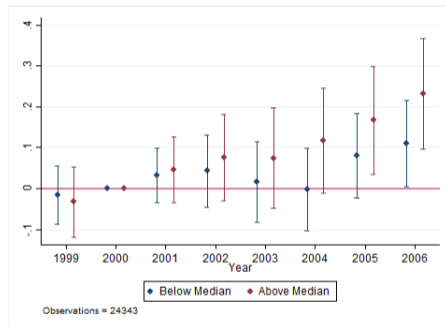


Figure: Employment (Marginal and Non-Marginal)



For high income mothers:

- 50% increase in employment
- 20% increase in overall employment

Heterogeneity by Pre-Birth Earnings: Marginal Employment

Figure: Marginal Employment

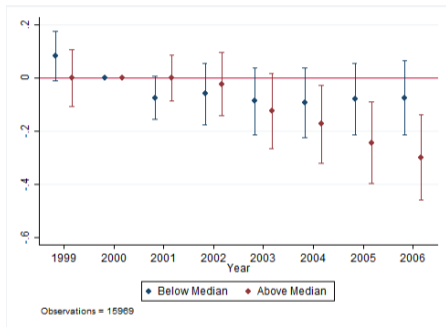
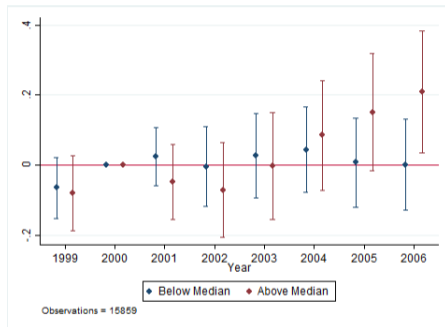


Figure: Full Time



For high income mothers:

- Decline of marginal employment by 86%
- Increase in full-time employment by 45%

Heterogeneity by Pre-Birth Earnings: Same Firm and Occupation

Figure: Same Firm

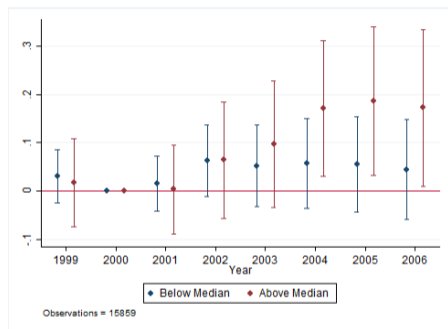
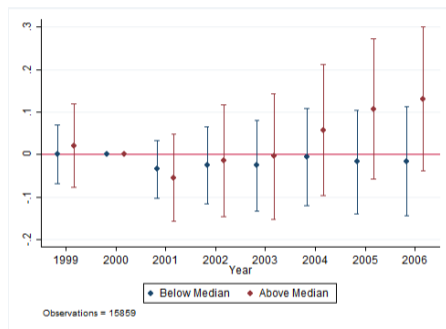


Figure: Same occupation



For high income mothers:

- 24% increase in working at the same firm
- Limited change for working in same occupation

Restriction to Pre-1999

Figure: Employment

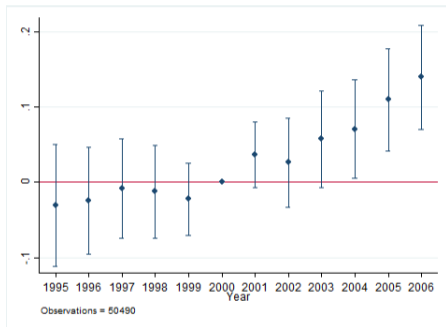
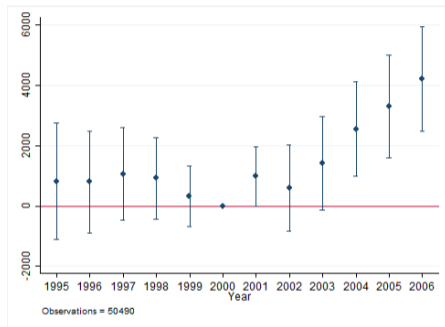


Figure: Total Employment Earnings



- 19% increase in employment
- 33% increase in employment earnings

Figure: Employment

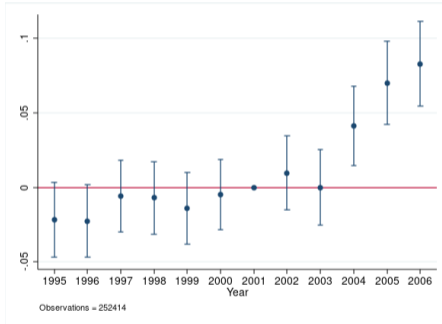
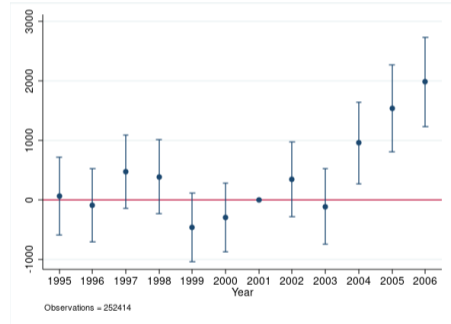


Figure: Total Employment Earnings



Annual Pension Letter

Beginning in 2002, phased introduction of annual notification of expected pension benefits if 27 or older

- Dolls et al. (2018) find a significant increase in employment earnings and retirement savings after notification

Renteninformation 2012

in dieser Renteninformation haben wir die für Sie vom 01.10.1974 bis zum 31.12.2011 gespeicherten Daten und das geltende Rentenrecht berücksichtigt. Ihre **Regelaltersrente** würde nach Erreichen der Regelaltersgrenze (04.04.2021) am **01.05.2021** beginnen. Änderungen in Ihren persönlichen Verhältnissen und gesetzliche Änderungen können sich auf Ihre zu erwartende Rente auswirken. Bitte beachten Sie, dass von der Rente auch Kranken- und Pflegeversicherungsbeiträge sowie gegebenenfalls Steuern zu zahlen sind. Auf der Rückseite finden Sie zudem wichtige Erläuterungen und zusätzliche Informationen.

Rente wegen voller Erwerbsminderung
Wären Sie heute wegen gesundheitlicher Einschränkungen voll erwerbsgemindert, bekämen Sie von uns eine monatliche Rente von:

Höhe Ihrer künftigen Regelaltersrente
Ihre bislang erreichte Rentenanwartschaft entspräche nach heutigem Stand einer monatlichen Rente von:
Sollten bis zur Regelaltersgrenze Beiträge wie im Durchschnitt der letzten fünf Kalenderjahre gezahlt werden, bekämen Sie ohne Berücksichtigung von Rentenanpassungen von uns eine monatliche Rente von:

Rentenanpassung
Aufgrund zukünftiger Rentenanpassungen kann die errechnete Rente in Höhe von 1.942,76 EUR tatsächlich höher ausfallen. Allerdings können auch wir die Entwicklung nicht vorhersehen. Deshalb haben wir - ohne Berücksichtigung des Kaufkraftverlustes - zwei mögliche Varianten für Sie gerechnet. Beträgt der jährliche Anpassungssatz 1 Prozent, so ergäbe sich eine monatliche Rente von etwa 2.120 EUR. Bei einem jährlichen Anpassungssatz von 2 Prozent ergäbe sich eine monatliche Rente von etwa 2.320 EUR.

1.351,11 EUR
1.399,02 EUR
1.942,76 EUR

Date of first social insurance contribution

Date when the statutory legal retirement age will be reached

Monthly pension in case of immediate disability

Monthly pension at statutory retirement age if no more social-insurance contributions were to be paid between now and retirement

Monthly pension at statutory retirement age if social-insurance contributions between now and retirement amounted to the avg. of contributions of the past 5 years

Pension at statutory retirement with pension adjustments of 1%

Pension at statutory retirement with pension adjustments of 2%

Simulations

Figure: Consumption, €

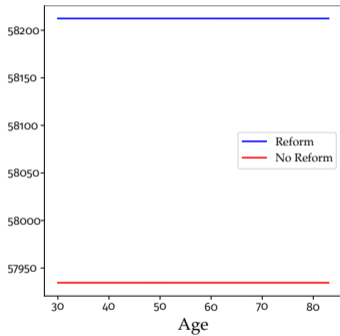
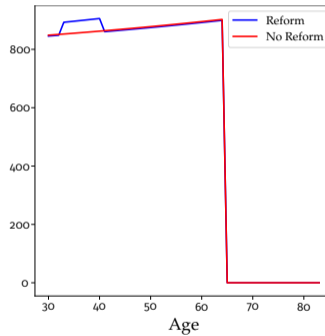


Figure: Hours Worked, €



Heterogeneity by Childcare Availability: % 3-6 year olds in kindergarten/daycare 1997-2000

Figure: Employment

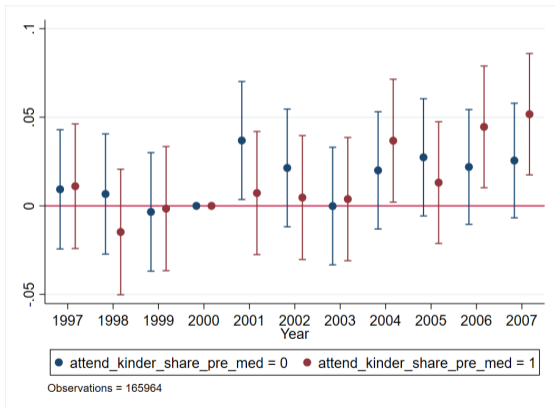
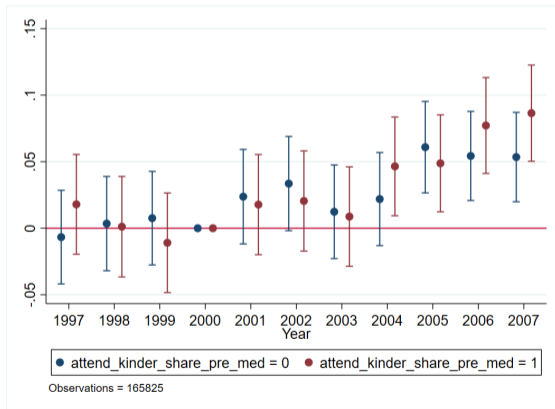


Figure: Pension Insured



Heterogeneity by Childcare Availability: Has Additional Adults in HH

Figure: Employment

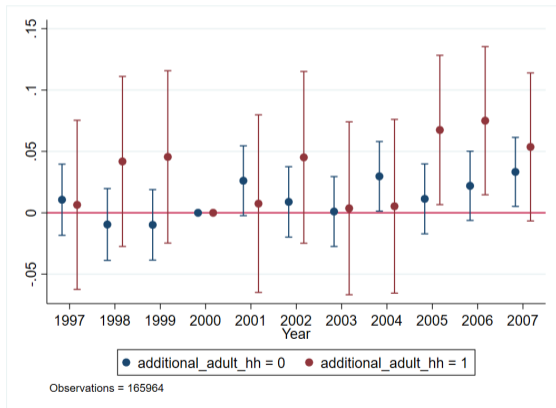
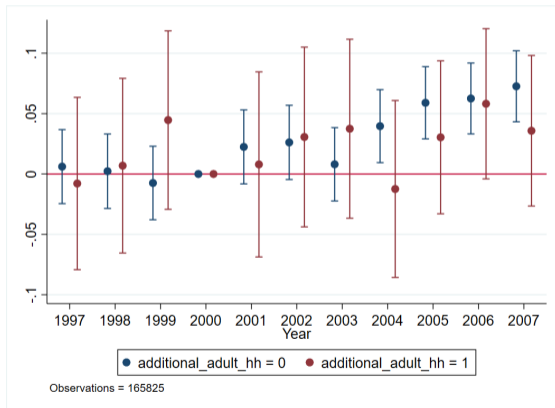


Figure: Pension Insured



Heterogeneity by Marital Status

Figure: Employment

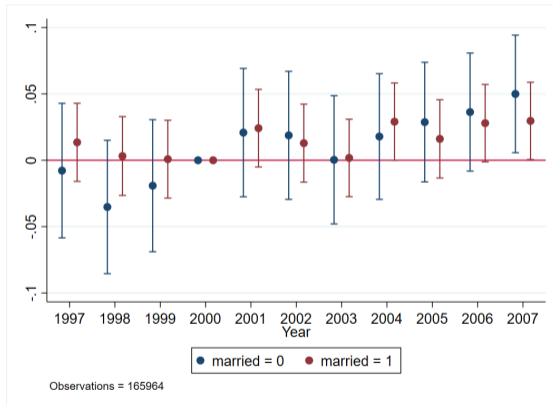
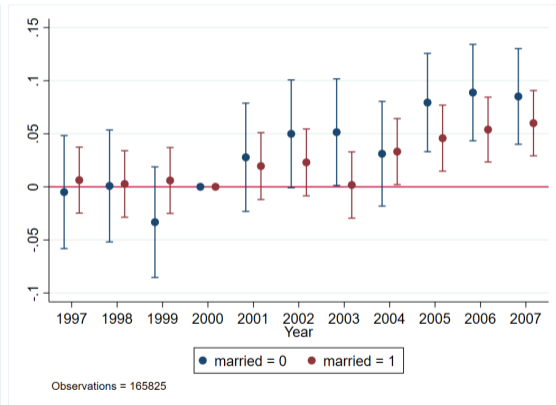


Figure: Pension Insured



Heterogeneity by HH Resources: HH income/total members

Figure: Employment

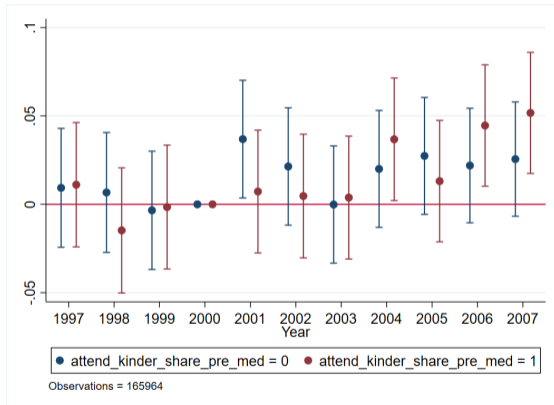
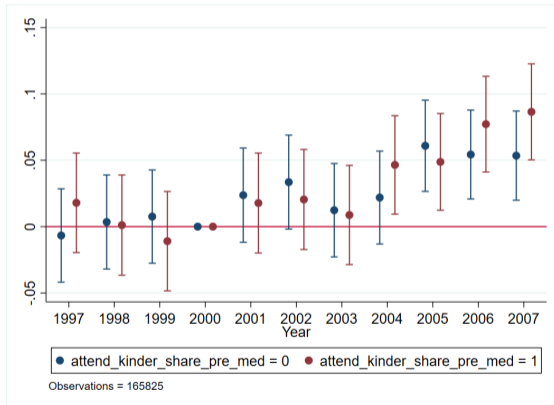
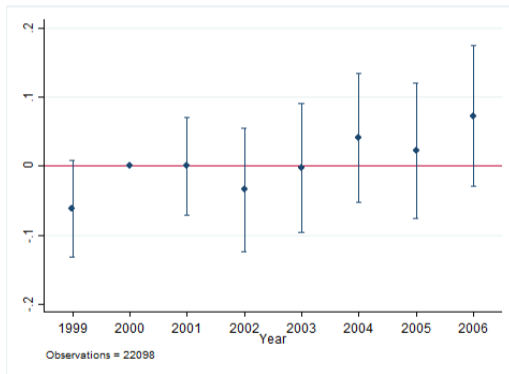


Figure: Pension Insured



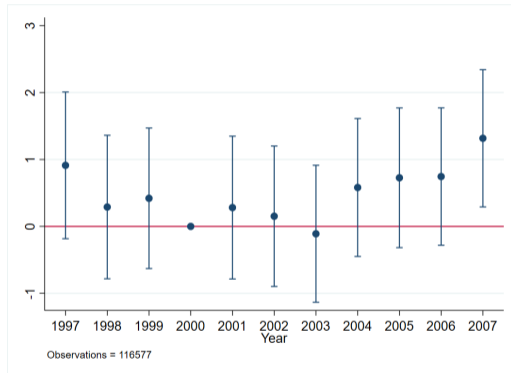
Full-Time Status

Figure: Full-Time (Conditioned on Working)



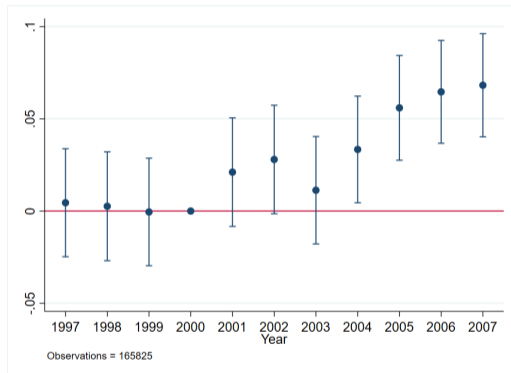
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Microcensus: Hours Worked



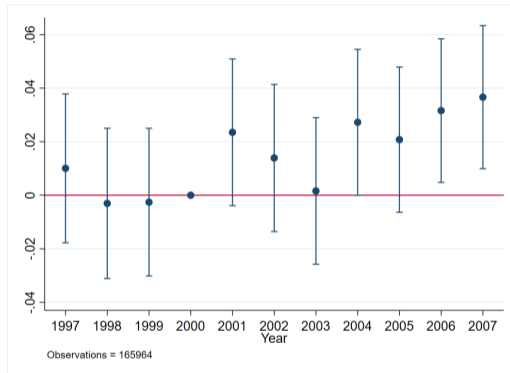
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Microcensus: Pension Insured



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Microcensus: Employment



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