Elderly Care Across Europe: The Role of Formal and Informal Care in Family Decision-Making

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Introduction

Motivation

Population aging in Europe:

- ▶ 48.7% of the population over 65 years-old have difficulties to carry out their daily activities. This share will keep growing.
- ▶ The ratio of people aged 65 or above to working-age individuals is expected to go from 32.5% to 51.2% by 2070.

Elderly care:

- ▶ Governments spend large amounts of resources on formal care.
- ▶ Adult children are one of the most important sources of informal care.
- ▶ The decision to give care is connected with labor supply.
- ▶ Care arrangements often concern multiple children.

Research Questions

▶ What factors determine families' elderly care choices?

▶ What are the implications of these decisions for labor supply?

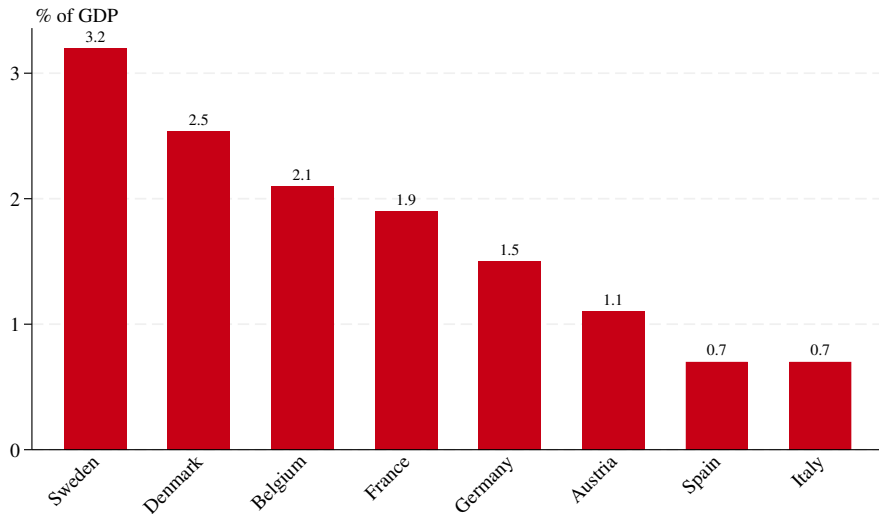▶ What policies can support care recipients and informal caregivers?

Motivating Facts

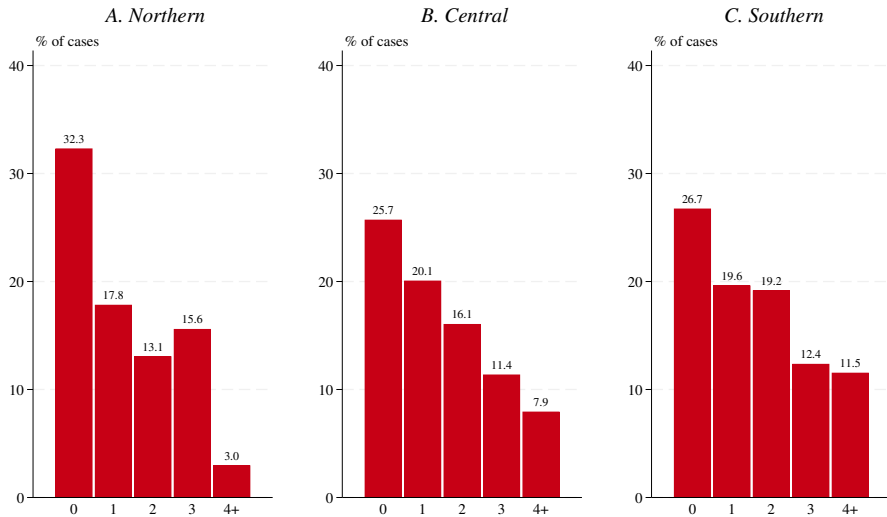**Figure 1:** Type of care received by individuals aged 70 or older with care needs
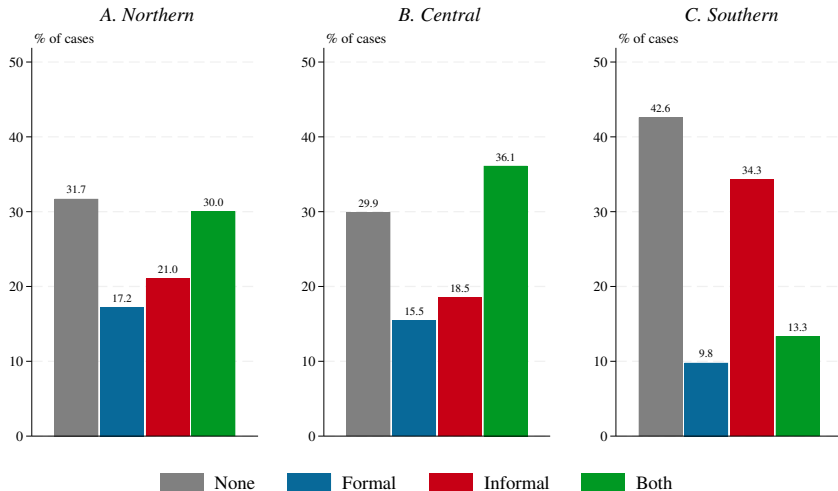
Source: SHARE, waves 5 and 6.

Figure 2: Public spending on long-term care as a share of GDP

% of GDP

Source: OECD, 2017 or nearest year

Figure 3: Probability of giving informal care to parents by number of siblings

A. Northern

B. Central

C. Southern

Source: SHARE, waves 5 and 6.

Figure 4: Employment rate of children by informal care given to parents

A. Northern   *B. Central*   *C. Southern*

No care   Care
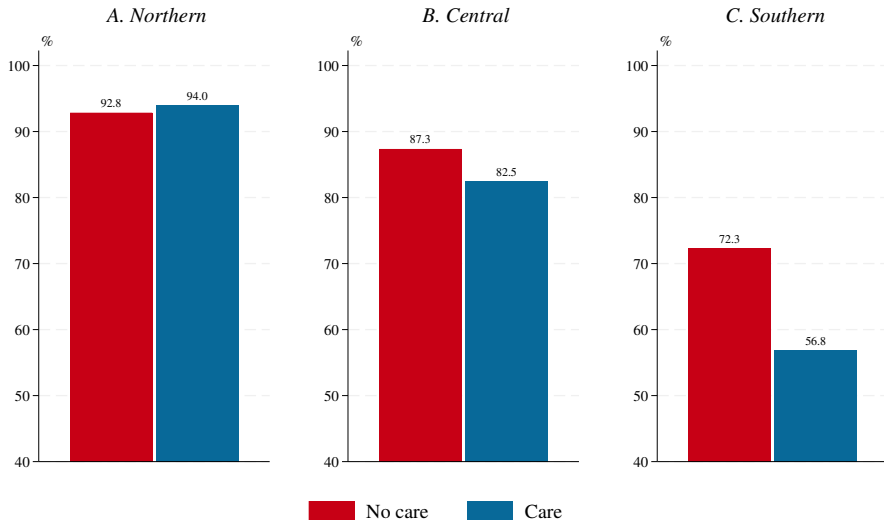
Source: SHARE, waves 5 and 6.

This paper

▶ I build and estimate a static, non-cooperative game of complete information:

- Interactions between parents and children.

- Care provision and labor force participation decisions.

- I estimate this model for Northern, Central and Southern Europe, using data from SHARE.

▶ I use the model for:

- Decomposition analysis of the differences in formal/informal care and labor force participation decisions across regions.

- Policy evaluation: subsidies for care recipients and informal caregivers.

Related literature

Structural models of elderly care:

▶ Skira (2015), Dobrescu (2015), Korfhage (2019): one decision-maker.

▶ Pezzin and Schone (1999), Dobrescu and Iskhakov (2013), Mommaerts (2020), Ko (2021): one parent and one child.

▶ Hiedemann and Stern (1999), Engers and Stern (2002), Checkovich and Stern (2002), Fontaine et al. (2009): limited care alternatives, no labor supply choice.

▶ Byrne et al. (2009): no policy effects.

▶ Barczyk and Kredler (2018): stylized, OLG model.

▶ <u>My paper</u> models both care and labor supply decisions, allows for the combination of formal and informal care in heterogeneous families, incorporates strategic interactions among siblings, and finds substantial policy effects.

Related literature

Elderly care in Europe:

▶ Differences across countries: Attias-Donfut et al. (2005), Bolin et al. (2008a), Bonsang (2009), Fontaine et al. (2009), Dobrescu and Iskhakov (2013), Dobrescu (2015), Bakx et al. (2015), Barczyk and Kredler (2019).

▶ Labor market outcomes for caregivers: Spiess and Schneider (2003), Viitanen (2005), Bolin et al. (2008b), Crespo and Mira (2014).

▶ <u>My paper</u> considers the decisions of multiple children and their parent together in a structural model.

Outline

1. Introduction

2. Model

3. Estimation

4. Decomposition Analysis

5. Policy Experiments

6. Conclusion

Model

Model

The decision-making process of a family is modeled as a static, non-cooperative game of complete information:

▶ A family is composed of a parent and N working-age children.

▶ Children are indexed by $i = 1, 2, ..., N$.

▶ They make simultaneous decisions:

  • **Children**: employment and informal care.

  • **Parent**: formal care.

▶ The outcome of the game is a Nash equilibrium.

Model

Family members make their choices to maximize utility. This depends on:

- ▶ Family and individual characteristics (observable): $\boldsymbol{x}$.

- ▶ The actions of the rest of family members.

- ▶ Choice-specific unobservables: $(\boldsymbol{\epsilon}_1, ..., \boldsymbol{\epsilon}_N)$ for children, and $\boldsymbol{\zeta}$ for the parent.

- ▶ All this information is common knowledge.

Discrete choices map into hours:

- ▶ Informal and formal care: $I_i(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x})$ and $F(\boldsymbol{a}, b, \boldsymbol{x})$.

- ▶ Work:

$$N_i(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x}) = \begin{cases} \tilde{N}_i(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x}) & \text{if } a_i = \text{ENC}, \\ \tilde{N}_i(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x}) - I_i(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x}) & \text{if } a_i = \text{EIC}, \\ 0 & \text{otherwise.} \end{cases}$$

Estimation

Estimation

I estimate the model separately for Northern, Central, and Southern Europe $\rightarrow$
Summary statistics

Estimated outside the model: $I_i\left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x}\right)$, $F\left(\boldsymbol{a}, b, \boldsymbol{x}\right)$, $N_i\left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x}\right)$, and $w\left(\boldsymbol{x}_i\right)$.

Preference parameters $\boldsymbol{\alpha}, \beta$ and $\boldsymbol{\delta}$ are estimated by maximum simulated likelihood using waves 5 and 6 of SHARE:

- ▶ I observe $\left(\boldsymbol{a}_f, \boldsymbol{x}_f\right)$ for a sample of families, indexed by $f = 1, ..., F$.

- ▶ The preference shocks $\boldsymbol{\epsilon}$ and ζ are i.i.d. type-I extreme value.

- ▶ Simulated log-likelihood:

$$\widehat{\mathcal{L}}\left(\boldsymbol{\theta}\right) = \sum_{f=1}^{F} \hat{\ell}_f(\boldsymbol{\theta}) = \sum_{f=1}^{F} \sum_{\forall \boldsymbol{d} \in \mathcal{D}_f} \mathbb{1}\{\boldsymbol{d}_f = \boldsymbol{d}\} \ln \widehat{\Pr}\left(\boldsymbol{d} | \boldsymbol{x}_f; \boldsymbol{\theta}\right).$$

Model fit

Decomposition Analysis

Decomposition Analysis

What factors determine different care choices across Europe?

I simulate the decisions of families in several **counterfactual** scenarios:

- ▶ I set the model parameters in Southern Europe equal to those of Northern Europe.

- ▶ I remove the differences across regions in the distributions of wages, parental health, and parental wealth.

- ▶ Parameters and wages explain most of the differences in care provision and employment of informal caregivers across regions: Figures
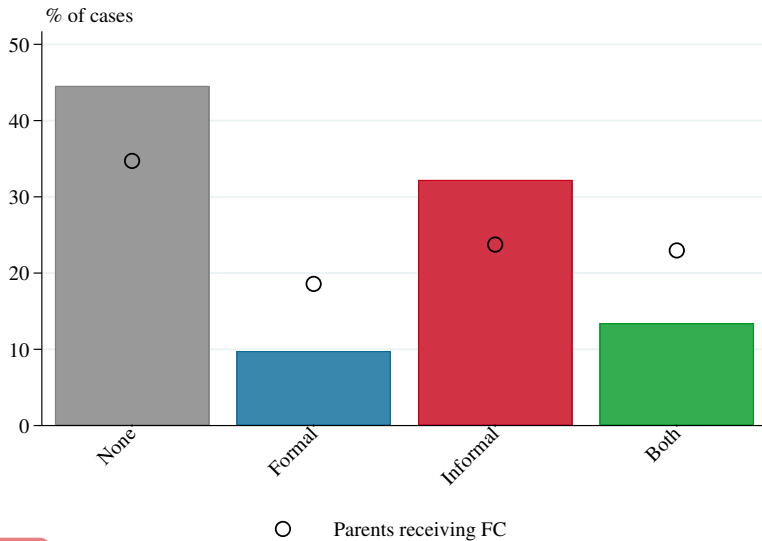
Policy Experiments

Policy Experiments

What policies can increase care provision and employment of informal caregivers in Southern Europe?

I evaluate **subsidies** for:

- Parents who receive formal care.

- All the parents with care needs.

- Employed children who give informal care.

- Non-employed children who give informal care.

- All the children who give informal care.

Figure 5: Type of care received by parents in Southern Europe

% of cases

○ Parents receiving FC

Figure 5: Type of care received by parents in Southern Europe
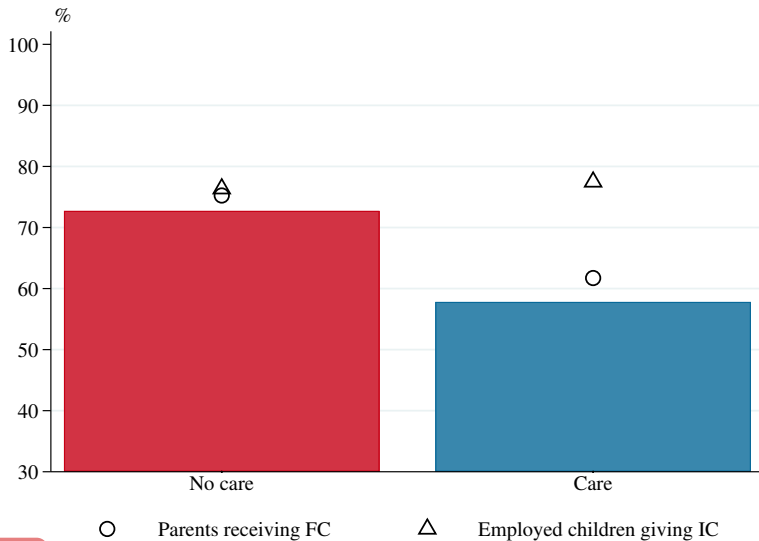
% of cases

○ Parents receiving FC   △ Employed children giving IC
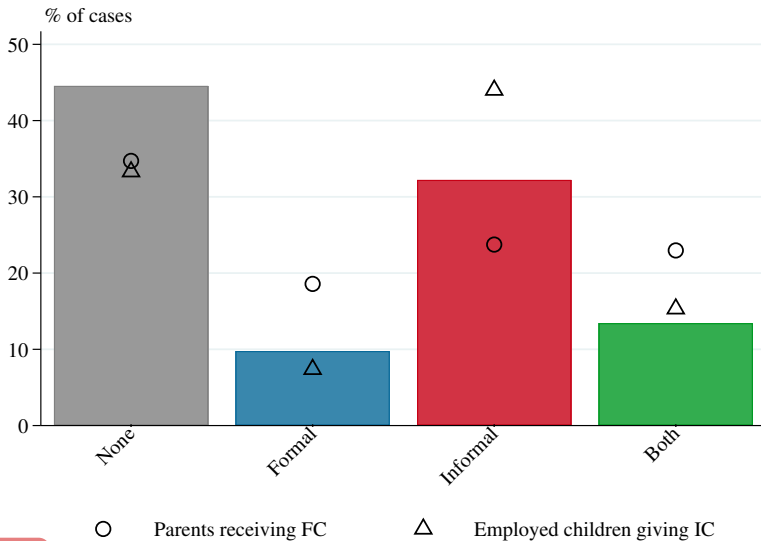
Figure 6: Employment rate of children by informal care given in Southern Europe

Conclusion

Conclusion

I build and estimate a static, non-cooperative game of complete information with:

- ► Elderly care (formal and informal) and labor force participation decisions.

- ► Interactions between family members.

I use the model to analyze the provision of care in Europe:

- ► Decomposition analysis: parameters and wages explain most of the differences in care provision and employment of informal caregivers across regions.

- ► Policies: subsidies for children who combine work with informal caregiving are more effective than subsidies for formal care recipients to increase care provision and employment of informal caregivers in Southern Europe.

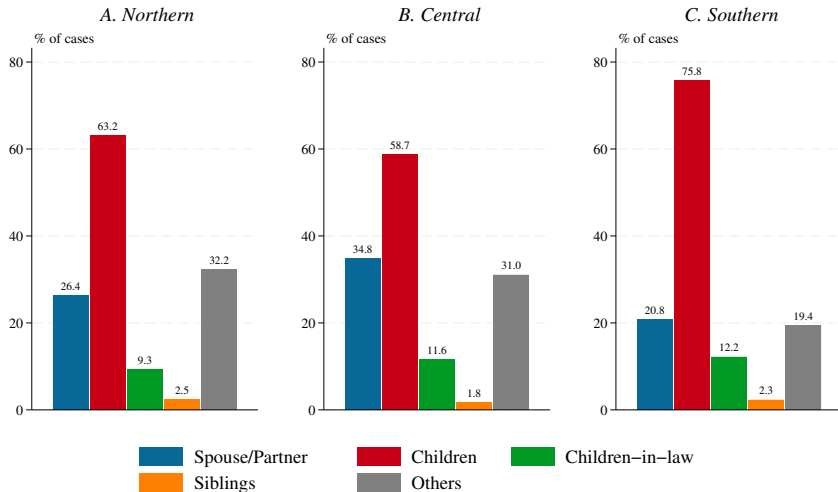# Thank you!

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Appendix

Figure A1: Sources of informal care received by individuals aged 70 or older with care needs

Source: SHARE, waves 5 and 6.

Parental health

Parental care needs are measured using information about ADL limitations and cognitive status:

▶ **Activities of daily living**: respondents report whether they have difficulties with dressing, bathing/showering, eating/cutting up food, walking across a room, getting in/out of bed, and using the toilet.

▶ **Cognitive status**: respondents take word recall, orientation, and numeracy tests. I classify a respondent as cognitively impaired if she is in the bottom 10% of the cognitive score distribution.

Parental health

Parents are classified as:

- **Healthy**: no ADL limitations and no cognitive impairment.

- **With light care needs**: 1-3 ADL limitations and no cognitive impairment.

- **With severe care needs**: 4-5 ADL limitations or cognitive impairment.

Back

Data

I use data from eight countries in the Survey of Health, Ageing and Retirement in Europe (SHARE):

► Northern Europe: Denmark and Sweden.

► Central Europe: Austria, Belgium, France and Germany.

► Southern Europe: Italy and Spain.

Choices

The choices of each agent are discrete and mutually exclusive.

▶ **Children**:

- Employment: employed or non-employed.

- Care: informal care or no care.

$$a_i \in \mathcal{A}_i \equiv \{\text{NENC, ENC, NEIC, EIC}\} \text{ for } i = 1, ..., N.$$

$$\boldsymbol{a} \equiv (a_1, ..., a_N) \in \mathcal{A} \text{ with } \mathcal{A} \equiv \mathcal{A}_1 \times ... \times \mathcal{A}_N.$$

▶ **Parent**:

- Care: formal care or no formal care.

$$b \in \mathcal{B} \equiv \{\text{NFC, FC}\}.$$

Back

Child's preferences

Child i's utility of choosing $a \in \mathcal{A}$:

$$U_{ia} = \alpha_{0a} + \alpha_{1a} \underbrace{\sum_{\ell \neq i} I_\ell \left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x} \right)}_{\substack{\text{hours of IC} \\ \text{by siblings}}} + \alpha_{2a} \underbrace{\sum_{\ell \neq i} \mathbb{1}\left\{ I_\ell \left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x} \right) = 0 \right\}}_{\substack{\text{number of siblings} \\ \text{who do not give care}}} + \alpha_{3a} \underbrace{F\left(\boldsymbol{a}, b, \boldsymbol{x} \right)}_{\substack{\text{hours} \\ \text{of FC}}}$$

$$+ \alpha_{4a} \underbrace{H}_{\substack{\text{parental} \\ \text{health}}} + \alpha_{5a} \text{widowed} + \alpha_{6a} \text{near}_i + \alpha_{7a} \text{female}_i + \alpha_{8a} \text{children}_i + \alpha_{9a} \text{married}_i$$

$$+ \beta \underbrace{C_i(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x})}_{\substack{\text{child's} \\ \text{consumption}}} + \epsilon_{ia}.$$

$$C_i \left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x} \right) = \underbrace{w\left(\boldsymbol{x}_i \right)}_{\substack{\text{child's} \\ \text{wage}}} \underbrace{N_i \left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x} \right)}_{\substack{\text{hours} \\ \text{worked}}} + \underbrace{y_i}_{\substack{\text{other} \\ \text{income}}}.$$

Back

Parent's preferences

Parent's utility of choosing $b \in \mathcal{B}$:

$$V_b = \delta_{0b} + \delta_{1b} \underbrace{\sum_{i=1}^{N} I_i \left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x}\right)}_{\substack{\text{hours of IC} \\ \text{by children}}} + \delta_{2b} \underbrace{\mathbb{1} \left\{ \sum_{i=1}^{N} I_i \left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x}\right) > 0 \right\}}_{\substack{\text{at least one} \\ \text{child gives IC}}} + \delta_{3b} \text{spouse}$$

$$+ \delta_{4b} \text{others} + \delta_{5b} \text{widowed} \times \text{male} + \delta_{6b} \text{widowed} \times \text{female} + \delta_{7b} \underbrace{W}_{\substack{\text{parents'} \\ \text{wealth}}} + \zeta_b.$$

Back

Nash equilibrium

Strategies:

▶ Child i has strategies over $\mathcal{A}_i$.

▶ The parent has strategies over $\mathcal{B}$.

A Nash equilibrium is a vector of strategies such that each player's strategy is a best response.

Back

Table A1: Summary statistics of the parents – Estimation sample

	Northern	Central	Southern
Female (dummy)	0.55	0.63	0.66
	(0.02)	(0.01)	(0.01)
Age	79.95	79.91	79.88
	(0.24)	(0.17)	(0.13)
Severe LTC needs (dummy)	0.46	0.49	0.83
	(0.02)	(0.01)	(0.01)
Widowed (dummy)	0.35	0.40	0.46
	(0.02)	(0.01)	(0.01)
Net assets (euros)	148,764.26	183,559.41	183,024.73
	(8,842.28)	(8,115.44)	(7,156.60)
Number of children	2.09	2.11	2.32
	(0.04)	(0.03)	(0.03)
Number of observations	797	2,710	2,874

Note: Standard errors in parentheses.

Back

Table A2: Summary statistics of the children – Estimation sample

	Northern	Central	Southern
Female (dummy)	0.47	0.50	0.49
	(0.01)	(0.01)	(0.01)
Age	50.09	50.10	48.81
	(0.16)	(0.12)	(0.10)
Living near the parent (dummy)	0.57	0.61	0.81
	(0.01)	(0.01)	(0.01)
Being married (dummy)	0.67	0.67	0.76
	(0.01)	(0.01)	(0.01)
Having children (dummy)	0.83	0.79	0.76
	(0.01)	(0.01)	(0.01)
Number of observations	1,738	6,053	6,879

Note: Standard errors in parentheses.

Back

Table A3: Parameter estimates of the child's utility

| β	Northern			Central			Southern		
	0.002			0.002			0.005		
	ENC	NEIC	EIC	ENC	NEIC	EIC	ENC	NEIC	EIC
α_0: Constant	0.393	-4.016	-1.602	0.513	-3.588	-1.373	0.122	-3.154	-2.774
α_1: Hours of informal care									
from siblings	-0.052	0.040	0.227	-0.062	0.107	0.101	-0.027	0.062	0.063
α_2: Number of siblings									
who do not give care	-0.013	-0.325	-0.708	-0.014	-0.337	-0.601	-0.034	-0.445	-0.608
α_3: Hours of formal care	-0.002	-0.007	0.000	-0.000	0.002	0.003	0.002	0.001	0.002
α_4: Severe care needs	0.075	0.453	0.036	0.067	0.333	-0.295	-0.181	0.481	0.046
α_5: Parent is widowed	-0.128	1.206	0.524	-0.590	0.160	0.122	-0.189	0.202	0.368
α_6: Near dummy	0.185	1.792	1.529	0.037	2.256	1.214	-0.271	1.069	0.830
α_7: Female dummy	-0.520	-0.033	-0.256	-0.243	0.802	0.373	-0.722	1.069	0.738
α_8: Children dummy	1.257	2.107	1.241	0.147	-0.088	-0.132	-0.096	0.002	-0.059
α_9: Married dummy	0.355	-1.347	-0.018	0.238	-0.038	-0.056	0.559	0.195	0.222

Note: Standard errors to be computed.

Back

Table A4: Parameter estimates of the parent's utility

	Northern	Central	Southern
δ_0: Constant	-1.094	-1.064	-1.760
δ_1: Hours of informal care from children	0.003	0.024	0.025
δ_2: At least one child gives some care (dummy)	0.639	0.647	-0.034
δ_3: Informal care from the spouse (dummy)	0.719	1.166	0.530
δ_4: Informal care from other sources (dummy)	0.556	0.512	0.596
δ_5: Widowed male	1.070	0.688	0.697
δ_6: Widowed female	1.241	1.243	0.327
δ_7: Wealth	0.00005	0.00005	0.00004

Note: Standard errors to be computed.

Back

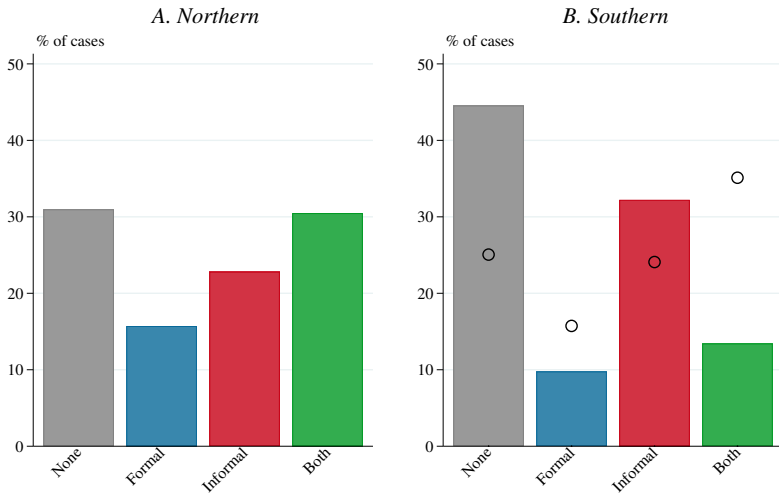**Figure A2:** Type of care received by parents – Model fit
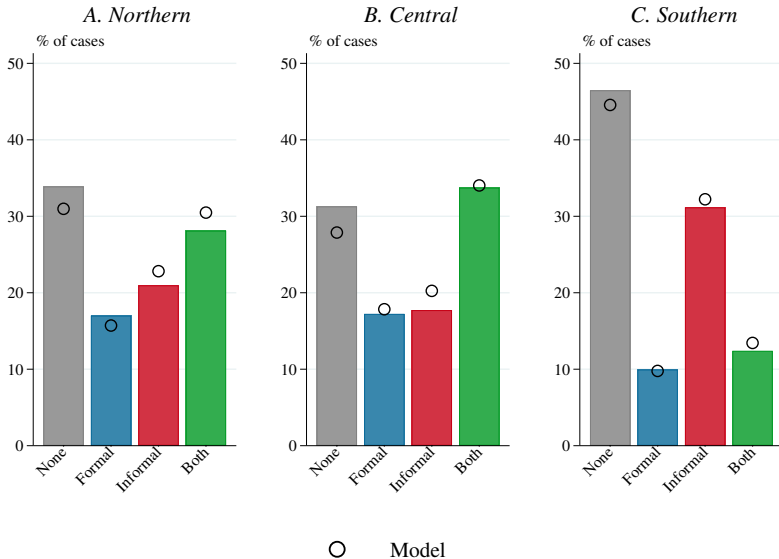
Figure A3: Employment rate of children by informal care given – Model fit
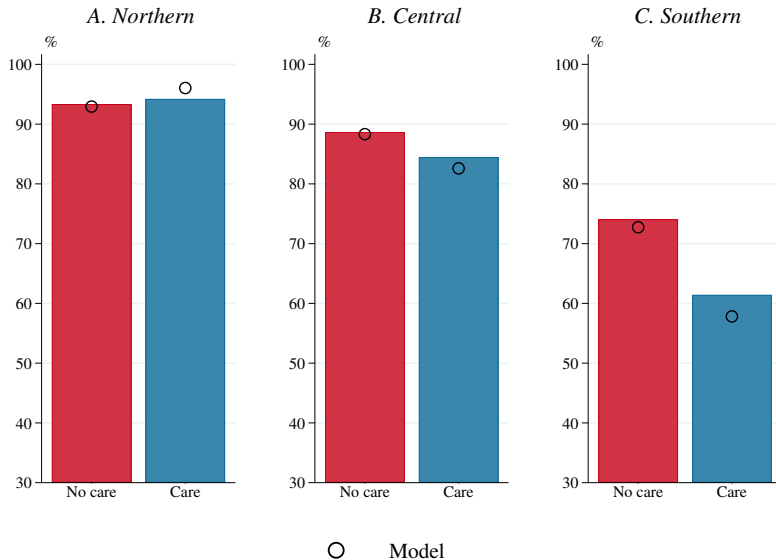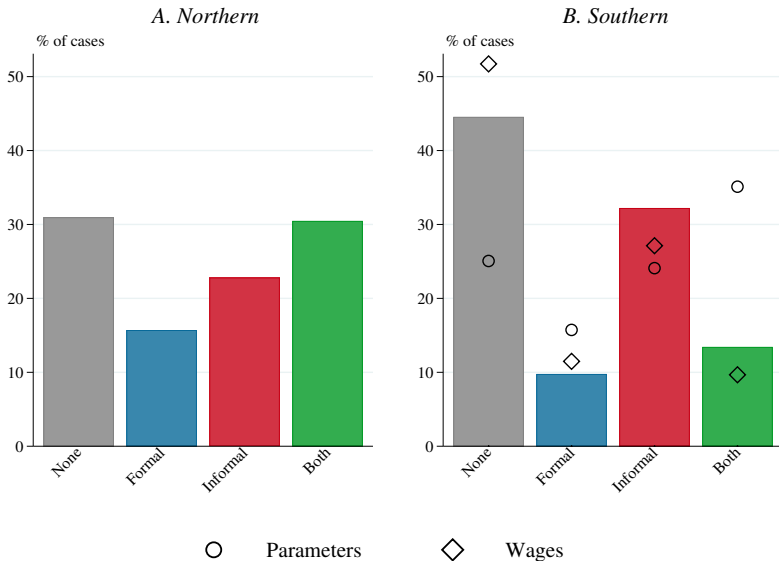
○ Model

Figure A4: Type of care received by parents – Baseline and counterfactual simulations
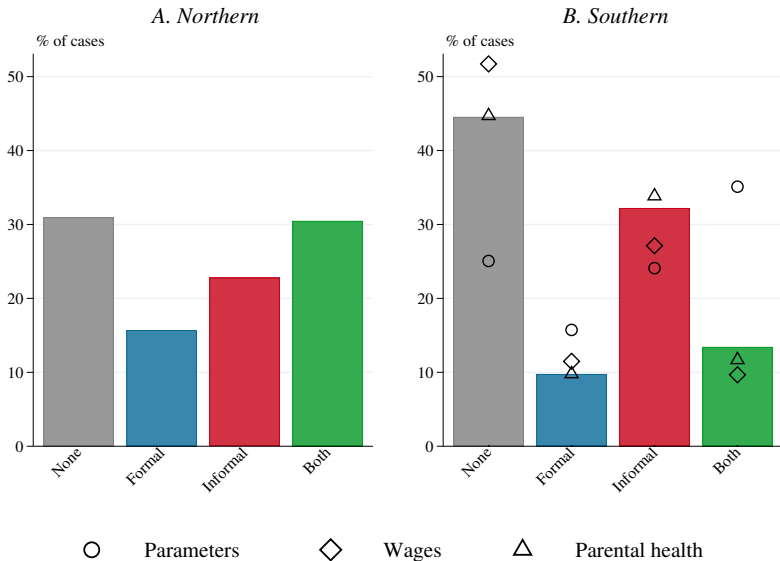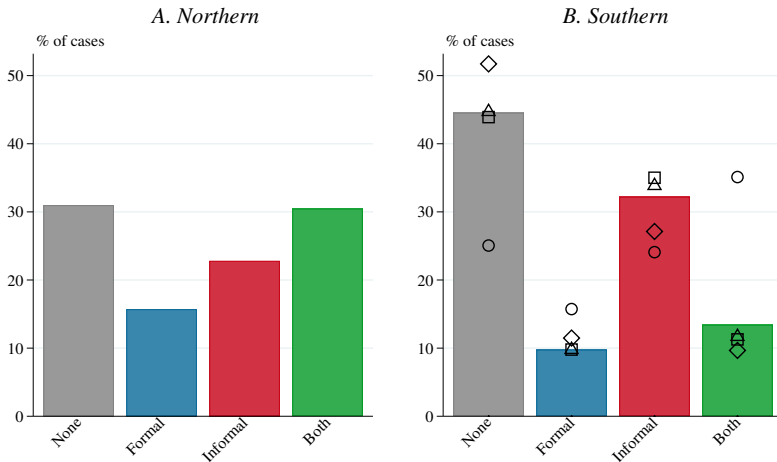
Figure A4: Type of care received by parents – Baseline and counterfactual simulations

A. Northern

B. Southern

Figure A4: Type of care received by parents – Baseline and counterfactual simulations

A. Northern

B. Southern

○ Parameters ◇ Wages △ Parental health

Figure A4: Type of care received by parents – Baseline and counterfactual simulations
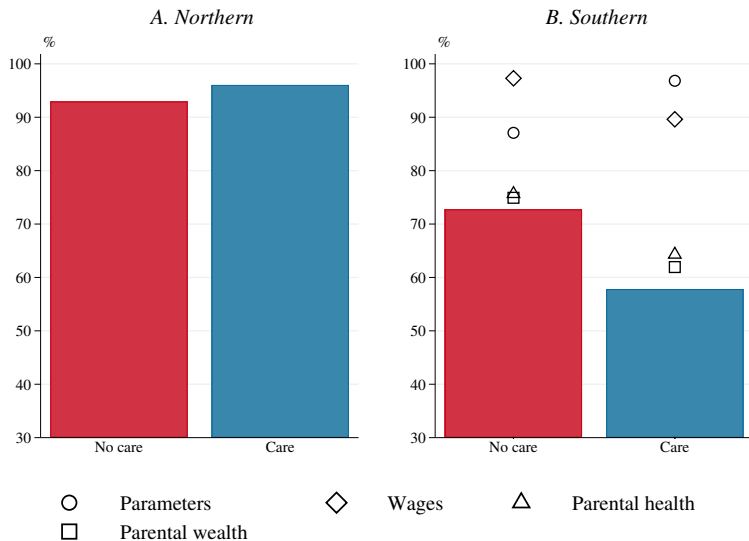
A. Northern

B. Southern

Parameters ○   Wages ◇   Parental health △   Parental wealth □

Figure A5: Employment rate of children by informal care given to parents – Baseline and counterfactual simulations

Preferences over the total amount of care

Child i's utility of choosing $a \in \mathcal{A}$:

$$U_{ia} = \alpha_{0a} + \alpha_{1a} \underbrace{\sum_{\ell \neq i} I_\ell\left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x}\right)}_{\substack{\text{hours of IC} \\ \text{by siblings}}} + \alpha_{2a} \underbrace{\sum_{\ell \neq i} \mathbb{1}\left\{I_\ell\left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x}\right) = 0\right\}}_{\substack{\text{number of siblings} \\ \text{who do not give care}}} + \alpha_{3a} \underbrace{F\left(\boldsymbol{a}, b, \boldsymbol{x}\right)}_{\substack{\text{hours} \\ \text{of FC}}}$$

$$+ \alpha_{4a} \underbrace{H}_{\substack{\text{parental} \\ \text{health}}} + \alpha_{5a}\text{widowed} + \alpha_{6a}\text{near}_i + \alpha_{7a}\text{female}_i + \alpha_{8a}\text{children}_i + \alpha_{9a}\text{married}_i$$

$$+ \beta \underbrace{C_i(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x})}_{\substack{\text{child's} \\ \text{consumption}}} + \epsilon_{ia}.$$
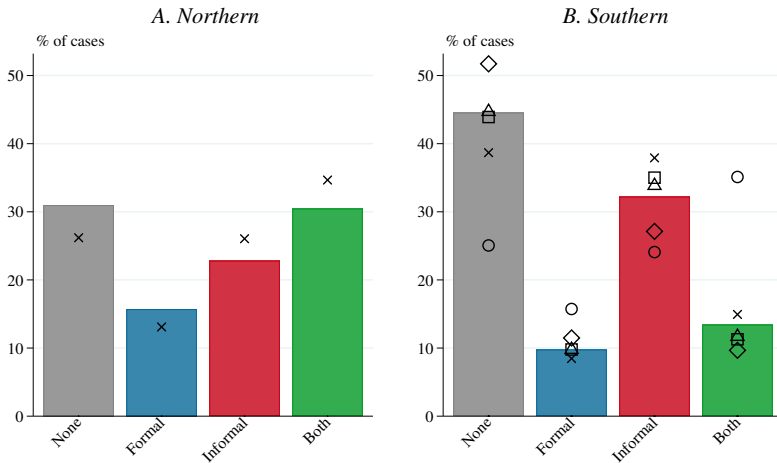
Back

Preferences over the total amount of care

If $\alpha_{1a} = \alpha_{3a}$ and $\alpha_{2a} = 0$:

$$U_{ia} = \alpha_{0a} + \alpha_{1a} \left(\underbrace{\sum_{\ell \neq i} I_\ell \left(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x} \right)}_{\substack{\text{hours of IC} \\ \text{by siblings}}} + \underbrace{F \left(\boldsymbol{a}, b, \boldsymbol{x} \right)}_{\substack{\text{hours} \\ \text{of FC}}} \right)$$

$$+ \alpha_{4a} \underbrace{H}_{\substack{\text{parental} \\ \text{health}}} + \alpha_{5a} \text{widow} + \alpha_{6a} \text{near}_i + \alpha_{7a} \text{female}_i + \alpha_{8a} \text{children}_i + \alpha_{9a} \text{married}_i$$

$$+ \beta \underbrace{C_i(a_i, \boldsymbol{a}_{-i}, b, \boldsymbol{x})}_{\substack{\text{child's} \\ \text{consumption}}} + \epsilon_{ia}.$$

Figure A6: Type of care received by parents – Baseline and counterfactual simulations

A. Northern

B. Southern

Legend:
- ○ Parameters
- ◇ Wages
- △ Parental health
- □ Parental wealth
- × Prefs. over total care

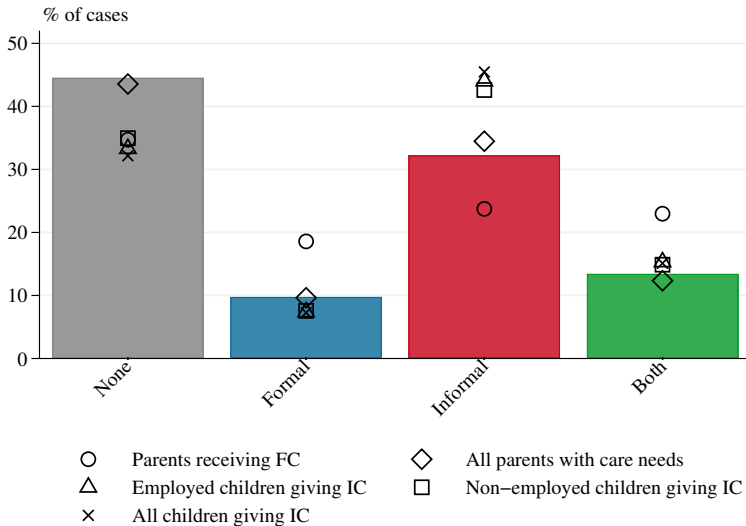**Figure A7:** Employment rate of children by informal care given to parents – Baseline and counterfactual simulations
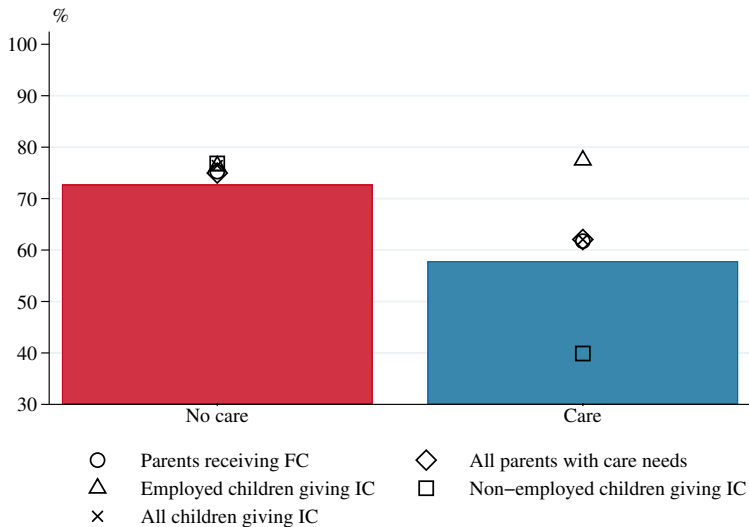
Figure A8: Type of care received by parents in Southern Europe – Baseline and policy simulations

Figure A9: Employment rate of children by informal care given in Southern Europe – Baseline and policy simulations

Table A5: Results of the policy experiments

Outcome	Parents receiving FC	All parents with care needs	Employed children giving IC	Non-employed children giving IC	All children giving IC
Rate of only FC users	+8.8	-0.1	-2.4	-2.2	-2.5
Rate of only IC users	-8.5	+2.2	+11.8	+10.4	+13.2
Rate of users of both types of care	+9.5	-1.1	+1.9	+1.4	+1.7
Rate of users of FC	+18.3	-1.2	-0.5	-0.8	-0.8
Rate of users of IC	+1.0	+1.2	+13.7	+11.8	+14.9
Rate of care users	+9.9	+1.0	+11.3	+9.6	+12.4
Employment rate	+2.7	+2.5	+7.2	-5.0	+1.7
Employment rate of non-caregivers	+2.5	+2.2	+3.6	+4.1	+3.7
Employment rate of caregivers	+3.9	+4.2	+19.7	-17.9	+4.2
Employment rate gap non-caregivers/caregivers	-1.4	-2.0	-16.0	+22.0	-0.5
Cost (million euros/year)	35,695.5	85,069.0	35,695.5	35,695.5	35,695.5
Cost (% GDP)	1.3%	3.0%	1.3%	1.3%	1.3%

Back

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