SHARE and LTC insurance

Pierre Pestieau & Jérôme Schoenmaeckers

HEC Liège, Université de Liège, Belgium
Emails: **p.pestieau@uliege.be; jerome.schoenmaeckers@uliege.be**

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Introduction

- Ageing population in Europe: risks (and costs) of loss of autonomy increase
- Decrease in the availability of informal care: more divorces, less children (more mobile and more working)
- LTC insurance market almost absent
- Social LTC insurance ? Need evidence to determine optimal policy

SHARE and Stylized facts

- Use of SHARE data to establish relationships about
  - Loss of autonomy and socio-economic status (SES)
  - Substitution or complementarity between formal and informal care
  - Impact of housing (at home or in nursing home) choices in case of loss of autonomy
  - Motive(s) behind this intergenerational help
- SHARE: Survey of Health, Ageing and Retirement in Europe
  - Goal: to study the living conditions of people aged 50 and above
  - Same people are interviewed every 2 years to study changes over time
  - Long standing research on older adults in Europe; first wave was in 2004
  - Currently 9 waves of data available for research, free of charge, 10th wave now ending, 27 countries with the same questionnaire

SHARE and Stylized facts

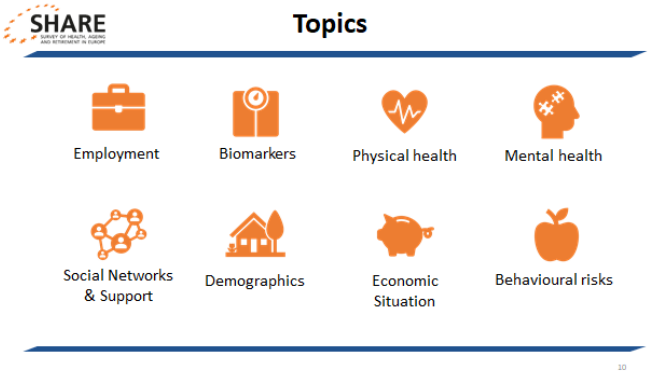

Figure 1: SHARE Topics

SHARE and Stylized facts

Wave overview

Wave #	Year	# countries	# interviews
1	2004/2005	12	30,416
2	2006/2007	15	37,132
3*	2008/2009	14	28,454
4	2010/2011	16	57,982
5	2012/2013	15	66,038
6	2014/2015	18	68,055
7*	2016/2017	28	77,181
8**	2019/2020	28	53,695
9	2021/2022	28	69,447

* Wave 3 : SHARELIFE ; Wave 7 : partially SHARELIFE
** Wave 8 got interrupted by COVID

Figure 2: Wave Overview

SHARE and Stylized facts: Loss of autonomy and socio-economic status

M. Lefebvre, S. Perelman, and J. Schoenmaeckers (2018). "Inégalités face à la mort et au risque de dépendance". In: *Revue française d'économie* 33.2, pp. 75–111

- Goal: relationships between loss of autonomy and SES
- Method: Two-stage model (2SLS) with wealth instrumentalised by
  - having received an inheritance
  - being owner
- Results: Triple penalty
  - Thanks to the longitudinal nature of the SHARE data (we observe health statutes of respondents in W2, W4 and W6):
  - The poorest die sooner, are more likely to become dependent, and when they do, they remain dependent for longer.
- But, a posteriori, doubts about the instruments (potential link between receiving inheritance and health of the respondent (genetics, inherited health behaviors), etc.)

SHARE and Stylized facts: Loss of autonomy and socio-economic status

M. Lefebvre L. Heymans and J. Schoenmaeckers (2025). "Impact of socio-economic status on loss of autonomy in the old age". Mimeo

- Addition of HRS (American "parent" survey)
- Restriction on the instrument: inheritance not from close relatives + wealth from period 1
- Addition of number of waves (from 3 to 5 periods)
- **CRE + IV** (Joshi and Wooldridge, 2019)

→ Double penalty confirmed (higher probabilities of death and loss of autonomy for the poorest) but not the length...
Why? One possible explanation: the type of dependency (physical vs. neurodegenerative (such as Alzheimer)) varies according to SES → research in progress (Survival analyses, etc.)

SHARE and Stylized facts: Substitution or complementarity between formal and informal care

E. Bonsang (2009). "Does informal care from children to their elderly parents substitute for formal care in Europe?" In: *Journal of Health Economics* 28, pp. 143–154, 898 citations → $H_{12}(a,m) \lessgtr 0$.

- Goal: look at the potential causal effect of informal care provided by adult children on the utilization of formal home care by their parents
- A two-part model:
  - $P(g_i > 0 \mid h_i, D_i, X_i)$, a Probit model for the extensive margin, and
  - $\mathbb{E}[\ln(g_i) \mid g_i > 0, h_i, D_i, X_i]$, a conditional regression model for the intensive margin.

SHARE and Stylized facts: Substitution or complementarity between formal and informal care

- The partial effect of h_i on g_i, or in other words, the elasticity of formal care with respect to informal care, is of particular interest
- But informal care is potentially endogeneous → IV methodology with specific sibling' characteristics, gender composition and distance from parents, as instruments for informal care.
- Results:
  - Informal care provides an alternative (substitute) for formal care as long as the burden and complexity of dependency is limited
  - Once the disability level increases, and requires more skilled support, children and the formal services tend to be complementary

SHARE and Stylized facts: Substitution or complementarity between formal and informal care

Table 2
Two-part model of paid domestic help utilization and the first-stage equation of informal care receipt.

Dependent variable	Informal care	Paid domestic help			
	OLS	Probit	IV Probit	OLS	2SLS
Intercept	−1.945*** (0.177)	−6.643*** (0.350)	−7.894*** (0.517)	0.662 (0.566)	0.808 (0.609)
Informal care	–	0.050*** (0.018)	−0.594*** (0.185)	0.121*** (0.025)	0.184* (0.106)
Woman	0.091*** (0.028)	0.259*** (0.058)	0.314*** (0.063)	−0.105 (0.094)	−0.112 (0.093)
Age	0.032*** (0.002)	0.058*** (0.004)	0.078*** (0.007)	0.010 (0.006)	0.008 (0.008)
Years of education	−0.019*** (0.004)	0.009 (0.008)	−0.006 (0.009)	0.027** (0.013)	0.029** (0.013)
Single household	0.378*** (0.036)	0.503*** (0.065)	0.743*** (0.098)	0.057 (0.101)	0.049 (0.100)
Income quartile					
1st	–	–	–	–	–
2nd	0.070* (0.036)	0.107 (0.070)	0.145* (0.074)	0.057 (0.107)	0.064 (0.106)
3rd	0.043 (0.041)	0.017 (0.087)	0.038 (0.092)	0.359** (0.145)	0.356** (0.143)
4th	0.121*** (0.043)	0.180** (0.087)	0.246*** (0.093)	0.305** (0.139)	0.334** (0.145)
Wealth quartile					
1st	–	–	–	–	–
2nd	−0.011 (0.036)	−0.026 (0.068)	−0.035 (0.072)	0.017 (0.105)	0.025 (0.104)
3rd	−0.031 (0.038)	−0.108 (0.077)	−0.143* (0.082)	−0.094 (0.127)	−0.102 (0.126)
4th	−0.009 (0.041)	−0.023 (0.087)	−0.040 (0.091)	−0.261* (0.147)	−0.277* (0.147)
Disability index	0.218*** (0.019)	0.525*** (0.041)	0.671*** (0.060)	0.069 (0.069)	0.047 (0.078)
(Disability index)^2	0.039*** (0.010)	−0.046*** (0.017)	−0.022 (0.020)	0.060** (0.025)	0.063** (0.025)
Instrumental variables					
Proportion of daughters	0.086** (0.035)				
Distance to the nearest child	−0.310*** (0.045)				
(Distance to the nearest child)^2	0.045*** (0.010)				
Country dummies	Yes	Yes	Yes	Yes	Yes
(Pseudo-) R^2	0.178	0.336	–	0.213	0.232
Number of observations	7,329	7,329	7,329	635	635

Notes: SHARE 2004. Sample includes all individuals being 65 year old or over having at least one child and not living with them. Asterisks (*), (**), (***) means that the coefficient estimate is significantly different from zero at the 10%, 5%, 1% level, respectively. Standard errors are in parentheses. Informal care corresponds to the logarithm of the number of hours of informal care provided to the parents (plus one).

SHARE and Stylized facts: Substitution or complementarity between formal and informal care

And now? At the European level, once monetary valuation of informal care is imputed → S. Perelman and P. Pestieau (2025). *The economic value of informal LTC*.

- **Informal LTC** (% GDP): SHARE estimates based on the SHARE Time-Use questionnaire (Wave 9, 2022)
- **Formal LTC** (% GDP): Value of formal LTC (European Commission, 2021).

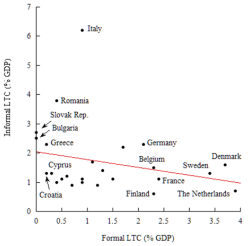

Figure 4: Informal vs Formal Care (%)

SHARE and Stylized facts: Impact of housing (at home or in nursing home) choices in case of loss of autonomy

X.Flawinne et al. (2022). "Nursing homes and mortality in Europe: Uncertain causality". In: *Health Economics*

A.Lafferère and J. Schoenmaeckers (2025). "Do Europeans really feel better at home than in a nursing home?" In: *American Journal of Epidemiology*

- Goal: impact of housing choices (and therefore type of care) on mortality and well-being
- Methods: Matching (PSM and PSM-DID) → ATTs
- Results:
  - "Positive impact" on mortality in some countries but not in all
  - "Negative impact" on life satisfaction in some countries but not in all but observation of a phenomenon of satisfaction catch-up for those observed more than once (panel FE analysis)

SHARE and Stylized facts: Impact of housing (at home or in nursing home) choices in case of loss of autonomy

Figure 5: Mortality

TABLE 4 Average Treatment of the Treated (ATT) estimation with the Propensity-Score Kernel Matching (exact matching with replacement)

Groups of countries/Countries	# treated	# control	ATT	S.E.
All	803	6301	0.107***	0.023
North	172	746	0.113**	0.052
Denmark	87	309	0.056	0.077
Netherlands	14	37	0.133	0.186
Sweden	70	406	0.145*	0.082
Central	434	2822	0.105***	0.032
Austria	66	634	0.062	0.079
Belgium	190	1011	0.092*	0.049
France	76	495	0.039	0.084
Germany	47	326	0.277***	0.080
Luxembourg	26	35	0.205	0.126
Switzerland	37	226	0.270***	0.099
South	91	1113	0.001	0.062
Italy	20	343	–0.084	0.110
Spain	74	785	0.001	0.991
East	106	1558	0.146***	0.052
Czech Rep.	67	779	0.165**	0.070
Estonia	39	336	0.147*	0.088

Note: ***, ** and * stand for statistically significant at the 1%, 5% and 10% levels respectively.
Abbreviation: ATT, Average Treatment of the Treated.

Figure 6: Satisfaction

Groups of countries/Countries	# treated (#used)	# control (#used)	ATT 65+	S.E.	ATT 75+
All	1095 (1019)	18993 (13889)	-0.300***	0.095	-0.280***
North	226 (221)	2144 (1910)	-0.353*	0.185	-0.330*
Denmark	95 (91)	718 (517)	-0.044	0.356	0.102
Netherlands	45 (45)	384 (219)	-0.727**	0.323	-0.669*
Sweden	86 (84)	1042 (975)	-0.432	0.306	-0.618*
Central	552 (518)	7210 (5361)	-0.220*	0.130	-0.230*
Austria	85 (81)	1267 (1102)	0.129	0.310	0.030
Belgium	201 (197)	2219 (1950)	-0.488**	0.214	-0.446**
France	86 (81)	1663 (890)	-0.181	0.328	-0.202
Germany	76 (73)	1320 (795)	-0.456	0.323	-0.533
Luxembourg	36 (34)	256 (158)	0.022	0.419	0.154
Switzerland	68 (67)	585 (518)	-0.227	0.308	-0.118
South	109 (101)	3867 (2630)	-0.815***	0.297	-0.707**
Italy	32 (30)	1454 (467)	-1.044	0.857	-1.139
Spain	60 (56)	1842 (1529)	-0.176	0.316	-0.497
Portugal	16 (16)	571 (205)	-1.339*	0.718	-1.711
East	209 (200)	5772 (4072)	-0.084	0.240	-0.200
Czech Rep.	106 (100)	1944 (1551)	0.002	0.347	-0.233
Estonia	68 (65)	2849 (1715)	-0.253	0.418	0.129
Slovenia	35 (35)	979 (347)	-0.441	0.468	-0.513

SHARE and Stylized facts: Impact of housing (at home or in nursing home) choices in case of loss of autonomy

- Sensitivity analysis suggested by Ichino et al. (2008) to test whether our results are robust to the violation of the CIA
- Indeed, one may think of one unobserved variable that would simultaneously influence the decision to go into a nursing home (selection effect) and the probability to die (outcome effect)
- For example, actual informal care may influence simultaneously the decision to enter a nursing home and the health of the elderly. The former would be related to a selection effect and the later would have an outcome effect.

The results hold (see next slide for life satisfaction) → useful to anticipate comments from potential referees (routine in STATA)

SHARE and Stylized facts: Impact of housing (at home or in nursing home) choices in case of loss of autonomy

		Confounder-like		
		Being a female	Being in bad health	Having at least one child
All	ATT Radius matching		-0.264*** (0.079)	
	Outcome Effect Γ	0.816	0.149	1.270
	Selection Effect Λ	1.401	0.715	0.383
	ATT (S.E.)	-0.267*** (0.079)	-0.262*** (0.079)	-0.265*** (0.079)
North	ATT Radius matching		-0.449*** (0.156)	
	Outcome Effect Γ	1.118	0.121	2.167
	Selection Effect Λ	1.096	2.211	0.609
	ATT (S.E.)	-0.444*** (0.157)	-0.420*** (0.158)	-0.446*** (0.157)
Center	ATT Radius matching		-0.367*** (0.103)	
	Outcome Effect Γ	0.844	0.123	1.175
	Selection Effect Λ	1.767	0.817	0.432
	ATT (S.E.)	-0.361*** (0.104)	-0.368***(0.103)	-0.365*** (0.103)
South	ATT Radius matching		-1.236*** (0.274)	
	Outcome Effect Γ	0.807	0.323	1.198
	Selection Effect Λ	1.706	0.413	0.210
	ATT (S.E.)	-1.215*** (0.276)	-1.233*** (0.274)	-1.224*** (0.274)
East	ATT Radius matching		-0.212 (0.206)	
	Outcome Effect Γ	0.929	0.191	1.556
	Selection Effect Λ	1.169	0.856	0.354
	ATT (S.E.)	-0.229 (0.205)	-0.210 (0.205)	-0.227 (0.205)

Figure 7: Ichino (2008) method on life satisfaction

SHARE and Stylized facts: Motive(s) of intergenerational help

J. Klimaviciute et al. (2017). "Caring for dependent parents: altruism, exchange or family norm?" In: *Journal of Population Economics* 30, pp. 835–873. $\beta > 0$.

- Goal: Identify motives of intergenerational help
- Methods:
  - Theoretical models → comparative statics (relationships between ascending informal care and descending financial transfers)
  - Empirical results (Tobits + Mundlak (1978) correction)
- Comparing the empirical results to the theoretical models developed, it appears that, depending on the regions analyzed, long-term caring is driven by moderate altruism or by family norm, not by exchange

SHARE and Stylized facts: Motive(s) of intergenerational help

Figure 8: Theoretical models

Table 1 Summary of theoretical models

	Child's help side		Parent's transfer side	
	da/dy	da/dw	db/dy	db/dw
Altruism	> 0 if comp		>0 if $\alpha = 1$	<0 if $\alpha = 1$
	< 0 if subs	$\gtrless 0$	$\gtrless 0$ if $0 < \alpha < 1$	$\gtrless 0$ if $0 < \alpha < 1$
	0 if indep			
Exchange	> 0 if comp or indep	< 0 if comp or indep	> 0 if comp or indep	
	$\gtrless 0$ if subs (but same as db/dy)	$\gtrless 0$ if subs	$\gtrless 0$ if subs (but same as da/dy)	$\gtrless 0$
Family norm	0	0	> 0 (P altruist)	< 0 (P altruist)
			0 (P not altruist)	0 (P not altruist)

Figure 9: Empirical results

Table 7 Summary of empirical findings (All HHs sample, $n = 28{,}780$)

Countries	Child's help		Parent's transfer	
	da/dy	*da/dw*	*db/dy*	*db/dw*
SHARE	< 0	$= 0$	> 0	> 0
North	< 0	$= 0$	> 0	$= 0$
Center	< 0	$= 0$	> 0	$= 0$
South	< 0	$= 0$	> 0	$= 0$
East	$= 0$	$= 0$	$= 0$	$= 0$

SHARE and Stylized facts: Motive(s) of intergenerational help

P. Pestieau M. Lefebvre and J. Schoenmaeckers (2025). "Grandchild care and eldercare. A quid pro quo arrangement". In: *Economic Modelling* 146.

- Examining a novel motive for grandchild care: reciprocity in case of LTC need
- We design a two-period model for grandparents anticipation of reciprocity
- Using SHARE data, we confirm reciprocity of care when dependence arises (CRE models)
- The more care grandparents provide, the more support they receive when in need

SHARE and Stylized facts: key points to take home

- SHARE is a free outstanding database (international, longitudinal and topic coverage)
- We can test theoretical models
- Different empirical approaches (OLS, 2SLS, PSM, PSM-DID, FE, CRE, etc.)
- Do not hesitate to use SHARE (even if some entry costs)

Gist of this presentation

- A public LTC insurance is desirable.
- Its design should take into account family altruism: intensity and reliability.

Basic model. No family.

Two period model with individuals differing in wages w_i and disability risk π_i. Lifetime utility :

$$U_i^p = u(w_i(1-\tau)l_i - s_i - l_i - v(l_i)) + (1-\pi_i)\,u(s_i) + \pi_i H(l_i/\pi_i + s_i + g)$$

The timing of the game is the following:

1. The government chooses the tax rate τ and the benefit level g that maximizes the parent's welfare.
2. The parent chooses labor supply l, their saving s, and the LTC insurance premium I, if any .

Individual's problem

The FOCs are:

$$w_i(1-\tau) - v'(l_i) = 0$$
$$-u'(c_i) + (1-\pi_i)\,u'(s_i) + \pi_i H'(m_i) = 0$$
$$-u'(c_i) + H'(m_i) \leq 0.$$

In case of interior solution with $l_i > 0$,we have:

$$H'(m_i) = u'(c_i) = u'(s_i).$$

Government's problem

$$\mathscr{L} = E\{u(w(1-\tau)l - s - l - v(l)) + (1-\pi)\,u(s) + \pi H(l/\pi + s + g)$$

$$+\mu[\tau w l - \pi g]$$

We obtain the FOCs:

$$\frac{\partial \mathscr{L}}{\partial g} = E\left[\pi H'(m) - \mu\pi\right] = 0$$

$$\frac{\partial \mathscr{L}}{\partial \tau} = E\left[-u'(c)wl + \mu\left(wl + \tau w\frac{\partial l}{\partial \tau}\right)\right] = 0$$

Government's problem

In compensated terms:

$$\frac{\partial \mathscr{L}^{\mathscr{C}}}{\partial \tau} = -Eu'(c)wl + E\pi H_2 \frac{Ewl}{E\pi} + \mu\tau Ew\frac{\partial l}{\partial \tau} = 0$$

or

$$\frac{\partial \mathscr{L}^{\mathscr{C}}}{\partial \tau} = -cov\left(u'(c), wl\right) + cov\left(u'(c), \pi\right)\frac{Ewl}{E\pi} + \mu\tau Ew\frac{\partial l}{\partial \tau} = 0.$$

And thus :

$$\tau = \frac{-cov\left(u'(c), wl\right) + cov\left(u'(c), \pi\right)\frac{Ewl}{E\pi}}{-\mu Ew\frac{\partial l}{\partial \tau}}$$

With family solidarity

The basic model used involves parent-child families. Families differ in the levels of wages w_i and ω_i of the parent and the child and the disability risk π_i. Parent's lifetime utility :

$$U_i^p = u(w_i(1-\tau)l_i - s_i - l_i - v(l_i)) + (1-\pi_i)\,u(s_i) + \pi_i H(a_i, l_i/\pi_i + s_i + g)$$

The timing of the game is the following:

1. The government chooses the tax rate and the benefit level that maximize social welfare.
2. The parent chooses their labor supply, their saving and the LTC insurance premium, if any .
3. The child chooses a_i

Child's problem

- in case of healthy parent: $U_i^c = u(\omega_i)$
- in case of disabled parent: $U_i^c = u(\omega_i(1-a_i)) + \beta H(a_i, m_i)$,

$$-u'((1-a_i)\omega_i)\omega_i + \beta H_1(a_i, m_i) = 0.$$

Supply function for caring time: $a_i = a(m_i; \beta, \omega_i)$.

$$\frac{\partial a_i}{\partial m_i} \lessgtr 0 \Leftrightarrow H_{12} \lessgtr 0.$$

Parent's problem

The FOCs are:

$$w_i(1-\tau) - v'(l_i) = 0$$

$$-u'(c_i) + (1-\pi_i)\,u'(s_i) + \pi_i H_2(a_i, m_i) + \pi_i H_1(a_i, m_i)\frac{\partial a_i}{\partial s_i} = 0$$

$$-u'(c_i) + H_2(a_i, m_i) + \pi_i H_1(a_i, m_i)\frac{\partial a_i}{\partial l_i} \leq 0.$$

In case of interior solution with $l_i > 0$,we have:

$$-u'(c_i) + H_2(a_i, m_i) + \pi_i H_1(a_i, m_i)\frac{\partial a_i}{\partial l_i} = 0; u'(c_i) = u'(s_i).$$

Government's problem

$$\mathscr{L} = E\{u(w(1-\tau)l - s - l - v(l)) + (1-\pi)\,u(s) + \pi H(a(.), l/\pi + s + g)$$

$$+\mu[\tau w l - \pi g]$$

We obtain the FOCs:

$$\frac{\partial \mathscr{L}}{\partial g} = E\left[(-u'(c) + (1-\pi)\,u'(d) + \pi H_2)\frac{\partial s}{\partial g} + (-u'(c_i) + H_2)\frac{\partial l}{\partial g} + \pi H_2 + \pi H_1 \frac{da}{dg} - \mu\pi\right] = 0$$

$$\frac{\partial \mathscr{L}}{\partial \tau} = -E\left[u'(c)wl - \mu\left(wl + \tau w\frac{\partial l}{\partial \tau}\right)\right] = 0.$$

Government's problem

If $l > 0$:

$$\frac{\partial \mathscr{L}^{\mathscr{C}}}{\partial \tau} = -cov\left(u'(c), wl\right) + cov\left(u'(c), \pi\right) \frac{Ewl}{E\pi} + \mu \tau Ew \frac{\partial l}{\partial \tau} = 0.$$

And thus :

$$\tau = \frac{-cov\left(u'(c), wl\right) + cov\left(u'(c), \pi\right) \frac{Ewl}{E\pi}}{-\mu Ew \frac{\partial l}{\partial \tau}}$$

Government's problem

If $I = 0$:

$$\frac{\partial \mathscr{L}^{\mathscr{C}}}{\partial \tau} = -cov\left(u'(c), wl\right) + cov\left(\pi, H_2\right)\frac{Ewl}{E\pi} + EwlE\left[H_2 - u'(c)\right] + E\pi H_1 \frac{\partial a}{\partial m}\frac{Ewl}{E\pi} - \mu\tau Ew\frac{\partial l}{\partial \tau} = 0.$$

And thus :

$$\tau = \frac{-cov\left(u'(c), wl\right) + cov\left(\pi, H_2\right)\frac{Ewl}{E\pi} + EwlE\left[H_2 - u'(c)\right] + E\pi H_1 \frac{\partial a}{\partial m}\frac{Ewl}{E\pi}}{-\mu Ew\frac{\partial l}{\partial \tau}}$$

Proposition 1. *Complementarity (substitutability) between formal and informal care fosters (reduces) public LTC spending when private LTC insurance is not available.*

Parent's lifetime utility can be written as:

$$U_i^p = u(w_i(1-\tau)l_i - s_i - l_i - v(l_i)) + \phi_i(1-\pi_i)u(s_i/\phi_i + P) + \phi_i\pi_i H(a_i, l_i/\pi_i + s_i/\phi_i + P + g)$$

Government's Lagrangian:

$$\mathscr{L} = E\{u(w(1-\tau)l - s - l - v(l)) + \phi(1-\pi)\,u(s/\phi + P) + \phi\pi H(a(.), m)$$

$$+\mu[\tau wl - \phi\pi g - \phi P]$$

Government's Lagrangian:
If $I > 0$:

$$\frac{\partial \mathscr{L}^{\mathscr{C}}}{\partial P} = cov\left(\phi(1-\pi), u'(c)\right) - \frac{E(\phi(1-\pi))}{E\phi\pi} cov\left(\phi\pi, u'(c)\right)$$

If $I = 0$:

$$\frac{\partial \mathscr{L}^{\mathscr{C}}}{\partial P} = cov\left(\phi(1-\pi), u'(d)\right) - \frac{E\phi(1-\pi)}{E\phi\pi}\left[cov\left(\phi\pi, H_2\right) + E\left(H_2 - u'(c)\right) + E\left(\phi\pi H_1 \frac{\partial a}{\partial m}\right)\right].$$

Proposition 2. *The negative effect on social welfare of a budget-balancing increase in public pension offset by a decrease in public LTC is influenced by family solidarity when private LTC insurance is not available.*

$$u(w_i(1-\tau)l_i - s_i - l_i - v(l_i)) + (1-\pi)\,u(s_i) + \pi_i\,(1-\zeta)\,H(0, l_i/\pi_i + s_i + g)$$

$$+\pi_i\zeta H(a_i(.), l_i/\pi_i + s_i + g)$$

$$\mathscr{L} = E\{u(w(1-\tau)l - s - l - v(l)) + (1-\pi)\,u(s) + \pi\,(1-\zeta)\,H(0, m)$$

$$+\pi\zeta H(a, m) + \mu\,[\tau w l - \pi g]\}$$

If $I > 0$,

$$\tau = \frac{-cov\left(u'(c), wl\right) + cov\left(u'(c), \pi\right) \frac{Ewl}{E\pi}}{-\mu E w \frac{\partial l}{\partial \tau}}$$

If $I = 0$, we have

$$\tau = \frac{B + \zeta E\pi H_1(a, m) \frac{\partial a}{\partial m} \frac{Ewl}{E\pi}}{-\mu E w \frac{\partial l}{\partial \tau}}$$

Focusing on this case, we obtain that:

$$\frac{d\tau}{d\zeta} = C + E\pi H_1(a, m) \frac{\partial a}{\partial m} \frac{Ewl}{E\pi}$$

Proposition 3. *Family solidarity increases the level of public LTC in case of complementarity.*

Thank you for your attention !

Pierre Pestieau

Email: **p.pestieau@uliege.be**