Public Insurance and Wealth Inequality: A Euro Area Analysis

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CEPR European Conference on Household Finance


Disclaimer: The views expressed in this presentation are those of the author and do not necessarily reflect those of the Bundesbank or the Euro System as a whole.
Wealth Inequality and Redistributive Transfers

Hubbard et al. (1995): Public insurance reduces income risks and crowds out private savings, especially of the poor.

Research Question

(1) What fraction of euro area differences in wealth inequality can be attributed to cross-country differences in labor market dynamics as well as social security institutions?

- Model accounts for 70.1% of the euro area variation (for the bottom 95% of the wealth distribution)

(2) Decomposition that isolates role of considered factors

- Public transfers: 57.5% \(\Rightarrow\) Minimum-income support: 44.8%
(1) What fraction of euro area differences in wealth inequality can be attributed to cross-country differences in labor market dynamics as well as social security institutions?

- Model accounts for 70.1% of the euro area variation (for the bottom 95% of the wealth distribution)

(2) Decomposition that isolates role of considered factors

- Public transfers: 57.5% ⇒ Minimum-income support: 44.8%
Means-tested minimum-income benefits as % of median household net labor income

\[ \text{corr} = 0.81 \]

Empirical evidence

Median net pension replacement rate

\[
\text{Median net old-age/survivors’ benefit (retired 65-75 y)} = \frac{\text{Median net earnings (employed and unemployed, 50-60 y)}}{}
\]

\[
\text{corr} = 0.73
\]

Life-cycle partial equilibrium model

- Life-cycle model with heterogeneous households and incomplete markets
- Households face exogenous earnings and unemployment risk, and life-span risk
- Precautionary savings and bequest motive, old-age provision
Effects on wealth inequality

Model features

(1) **Earnings inequality and unemployment** ↑
   ⇒ **wealth inequality** ↑

(2) **Public insurance** ↑
   - Public and occupational pensions
   - Unemployment insurance
   - Means-tested minimum income benefits (asset and income)
   ⇒ **wealth inequality** ↑, due to crowding out private savings, especially of the poor
Calibration Strategy

- All countries share the same technological and preference parameters
- **Country-specific calibration** of:
  1. After-tax earnings and unemployment process
  2. Social security system: Unemployment benefits, public and occupational pensions, means-tested minimum income support

  ⇒ Parameter \( \theta_c = \{\theta_1^c, ..., \theta_M^c\} \) based on EU-SILC or OECD benefit and tax model

- Coefficient of determination quantifies explanatory power of model
Model: Earnings during working age

- Households face earnings and unemployment risk during working life
- If employed: gross earnings process

\[ \omega_h = \mu_{c,h} + \rho z_{h-1} + \epsilon_h, \quad \epsilon_h \sim N(0, \sigma_c^2), \text{ if } h \leq 40 \]

\[ c \in \{ AT, BE, FI, FR, DE, GR, IT, NL, PT, ES \} \]

- Net earnings

\[ w_{h}^{\text{net}} = \omega_h (1 - \tau_c(\omega_h)) \]
Unemployment benefits during working age

- If **unemployed**: net unemployment benefits as a fraction of *today’s* net earnings

\[
b_h = \begin{cases} 
rr_c(\omega_h)w_h^{net}, & \text{if eligible} \\
0, & \text{if not eligible}
\end{cases}
\]

*rr_c(\omega_h)* is country specific net replacement rate

- Households keep benefits with prob. *p_c* ⇒ allow for different duration of eligibility across countries
Pensions during retirement

- If **retired**: net pensions benefits

\[ w_h^r = f_c(w_{H_{40}}^{net}), \text{ if } h > 40 \]

where \( f_c \) is a concave function
Minimum-income support

- Means-tested transfers (w.r.t. assets and net earnings)

\[ TR(a_h, w_{h,\text{net}}) = \max\{0, \bar{TR}_c - a_h(1 + r) - w_{h,\text{net}}\} \]

  1. Minimum-income support programs reduce the downward income risk
  2. Asset based means-testing introduces an implicit tax on savings and a trade-off between precautionary saving and dissaving to potentially become eligible for income support

⇒ Distortion of precautionary savings motive for lower part of the income distribution
Minimum-income support

- Means-tested transfers (w.r.t. assets and net earnings)
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  ⇒ Distortion of precautionary savings motive for lower part of the income distribution
Optimization problem of employed household at age $h$

- Bellman equation

$$V(h, a, z, e) = \max_{c,k} \left\{ u(c) + \beta \mathbb{E}\left\{ (1 - \iota_h)[(1 - \delta_c)V(h+1, a', z', e) \right. \\
\left. + \delta_c V(h+1, a', z', u_b)] + \iota_h \phi(a') \right\} \right\}$$

$$\phi(a) = \phi_1 \frac{(a + \phi_2)^{1-\xi}}{1-\xi} \quad \text{(De Nardi and Yang, 2015)}$$

s.t. $c + \frac{a'}{1+r} = a + w^{\text{net}} + \frac{TR_c(k, w^{\text{net}})}{1+r}$

$$a' = (1+r)k + TR_c(k, w^{\text{net}}) \geq 0$$

plus optimization problem of unemployed household, in case of benefits ($u_b$) and no benefits ($u$)
Optimization problem of employed household at age $h$

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plus optimization problem of unemployed household, in case of benefits ($u_b$) and no benefits ($u$)
Determining the Predictive Power of the Model

- Gini coefficient of net wealth in country c: $\lambda_c, \ c = 1, \ldots, 10$
- Gini coefficient predicted by the model $\hat{\lambda}_c(\theta_c)$
- Calibration of time preference parameter $\beta$:

$$\bar{\lambda} = \frac{\sum_{c=1}^{10} \lambda_c}{10} = \frac{\sum_{c=1}^{10} \hat{\lambda}_c(\beta, \theta_c)}{10}$$

- Modified coefficient of determination:

$$R = 1 - \left( \frac{\sum_{c=1}^{10} |\lambda_c - \hat{\lambda}_c(\theta_c)|}{\sum_{c=1}^{10} |\lambda_c - \bar{\lambda}|} \right), \quad \bar{\lambda} = \frac{\sum_{c=1}^{10} \lambda_c}{10}$$
# Common parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Target/Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta )</td>
<td>0.983</td>
<td>Discount factor</td>
</tr>
<tr>
<td>( \xi )</td>
<td>1.5</td>
<td>Coefficient of RRA</td>
</tr>
<tr>
<td>( r )</td>
<td>2.5%</td>
<td>Annual real interest rate</td>
</tr>
<tr>
<td>( \phi_1 )</td>
<td>28</td>
<td>Bequest utility</td>
</tr>
<tr>
<td>( \phi_2 )</td>
<td>8.8</td>
<td>Bequest utility shifter</td>
</tr>
<tr>
<td>( h_1 )</td>
<td>22</td>
<td>Age of labor market entry</td>
</tr>
<tr>
<td>( h_{40} )</td>
<td>62</td>
<td>Age of retirement</td>
</tr>
<tr>
<td>( h_{62} )</td>
<td>84</td>
<td>Age of decease</td>
</tr>
</tbody>
</table>

Country-specific parameters: [Labor market process](#)
## Country-specific policy parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Target</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum income benefits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Unemployment insurance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$rr_c(\omega_h)$</td>
<td>Initial net replacement rate (weighted)</td>
<td>OECD “Benefits and Wages” database (2004/2010)</td>
</tr>
<tr>
<td>$p_c$</td>
<td>Avg. net replacement rate over first 5 years of unemployment</td>
<td></td>
</tr>
<tr>
<td><strong>Pensions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$f_c(x) = a_c x^\frac{1}{b_c}$</td>
<td>Median net pension replacement rate</td>
<td>EU-SILC (2004-2010), adjusted for real wage growth</td>
</tr>
<tr>
<td></td>
<td>Pension progressivity index $1 - \frac{\text{gini}(w_{41})}{\text{gini}(w_{40}^{\text{net}})}$</td>
<td></td>
</tr>
<tr>
<td><strong>Earnings tax</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\tau_c(\omega_h)$</td>
<td>Avg. tax rate schedule defined on multiples of average earnings</td>
<td>OECD tax database (2010)</td>
</tr>
</tbody>
</table>
## Data vs. Model

<table>
<thead>
<tr>
<th></th>
<th>Data (bottom 95%)</th>
<th>Model</th>
<th>Forecast Error</th>
<th>Coefficient of determination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\lambda_c$</td>
<td>$</td>
<td>\lambda_c - \bar{\lambda}</td>
<td>$</td>
</tr>
<tr>
<td>AT</td>
<td>0.656</td>
<td>0.0833</td>
<td>0.634</td>
<td>0.061</td>
</tr>
<tr>
<td>BE</td>
<td>0.522</td>
<td>0.0508</td>
<td>0.535</td>
<td>0.037</td>
</tr>
<tr>
<td>FI</td>
<td>0.612</td>
<td>0.0399</td>
<td>0.608</td>
<td>0.035</td>
</tr>
<tr>
<td>FR</td>
<td>0.591</td>
<td>0.0190</td>
<td>0.603</td>
<td>0.031</td>
</tr>
<tr>
<td>DE</td>
<td>0.661</td>
<td>0.0884</td>
<td>0.624</td>
<td>0.052</td>
</tr>
<tr>
<td>GR</td>
<td>0.499</td>
<td>0.0738</td>
<td>0.525</td>
<td>0.048</td>
</tr>
<tr>
<td>IT</td>
<td>0.516</td>
<td>0.0561</td>
<td>0.518</td>
<td>0.055</td>
</tr>
<tr>
<td>NL</td>
<td>0.629</td>
<td>0.0569</td>
<td>0.607</td>
<td>0.034</td>
</tr>
<tr>
<td>PT</td>
<td>0.540</td>
<td>0.0326</td>
<td>0.547</td>
<td>0.025</td>
</tr>
<tr>
<td>ES</td>
<td>0.498</td>
<td>0.0741</td>
<td>0.524</td>
<td>0.048</td>
</tr>
<tr>
<td>Mean</td>
<td>0.573</td>
<td>0.0575</td>
<td>0.573</td>
<td>0.043</td>
</tr>
</tbody>
</table>
## Decomposition Results

Conditional and unconditional on ordering

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>Fraction explained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(a) cond. (b) uncond.</td>
</tr>
<tr>
<td>Minimum income support</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>42.6%</td>
</tr>
<tr>
<td>Pensions system</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>set to EA</td>
<td>10.6%</td>
</tr>
<tr>
<td>Unemployment Insurance</td>
<td>-</td>
<td>-</td>
<td>set to EA</td>
<td>set to EA</td>
<td>4.7%</td>
</tr>
<tr>
<td>Income dynamics</td>
<td>-</td>
<td>set to EA</td>
<td>set to EA</td>
<td>set to EA</td>
<td>12.2%</td>
</tr>
</tbody>
</table>

**Fraction of EA - other countries predicted differences explained by model**

| $R$ | 70.1% | 57.9% | 53.1% | 42.6% |

EA = euro area
Conclusion

- Large cross-country differences in wealth inequality within euro area (even for bottom 95%)
- Factors considered account for 70.1% of euro area differences in wealth inequality
- Minimum-income support programs contribute with 44.8% the lion’s share, followed by labor market dynamics with 12.6% and public pensions with 10.7%
- Unemployment insurance has only little explanatory power
Thank you for your attention
Share of wealth held by 50th percentile (bottom 95%)

Gini coefficient of equivalized household net wealth (bottom 95%)

## Cross-country variation in exogenous income process

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rho$</td>
<td>0.95 Pers. of earnings shocks</td>
<td>Common micro estimate</td>
</tr>
<tr>
<td>$\sigma^2_c$</td>
<td>Var. of earnings shocks</td>
<td>Estimated for employed households with heads aged 25-60 (EU-SILC, 2004-10)</td>
</tr>
<tr>
<td>$\mu_{c,h}$</td>
<td>Deterministic age-earnings profile</td>
<td>Estimated from EU-SILC (2004-10)</td>
</tr>
<tr>
<td>$\delta_c$</td>
<td>Job separation rate</td>
<td>Household unemployment rate (EU-SILC, 2004-10)</td>
</tr>
<tr>
<td>$\lambda_c$</td>
<td>Job finding rate</td>
<td>Share of long-term unemployed (Eurostat, 2004-10)</td>
</tr>
</tbody>
</table>
## Robustness

**Table: Robustness**

<table>
<thead>
<tr>
<th>Specification</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) No asset test</td>
<td>70.8%</td>
</tr>
<tr>
<td>2) Private transfers</td>
<td>68.2%</td>
</tr>
<tr>
<td>3) Share held by bottom 50%</td>
<td>69.7%</td>
</tr>
</tbody>
</table>
3. Income tax progressivity wedges (67\% − 400\% of average earnings)

Source: OECD tax database, 2010, own calculation: $PW = 1 - \frac{1 - \tau(4\bar{y})}{1 - \tau(0.67\bar{y})}$
Earnings risk:
Standard deviation of persistent earnings shocks

Source: Estimates from EU-SILC, 2004-10
Cross-sectional age-earnings profile (PPP and euro area real wage growth adjusted)

Source: Own estimates, EU-SILC (2004-10)
Wealth inequality and unemployment insurance (weighted, 2010)

UI: Household initial net replacement rate in 1st year of unemployment (weighted, 2010)

Public and occupational pension replacement rate

Source: Own estimates, EU-SILC (2004-10)
Means-tested minimum income support programs

2-period certainty model: $E_1 > \bar{C}$ and $E_2 = 0 < \bar{C}$
Optimization problem of unemployed household at age $h$

- Bellman equation when receiving unempl. benefits

$$V(h, a, z, u_b) = \max_{c, k} \left\{ u(c) + \beta \mathbb{E} \left\{ (1 - \iota_h) \left[ \gamma_c V(h + 1, a', z', e) ight. ight. ight.$$ 

$$\left. \left. + (1 - \gamma_c) [p_c V(h + 1, a', z', u_b) + (1 - p_c) V(h + 1, a', z', u)] \right] + \iota_h \phi(a') \right\} \right\}$$

$$s.t. \ : c + \frac{a'}{1 + r} = a + b + \frac{TR_c(k, b)}{1 + r} \geq 0$$