The Sustainability of the Welfare State: A Historical Cohort Analysis

Miguel Sánchez-Romero, Alexia Prskawetz, Gemma Abio, Concepción Patxot, Guadalupe Souto, Gustav Öberg, Lili Vargha, Joze Sambt, Meritxell Solé Juvés, Montserrat Botej

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Motivation

- Population aging will exert fiscal pressure on public pay-as-you-go basis program. Austria, France, Spain: Pensions from 6-10% (1980) to 11.5-14% (2013) of GDP;
  Austria, France, Spain: Education stable at 4-5% of GDP
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- The analysis must be longitudinal
Designing an OLG-CGE model based on AGENTA National Transfer Accounts (NTA) and National Time Transfer Accounts (NTTA) data to simulate the consequences of population ageing.
Stylized OLG-CGE (combining WIC, NTTA/NTA, and demographic data)

NTA and historical Nat. Accounts

WIC, Demographics, NTTA

- Households
  - Market goods and services
  - Non market goods and services
  - Demand
  - Consumption
  - Factor supply

- Government
  - Revenues
  - Production
  - Consumption
  - Taxes
  - Factor demand
  - Factor cost

- Firms
  - Market goods and services
  - Factor demand
  - Factor supply

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  - Rents and wages
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  - Factor demand
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- Non market goods and services
  - Pen., edu.
  - Factor supply
  - Factor demand

- Factors market
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Market goods and services
- consumption
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rents and wages
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WIC, Demographics, NTA

NTA and historical Nat. Accounts
Utility function

\[ U = \phi_m \log \left( \frac{c_m}{\eta} - \bar{c}_m \right) + \phi_h \log \left( \frac{c_h}{\eta} - \bar{c}_h \right) + \phi_n \eta \log t_c + \phi_z \frac{z^{1-\sigma} - 1}{1 - \sigma} \]  

(1)

Market goods and services

Home goods and services

Childcare

Leisure

Home production

\[ c_h = (c_x)^\theta (t_h)^{1-\theta}, \]  

(2)

where \( c_x \) = inter. goods, \( t_h \) = time use on home production, \( \theta \) = home technology.

Budget constraint

Standard (including intermediate goods)  

(3)
Time Use (Optimal behavior)

Childcare:
\[ t_c = \frac{\phi_n}{\phi_z} z^\sigma, \]  
(4)

Home production:
\[ t_h = (1 - \theta) \frac{\phi_h}{\phi_z} \frac{c_h}{c_h - \eta \bar{c}_h} z^\sigma, \]  
(5)

Market labor:
\[ \ell = T(e) - t_c - t_h - z. \]  
(6)
Model (II/II)

**Time Use** (Optimal behavior)

Childcare:

\[ t_c = \frac{\phi_n}{\phi_z} z^\sigma, \quad \text{(4)} \]

Home production:

\[ t_h = (1 - \theta) \frac{\phi_h}{\phi_z} \frac{c_h}{c_h - \eta \bar{c}_h} z^\sigma, \quad \text{(5)} \]

Market labor:

\[ \ell = T(e) - t_c - t_h - z. \quad \text{(6)} \]

Firms: Neoclassical production (capital and labor)
**Table 1: Data Sources**

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Census data, Human Mortality Database, Human Fertility Database, Human capital (WIC data), IPUMS, etc...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Historical National Accounts Data, AGENTA data (NTA/NTTA), EU-SILC, OECD, Eurostat, etc...</td>
</tr>
<tr>
<td>Countries</td>
<td>Austria, France, Spain and <strong>Sweden</strong></td>
</tr>
</tbody>
</table>
Figure 1: Per capita income and consumption measured in EUR 2010 in natural log, 1870–2015.

Source: Historical national accounts (see Deliverable 5.4 and Prados de la Escosura, 2017) and authors’ estimations.

Additional variables: Total hours worked, Per capita hours worked in 2010, Capital to output
The evolution of public spending on pensions and education

Assumption: Pension and educational expenditures relative to labor income fixed at 2010 level.

Figure 2: Public spending on pensions and education (% GDP), 1870–2015.

Source: Authors’ calculations.
Figure 3: Present value at birth of benefits and taxes paid for pensions and education: Cohorts 1900-2100

Source: Authors’ calculations.
Intergenerational contract (education and pensions)

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Source: Authors' calculations.
Intergenerational contract (education and pensions)

![Graphs showing present value at birth of benefits and taxes paid for pensions and education: Cohorts 1900-2100 for Austria, France, and Spain.](image)

**Figure 3:** Present value at birth of benefits and taxes paid for pensions and education: Cohorts 1900-2100

Source: Authors’ calculations.
Intergenerational contract (education and pensions): Changes in the mandatory retirement age

Figure 4: Present value at birth of net benefits for pensions and education: Cohorts 1900-2100

Source: Authors' calculations.
No Capital Deepening

(a) Austria  
(b) France  
(c) Spain

Figure 5: Productive Capital Stock: Period 1950-2100

Source: Authors’ calculations.

Additional results: Higher productivity and higher retirement age also lead to a reduction in $K/Y$. 
Conclusions

• For younger cohorts the negative net present value of pension benefits is higher than the positive net present value of educational expenditures

• A postponement of the retirement age does not solve the intergenerational (social) contract → Other policies necessary

• We will not experience a second demographic dividend (capital deepening)
Thank you!

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Social security contributions

Figure 6: Social security contribution rate, Period 1950–2100.
Figure 7: Educational distribution, Birth cohort 1850–2100.