Spanish NTA along time
Work in progress based on the following paper

Cyclically Neutral Generational Accounting

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Outline of the presentation

• The Generational Accounting technique
• A methodological improvement:
  – Isolating indicators from the cycle
  – Disentangling other effects: demographic, wealth and pure cycle effects
• An illustration to the Spanish case
GA in partial equilibrium

(Auerbach, Gokhale and Kotlikoff, 1991, 1992)

• Does the IBCG holds? If living and future generations pay enough

\[ D_{t0} = \sum_{t=t0}^{\infty} S_t (1+r)^{t_0-t} = \sum_{k=t-D}^{t} N_{t,k} + \sum_{k=t+1}^{\infty} N_{t,k} \]

• Estimating net payments of living generations (\( N \)):
  1. From cross section data by age project longitudinal profiles up rating at “g”
  2. Assuming constant policy (future generations pay/receive the same)

Being P population of this age (\( j \)), year (\( t \))

• This \( \tau \) is also NTA TG

\[ S_t = \sum_{j=0}^{J} P_{jt} \tau_{jt} \]

\[ \tau_{jt} = \tau_{jt_0} (1+g)^{t-t_0} \]

• A positive (negative) residual is the implicit debt (wealth)

  – Expressed in absolute terms:
    • sustainability gap (SG)
    • As a share of (intertemporal) GDP (\( k \))

\[ D_{t0} = \sum_{t=t0}^{\infty} S_t (1+r)^{t_0-t} + SG_{t_0} \]
The need to Isolate GA (\&NTA) indicators from the cycle

- GA basic claim: under changing population structure, short run deficit/wealth measures might not reflect at all the long situation of fiscal policy.
  - Long run forward looking techniques projecting future implicit debt.
- But, short run deficit/wealth measures mix cycle, policy and other effects.
  - Short run techniques that try to “clean” the cycle from deficit measures.
  - Common feature: Backward looking econometric analysis on correlations between government revenue/expenditure and economic activity.

- We combine both to obtain neutral GA. As a result, other effects arise
  - Incorporate in GA short run method by Girouard and André (2005), the basis for the standardized measure of the *cyclically adjusted budget balance* reported by the European Commission.
  - Basic idea: depart from a cyclically neutral budget balance. Other attempts Feist et al. (1999) application to Finland. discrete adjustments during the forecast that design a return to what is considered a cyclically neutral state
  - We establish a systematic process -within the GA framework- to disentangle cycle effect and other sources of mismeasurement of the pure policy effect –the demographic effect and the debt effect.
  - Relevant for international comparison
Obtaining a cyclically neutral budget balance

• Methods directed to disentangle cyclical from structural budget components
• Basic idea:
  – Economic activity (output gap) affects tax bases (wages, benefits, consumption, etc.).
    • 1\textsuperscript{st} step: Identifying cycle (trend or potential GDP)
  – Those tax bases affect public revenue and expenditure.
    • 2\textsuperscript{nd} step: Obtaining elasticities of budget aggregates to the cycle
• Methods differ in the approach taken in both steps:
Obtaining a cyclically neutral budget balance: 1\textsuperscript{st} step

- **1\textsuperscript{st} Step: Identifying the cycle (trend or potential GDP)**
  - Directly extracted from observed output data using econometric smoothing devices like Hodrick-Prescott filters to obtain trend GDP
    - Advantages: transparent and mechanical, hence more comparable.
    - Problem: end point bias (underestimates the last observations)
  - Estimating potential output based on the production function approach (OCDE, EU moves from 1 to 2, still some countries use 1)
    - Advantage: Micro foundations
    - Problem: increasing the arbitrariness in the decisions of key variables like the structural unemployment rate, the rate of technological change, the way it affects to productive factors, etc

- **EC method:**
  - Estimates the potential output based on a Cobb-Douglas production function.
  - Inputs: Capital stock and Potential labor estimated combining data on:
    - the working age population;
    - a measure of trend total factor productivity and trend labor force obtained throw the HP filter
    - the NAIRU unemployment rate, derived form a Kalmar filter Phillips curve approach

- Once the output gap is identified, we move to 2\textsuperscript{nd} step: elasticities
2nd step: Obtaining a cyclically neutral budget balance

- Elasticities of budget aggregates to economic activity (to the output gap). Girouard and André (2005) estimate separate elasticities for affected aggregates:
  - Revenues: Income tax (personal and corporate), Social contributions, Consumption taxes.
  - Expenditure: Unemployment.
  - EC uses global tax/exp, we use desegregated

\[
\begin{align*}
\frac{T^*_{i,t}}{T_{i,t}} &= \left[ \frac{Y^*_{i,t}}{Y_{i,t}} \right]^{e_{i,y}} \\
\frac{G^*_{i,t}}{G_{i,t}} &= \left[ \frac{U^*_{i,t}}{U_{i,t}} \right]^{e_{g,u}}
\end{align*}
\]

1+ 2 implies: a Cyclically Adjusted Budget Balance (CABB) in the base year of the GAc exercise

\[ S^*_t \]
Decomposing changes in fiscal sustainability

\[ S_t^* = \sum_{j=0}^{J} P_{jt} T_{jt}^* = P_t T_t^* \]

1. Cycle effect: Once the cycle is smoothed \( S \) becomes \( S^* \)

As long as we move the starting year:

2. Debt effect, as long as windfall looses make not true that

\[ D_{t_0+1} = D_{t_0} - S_{t_0} \]

3. Discounting effect: small but increasing with period. Present surpluses pass and future deficits approach

\[ Eq. \ 6 \ and \ 7 \]

\[ D_{t_0} = P_{t_0} T_{t_0} + P_{t_0+1} T_{t_0} + \sum_{t=t_0+2}^{\infty} P_t T_{t_0}^* + S G_{t_0} \]

\[ D_{t_0+1} = P_{t_0+1} T_{t_0+1} + \sum_{t=t_0+2}^{\infty} P_t T_{t_0+1}^* + S G_{t_0+1} \]

4. Demographic effect:
Due to changes in the initial demographic structure

\[ Eq. \ 6' \ and \ 7' \]
Obtaining the pure policy effect

\[ D_{t_0} = \sum_{t=t_0}^{\infty} S_t (1+r)^{t_0-t} + SG_{t_0} \]  \hspace{1cm} (1')

1. **Cycle effect**: SG (1') - SG (6)

\[ D_{t_0} = \sum_{t=t_0}^{\infty} S_t^* (1+r)^{t_0-t} + SG_{t_0} \]  \hspace{1cm} (6)

Compute series of SG in (8)  
( 8=7 replacing each D by constant D in t0)

2. **Wealth effect**: SG (6) - SG (8)

\[ D_{t_0+1} = \sum_{t=t_0+1}^{\infty} S_t^* (1+r)^{t_0+1-t} + SG_{t_0+1} \]  \hspace{1cm} (7)

3. **Demographic effect**: SG (8) - SG (9)

\[ D_{t_0} = \sum_{t=t_0+1}^{\infty} S_t^* (1+r)^{t_0+1-t} + SG_{t_0+1} \]  \hspace{1cm} (8)

\[ D_{t_0} = \sum_{t=t_0+1}^{\infty} \sum_{j=0}^{J} \sum_{j_0}^{J} \tau_{j,j_0+1} (1+r)^{t_0+1-t} + SG_{t_0+1} \]  \hspace{1cm} (9)

Compute series of SG in (9)  
(9) holds t-1 population structure constant

Pure policy as residual = total effect -cycle-wealth-demographic, or (9)-(2,t-1)
An application to the Spanish case

• Data needs:
  – Aggregates (IGAE 1998-2003) reclassified to refer to,
  – Micro profiles
• Base year 1996, updated aggregates till 2004
• Results:
  – Cycle correction matters
  – $k$ more informative than $SG$ as it also captures effect on GPD. Sometimes different signs: demographic effect (due to migration!)
  – Positive windfall except last period (both $k$ and $SG$, but $SG$ gives the absolute value)
  – Policy effect
    • Similar values and the same direction.
    • The most important together with the cycle effect
    • Expansive phase (OGap improving) only two episodes of policy improvement
    • ¿No such consolidation process at least not due to pure policy effects?
      – Positive policy effects in 97 and 99 reflect fiscal consolidations
      – Positive policy effect –according to the budget balance- offset by the increase in age related expenditure
Evolution of the SG and in the output gap (%)
Evolution of the SG and in the output gap

% change in Kappa

Output gap (%GDP)

Change in Kappa  Output Gap
Standard vs. cyclically neutral Generational Accounting (Differences)

![Chart showing comparisons between Standard Generational Accounting and Cyclically Neutral Accounting from 1997 to 2004.](chart.png)
# Decomposition of Changes in –cyclically neutral- Fiscal Sustainability Indicator

## 1. Kappa

### a) series of sustainability indicators

<table>
<thead>
<tr>
<th>Year</th>
<th>Current budget</th>
<th>Cyclically neutral (CN)</th>
<th>CN previous debt</th>
<th>CN previous debt and population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>3.68938</td>
<td>2.22908</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>2.65045</td>
<td>1.69844</td>
<td>1.53564</td>
<td>1.51954</td>
</tr>
<tr>
<td>1998</td>
<td>2.64632</td>
<td>2.3068</td>
<td>2.25293</td>
<td>2.25829</td>
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<tr>
<td>1999</td>
<td>1.96023</td>
<td>2.25007</td>
<td>2.20052</td>
<td>2.19494</td>
</tr>
<tr>
<td>2000</td>
<td>2.1623</td>
<td>3.05187</td>
<td>2.98921</td>
<td>3.09149</td>
</tr>
<tr>
<td>2001</td>
<td>2.36249</td>
<td>3.22906</td>
<td>3.16545</td>
<td>3.21463</td>
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<tr>
<td>2002</td>
<td>2.82654</td>
<td>3.26221</td>
<td>3.24658</td>
<td>3.30749</td>
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<tr>
<td>2003</td>
<td>3.30418</td>
<td>3.38222</td>
<td>3.36353</td>
<td>3.42602</td>
</tr>
<tr>
<td>2004</td>
<td>4.26339</td>
<td>4.06272</td>
<td>4.06804</td>
<td>4.14943</td>
</tr>
</tbody>
</table>

### b) Isolating the policy effect

<table>
<thead>
<tr>
<th>Year</th>
<th>Δ1-Δ2</th>
<th>Δ2-3</th>
<th>Δ3-4</th>
<th>Δ1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Δ1</td>
<td>Δ2</td>
<td>Δ3</td>
<td>Δ4</td>
</tr>
<tr>
<td>1997</td>
<td>-0.50829</td>
<td>0.1628</td>
<td>0.0161</td>
<td>-0.70954</td>
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<tr>
<td>1998</td>
<td>-0.61249</td>
<td>0.05387</td>
<td>-0.00536</td>
<td>0.55985</td>
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<tr>
<td>1999</td>
<td>-0.62936</td>
<td>0.04955</td>
<td>0.00558</td>
<td>-0.11186</td>
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<td>2000</td>
<td>-0.59973</td>
<td>0.06266</td>
<td>-0.10228</td>
<td>0.84142</td>
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<tr>
<td>2001</td>
<td>0.023</td>
<td>0.06361</td>
<td>-0.04918</td>
<td>0.16276</td>
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<td>2002</td>
<td>0.4309</td>
<td>0.01563</td>
<td>-0.06091</td>
<td>0.07843</td>
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<td>2003</td>
<td>0.35763</td>
<td>0.01869</td>
<td>-0.06249</td>
<td>0.16381</td>
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<td>2004</td>
<td>0.27871</td>
<td>-0.00532</td>
<td>-0.08139</td>
<td>0.76721</td>
</tr>
</tbody>
</table>
Decomposition of Changes in –cyclically neutral- Fiscal Sustainability Indicator

Only in two periods there have been pure fiscal policy consolidation. There have been only...
### 2. Sustainability Gap

**a) series of sustainability indicators**

<table>
<thead>
<tr>
<th>Year</th>
<th>Current budget</th>
<th>Cyclically neutral (CN)</th>
<th>CN previous debt</th>
<th>CN previous debt and population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>770,443</td>
<td>481,378</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>577,732</td>
<td>378,545</td>
<td>342,261</td>
<td>328,150</td>
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<tr>
<td>1998</td>
<td>605,230</td>
<td>531,835</td>
<td>519,416</td>
<td>503,324</td>
</tr>
<tr>
<td>1999</td>
<td>469,269</td>
<td>534,910</td>
<td>523,130</td>
<td>506,047</td>
</tr>
<tr>
<td>2000</td>
<td>557,853</td>
<td>770,403</td>
<td>754,587</td>
<td>734,941</td>
</tr>
<tr>
<td>2001</td>
<td>634,668</td>
<td>848,792</td>
<td>832,069</td>
<td>811,491</td>
</tr>
<tr>
<td>2002</td>
<td>786,437</td>
<td>897,779</td>
<td>893,477</td>
<td>869,407</td>
</tr>
<tr>
<td>2003</td>
<td>955,281</td>
<td>975,891</td>
<td>970,500</td>
<td>942,861</td>
</tr>
<tr>
<td>2004</td>
<td>1,283,240</td>
<td>1,228,986</td>
<td>1,230,596</td>
<td>1,197,260</td>
</tr>
</tbody>
</table>

**b) Isolating the policy effect**

<table>
<thead>
<tr>
<th>Year</th>
<th>Δ1-Δ2</th>
<th>2-3</th>
<th>3-4</th>
<th>Δ1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>-89,878</td>
<td>36,284</td>
<td>14,111</td>
<td>-153,228</td>
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<tr>
<td>1998</td>
<td>-125,792</td>
<td>12,419</td>
<td>16,092</td>
<td>124,779</td>
</tr>
<tr>
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<td>-139,036</td>
<td>11,780</td>
<td>17,083</td>
<td>-25,788</td>
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<td>2000</td>
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<td>15,816</td>
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<td>2001</td>
<td>-1,574</td>
<td>16,723</td>
<td>20,578</td>
<td>41,088</td>
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<tr>
<td>2002</td>
<td>102,782</td>
<td>4,302</td>
<td>24,070</td>
<td>20,615</td>
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<td>2003</td>
<td>90,732</td>
<td>5,391</td>
<td>27,639</td>
<td>45,082</td>
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<td>2004</td>
<td>74,864</td>
<td>-1,610</td>
<td>33,336</td>
<td>221,369</td>
</tr>
</tbody>
</table>
Conclusions

• A key methodological innovation into generational accounting: Incorporating cyclically adjusted balances into the forward-looking budget projections:
  – We isolate pure policy effects,
  – We also show that a demographic effect and a debt effect may drive fiscal sustainability measures over time and
  – Establish a routine to control for these effects in the generational accounting framework.
  – Which render comparisons across time and countries of the fiscal sustainability indicators obtained truly meaningful

• An empirical application for Spain illustrates:
  – The proposed decomposition of indicators is empirically relevant
  – Standard generational accounting suggests that fiscal sustainability in Spain improved substantially in preparing for the EMU. However, calculation of the pure policy effects reveals that this actually has not been the case
Thanks for your attention