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Sovereign Debt Sustainability, Carbon Budgets, and Climate Damages

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Executive summary

The dual crises of sovereign debt sustainability and climate change pose critical challenges for governments worldwide. Advanced economies, grappling with substantial public debt, now face the economic consequences of transitioning to low-carbon economies. While the Paris Agreement underscores the urgency of limiting global warming to 1.5°C or 2°C, the associated mitigation efforts and rising temperatures imply economic costs that could significantly constrain fiscal space. This brief explores the trade-offs between environmental choices and sovereign debt sustainability, presenting evidence on how coordinated global action can mitigate risks and enhance fiscal stability.

This Policy Brief is based on the webinar of the 2nd of December 2025 with Caterina Seghini and hosted by Parinitha Sastry (Columbia Business School) entitled "Sovereign Debt Sustainability, Carbon Budgets, and Climate Damages".

Policy Brief

In Seghini (2024), I examine how mitigation costs and climate damages affect the debt limits of advanced economies, defined as the maximum debt-to-GDP ratios sustainable without risk of default. The analysis incorporates diverse scenarios to evaluate fiscal sustainability under both coordinated global transitions and fragmented approaches. The findings reveal that without coordinated efforts to curb emissions and stabilize climate damages, fiscal limits will deteriorate for all countries, even those actively implementing transition measures. Conversely, global coordination enables debt limits to stabilize at higher levels, offering greater fiscal resilience.

Fiscal Limits and Climate Change

Fiscal limits traditionally depend on economic growth, risk-free interest rates, and primary surpluses. However, the integration of climate-related costs redefines these parameters:

- **Mitigation Costs**: Efforts to reduce greenhouse gas emissions (GHG) entail economic costs which reduce growth rates in the short-term, as economies adapt to less carbon-intensive production methods.
- **Climate Damages**: The long-term costs of unmitigated climate change—ranging from natural disasters to declining productivity—further erode growth, compounding the pressures on fiscal limits.

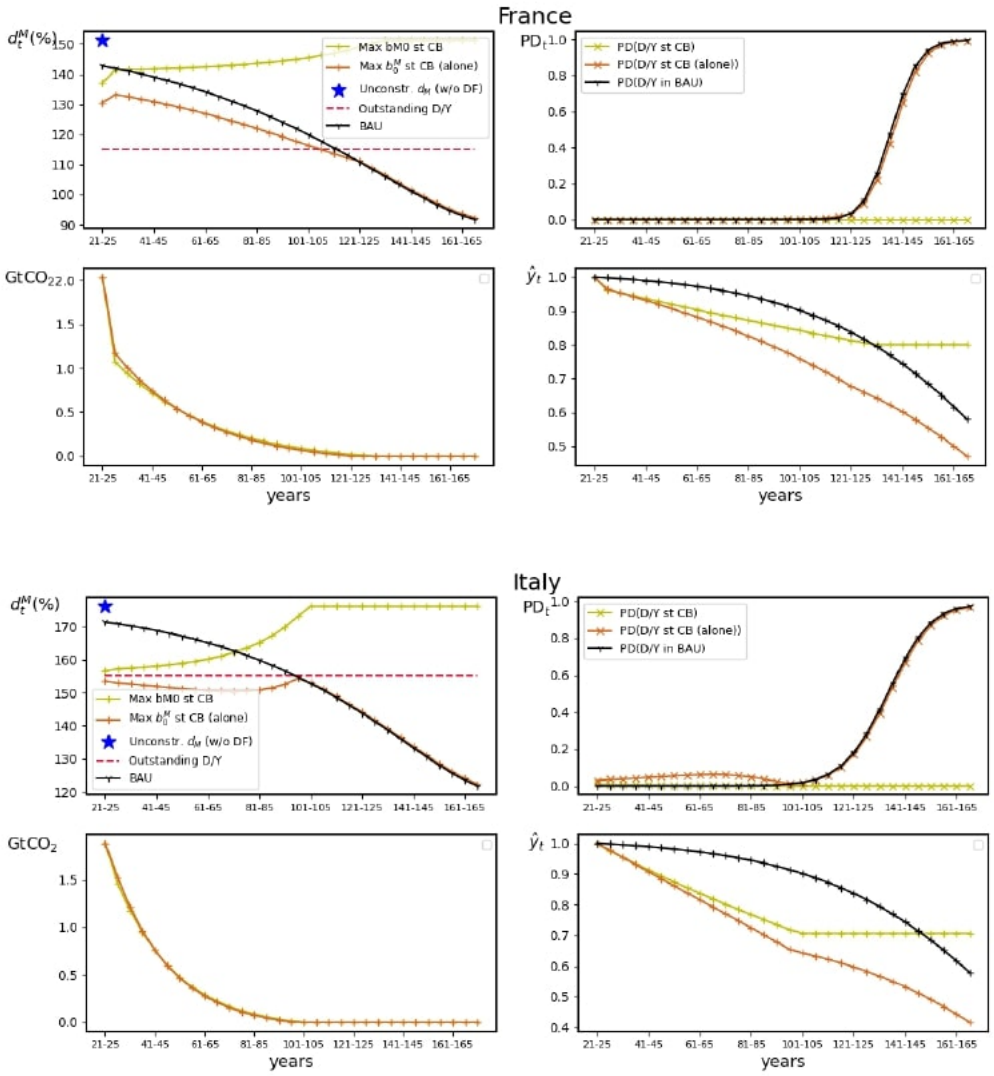
The study uses a partial equilibrium model, extending the work of Collard et al. (2015) , to estimate national fiscal limits under varying scenarios of emission reductions and climate damages. It employs OECD data to calibrate abatement costs for 31 advanced economies and the damage function proposed by Dietz & Venmans (2019), in order to integrate environmental considerations into fiscal sustainability analyses.

Global Coordination: The Linchpin of Fiscal and Climate Stability

The quantitative exercise provide results under three extremes scenarios of carbon emission paths:

- **Business-as-usual**: Global emissions continue to increase following the historical dynamic.
- **Uncoordinated solitary transition**: The country for which the fiscal sustainability analysis is conducted is the only one in the world to deviate from historical dynamics and to respect its commitments in terms of national emissions' reduction.
- **Globally coordinated transition**: All countries follow the transition path which ensures that the global carbon budget in line with a 2°C scenario is respected.

The first two scenarios emphasize that insufficient or fragmented efforts exacerbate fiscal vulnerabilities in the long run by failing to keep climate damages under control. Growth rates and debt limits continue to decline, possibly below current debt levels.



Notes: Debt sustainability in a coordinated transition (light green), a "solitary" transition (orange) and a global business-as-usual scenario (black). r = 2.44%, parallel hypothesis scenario.

In contrast, a worldwide approach to emission reductions stabilizes fiscal limits in the long term by reducing the global warming's economic toll. All countries participating in coordinated transitions witness a positive outcome: fiscal limits stabilize despite initial declines due to abatement costs, and economic growth recovers to rates able to sustain current debt-to-GDP levels.

Abatement costs

Despite mitigation efforts are necessary to avoid plunging fiscal limits in the long run, they are associated with costs that can threaten sustainability in the short term. The sensitivity analysis around higher abatement costs performed in the study shows how efficiently

planning the transition is central for ensuring a smooth greening process compatible with fiscal sustainability. For countries like Italy, but also France, higher than expected mitigation costs would push public debt into unsustainable territory. The choice of the optimal policy mix between carbon taxes, subsidies to private abatement and public mitigation is analyzed in a general equilibrium framework with risky government debt in the companion paper Seghini & Dees (2024) .

Implications for Policymakers

The findings underscore the urgent need for policymakers to prioritize both immediate and collaborative action on climate change. Key recommendations include:

Align Fiscal and Climate Policies: Governments must integrate climate mitigation into fiscal planning, recognizing that short-term sacrifices lead to long-term stability.

- **Enhance Global Cooperation**: International agreements must ensure equitable burden-sharing and adherence to carbon budgets that fairly allocate emissions reductions to meet Paris Agreement objectives.
- **Careful and efficient transition planning**: Transition strategies must balance mitigation costs with fiscal sustainability. Efficient planning, including optimal use of carbon taxes, subsidies, and public investments, is vital to prevent high abatement costs from pushing nations with problematic debt levels into fiscal instability.

Conclusion

This research provides compelling evidence that addressing climate change collaboratively is not only an environmental imperative but also a fiscal necessity. The choice is stark: fragmented action leads to deteriorating fiscal limits and heightened default risks, while coordinated efforts pave the way for sustainable public debt and a global economy more resilient to climate change. Governments must act decisively and collectively to align fiscal policies with the goals of the Paris Agreement, ensuring a stable and environmentally sustainable future.

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