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Growth Welfare Innovation Productivity

How to achieve sustainable growth

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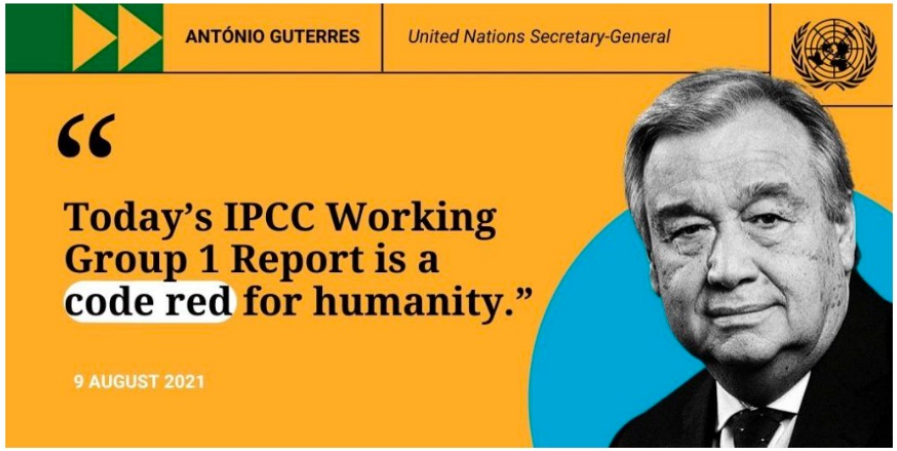
The climate emergency

- Last IPCC report (AR6 - WGII) describes a code red for humanity
- Impacts are likely being larger than previously understood, even containing temperature at +2 degrees with respect to pre-industrial average



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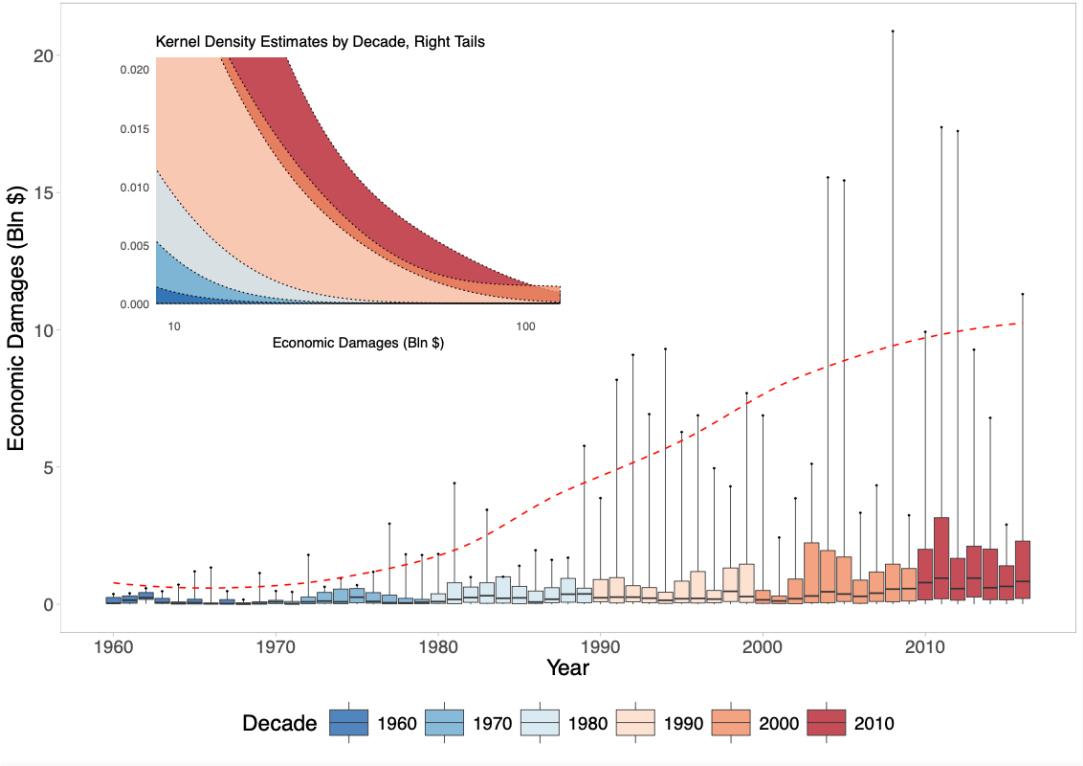
The climate emergency

- GROWINPRO research contributed to show that the costs of climate anomalies are already on the rise

- Trends of economic damages from climate-related events are positive everywhere and more pronounced for temperate zones (e.g. EU)



Coronese, M., Lamperti, F., Keller, K., Chiaromonte, F., & Roventini, A. (2019). Evidence for sharp increase in the economic damages of extreme natural disasters. Proceedings of the National Academy of Sciences (PNAS), 116 (43), 21450-21455.

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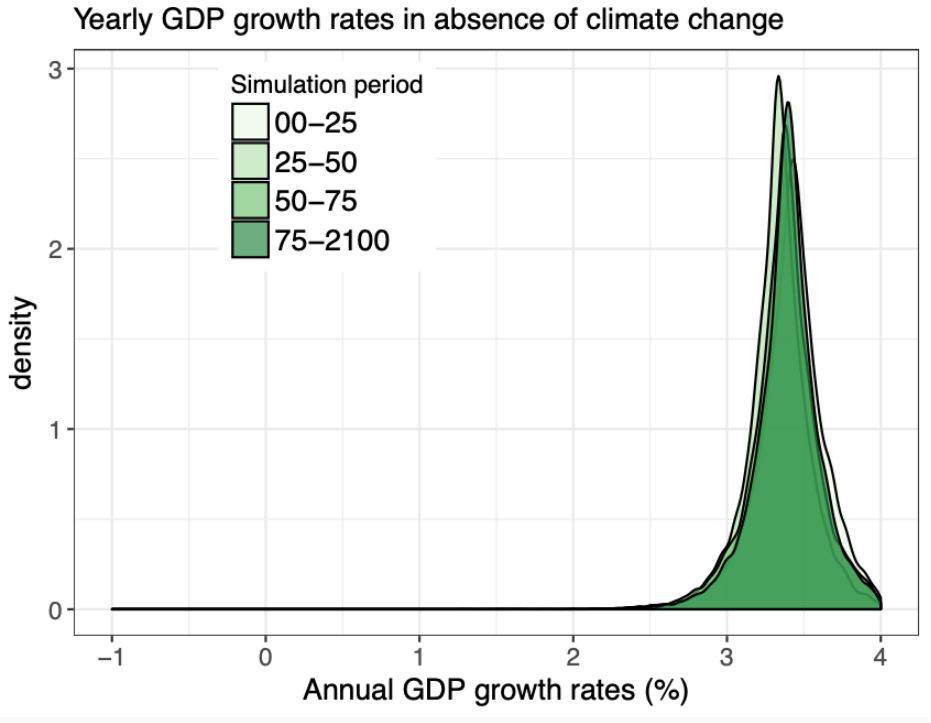
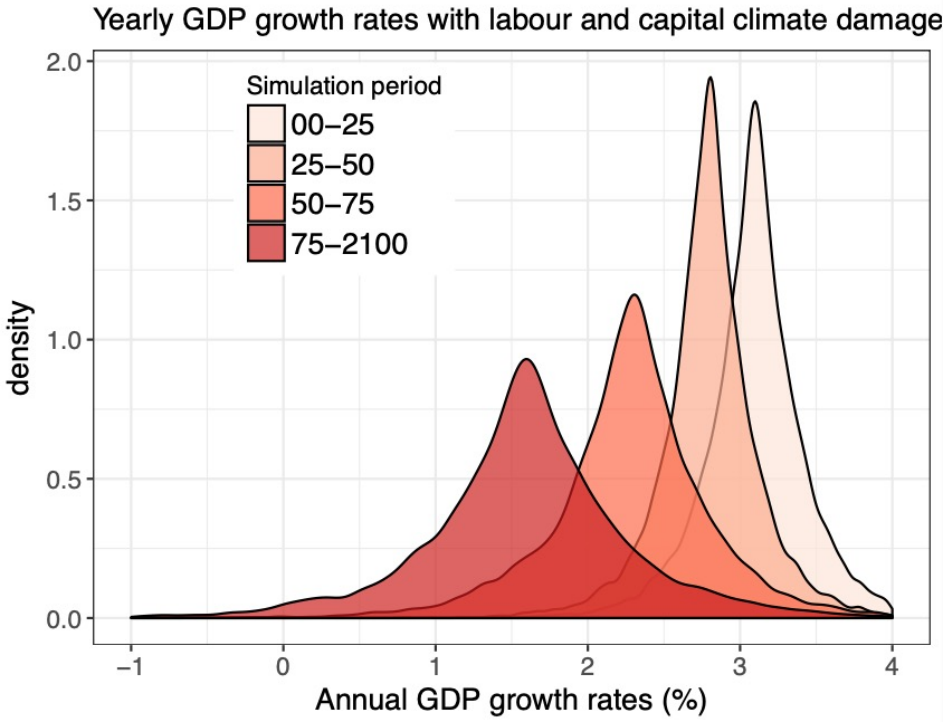
The climate emergency

- GROWINPRO research contributed to show that impacts of unmitigated climate change can alter the properties of the growth process





Lamperti, F., Bosetti V., Roventini, A. & Tavoni, M. (2019). The public costs of climate-induced financial instability, Nature Climate Change, 9, 829-833.

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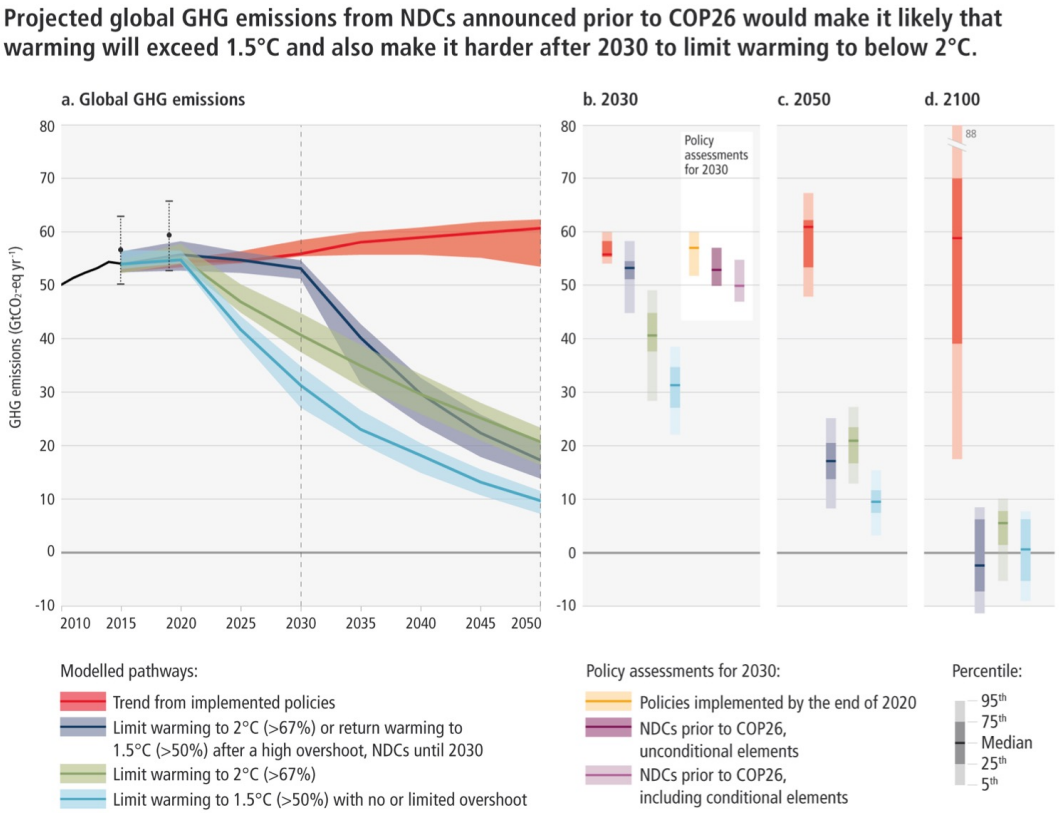
The transition we need

- The current set of climate policies (in red) is deeply insufficient to achieve a rapid transition allowing to limit global warming to 1.5 degrees (in light blue) or 2 degrees (in green)
- We need net zero emission by 2060 globally
- The EU aims at net zero by 2050
- **<u>Which policy mix most suitable to reach the goal?</u>**



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Decarbonization & sustainable growth

- Using the DSK model as a simulation laboratory, we tested policy combinations delivering a orderly transition that achieves the Paris agreement

- That is, we performed i.e. policy evaluation with respect to **compliance to <2° C, transition frictions, sustainable growth**

Policy instrument	Description
Carbon Taxation	
Constant carbon tax	Sufficiently high tax to induce full energy transition by 2100
Constant carbon tax	Sufficiently high tax to keep warming below 2°C
Constant carbon tax	As Tax2d, with full rebate of revenues on households
Constant carbon tax	As Tax2d, with full rebate of revenues on firms
Increasing carbon tax	Exponentially increasing tax; same rate as the optimal policy of the DICE model constrained to below 2°C warming
Increasing carbon tax	Exponentially increasing tax; same rate as the optimal policy of the (unconstrained) DICE model
Increasing carbon tax	As TaxDICE2d, but with initial value corresponding to Taxcrit
Green Subsidies	
Lump-sum transfer	Subsidy for the construction of green plants in the power sector
Lump-sum transfer	Subsidy for green R&D in the power sector
Command and Control	
Mandatory regulation with fine	Ban on fossil-fuel use in the capital good sector, with T_{Elreg} years grace period
Mandatory regulation with fine	Ban on the construction of brown electricity plants, with T_{Ban} years grace period

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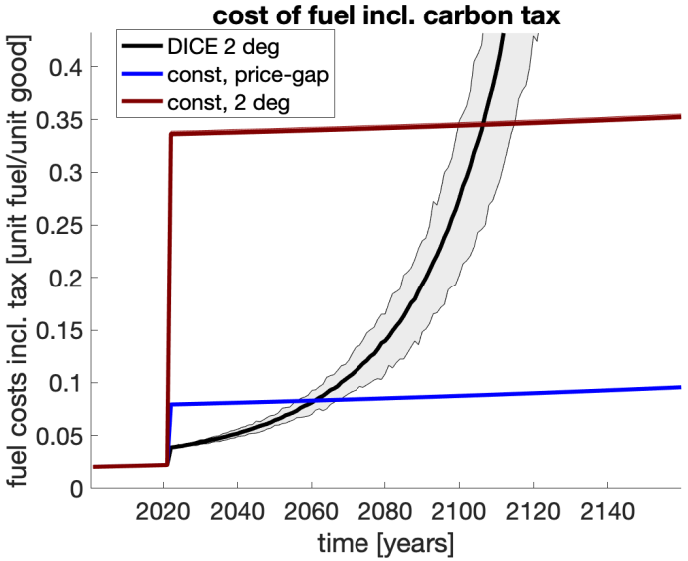
The fallacy of carbon taxation

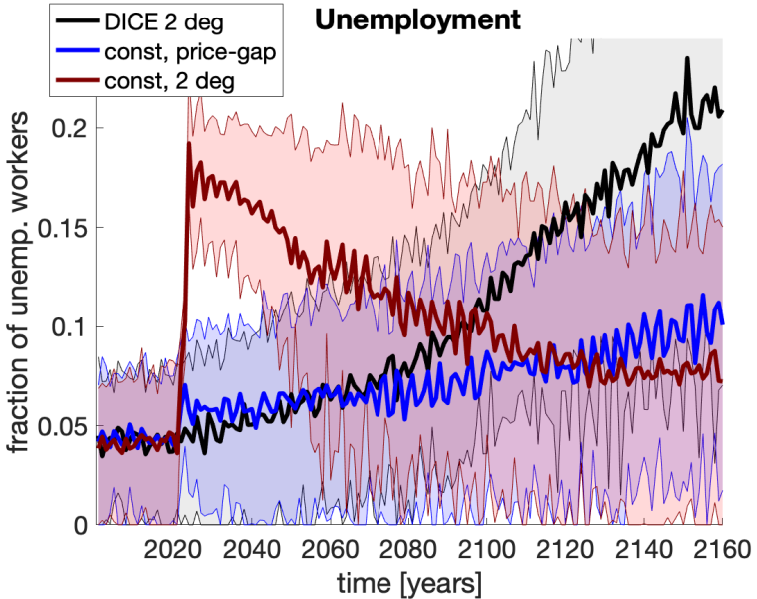
Three carbon tax schemes:

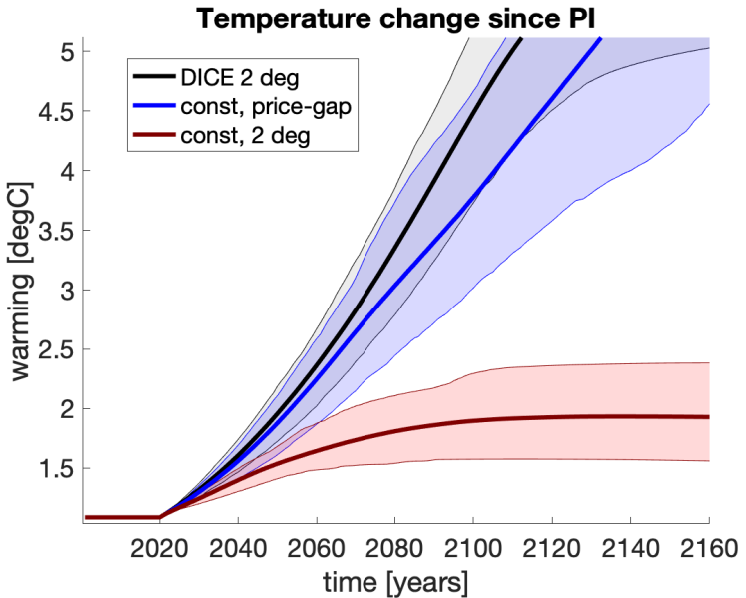
1. low constant tax (const, price-gap)
2. high constant tax (const, 2 deg)
3. increasing carbon tax (DICE 2 deg)

Results"

- if excessively low, ineffective
- if high enough to meet the 2 degrees, it creates an employment crisis
- increasing tax combines both downsides

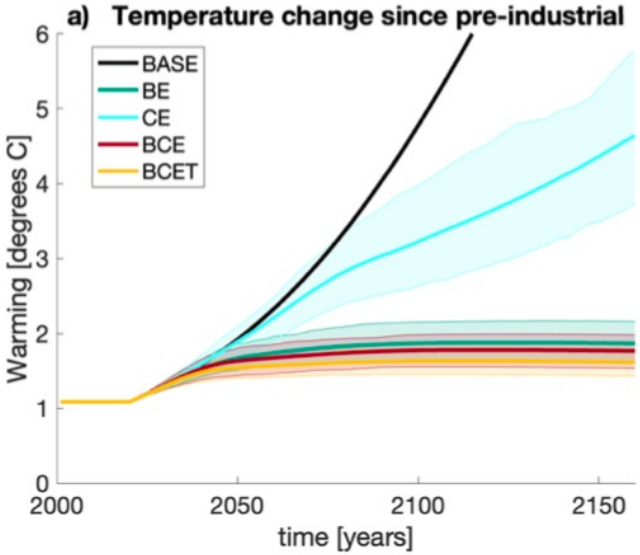


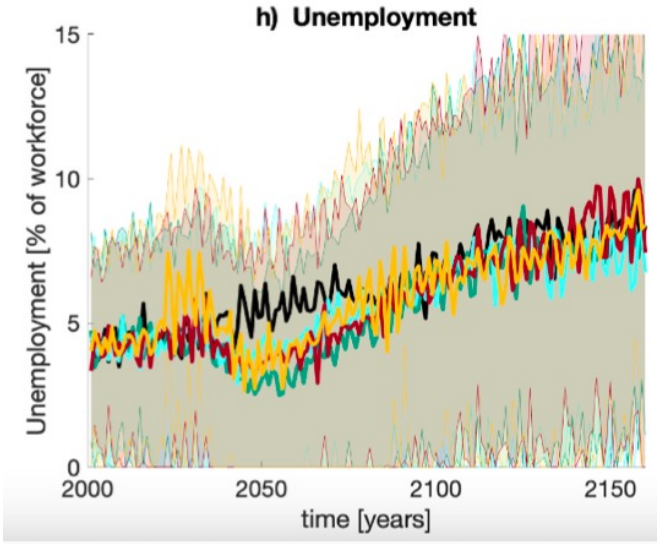




Direct policies

- **We test combinations of command-and-control regulation and green public investment schemes**
  - ban on the construction of brown energy plants (B)
  - ban on fossil fuel use in industry (E)
  - public financing of green energy plants (C)
- **All policy mixes encompassing regulation (B and E) foster employment during the transition while rapidly decarbonizing**
- **Limited negative impact on the public budget**
- **Adding a "small" carbon tax (BCET) eliminate the adverse effect on public finance**





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Overall policy comparison

- **High carbon taxation increases business failure rates** while depressing investments, which triggers economic instability and the cost of transition
- **Public investment in renewables coupled with command-and-control regulation trigger a rapid transition and foster job creation**
- **The limited cost of such policies can be neutralized by a mild carbon tax**

		Decarbonization speed		Climate mitigation	Transition frictions		Sustainable growth		Policy cost
	Policy	*Power sector*	*Industry sector*	*Peak warming*	*Business failures*	*Unemployment crises*	*Job creation during the transition*	*Long run growth*	*Impact on deficit*
Taxcrit	Carbon tax								
Tax2d	Carbon tax								
Tax2dh	Carbon tax								
Tax2df	Carbon tax								
TaxDICE2d	Carbon tax								
ET2	Regulation + tax								
RT2	Susbidy + tax								
BE	Only regulation								
CE	Regulation + subsidy								
BCE	Regulation + subsidy								
BCER	Regulation + subsidy								
BCET	Regulation + subsidy + tax								

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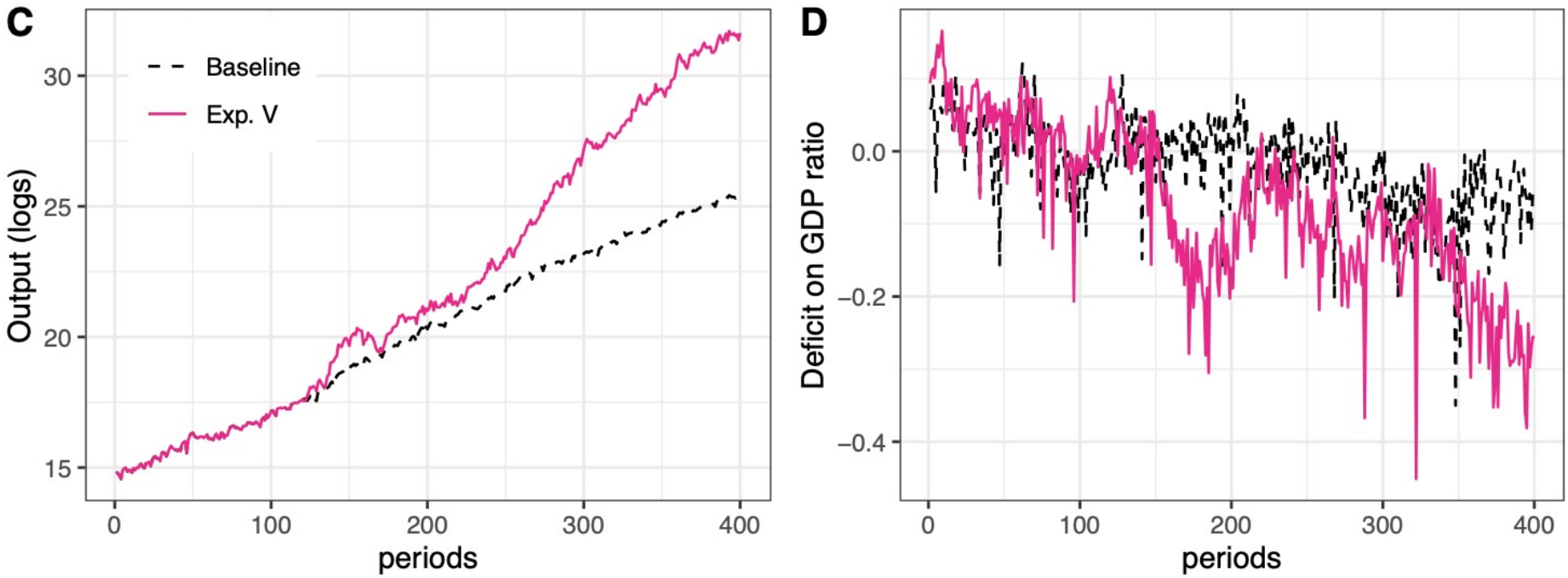
Towards a green entrepreneurial state

- Direct innovation policies improve the growth trajectory of the economy, generating positive hysteresis and amiliorating public deficits
- If directed toward the «climate stabilization» mission, high potential to facilitate a win-win pathway



Dosi, G., Lamperti, F., Mazzucato, M., Napoletano, M., & Roventini, A. Mission-Oriented Policies and the "Entrepreneurial State" at Work: An Agent-Based Exploration. GROWINPRO WP 64/2021

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The limited role of climate-finance policy

Climate impacts to capital and labour

	GDP growth	# Bank bailouts	Debt to GDP	Emissions growth
Baseline (BAU)	1 [0.024]	1 [0.035]	1 [2.09]	1 [0.014]
Risk adjustment	0.90**†	1.09*	1.04	0.95*
	(2.53)	(1.82)	(1.49)	(1.88)
Green credit easing	1.15*†	0.85**†	1.11*†	0.92**†
	(2.58)	(2.77)	(1.84)	(2.70)
Green Basel II	1.11*†	0.94	0.95*	0.93*†
	(1.80)	(1.87)	(1.70)	(1.88)
Policy mix	1.24**†	0.71**†	0.97*	0.76**†
	(3.50)	(6.04)	(1.78)	(4.02)

Lamperti, F., Bosetti V., Roventini, A., Tavoni, M. & Treibich, T. (2021). Three green financial policies to address climate risks, *Journal of Financial Stability*, 54, 100875.

- The non-trivial impact of climate-finance policy (each policy alone doesn't work)
- Combining all policies allows to achieve a win-win dynamics
- However, green finance policies are not enough and require additional mitigation measures

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Conclusions

- Carbon-pricing policies are ineffective to to stay below the 2 degrees target → binding trade-off between economic growth and the decarbonization of the economy

- A mix of command-and-control regulation and subsidies for investments and R&D in green energy technologies is able to put the economy on a win-win sustainable growth pathway …

- … with negligible cost on the public budget if a mild carbon tax is introduced

- While macroprudential and credit policies can attenuate the impact, their scope is relatively limited and they should be coupled with more direct mitigation policies

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