Green Growth Ideas and Discourses

Climate change mitigation policies and macroeconomic modelling

Șerban Scrieciu

based on a paper published in *WIREs Energy & Environment* 2013 (Șerban Scrieciu, Armon Rezai and Reinhard Mechler)

The economic problem: “the problem of want and poverty and the struggle between classes and nations” (Keynes 1931)

- Environmental degradation and exceeding biophysical system thresholds

Green economy hypothesis: Growth of modern economies may be sustained or even augmented, whilst human intervention ensures sustained environmental stewardship and better social outcomes

- Human intervention is equated to policy intervention in most discourses; role of multiple actors not truly understood

- While more recognition is given to policy intervention, the role and type of macroeconomic theories and policies are ambiguous and sidelined

- OECD definition of green growth (2012):

  "Growth that allows natural assets to continue to provide the resources and environmental services on which well-being relies"

- UNEP definition of green economy (2011):

  "An economy that results in improved human well-being and reduced inequalities over the long term, while not exposing future generations to significant environmental risks and ecological scarcities"

- Exploring the economic foundations of such claims

- Note differences between growth and development

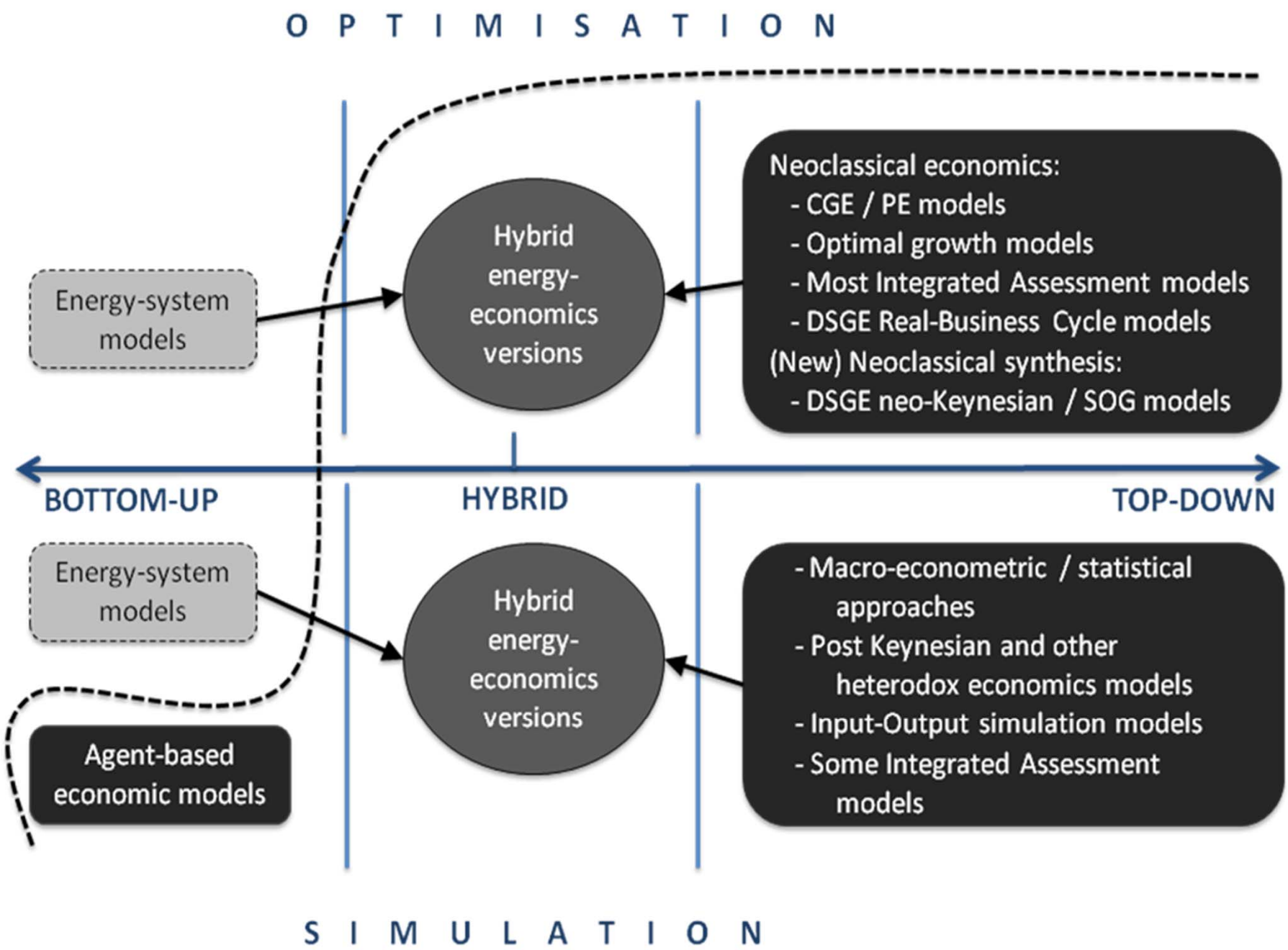
- Most macroeconomists continue to see growth as *the* socially stabilising necessity

- Traditional economists have rejected environmental limits to continuous growth and ever-growing consumption
- Ecological economists and other non-orthodox economists have been stressing the importance of environmental constraints and physical limits to economic growth
- The emergence of the man-made climate change problem is putting to test these opposing views

- The taxonomy proposed follows two criteria:
  1. The economic theoretical underpinnings and model solution approach: optimisation versus simulation
  2. The representation of (energy) technologies: bottom-up, hybrid, and top-down

- Optimisation models: employ mathematical optimisation techniques (e.g. linear programming) to economic analysis, and have taken, predominantly, the form CGE models, (exogenous or endogenous) optimal growth (OG) models or a combination of these

- Simulation models do not optimise a particular objective function, but describe a number of interlinked energy-emissions-economic relationships that allow for exploring the propagation of perturbations to the system


O P T I M I S A T I O N
Energy-system models
Hybrid energy-economics versions
Neoclassical economics:
- CGE / PE models
- Optimal growth models
- Most Integrated Assessment models
- DSGE Real-Business Cycle models
(New) Neoclassical synthesis:
- DSGE neo-Keynesian / SOG models
BOTTOM-UP
HYBRID
TOP-DOWN
Energy-system models
Hybrid energy-economics versions
- Macro-econometric / statistical approaches
- Post Keynesian and other heterodox economics models
- Input-Output simulation models
- Some Integrated Assessment models
Agent-based economic models
S I M U L A T I O N

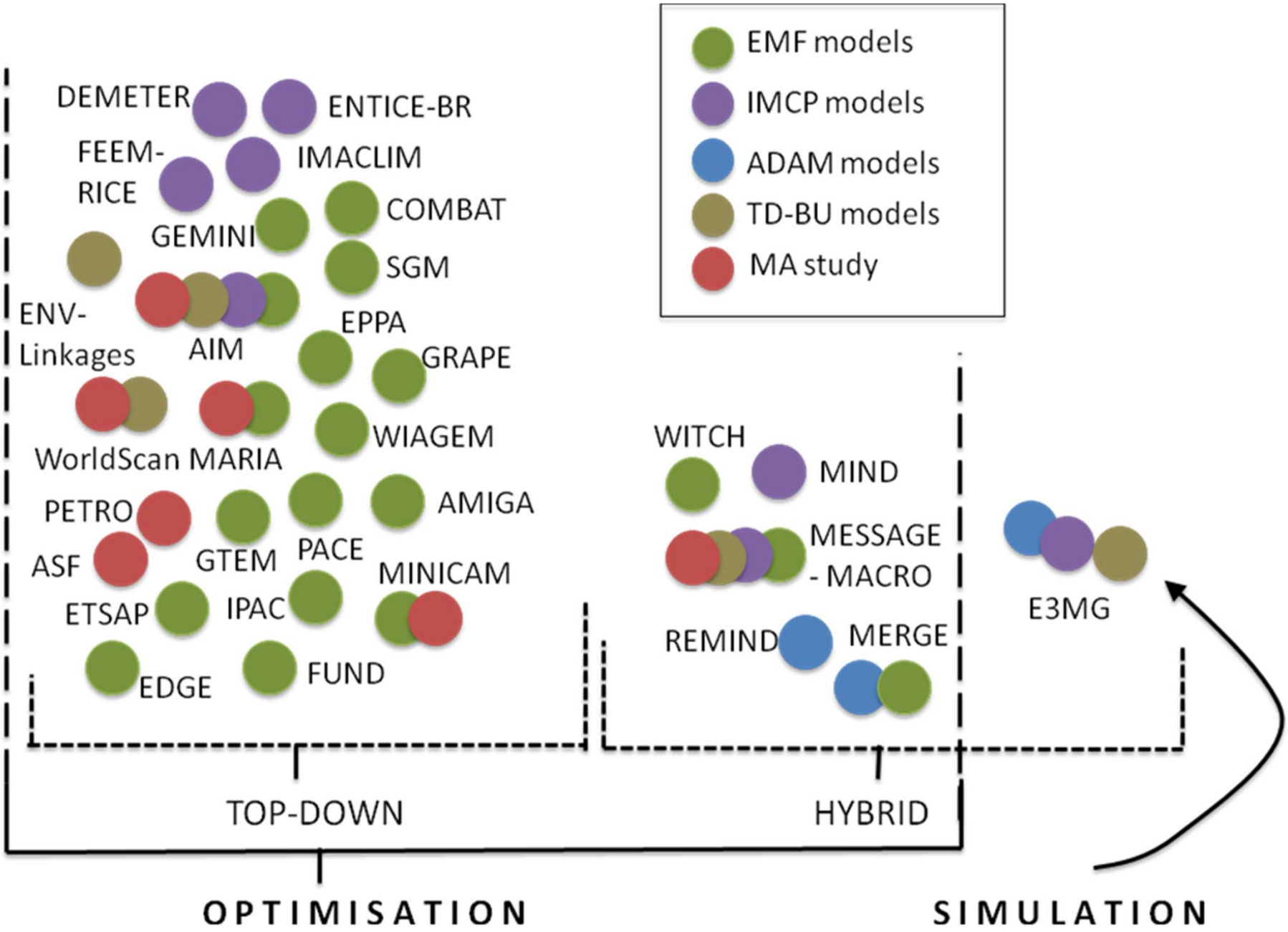
Key differences	Orthodox optimisation economic modelling	Alternative simulation economic modelling
Market equilibrium	Economies are in equilibrium, markets always clear via long run competitive pricing.	Markets do not necessarily clear. Economic systems evolve and are under continuous perturbations. Markets are not self-equilibrating in the short or long run.
View of the macro-world	First-best world with optimal utilisation and full employment of resources.	Second-best world with sub-optimal utilisation of resources. Allows for under-employment, (involuntary) unemployment and socially-determined income distribution
View of the micro-world	Representative economic agents, fully rational and often with perfect foresight	Heterogeneous agents with bounded rationality and limited foresight, tackling limitations to aggregation.
Empiricism	Predominantly deterministic with little empirical validation.	Can be empirically validated and grounded in observed behaviour.
Technological change	Limited endogeneity; belief in markets self-delivering (environmental) technologies	More comprehensive endogeneity; policy-induced technological change

Key differences	Orthodox optimisation economic modelling	Alternative simulation economic modelling
Economic growth	By and large supply driven with economies structured around production functions	Also draws attention to demand-driven output and employment (e.g. Keynesian based)
Uncertainty	Well-behaved and self-stabilising markets; the use of certainty equivalents	Market instability / volatility, fundamental uncertainty
Macroeconomic policy	Government intervention is generally seen as adding distortions to the economy and is reduced to market-based instruments (e.g. carbon pricing).	More room is given to policy intervention, and the importance of both fiscal and monetary policies in shaping “greener” growth pathways.
Institutions	Reduced to ensuring conventional (neoliberal) “macroeconomic stability” ; the use of logical time	Institutions are given wider scope and role in shaping development pathways; the use of historical time and institutional path dependency

Conventional general equilibrium and optimal growth modelling dominates the climate economics literature

- Despite some progress, their inherent restrictive peculiar assumptions on socioeconomic behaviour typically project a by-default cost to the economy from climate mitigation action
- The space for policy intervention is reduced to market-based instruments (linked to neoliberal laissez-faire take on the role of policy vis-à-vis “well-behaved” markets)
- Transitions to new economic-energy structures are almost exclusively considered as smooth processes
- Dominant climate economic thinking and orthodox economic equilibrium and optimisation modelling offers, in effect, little support to green growth claims.

Key differences	Orthodox optimisation economic modelling	Alternative simulation economic modelling
Green growth potential	Typically do not support the green growth hypothesis, as policy interventions for environmental stewardship and social cohesion are seen as negatively affecting growth (e.g. slower growth from mitigation). Mitigation costs increase with the stringency of the target	Can provide support to the green growth hypothesis. Climate mitigation action may benefit the economy and is not necessarily seen as a costly constraint Mitigation costs do not necessarily increase with the stringency of the target


EMF models
IMCP models
ADAM models
TD-BU models
MA study
DEMETER
ENTICE-BR
FEEM-RICE
IMACLIM
COMBAT
GEMINI
SGM
ENV-Linkages
AIM
EPPA
GRAPE
WIAGEM
WorldScan
MARIA
PETRO
AMIGA
ASF
GTEM
PACE
MINICAM
ETSAP
IPAC
EDGE
FUND
WITCH
MIND
MESSAGE - MACRO
REMIND
MERGE
E3MG
TOP-DOWN
HYBRID
OPTIMISATION
SIMULATION

Other examples of important alternative-simulation work applied to climate change policy:

- Macro-econometric models: GINFORS - Lutz et al 2010; PANTHA-REI – Bach et al 2002; HERMES and NEMESIS – Bossier et al 2008
- Agent-based models (macro-level): Janssen and de Vries 1998, Beckenbach and Briegel 2010
- Input-output simulation models: Jeeninga et al 1999
- Ecological macroeconomic modelling: Rezai et al 2012 (within a Keynesian demand-driven growth model)

Concluding remarks

The possibility of “green growth” or of a “green economy” remains yet to be established.

Simulation modelling could provide better scientific grounding to “greening” discourses as benefits from climate action are anticipated

Scale and ecological limits to growth still poorly addressed

Refocusing from growth per se to development issues

New thinking on economic behaviour, dynamics, complexity, and social relations is urgently called upon to solve for contemporary sustainability challenges.

The progress of the economics discipline appears to be painfully slow and fast losing its touch – the mainstream needs replacing

Thanks much for your attention

Contact: s.s.scrieciu@gre.ac.uk

Scrieciu S, Rezai A, Mechler R (2013) “On the Economic Foundations of Green Growth Discourses: The Case of Climate Change Mitigation and Macroeconomic Dynamics in Economic Modelling”, *WIREs Energy & Environ* 2(3): 251-268