The economics of the Green Transition, Zero-growth and De-growth

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Agenda

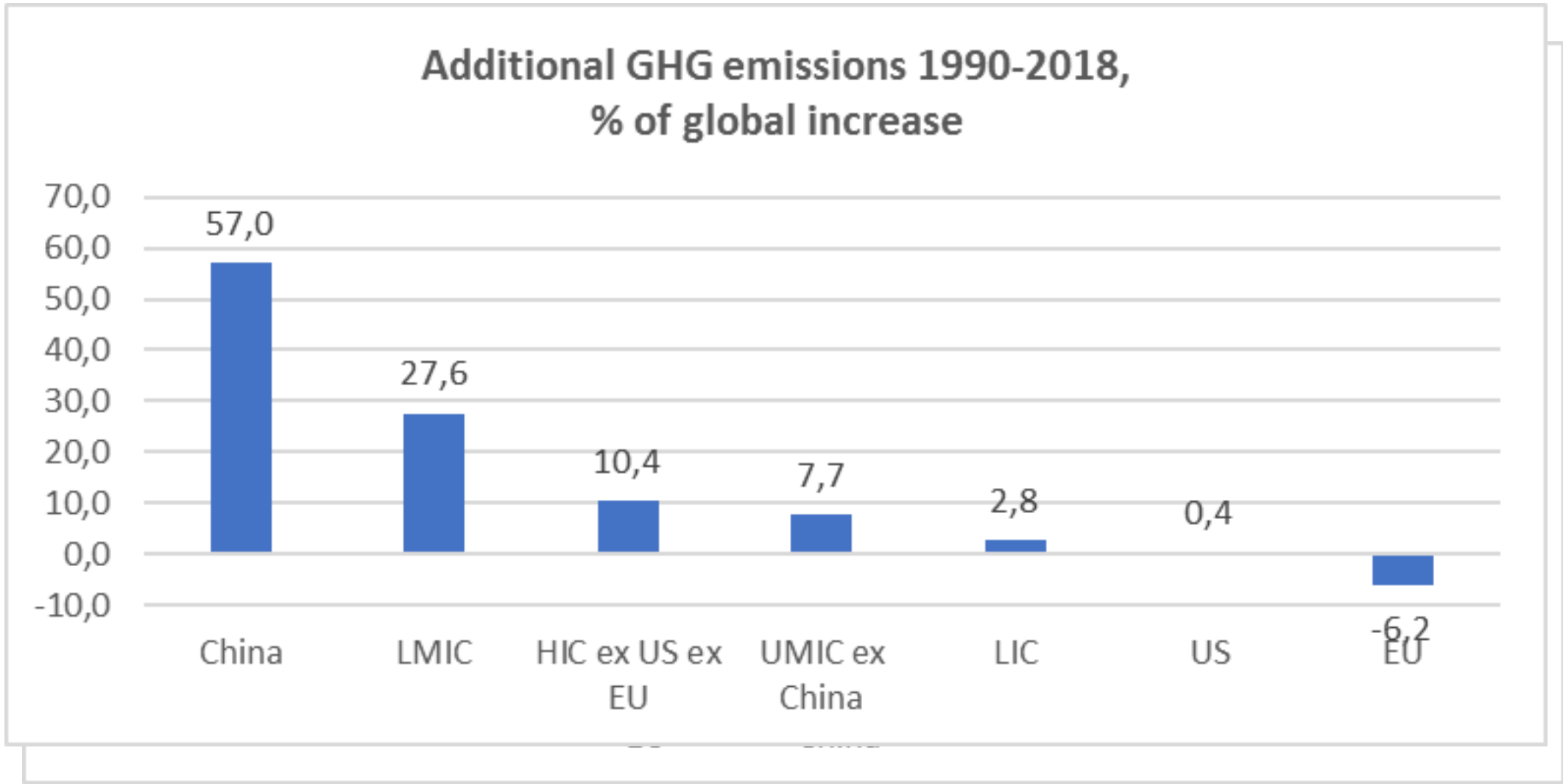
- Can zero-growth decarbonize the planet?
- Some stylised facts on climate change
- Main features of the green transition
- After the transition: zero-growth?
- Brief digression: zero-growth, de-growth and steady state in ecological economics
- Conclusions

Can zero-growth can de-carbonize the planet?

- Many papers on **zero-growth (ZG) disconnect the environmental analysis** from the economic analysis
- Some authors believe that **ZG is key for „prosperity“,** but at what level of output? **The level/scale of output matters for the environmental burden.**
- Others: ZG is meant to apply to an economy which has reached „environmental sustainability“ (ES). But a commitment to a „steady state economy“ is senseless if ES remains undefined.
- The key issue for planetary economics is reaching **„climate neutrality“** until 2045 or 2050 with limiting the average global temperature to +1.5°C-2°C
- Hence: **reducing GHG emissions from 45 Gt to 0 until < 2050** is the planetary challenge. Do we need green growth?

Stylized facts on the green transition until 2050

- **Residual budget approach of IPCC**: 400 Gt CO2E until 2050 for +1.5°C and 1,125 Gt for +2°C, probability 67%, hence 9 or 25 years time left until net zero
- „Net zero“ or zero? Zero. CCS and re-forestation can buy a little time, but are not sustainable.


Additional GHG emissions 1990-2018,
% of global increase
70,0
60,0
50,0
40,0
30,0
20,0
10,0
0,0
-10,0
57,0
27,6
10,4
7,7
2,8
0,4
-6,2
China
LMIC
HIC ex US ex EU
UMIC ex China
LIC
US
EU

Global composition of energy

- Sources for **electricity** generation: 63% 2019 fossil energy, especially coal
- Sources for **primary energy** consumption: 83% 2019 fossil energy
- Global **average carbon price** 2020: 3 US$

Stylised facts, summerized

- Tackling climate change is key for ES, but other issues remain
- **Scarcity of sinks** is the key problem, abundance of fossil energy must be maintained as an unused treasury
- GHG are **special externalities**: cumulating, irreversal, super long-lasting, not measureable in terms of money
- Peak GHG not yet reached**, speed** in decarbonisation is urgent after decades of delay
- **Cumulated CO2 grew by ca 9% p.a.** since 1970; 52% all fossil fuels burnt since 1896 were burnt after 1991
- So far: **relative decoupling** of flow of emissions and GDP growth - 1990-2018 1.6% p.a. to 2.9% p.a.; population growth 1.3%
- **GHG intensity** (GHG per unit GDP) fell by 1.26% p.a. since 1990
- 60% of GHG emissions by 10 large countries, 53% by **China, US, EU, India**
- Root cause is **extractive capitalism** since industrial revolution, replicated by China (and others) after 1980; climate problem is **crisis of development strategy** in EME

Transition with de-growth?

- Can it be done with de-growth? Halving global GDP to the level of 1994 would halve GHG emissions to 23 Gt – no option. Mission impossible.
- Pure ZG would wreck the planet …
- Y GDP → $\mathbf{G_t = Y_t\, G_t/Y_t}$ **(**G GHG emissions, Y GDP)
- **g = y + e** (g growth of G and e growth of G/Y)
- e is not only technology change but involves **behavioural change**

Economics of green transition

- Transition requires growth. Why? Besides population growth, z**ero-growth is blind** regarding the level of output and pollution
- Global ZG – applied to all nations - would stiffen income-distribution across countries
- Old carbon-based capital stock needs to be replaced by renewable energy capital stock → **creative destruction**
- Gross investment will exceed fixed investment for replacement (depreciation), **net fixed investment > 0**
- The higher the **speed** of transition the higher investment and growth rates in transition
- **All manufactured products** must change → wave of new electrification → new industrial revolution
- A new **Kondratiev upswing**? Even with redistribution of wealth and income – aggregate consumption might rise
- Green growth transition – **double-edged, green & brown**?

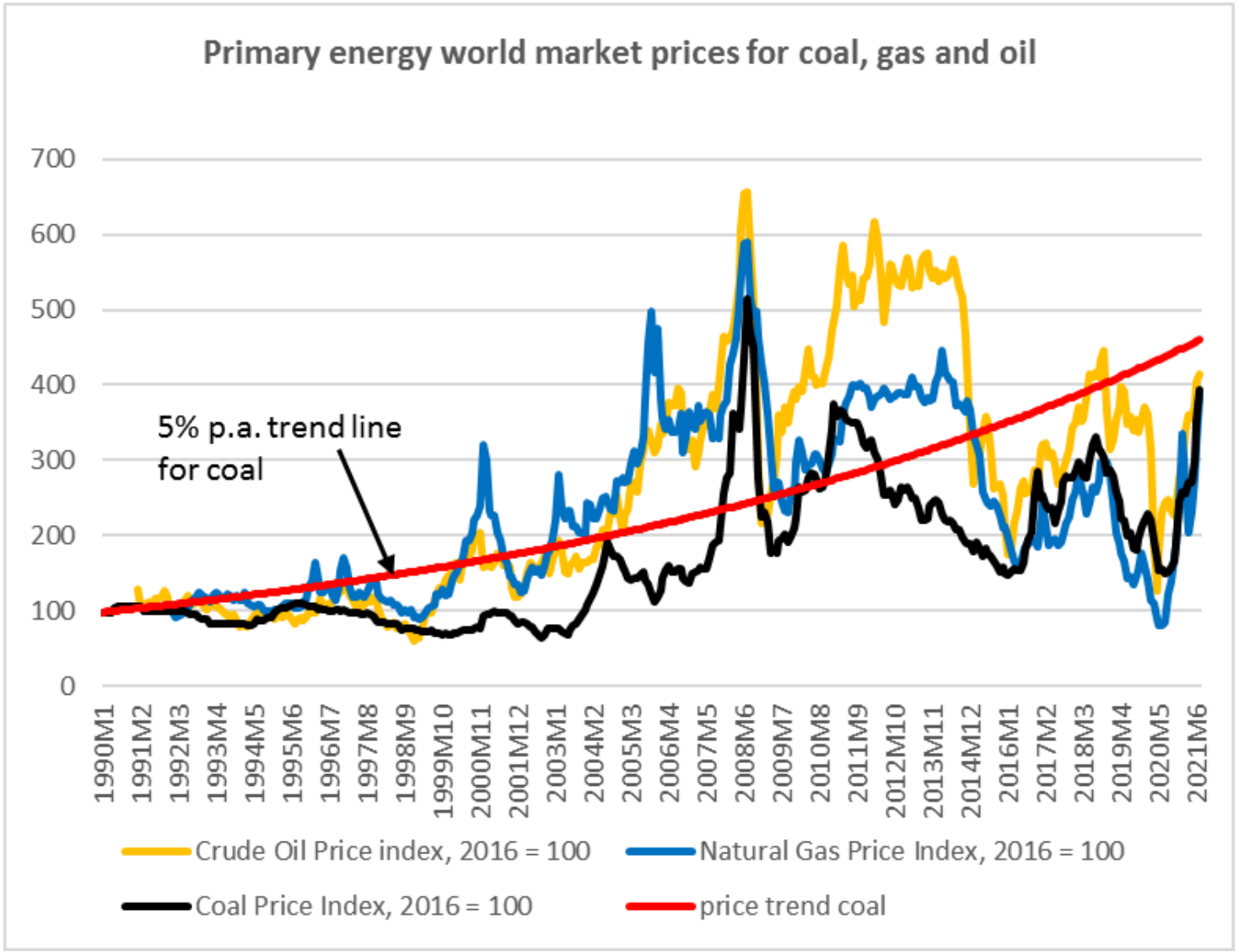
Instruments for Green Transition

- Improving **cost competitiveness of renewable energy** RE) against fossil energy, domestically and internationally
- Impose **higher carbon price** by tax or emission trading certificates or both
- Increase carbon price (CP) **gradually and foreseeable**, quicker in advanced countries than in dev-emerg-countries (Stern/Stiglitz 2017), up to US$ 100/t
- **Incentivises RE**, energy substitution, raise **revenues for social compensation** and R&D and public infrastructure
- **Fossil energy owners** might kickback and reduce fossil prices; price war?

Control of world market prices for coal, gas, oil is key issue

- Proposal Schulmeister 2020: control domestic trend price of fossil energy, reduce uncertainty
- **Border carbon fee/custom**? New role for WTO? Prevent carbon price and currency wars
- **„Climate Club“** (Nordhaus) → coalition of the willing (IMF, WB)?
- **5 industrial/sectoral policies**: agriculture, energy generation, industry, traffic, houses/buildings
- **mainly structural policies. Supported by macro policy: structural Keynesianism.**

World market prices for fossil energy 1990-2021



Brief digression on ecological economics

- **Adam Smith and classics**: steady state = stationary economy, constant capital stock
- **Ecological economics**: steady state is economic + ecological stability = constant flow of material/throughput/matter; GDP as a rough measure for flow of matter. Constant stock of physical capital and population.
- Georgecou-Roegen and Daly: respect laws of thermodynamics → zero growth of throughput
- **Georgescou-Roegen:** de-growth. until mineral resources used up, solar influx abundant. → Zero-growth environmentally unsustainable.
- **Boulding**: „spaceship earth“, circular economy, zero-growth. But: recycling is limited…
- **Daly**: zero-growth. Also focus on throughput. 3 proposals for zero-growth, 1. income/wealth redistribution, 2. transferable reproduction licenses for women, 3. Tradable licenses for throughput . No comment!
- Unclear whether de- or zero-growth. No measure for throughput (except proxy GDP). Unclear about zero-growth for all countries alike or not. Conflicts unresolved.
- **Conclusion: Steady state economy includes zero population growth and ecological stability (= ES). Differs from zero GDP growth. ES not really defined.**

Ecological economics, cont‘d

- Ecological **footprint research** (Wackernagel et al 2021, worldfootprintnetwork)): consumption of natural resources counted in land **(„global hectares“)**. Planetary equilibrium **biocapacity = footprint**, realised in 1970. 2021: global FP = 1.7 BC. Strong differences among countries.
- On average, 60% of FP caused by CO2, in advanced countries ~ 70%. Rest mainly by deforestation and agriculture, esp. Methane. Large part of FP caused by GHG. Land-measure questionable.
- **Planetary boundaries** (Steffen et al. 2015): 9 biochemical boundaries, of which climate change and biodiversity have priority. No overall quantification of risks/damages. Specific policies proposed. No economic analysis.
- ZG or de-growth cannot be derived from Wackernagel et al. or Steffen et al. or IPCC 2021.
- Other concepts of ZG and de-growth (O‘Neill 2012, 2015 and others) --> „hard sustainability“
- **Conclusion: GHG reduction to zero would reduce probably more than 70% of global footprint. Many other ecological problems (planetary and regional) remain**.

Conclusions

ZG can have many reasons

- **A: Economic reasons**: waning technical progress, aging, saturation of consumers, secular stagnation etc.
- **B: Ecological reasons**: over-use of biocapacity (sinks), natural resources used up or degraded; but zero-growth would be unsustainable . No clean level of GDP p.c.
- No clear global relationship GDP/p.c. and environmental quality. Level-issue irresolvable. Same in international comparison. Compare e.g. GHG p.c. USA and Switzerland (16t : 5t and 60k : 88k). Or Germany and Poland (GHG p.c. 10t:10t 2019)
- A and B. require different political responses Keeping output constant in all countries is arbitrary

Alternatives

a) Impose limits on global consumption of key natural resources → „guard railings“

b) reduce global GHG down to zero, preserve sinks. Within these limits GDP can rise or drop, as a result of the limits. Evolution uncertain.

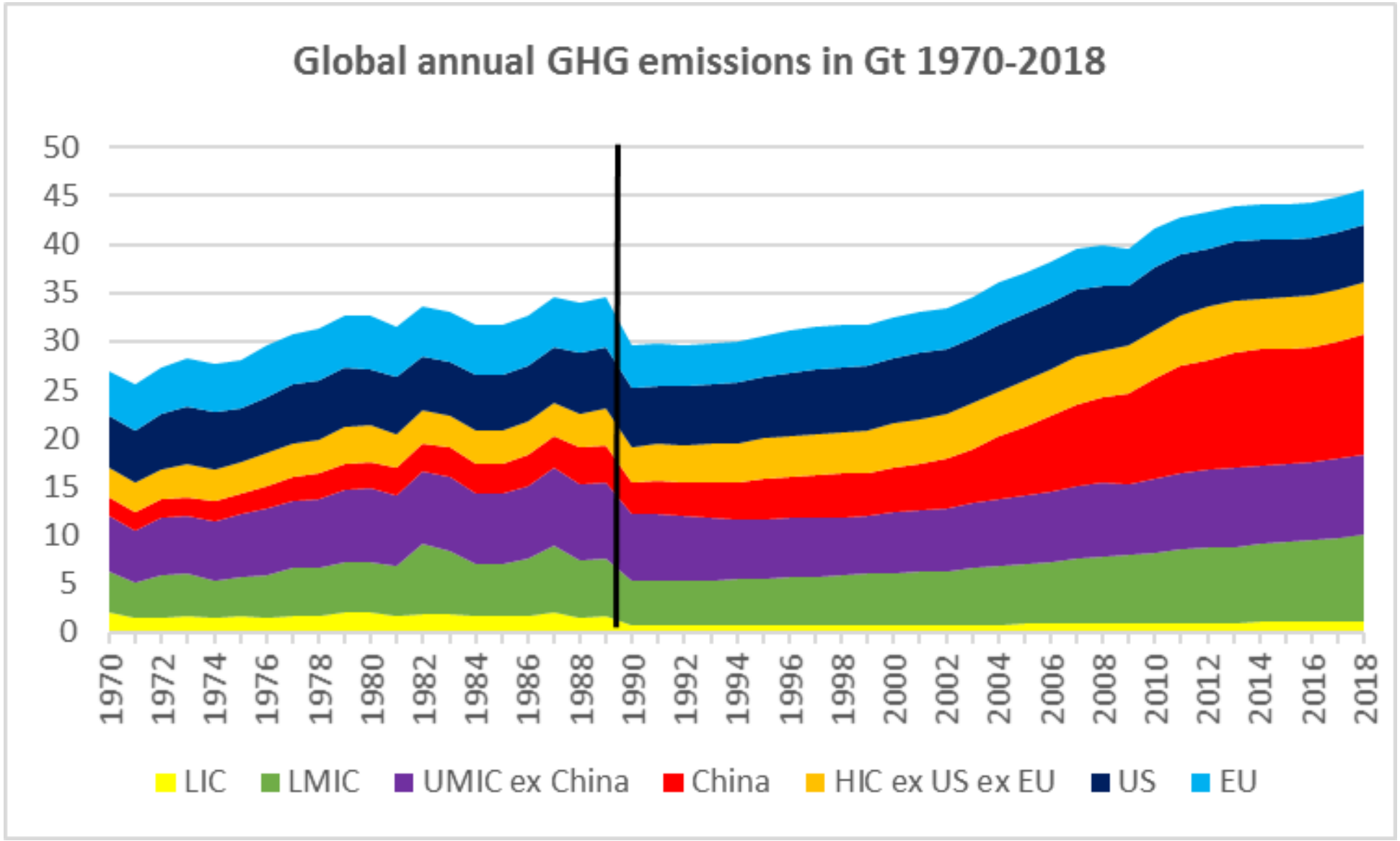
c) Use more specific environmental policy tools, rather than target throughput

d) Green growth – zero GHG emissions until < 2050

- Zero-growth: capitalism – capital accumulation ≠ capitalism → regime change

  profit motive replaced by consumption

  reduced profit rate, potentially zero or negative profit rate
- continued de-growth: negative profit rates, devaluation/loss of capital, severe regime change
- Zero-growth or de-growth in one country with open borders - capital moves to ROW. Capitalism is global and cannot be abandoned nationally.


Global annual GHG emissions in Gt 1970-2018
50
45
40
35
30
25
20
15
10
5
0
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
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2008
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2012
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LIC
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China
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