
CESifo

The Green Paradox

Global Warming:
The Neglected Supply Side
25 November 2008
DG Ecofin

Hans-Werner Sinn

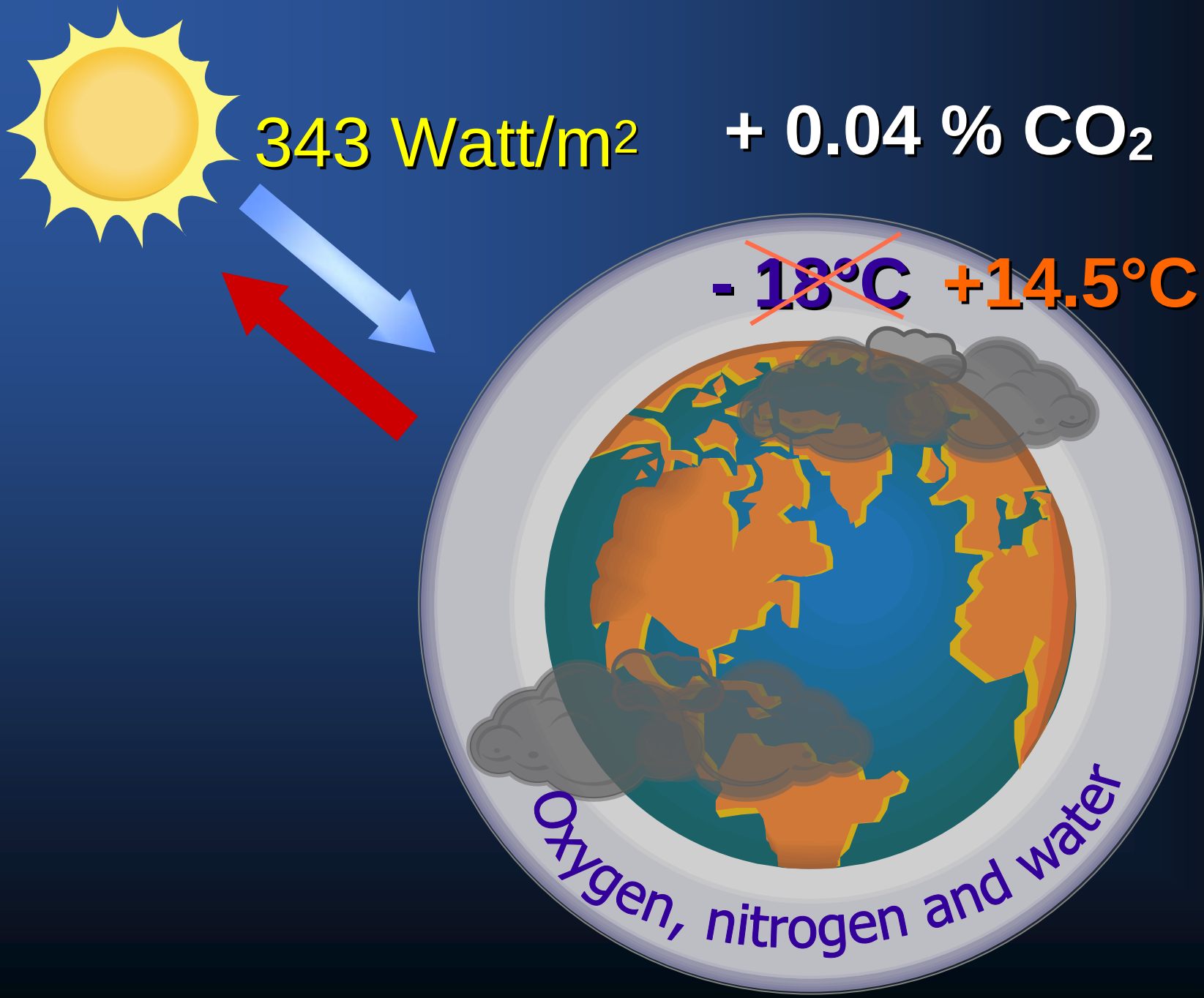
„Public Policies against Global Warming: A Supply Side Approach“, *International Tax and Public Finance 2008*

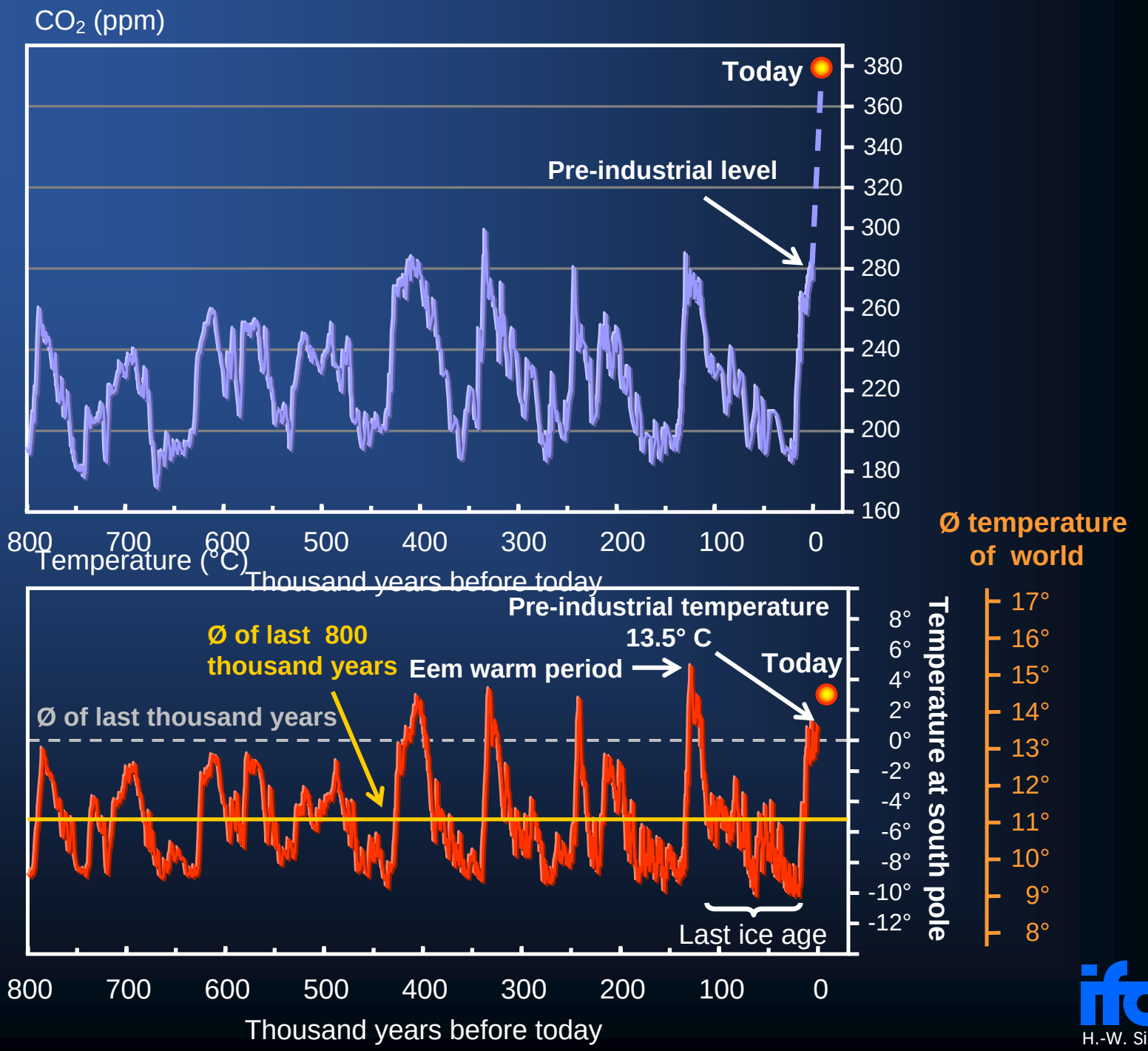
„Pareto Optimality in the Extraction of Fossil Fuels and the Greenhouse Effect: A Note“, *CESifo Working Paper* 2007

Das grüne Paradoxon. Ein Plädoyer für eine illusionsfreie Umweltpolitik, Econ, Berlin 2008, 450 pages

- The greatest externality ever
- Current policies
- The forgotten supply
- The nature of the externality
- The green paradox
- Effective policy measures

The greatest externality ever


343 Watt/m²
+ 0.04 % CO₂
- 18°C
+14.5°C
Oxygen, nitrogen and water


CO_2 (ppm)
Today
Pre-industrial level
380
360
340
320
300
280
260
240
220
200
180
160
800
700
600
500
400
300
200
100
0
Temperature (°C)
Thousand years before today
Ø temperature of world
Pre-industrial temperature
13.5° C
Ø of last 800 thousand years
Eem warm period
Today
Ø of last thousand years
Last ice age
8°
6°
4°
2°
0°
-2°
-4°
-6°
-8°
-10°
-12°
Temperature at south pole
17°
16°
15°
14°
13°
12°
11°
10°
9°
8°
800
700
600
500
400
300
200
100
0
Thousand years before today

H.-W. Sinn

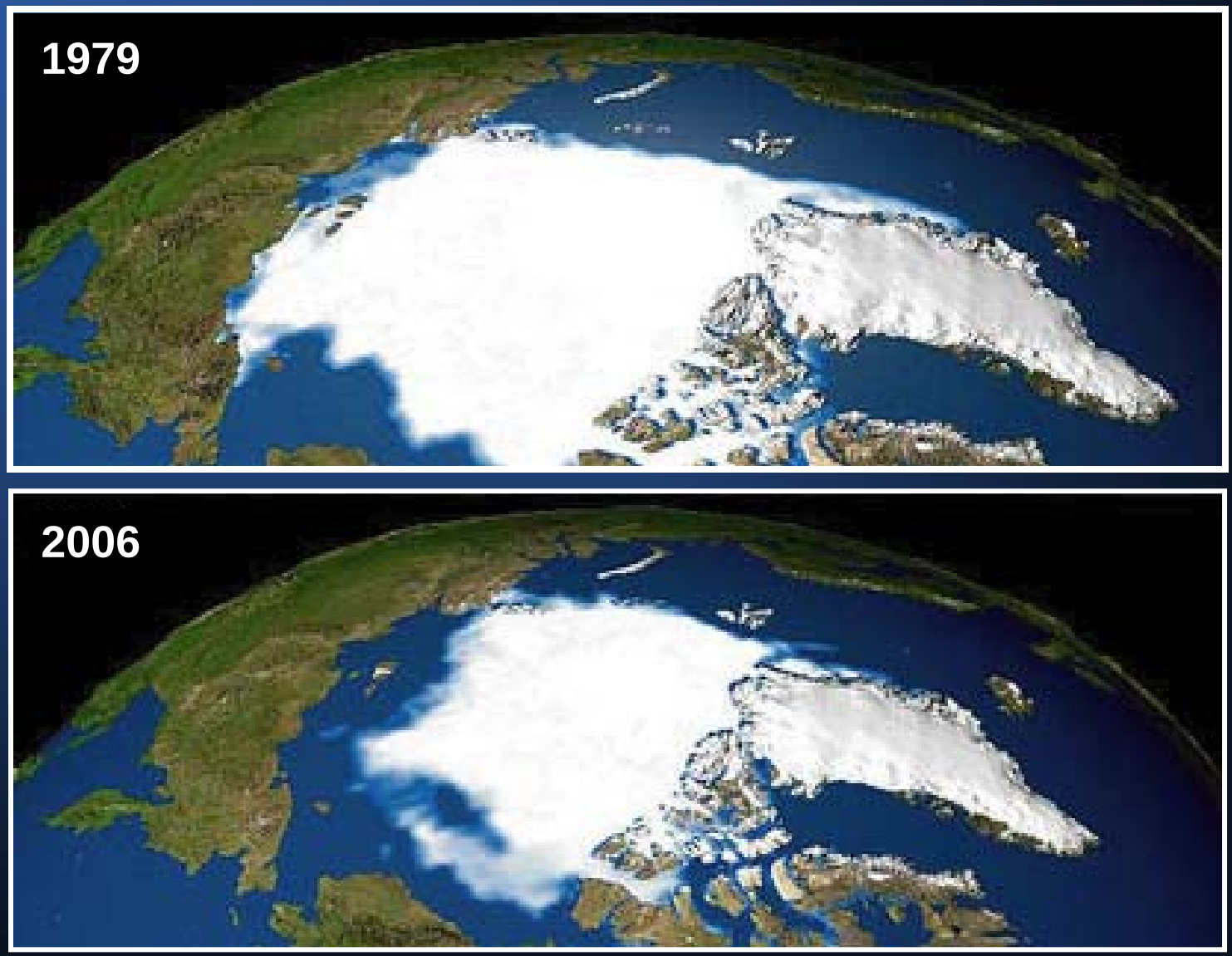
The fears of the Stern Review

Pre-industrial time until 2035-2050	+3° C
Pre-industrial time until 2100	+5° C

Stern Review (2006):

A temperature increase of more than 5°C *would "take humans into unknown territory".*

The north pole melts

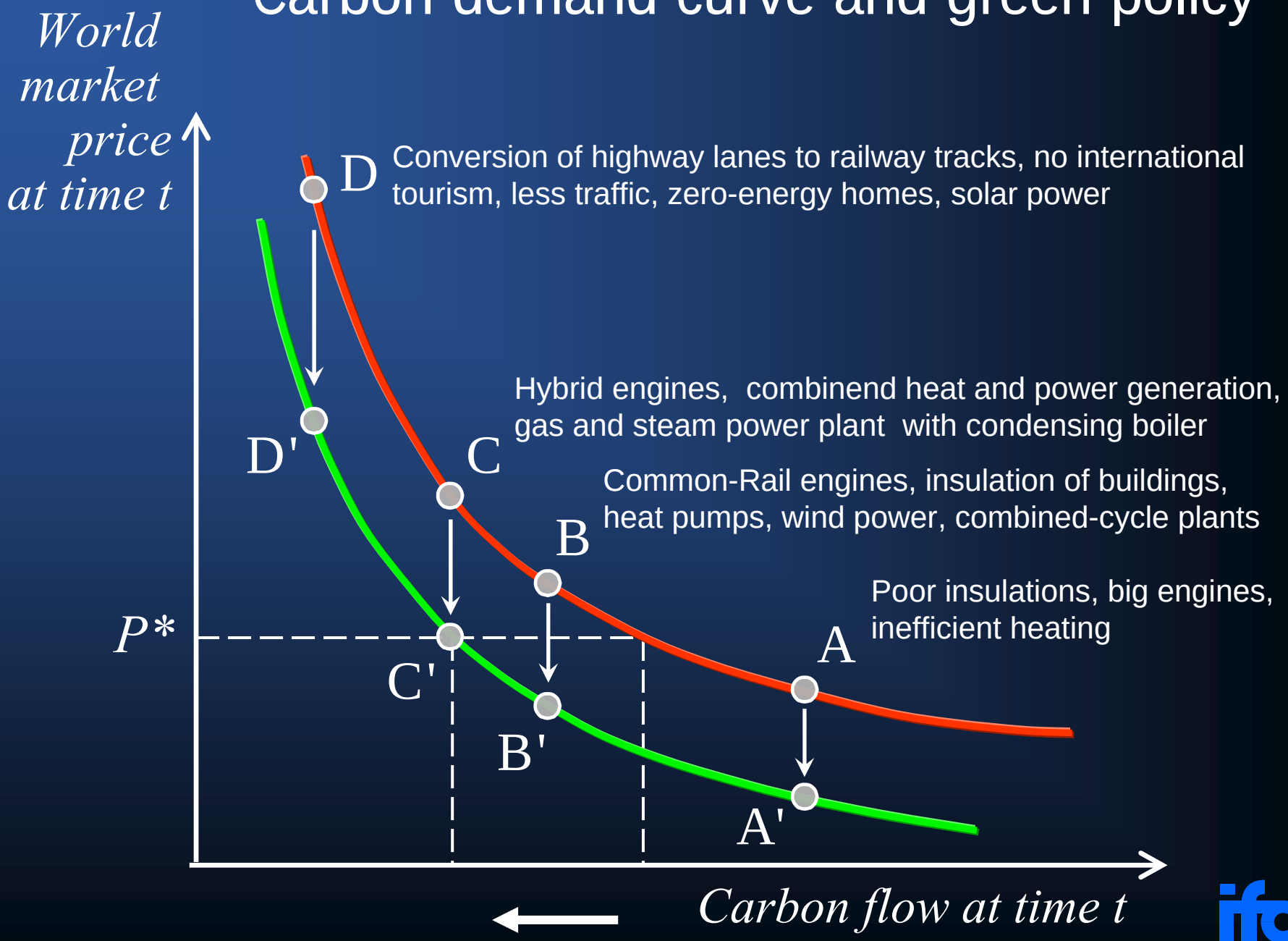


The current policies

Popular policies against CO_2 production
(Via taxes, subsidies and emissions trading)

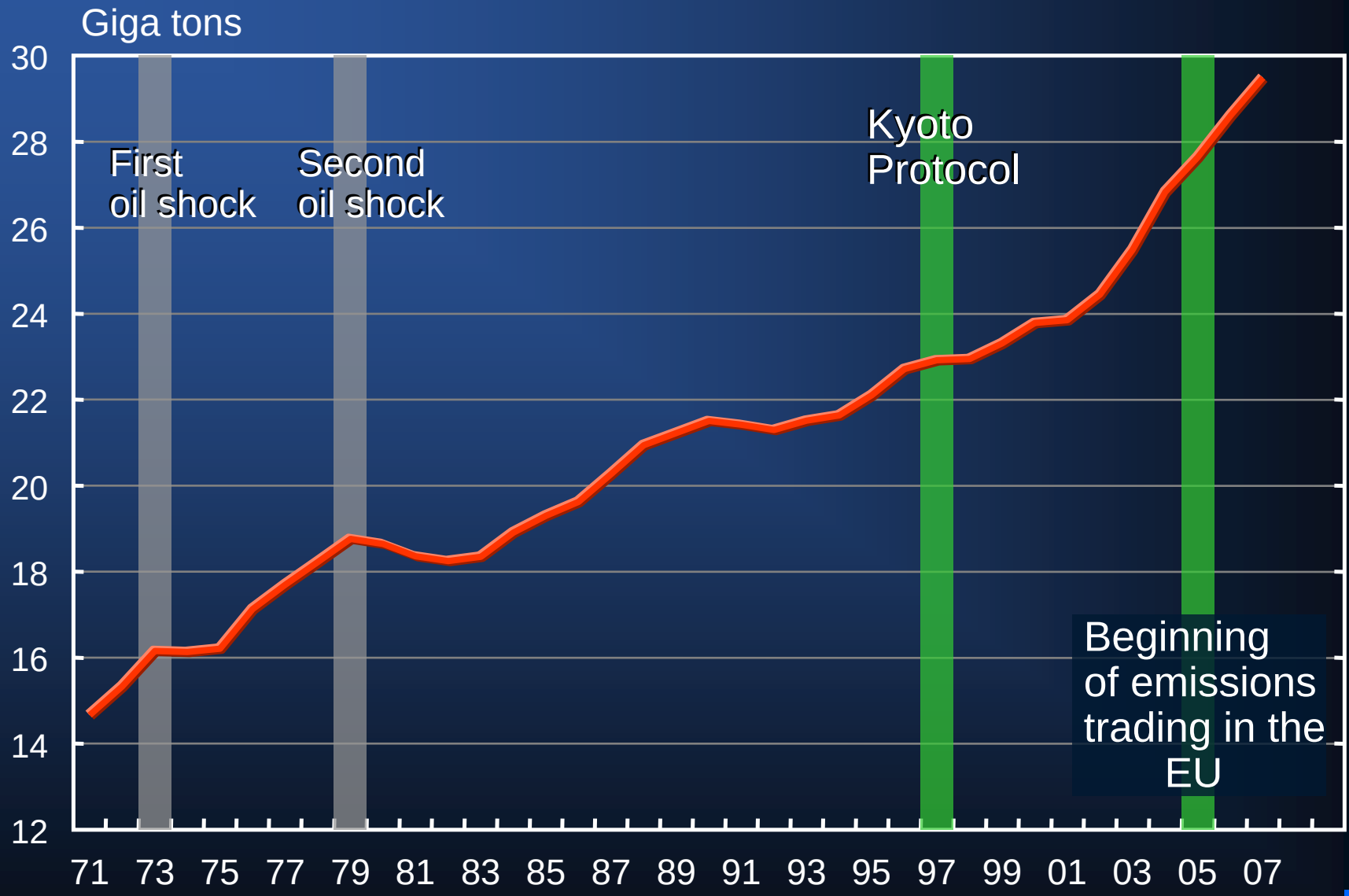
- Direct fuel demand reductions
  - Better insulation of homes, lighter cars and traffic reductions
- Green electricity
  - Wind, water, sunlight, biomass or hybrid cars
- Nuclear energy
  - Hydrogen technology
- Other green energy sources
  - Pellet heating, bio diesel, heat pumps, solar heating, geothermal heat
- More efficient combustion
  - Common rail diesel engines, optimized power plants

Carbon demand curve and green policy



H.-W. Sinn

World wide CO_2 production per year

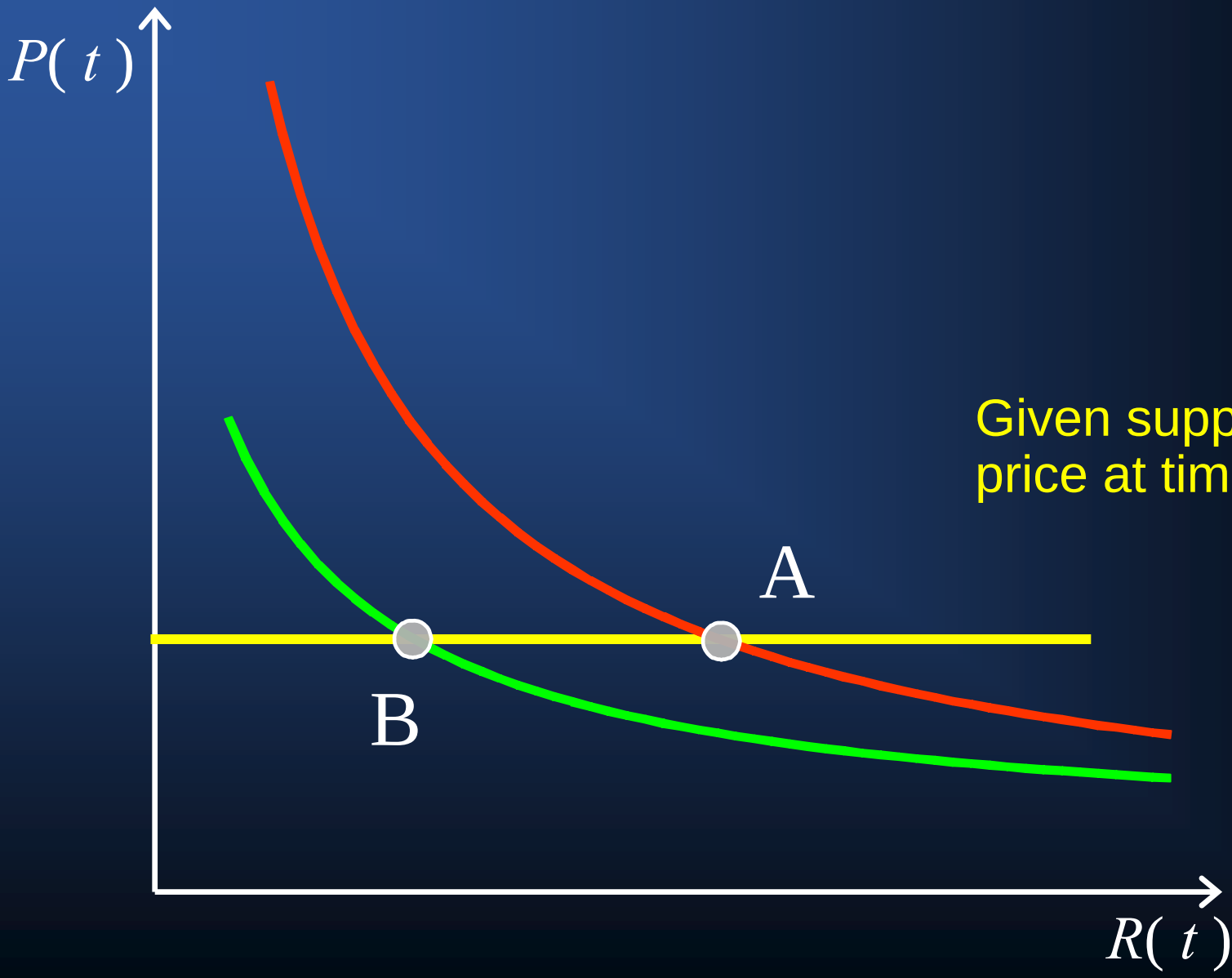


Source: IEA (2008).

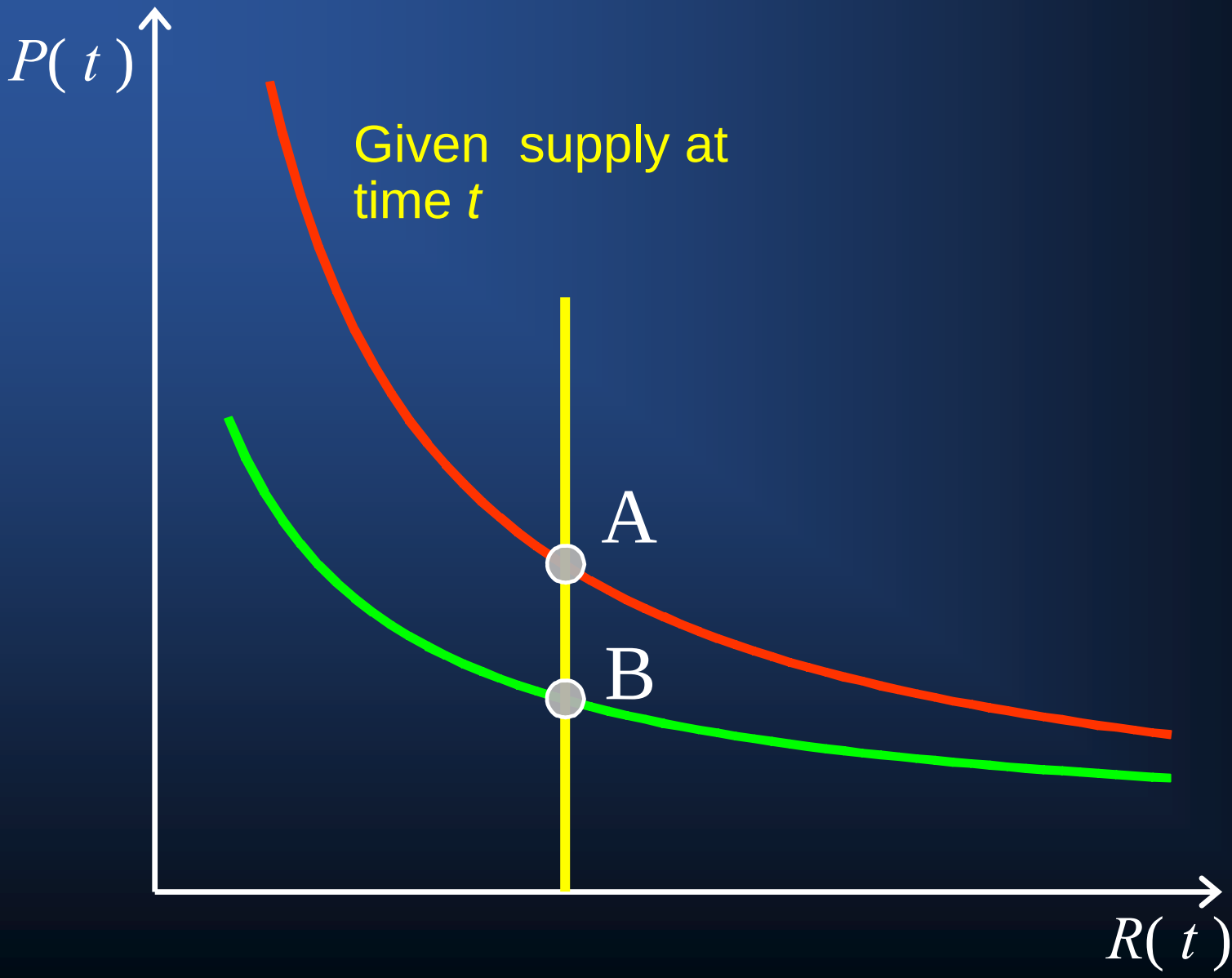
Why are the policies ineffective?

The forgotten supply

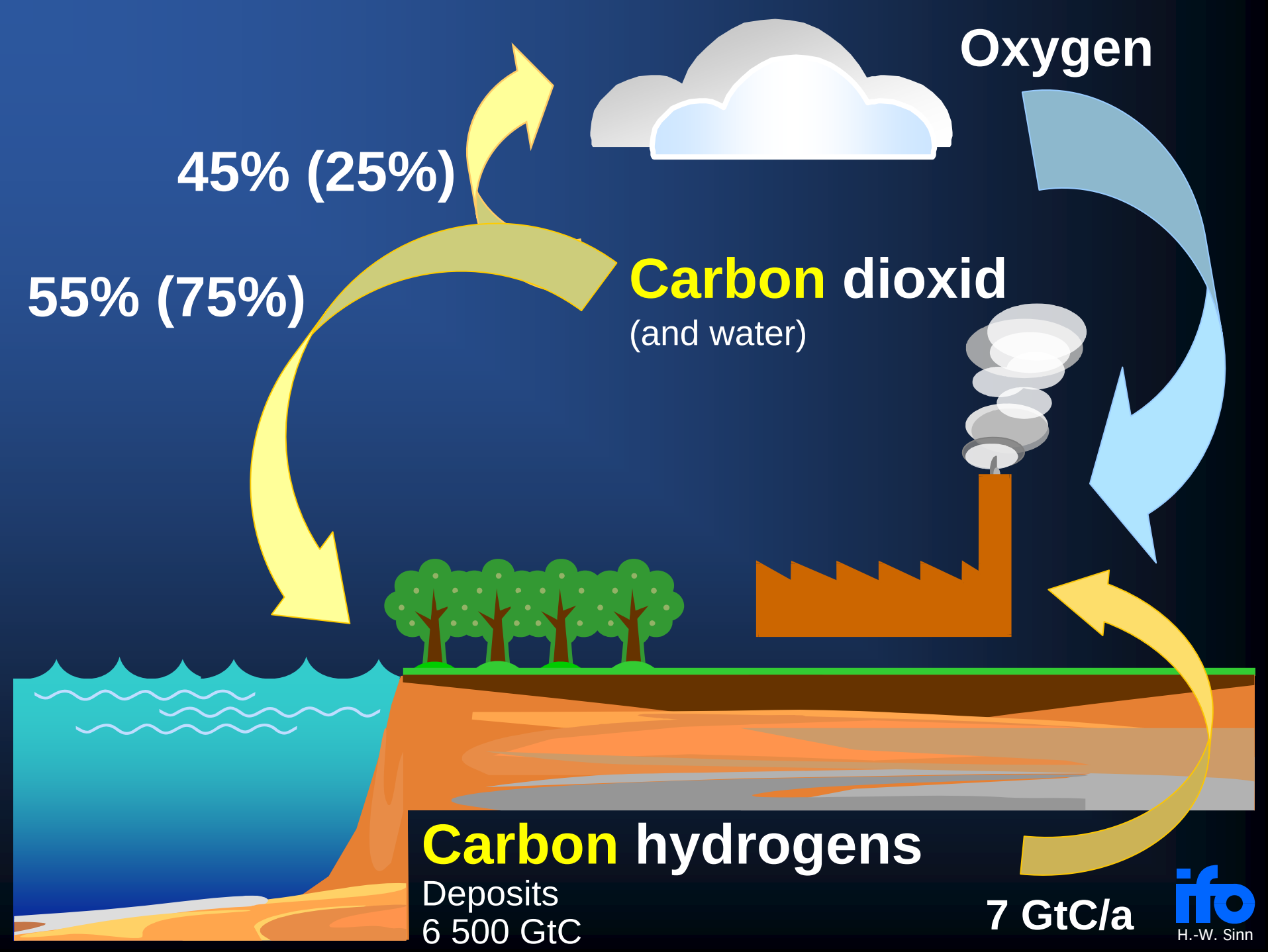
Elastic supply



Inelastic supply



The problem is more complicated,
as supply depends on the entire time path of prices.


Oxygen
45% (25%)
55% (75%)
Carbon dioxid
(and water)
Carbon hydrogens
Deposits
6 500 GtC
7 GtC/a
ifo
H.-W. Sinn

	Proportion of carbon resources consumed (including preindustrial reserves)	Carbon content in the atmosphere (GtC)	CO_2 concentration in the atmosphere (ppm)	Average temperature (°C)
Preindustrial age	0	600	280	13.5
Present	5% (347 GtC)	800 **	380	14.5
Mid-century* (according to Stern estimates)	18%	1200	560	16.5 (15.5–18.0)
All reserves burned: 1160 GtC (Estimates range from 868 to 1579 GtC) Near-term until 2100, 45% in the atmosphere	22%	1320	620	16.9 (15.8–18.7)
2100 (according to Stern's CO_2 estimates)	41%	1920	900	18.6 (16.9–21.1)
All resources burned: 6500 GtC (Estimates range from 5060 to 8980 GtC) Near-term until 2100, 45% in the atmosphere, hypothetical	100%	3730	1750 ***	21.4 *** (18.8–25.4)
All resources burned, Long-term from 2400, 25% in the atmosphere	100%	2430	1140	19.6 (17.6–22.6)

* In worst-case scenario, reached already by 2035 ** Including carbon through altered land use
*** According to IPCC-formula outside the estimation range

Climate problem is a resource extraction problem: Hotelling world

The nature of the externality

Sealing some of the resource in situ?

(boundedness of demand elasticity and unit extraction cost)

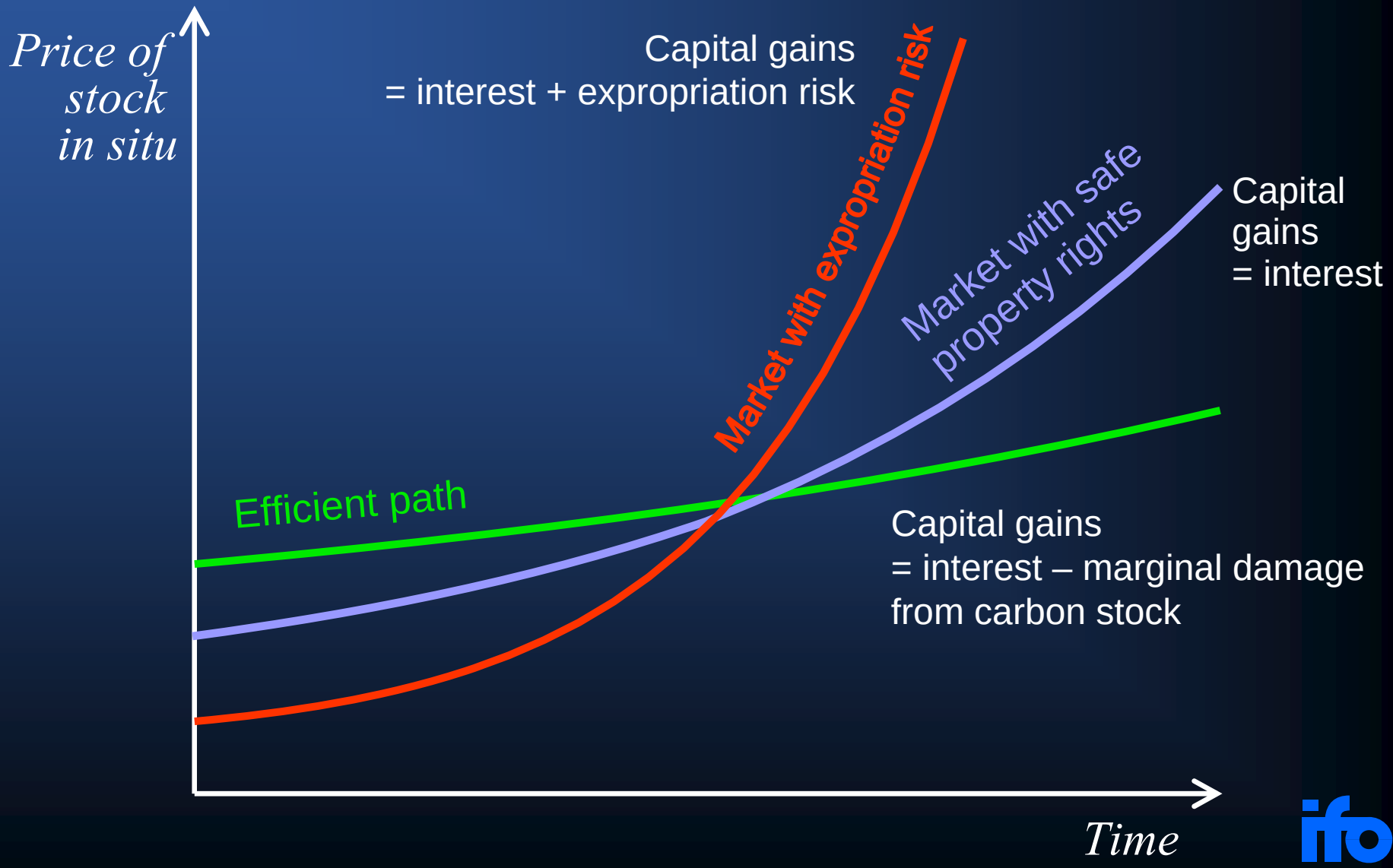
Lack of altruism?

Nirvana ethics.

Global warming in the Solow-Stiglitz condition (Sinn 2007)

$$f_K = \frac{\dot{f}_R + D_C(C)}{f_R - g(S)}$$

The market and the social optimum

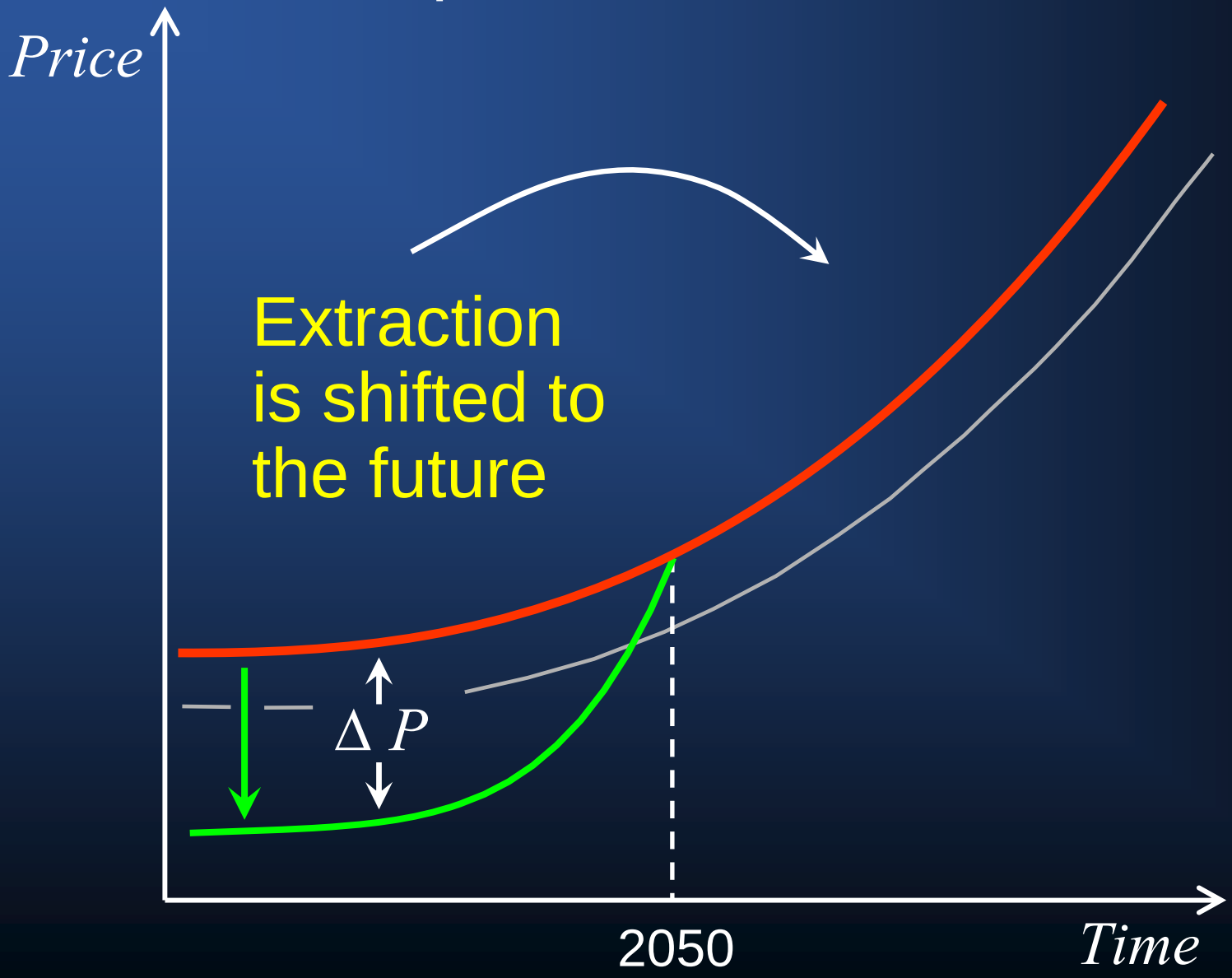


The green paradox

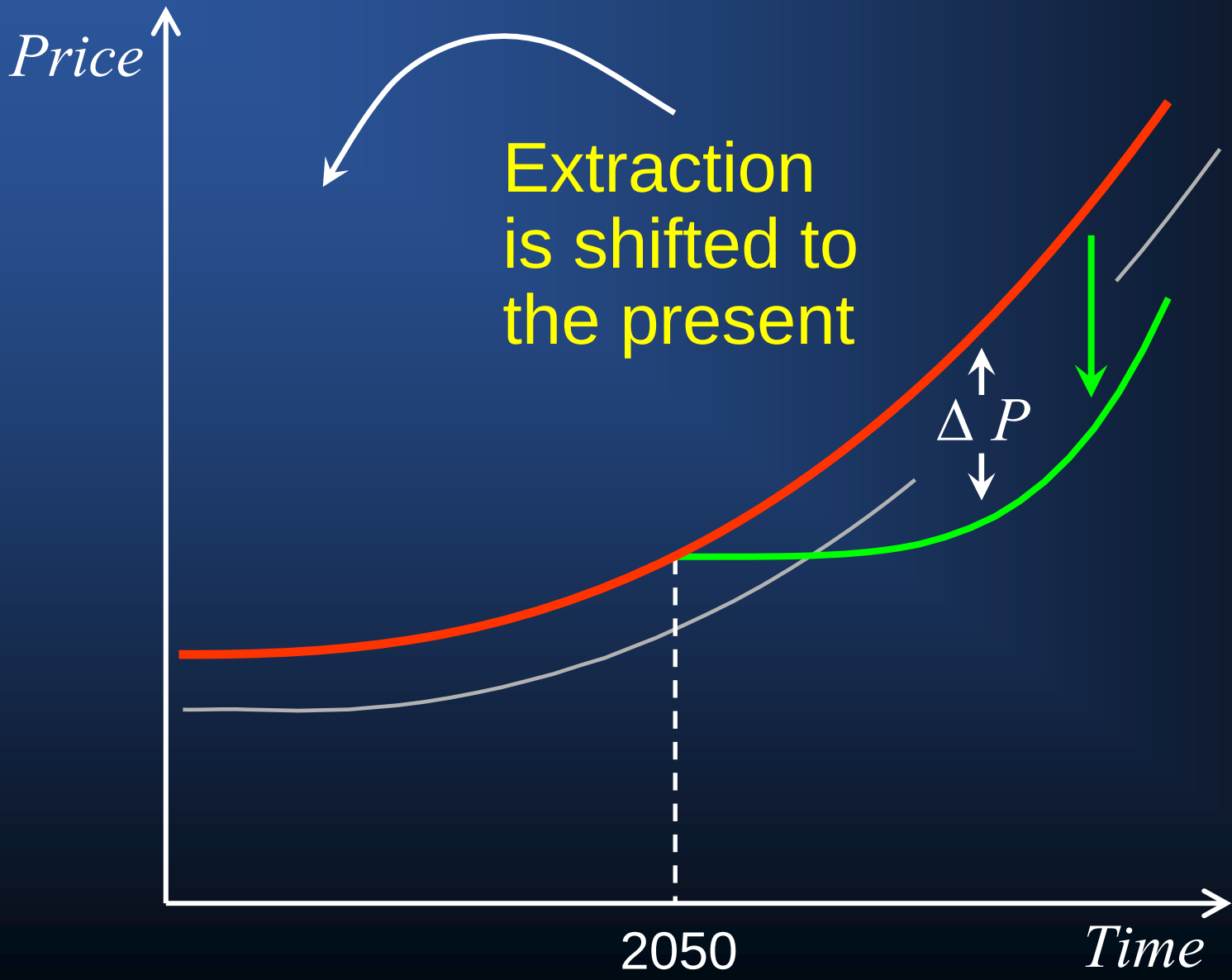
Temporary versus permanent price changes.

When will demand be curbed?

Demand reducing measures in the present and near future



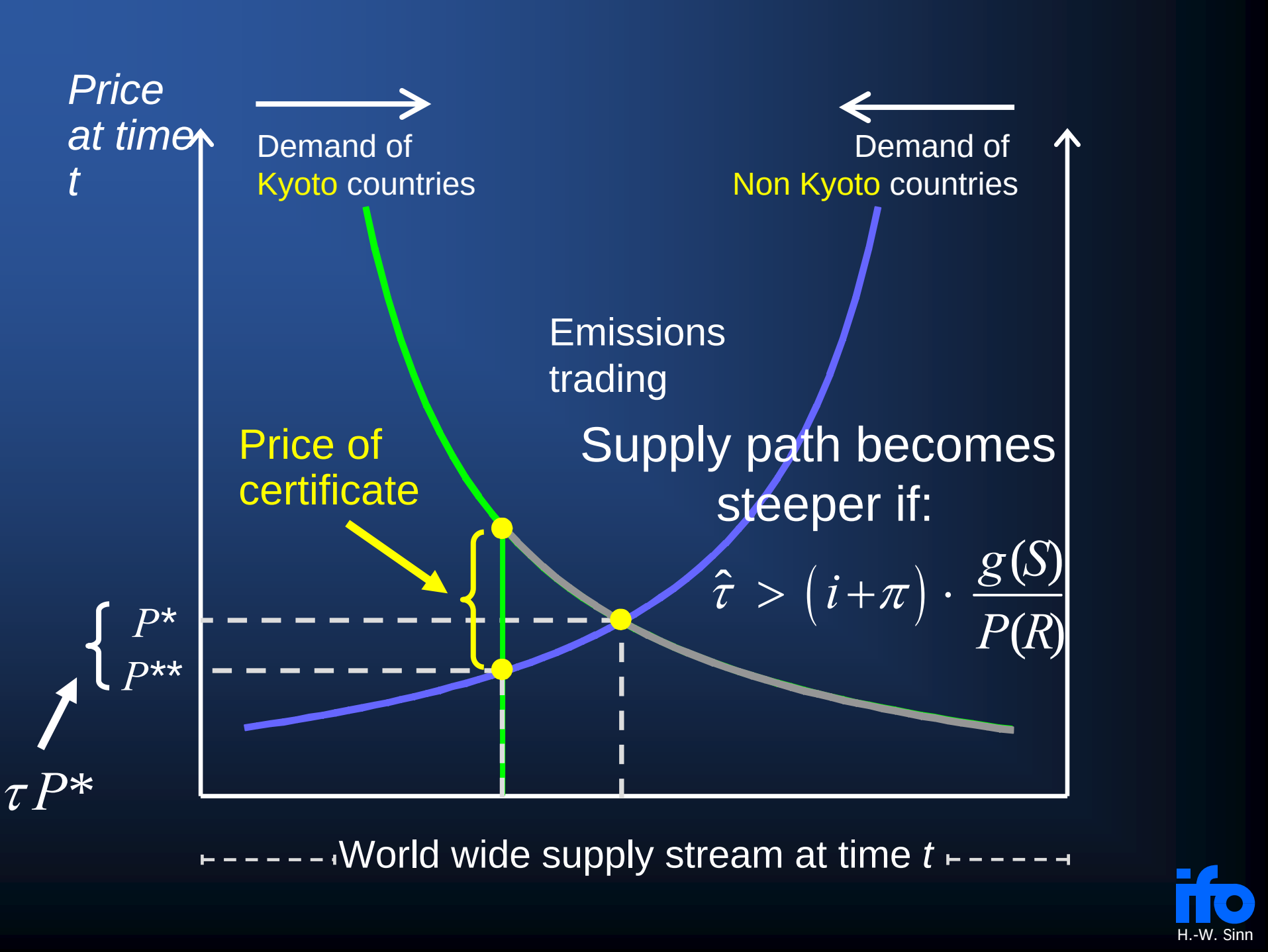
Demand reducing measures in the future



Policies that become greener over time speed up global warming.

Example: announced introduction of replacement technologies.

Will quantity constraints solve the problem?


Price at time t
Demand of Kyoto countries
Demand of Non Kyoto countries
Emissions trading
Price of certificate
Supply path becomes steeper if:
$\hat{\tau} > (i+\pi) \cdot \frac{g(S)}{P(R)}$
P^*
P^{**}
τP^*
World wide supply stream at time t

Effective policy measures

- Paling green policies?
- Source taxes on financial investment
- Super Kyoto
- Sequestration, afforestation

End


CESifo