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A Balance of 18 years EU ETS Wharf

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Opening the Wharf [Reading time: 40"]

At COP3 (Kyoto, Dec. 1997), the EU reluctantly accepted emissions trading as a climate policy instrument.

Soon, DG Environment minds were reprogrammed: *emissions trading markets would innovate mitigation solutions to save the climate.*

Spurred by energy corporates & neoclassical economists, the EC freshmen opened the EU ETS wharf.

From economics textbooks + superficial scan of the US SO₂ program, a too ambitious, simplistic 'cap-and-trade' market design emerged.

However, free permits, fraud, rent skimming, absent innovation, ... spoiled the dream and spread confusion.



ETS debate: issues & choices

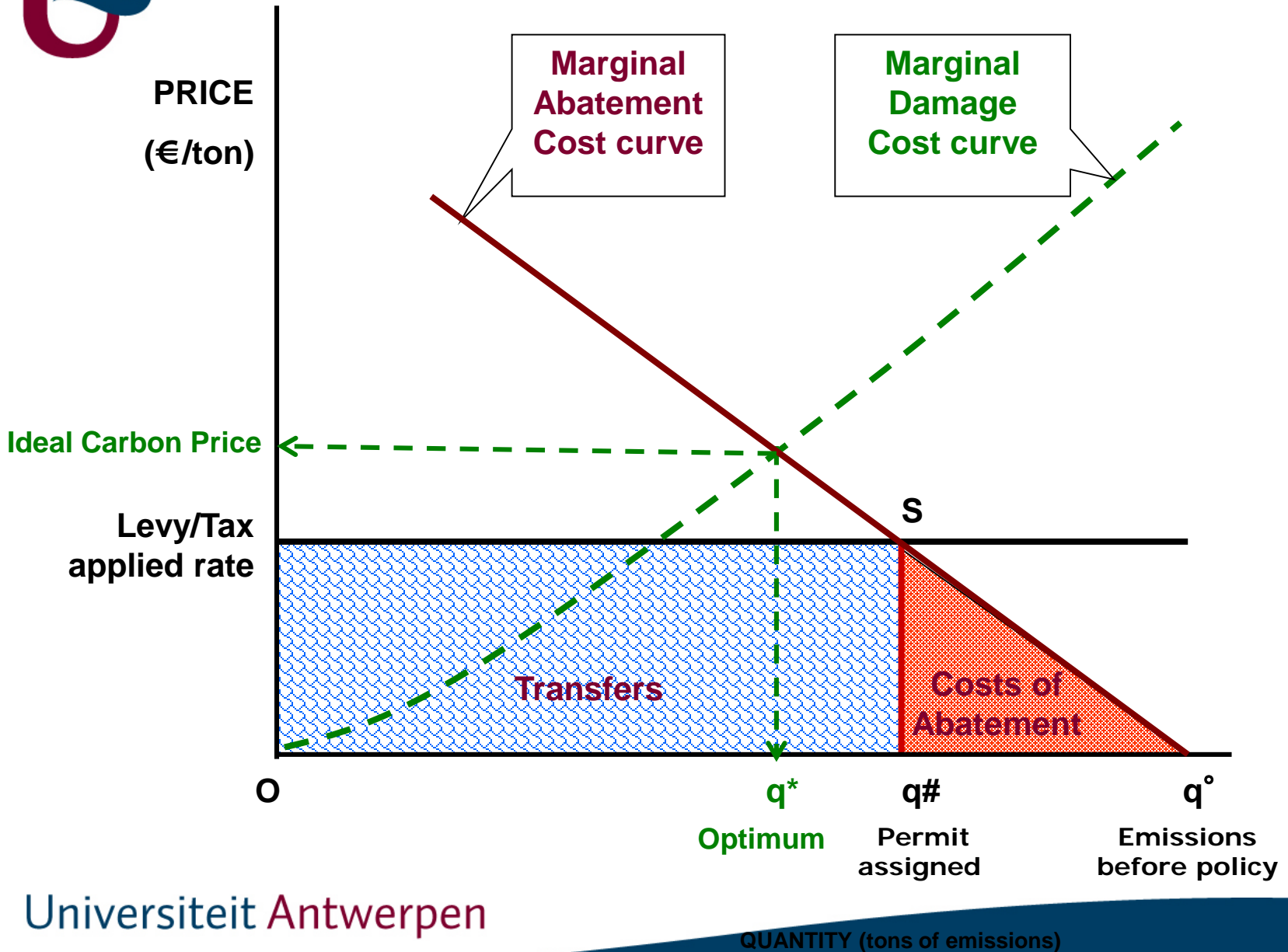
- ❑ **Economics & cost-benefit frame dominate**
 - ❑ 'Money makes the world go round'
 - ❑ Price everything – only what is priced, is relevant
 - ❑ Based on aggregates/averages – hides **inequality, diversity**
 - ❑ Assumes unlimited substitutability – hides **irreversibility**
- ❑ **Urgency of action & results**
 - ❑ **Atmosphere & Climate disruption is irreversible**
 - ❑ **No time for lenient experimentations**
- ❑ **ETS debate is unwieldy**
 - ❑ **Non-economic views neglected**
 - ❑ **Facts obscured – next phase will be better** (remind atoms)
 - ❑ This lecture addresses the economics core of ETS, i.e.:
 - * pricing GHG (carbon) emissions
 - * price induced innovation (IPCC WG3 IAM)



Lecture overview (+30 slides)

1. **Introductory economics (sorry, but necessary) +2**
2. **Anatomy of EU ETS (economic instrument) +12**
3. **Learning (US SO₂ policy; EU's Tradable Green Certificates) +3**
4. **Reality check on carbon prices +10**
5. **Evaluation & Future +3**

Cost-benefit: least-cost emission level q^* + polluters search minimum expenses

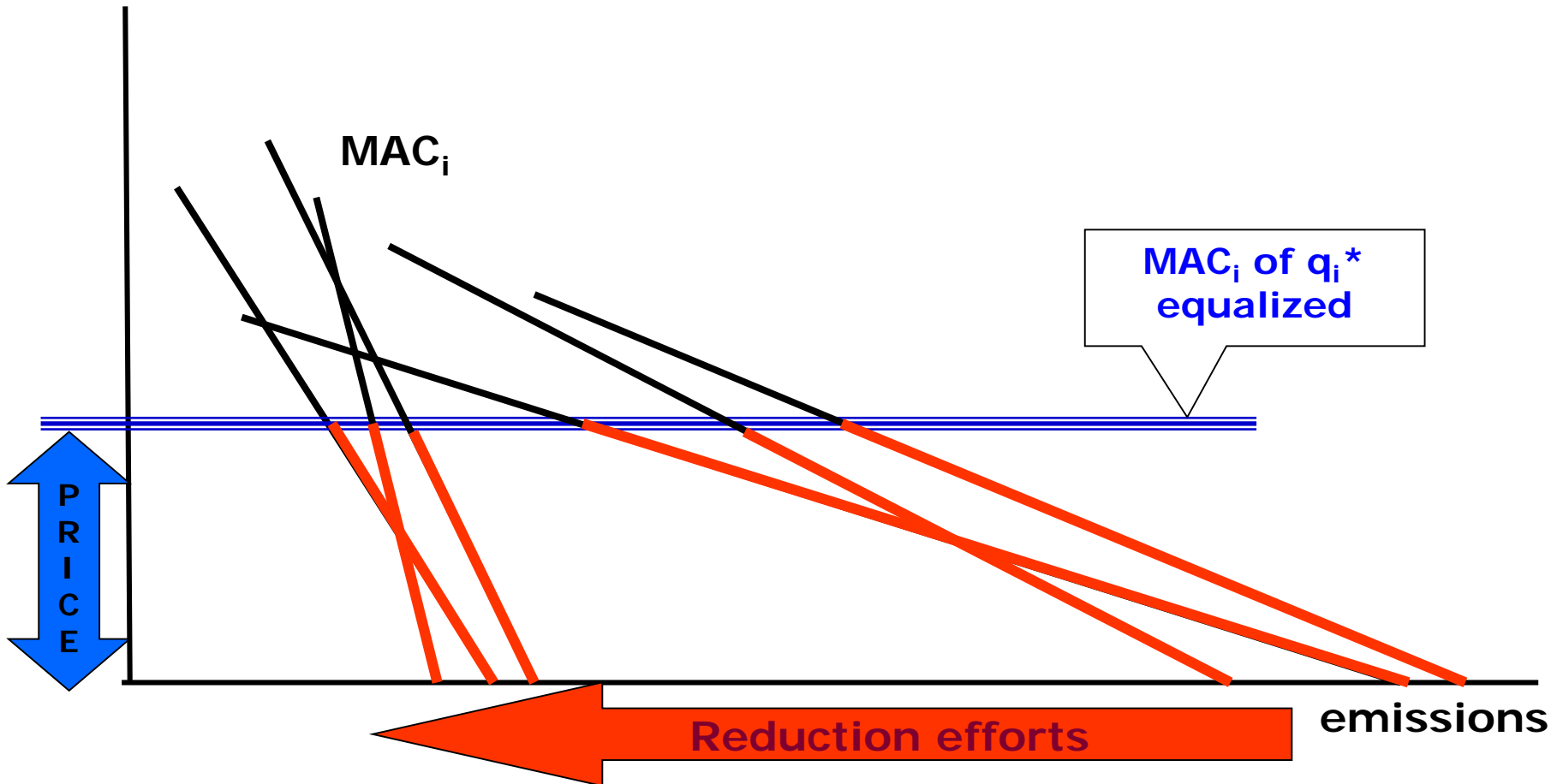




Minimize total expenses for all polluters, under one CAP
= find 11,500 q_i^* emission quantities; $\sum_i q_i^* = \text{CAP}$

€/unit

Mathematical rule (Lagrange): minimum expenses *iff* the 11,500 $\text{MAC}_i(q_i^*)$ are equal





2. Anatomy of ETS

Merriam Webster's Collegiate Dictionary:

Anatomy: 'the art of separating the parts of an organism in order to ascertain their position, relations, structure and function' (mostly, pictures support the descriptions).

An ETS holds 4 constituent parts:

- [i] Policy goals
 - [ii] Costs of GHG abatement (mitigation, compliance)
 - [iii] Carbon emissions prices
 - [iv] Allocations of tradable emissions permits
-
- every part = range of options (within constraints)
 - assemblage of particular options = ETS exemplar



Component [i] Two major policy goals for EU ETS

A-goal - Atmosphere

= pursue Atmospheric stability and cleanness

> emitting (industrial) activities

> carbon emissions down 80-95%

> by the nearest date (before 2050)

+ induce disruptive de-carbonizing innovations

++ higher carbon emissions prices as inducing force

II-goal – Profit / Protection of industries

= maintain/expand EU's industrial activities

> businesses, employment

>> profits

+ avoid 'carbon leakage'

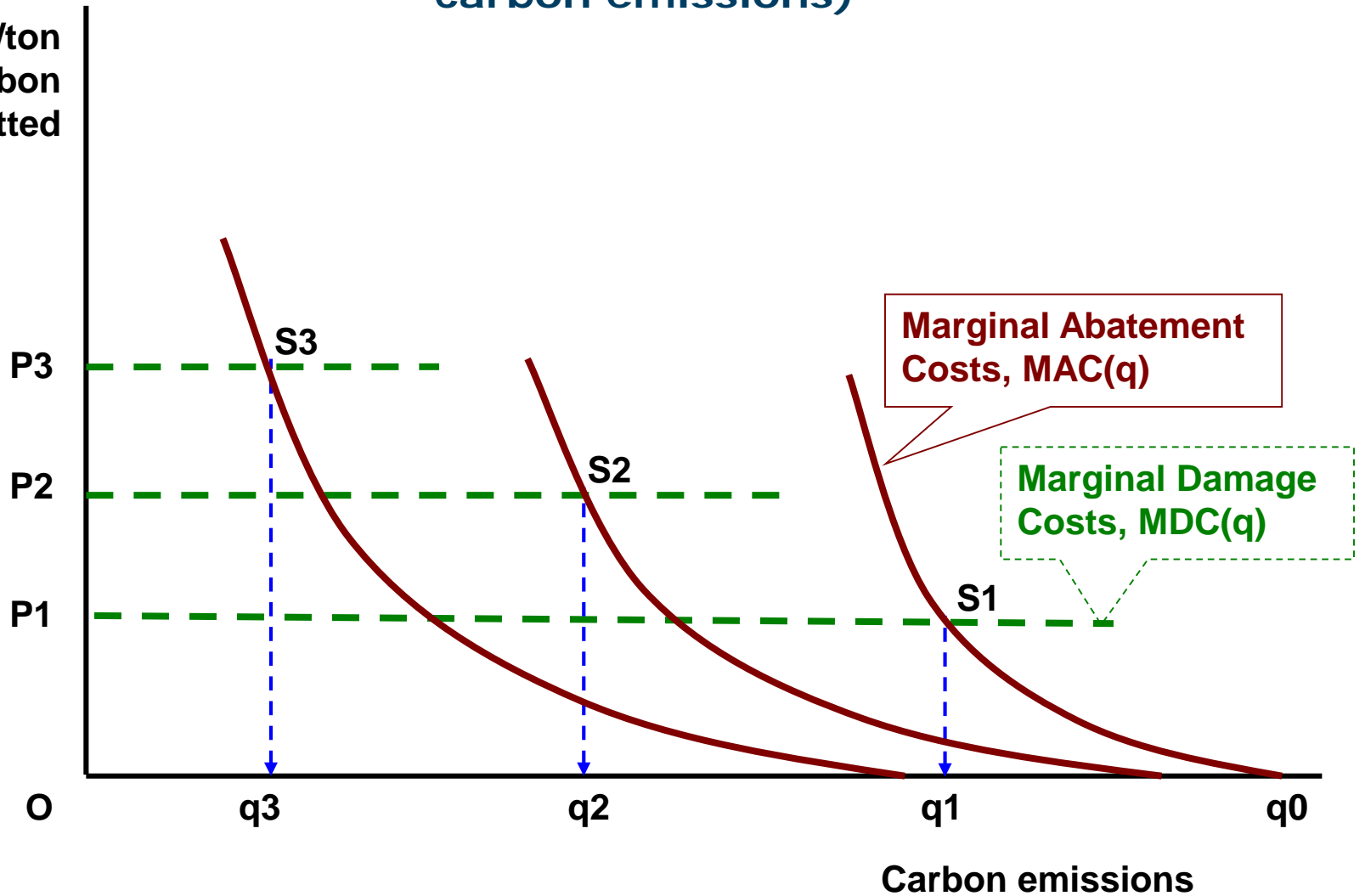
++ no € burdens on Energy-Intensive Trade-Exposed (EITE) industries

Are the two goals reconcilable?



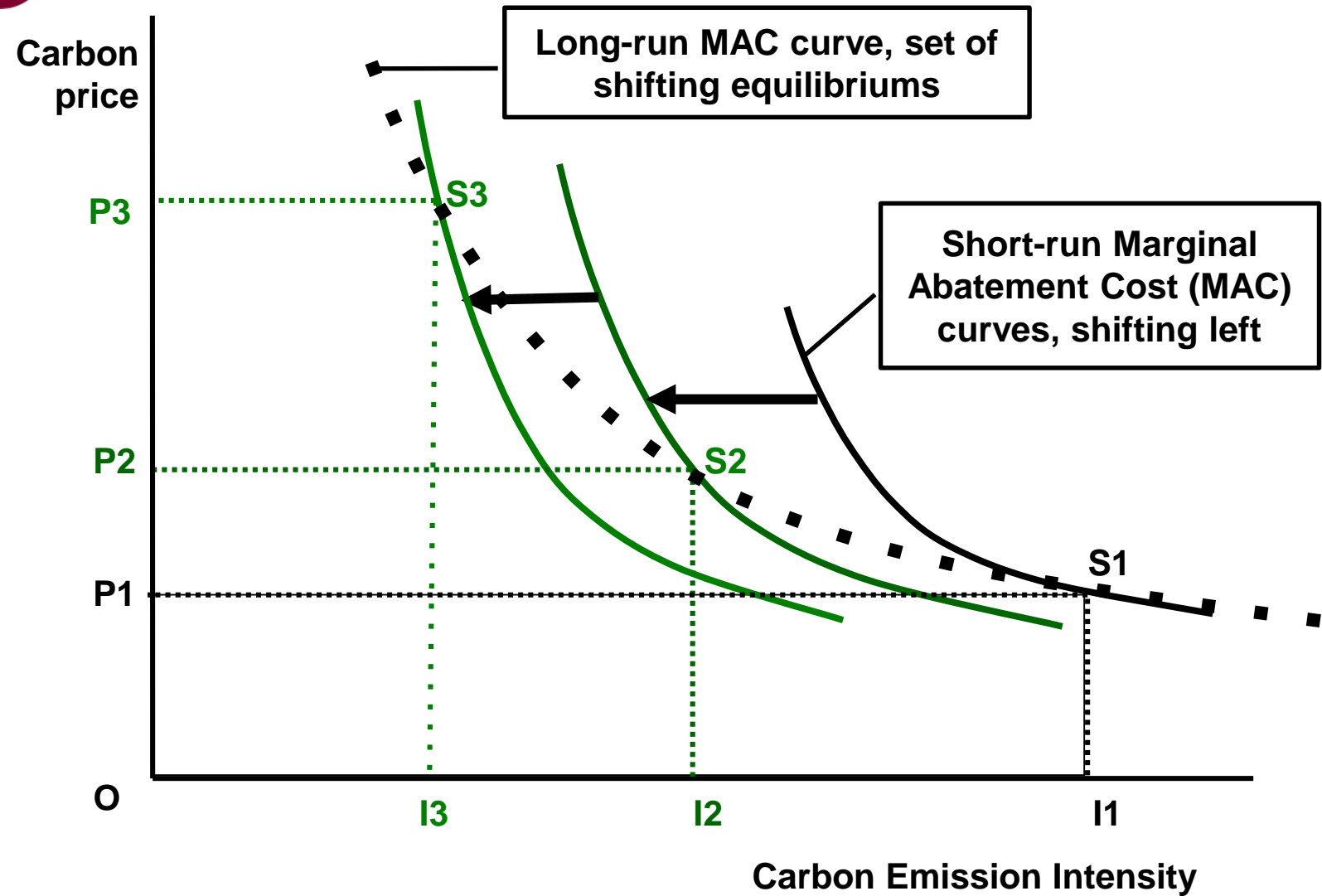
Price €/ton
carbon
emitted

Component [ii] Costs of compliance (abatement, mitigation of carbon emissions)



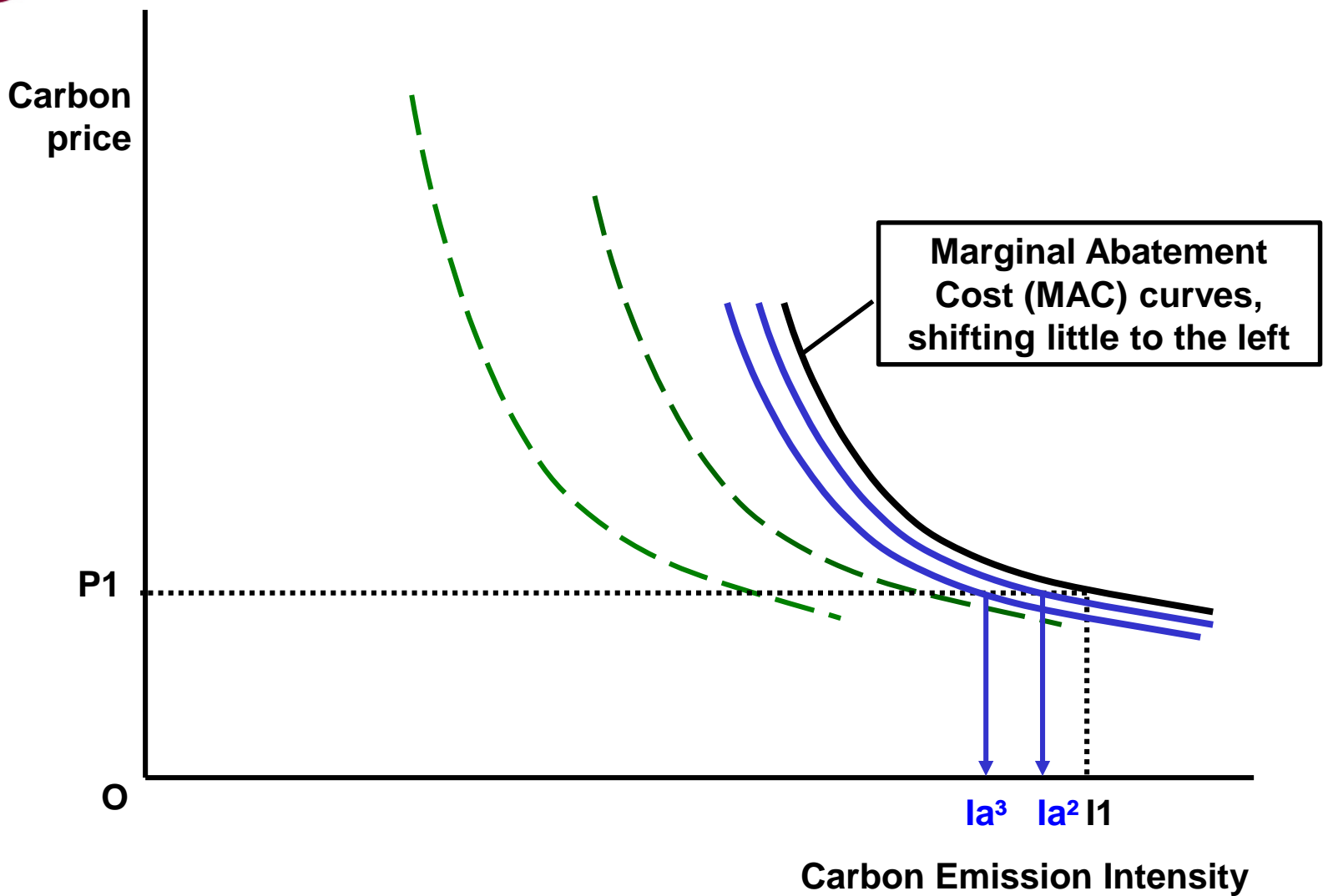


Innovations in compliance, induced by high Carbon prices, shift cost curves and reduce optimal Intensities

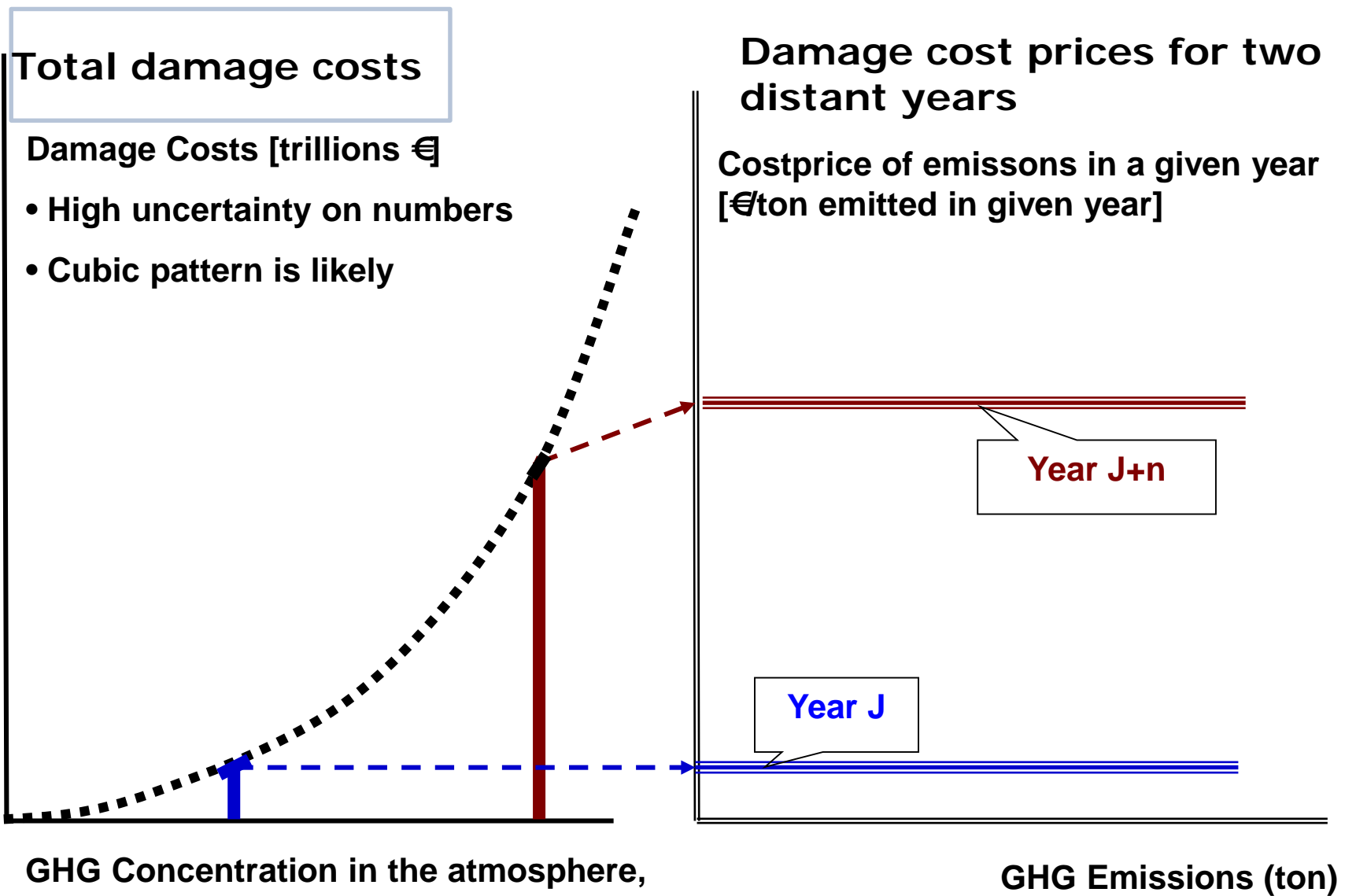




Without inducing carbon prices: autonomous innovations (ceteris paribus, other innovation drivers excluded)

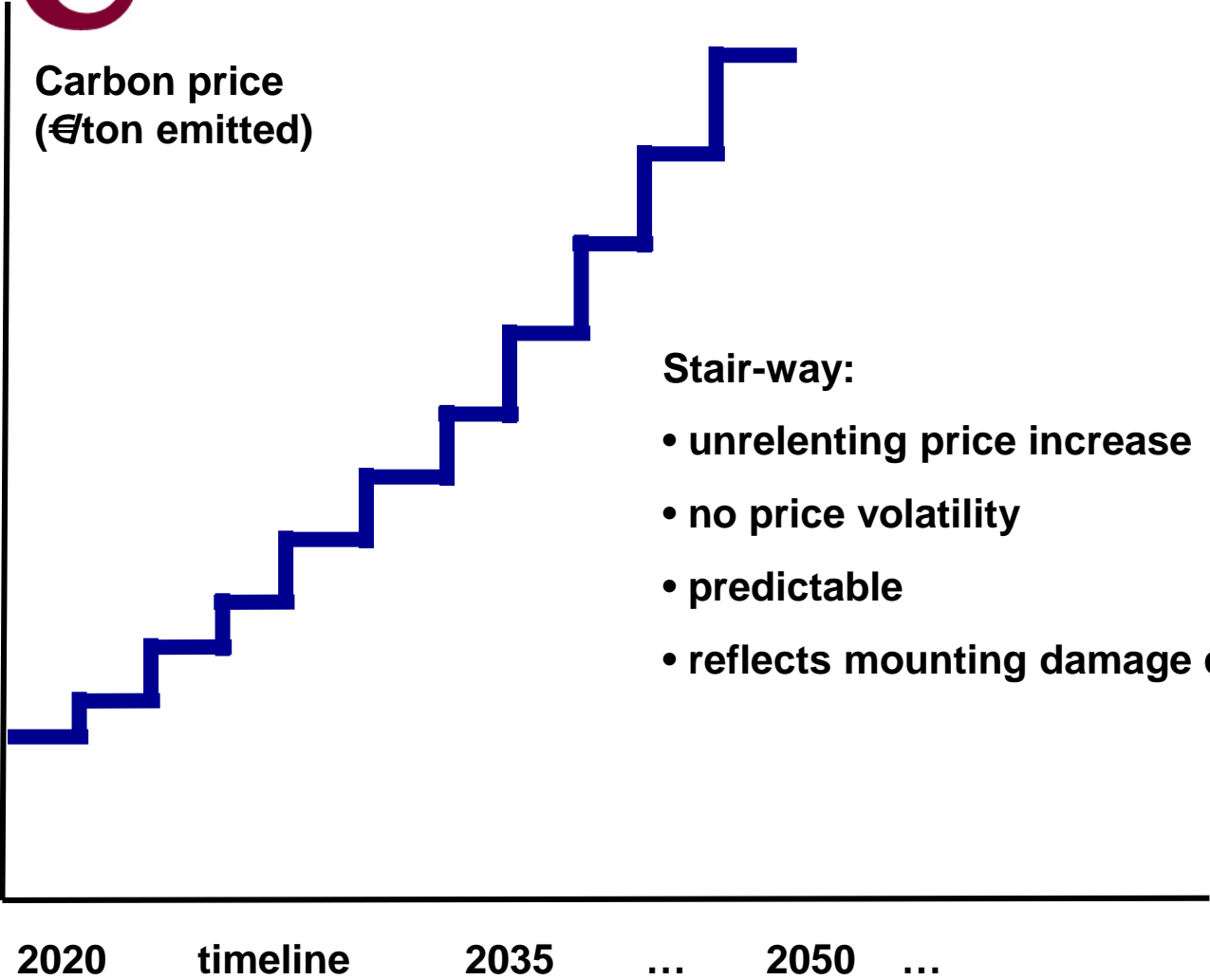


Component [iii] Carbon emissions pricing





Carbon price 'optimal' path = stair-way



Stair-way:

- unrelenting price increase
- no price volatility
- predictable
- reflects mounting damage costs



Carbon price stairs evolving over time

(specific outcomes depend on start year, height & gradient)



2020 ... 2035 ... 2050 ... timeline

Component [iv] Allocation of tradable emissions permits

ETS is a levies-permits hybrid \approx permits allocation

LEVIES

- Yearly auctioning of shrinking year quota
- Auctioning of quota for a trade period of a few years
- Auctions spread over years, following the demand for permits
- Partial auctioning, partial free gifts
- Assign permits to the principle $MAC_i = \lambda$
- Assigning expected BAT emissions
- Grandfathering

PERMITS

[i] Goals of EU policy

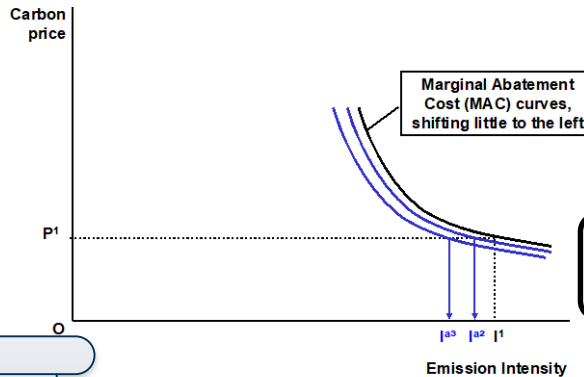
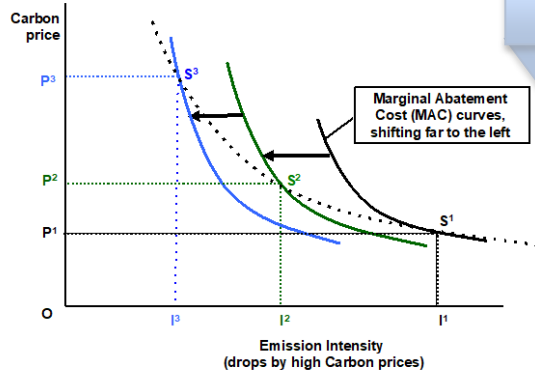
[ii] Costs of Compliance

[iii] Carbon emissions Prices

[iv] Allocations of tradable emissions permits

Atmosphere A-goal: all industrial activities without carbon emissions (by 2050?)

Induced Innovation



Autonomous Innovation

Profit π -goal: maintain, expand EU's industrial activities, business, employment

Antw

No leakage by carbon price

carbon price stair is not climbed

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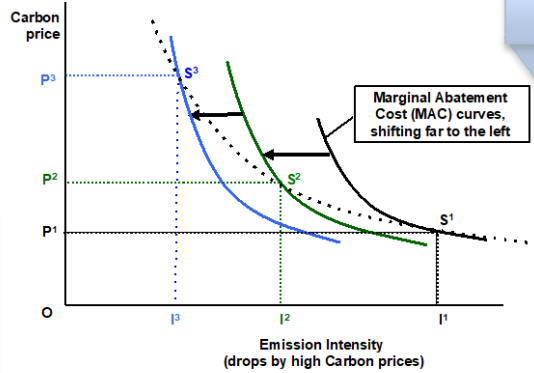
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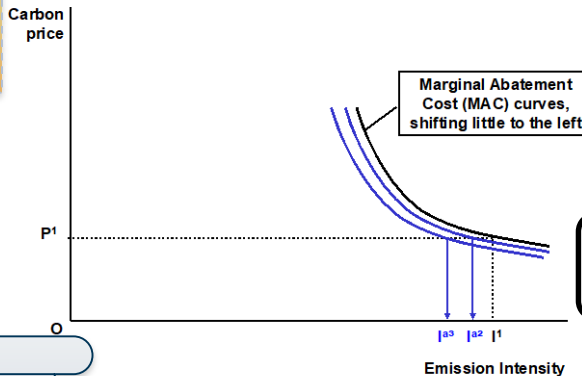
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Atmosphere A-goal: all industrial activities without carbon emissions (by 2050?)

Induced Innovation



Autonomous Innovation



Conflicting goals. Not attainable both with one instrument

Profit π -goal: maintain, expand EU's industrial activities, business, employment

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PERMITS



Findings from Anatomy study

- . ETS exemplars depend on assembled selection of component options
- . Conflicting goals require different exemplars
- . EU ETS successful in protecting (serving) EU's large industries interests
- . High-price [*with high-cost for industry*] EU ETS exemplar is unlikely [*the more sticky MACs are*]



Characteristics of US SO₂ program

- ❑ **Single segment of acid pollution**
 - ❑ SO₂ from USA coal fired power stations, production tech fully known
 - ❑ NOx regulated in separate segments
 - ❑ Leakage not an issue
- ❑ **Low abatement expenses**
 - ❑ Mainly low-sulfur coal substituted for high-sulfur coal
 - ❑ Mature add-on technologies (scrubbers)
 - ❑ Lousy cap did not need advanced scrubbers
- ❑ **Rich regulatory bequest at the start in 1990**
 - ❑ Sector regulated by state PUCs, coordinated by NARUC
 - ❑ EPA since 1970: capable, diligent, informed, ...
- ❑ **Thin market <<< stringent EPA policy making**
 - ❑ Free permits; 2.8% of cap auctioned + return of revenues
 - ❑ Banking as extra flexibility
 - ❑ Few trade across non-affiliated companies



EU's Tradable Green Certificates

- ❑ **1999:EC promotes TGC for pan-European RE support**
 - ❑ Germany resisted and saved FIT support
 - ❑ A few TGC were set-up: Frehsman Flanders exemplary

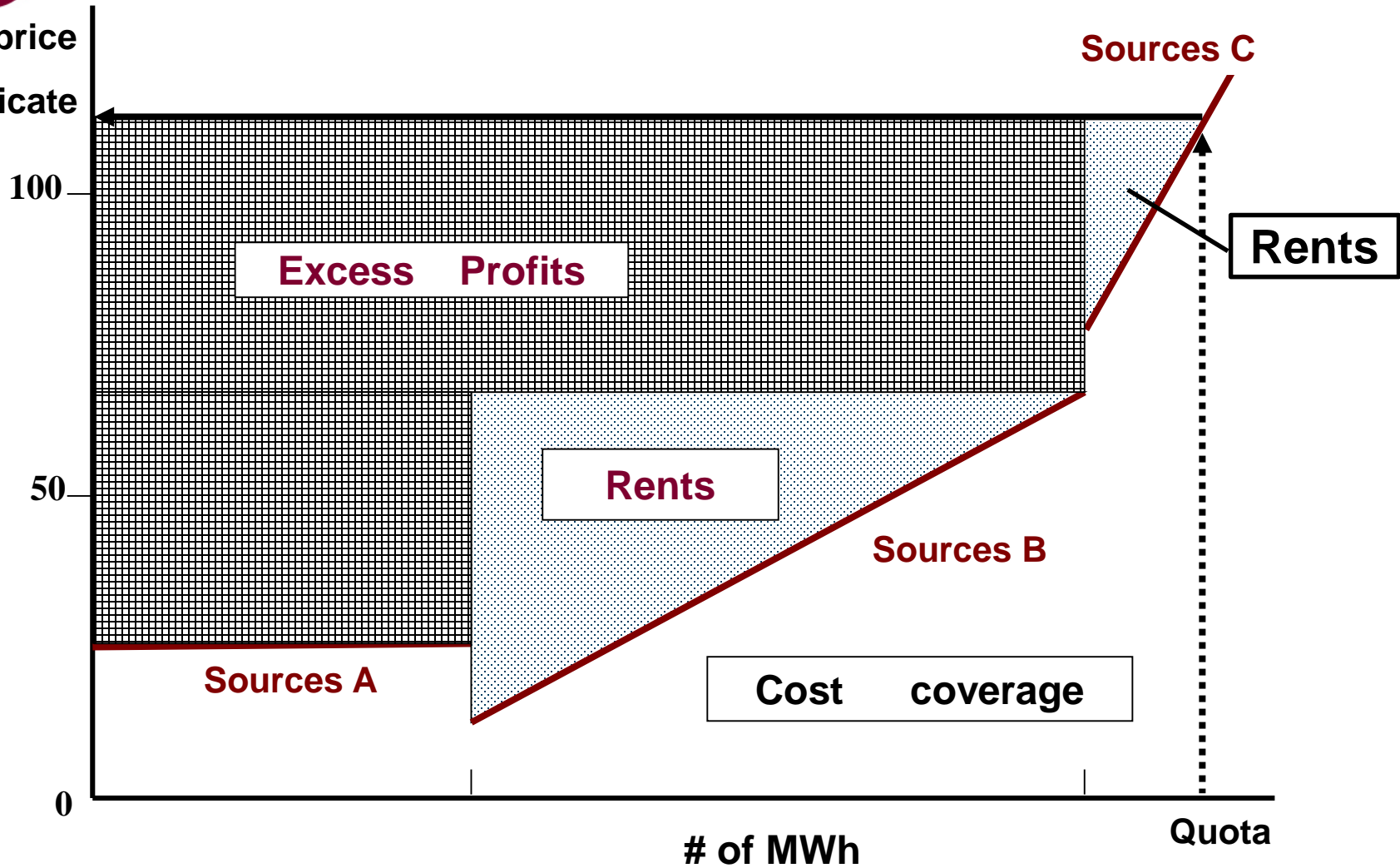
- ❑ **Salient attributes & results of TGC**
 - ❑ Amalgamate all RE supplies {source x technology}
 - ❑ Single price per certificate (= per MWh generated)
 - ❑ Huge excessive profits (euphemism: 'windfalls')
 - ❑ No technological innovation
 - ❑ 'Market' metamorphosed in ruling *à la tête du client*

- ↔ **Technology specific FIT support for solar PV + wind**
 - ❑ **Affordable, fast, deep, tech. development success**
 - ❑ **Economists: 'FIT expensive', 'perverse effects on ETS'**



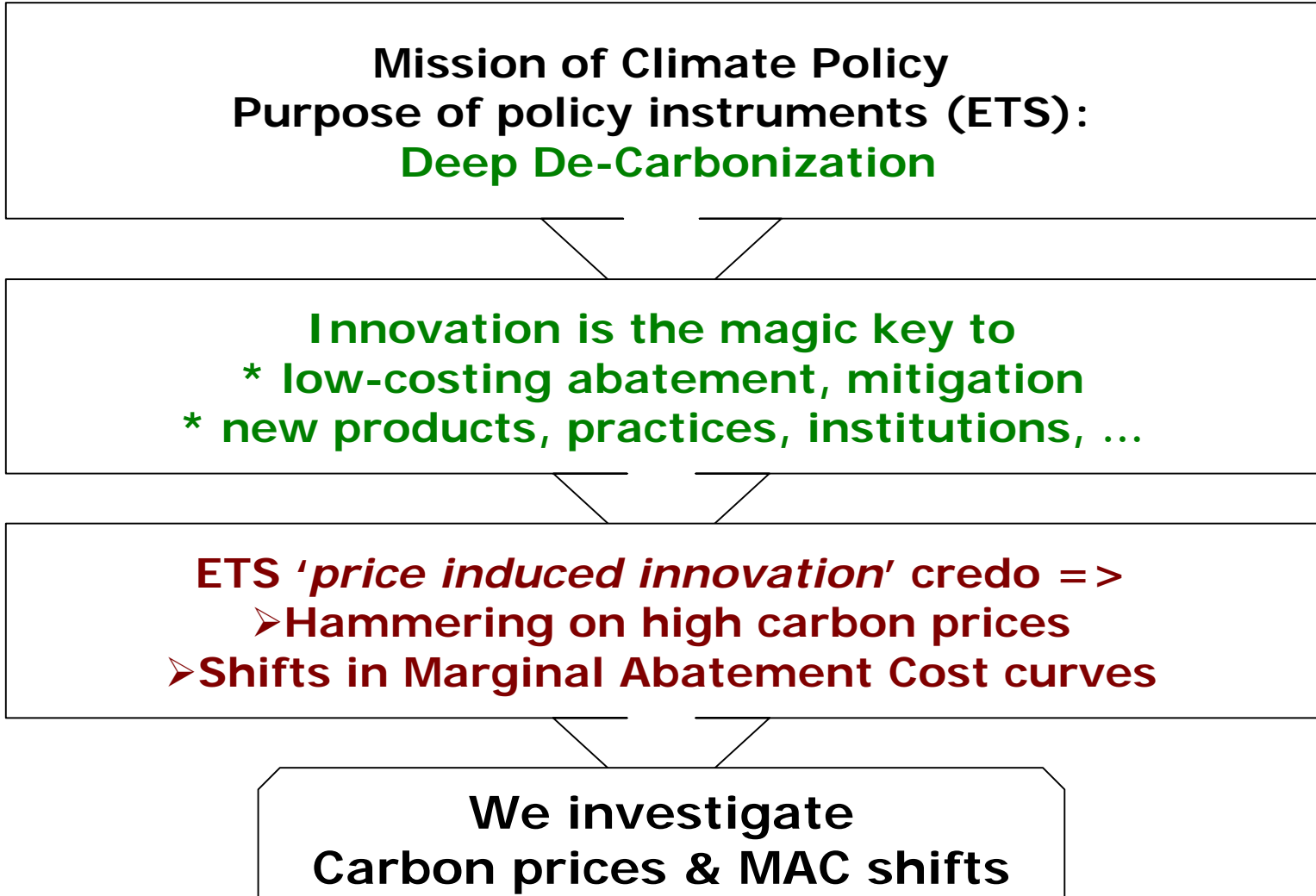
Cost coverage, Rents and Excess Profits in Tradable Green Certificate systems

Uniform price per certificate
€/MWh





4. Reality check





Carbon price or prices

- ❑ **Holy grail of neo-classical (neoliberal) economists**
 - ❑ Either 'harmonized global CO₂-eq levy/taks rate' (fixed)
 - ❑ Or: 'uniform ETS permit prices' (volatile)

- ❑ **'Money makes the world go round' affects all people**
 - ❑ Maximize Benefits (revenues) + Minimize Costs (expenses)
 - ❑ Self-interest keeps economic order (\approx gravity in physics)
 - ❑ Movement = overcoming gravity & short-near self-interest

- ❑ **Confusion price (€/unit) \neq bill (quantity of €)**
 - ❑ If one unit (house, car): price = bill
 - ❑ If many units (kWh, ton CO₂): price \ll bill
 - ❑ Real economic decisions are based on bills, not on prices (see: 'capital budgeting' for business investments)

4. Reality check

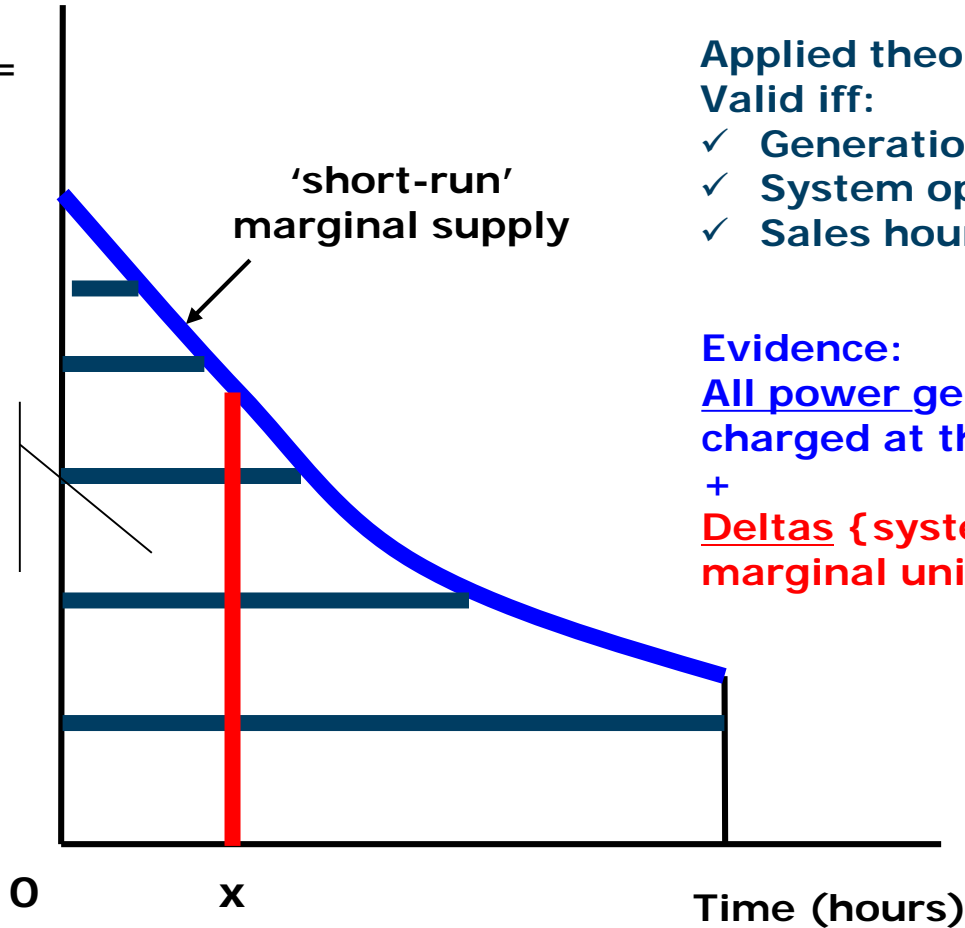


Economics Theory: welfare maximum by Short-Run Marginal Cost (SRMC) pricing [Ramsey – Boiteux – Steiner]

Electric loads = generated (kW)

'short-run' marginal supply

Power plants stapled in SRMC Merit order



Applied theory: power generation Valid iff:

- ✓ Generation units on command
- ✓ System optimally composed
- ✓ Sales hourly measured & billed

Evidence:
All power generated during hour x is charged at the system SRMC(x)
+
Deltas {system SRMC(x) – SRMC infra-marginal units}, cover fixed costs



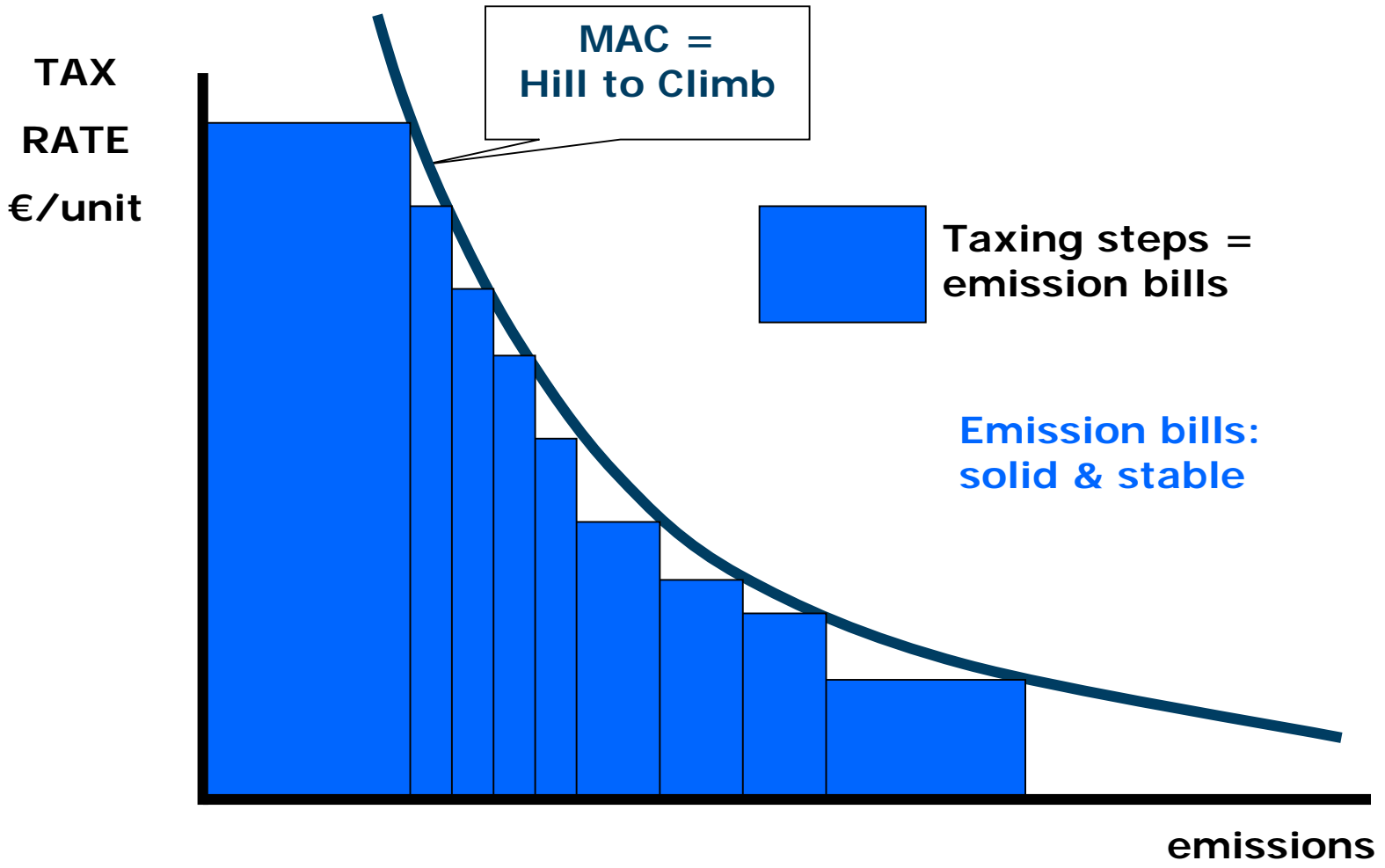
EU ETS in practice

- Free Permits up to 'benchmarked' emission levels
 - Permit price = penalty on emissions beyond
 - No trade in permits, but trade in penalties

- ETS advocates' discourse: 'Tail wags Dog'
 - ✧ ⇔ Marginal is derivative of total (not the reverse)
 - ✧ ⇔ MC-pricing optimal IFF all submarginal units also pay the system marginal cost

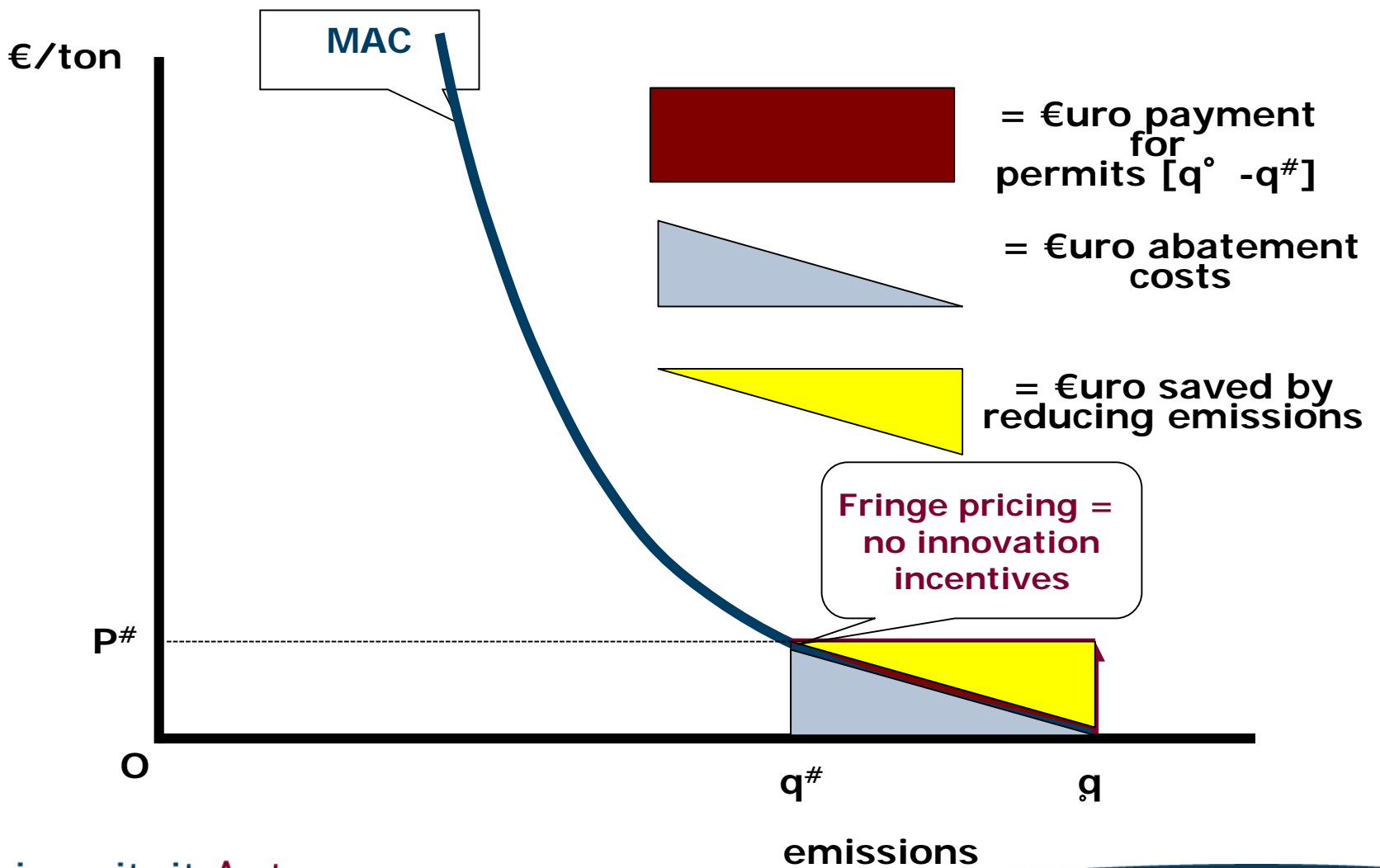


Climbing the Emissions Reduction Slope via Interior Stair



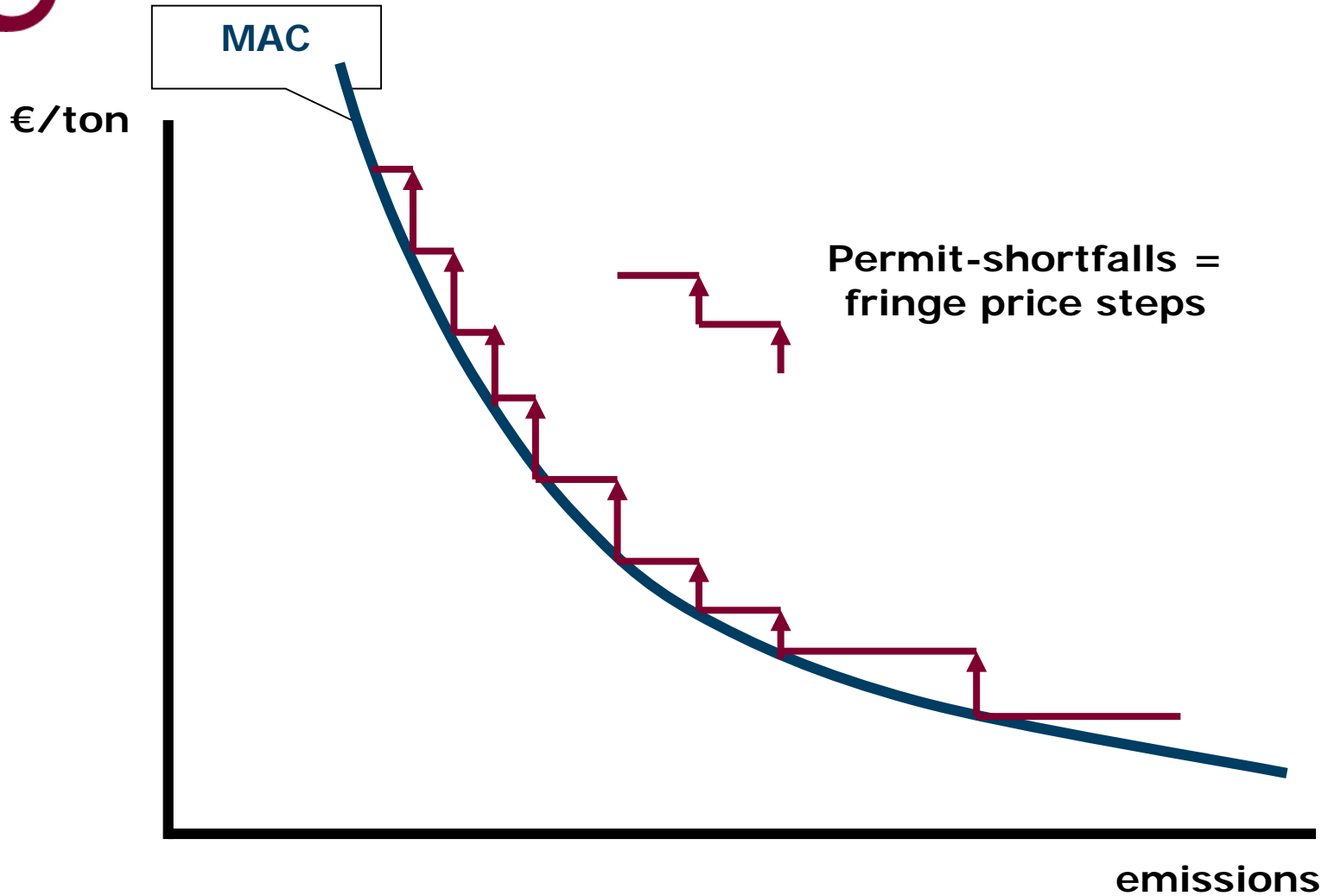


Free quota + fringe pricing of permit-shortfalls. The economics logic of a rational polluter





Free quota + fringe pricing of permit-shortfalls = Exterior stair

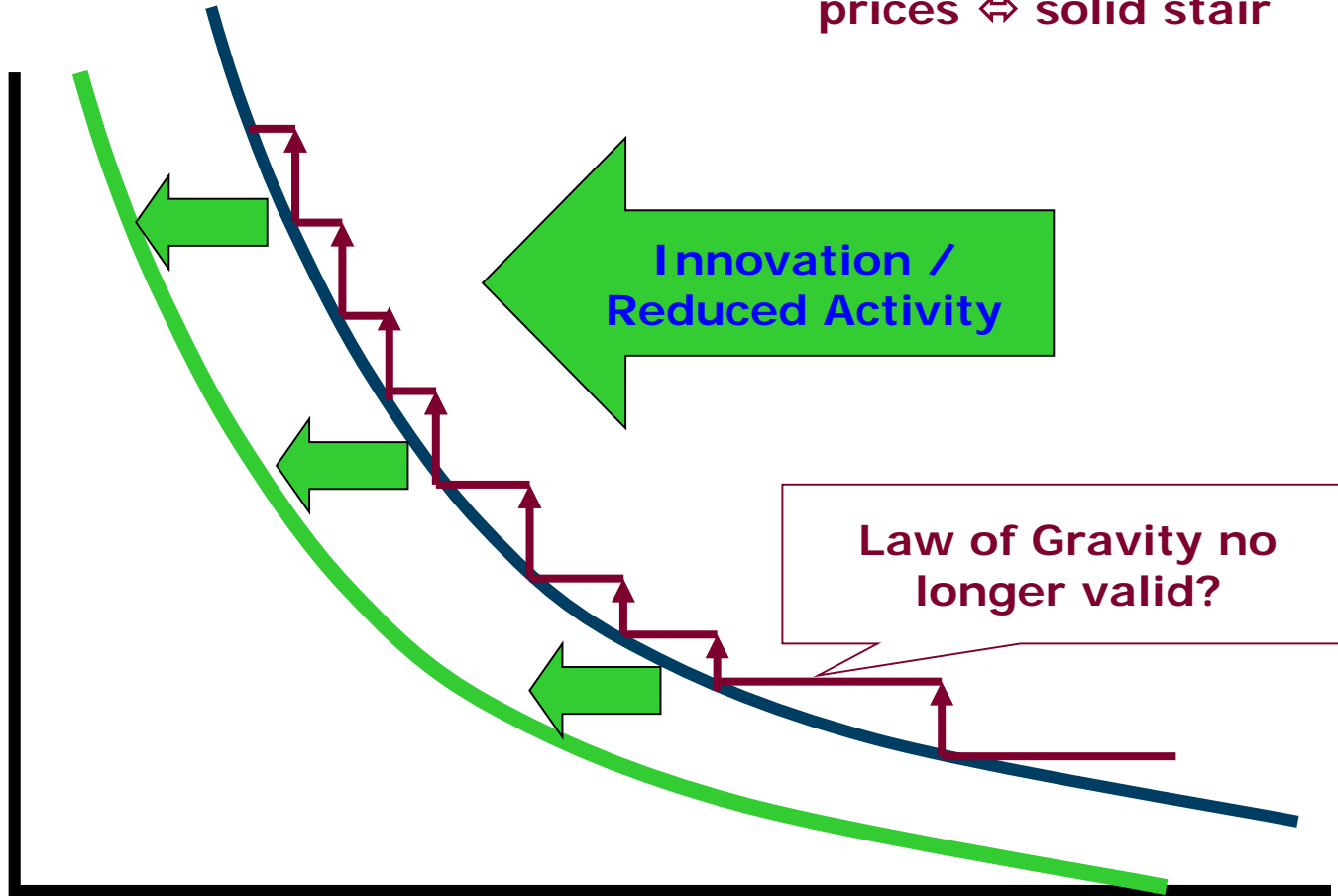




Exterior stair = unstable construction

Trade in penalties: volatile prices ↔ solid stair

€/ton



emissions



Dubious ETS Carbon Prices

❑ ETS permit prices

- ❑ **Fringe price \neq marginal price**
- ❑ ETS unique selling point 'uniform carbon price sets MAC_i equal = minimum total AC' is hollow
- ❑ Phase 1 & 2 [2005-2012]: 98% of permits free + banking into Phase 3: 2.3 billion permits hoarded + windfalls, fraud
- ❑ Phase 3: auction for power generators (prices €5 to €8) + EITE activities get free permits (bill = 0)

❑ Who pays the ETS bills?

- ❑ Electricity consumers are charged the ETS bills
- ❑ However, governments (UK, Germany, Belgium, ...) reimburse EITE 75-85% the ETS driven costs on their electricity bills
- ❑ Finally: non-ETS electricity consumers pay the ETS
- ❑ A considerable price increase = huge profits on the hoarded permit stock in 2018, before the MSR starts in 2019



ETS posted prices 24 August 2017-2018

(Source: Market Insider, 24 August 2018)

Significant increase since last year, from €6 to €20/permit





ETS helpful for climate policy?

❑ Untill today?

- ❑ After 2005: RWE, EON, GDF-SUEZ started construction of large scale coal plants in the Netherlands, Germany, ...
- ❑ ETS has not pulled decarbonization innovations
- ❑ Almost 20 precious years have been irrevocably lost, causing more irreversible losses to the globe's climate

❑ Phase 4 [2020-2030]

- ❑ In 2019: metamorphosis from cap-and-trade to a collar (bottom & ceiling) price control (MSR)
- ❑ Otherwise, no major changes
- ❑ One more decade lost?



Can ETS survive high permit prices?

Yes

- When roll-of mechanisms persist: the non-ETS electricity consumers pay the bill
- However, pivotal role of electric power corporates may be undermined by fast growth in solar & wind supplies

No, when prices are charged on industrial emissions

- Industries cannot, will not, pay twice: a yearly permits bill + investments in de-carbonizing innovations, i.e.
- price induced innovation is mostly fiction; the more fictitious, the more sticky the MAC curves are
- Carbon leakage is then likely to occur
- More likely is that industry will quit (blow-up) the ETS



Has GHG emissions trading a future?

Prerequisites:

- ❖ 'Diversity & Segmented' substitutes for 'Amalgamation & Uniform' in handling emission sources & applying economic instruments.
- ❖ Submit Policies & Instruments to Sustainability Assessment
- ❖ Accord with stimuli for decarbonization innovations, which are more important than market mechanisms
- ❖ Revise belief in uniform price induced innovation

Yes, GHG emissions trading may play a role

- When organized per industrial sector / subsector
- On a global scale, e.g, all cement plants (> some size) to preclude leakage
- Foster flexibility above permit trade

The EU ETS being a scam, generates two feelings:

- **Relief:** better climate policy is feasible after breaking the deception
- **Responsibility:** find new effective, efficient and fair policies