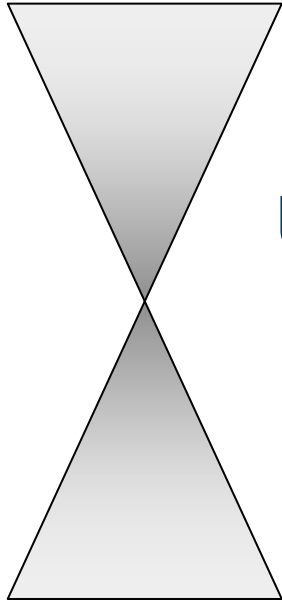




Salzburg Reform September 15, 2008



UNIFORMITY and DIVERSITY in Climate Change Policies

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Intro

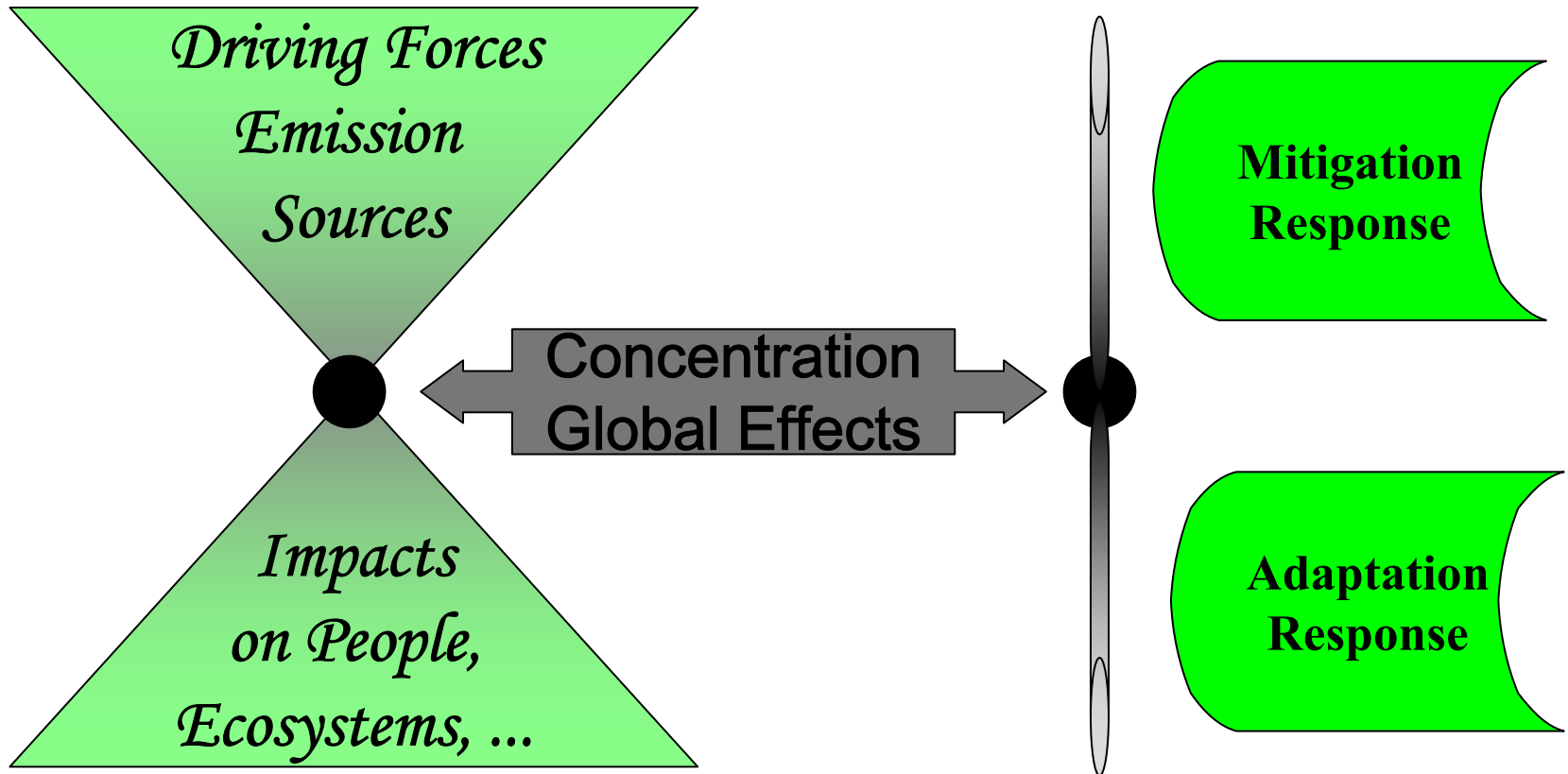
- **Full lecture takes 1½ hour**
- **Today: only a few snapshots on Mitigation Policy**
- **Uniformity versus Diversity**
 - **Both are neutral concepts**
 - **Once we need Uniformity, once Diversity**
 - **The very issue is: when the one, when the other?**
- **WRONG is applying:**
 - **Uniform rules on Diverse reality**
 - **Diverse rules on Uniform reality**



DPSI@R
(CC reduced form)

Reality = Diversity

Linearized
Linear Theory





Where **UNIFORMITY** is **NEEDED**

IPCC-2007: ~450 CO₂-eq. stabilisation trajectory = **single global common future emissions pathway**

= almost carbon free energy systems by 2050

- **Focus on CC risks => whitewashing nuclear risks**
- **'No single technology can solve the problem' (IEA) bolsters dominance of non-sustainable systems**
- **BUT future is **ONLY (diverse) Efficiency & RES-E****

On Climate Change and Energy Systems:

- **Either ... Or... choices are needed**
- **The and/and approach is gone**



When REDUCED Form is impossible: CO2 emission targets

$$\begin{aligned} \text{CO}_2\text{-emissions} &= \text{People} * \text{Affluence} * \text{Energy intensity} * \text{CO}_2 \text{ intens} \\ \text{Gigaton} &= \text{Gigacap} * \text{€ / cap} * \text{kWh / €} * \text{C / kWh} \end{aligned}$$

Political:

~~People ~ demography, migration, culture, traditions
Affluence ~ growth, trade, technology, distribution~~

Technical:

Energy Intensity ~ Efficiency (4/5) & Structure (1/5)

CO₂ Intensity ~ Renewable Energy



Reducing GHG Emissions

Negotiating Kyoto quota, Bali process

= reduce human & economic plurality and diversity to single numbers / vectors

= mission impossible for Kyoto-Bali approach

EU ETS: Economists' favourite:

single market ...

covering as many sectors ...

for setting uniform carbon price



Emission Trading is Hybrid of Taxing and Permitting: Which Hybrid?

Type of Assignment of permits

TAX

- Yearly full auction (renting)
- Open auction every few years
- Auction of futures and options
- Partly auctions / partly gifts
- Assign permits to $MAC_i = \lambda$

PERMIT

- Grandfathering
- Gifted along expected emissions



Cost Effectiveness: high-school mathematics (1)

$$\text{Min! } \sum_i AC(q_i) \text{ s.t. } \sum_i q_i = Q$$

$$\text{Min! } L = \{ \sum_i AC(q_i) - \lambda [\sum_i q_i - Q] \}$$

$$\text{when } \forall i, j: \text{MAC}^i = \text{MAC}^j = \lambda$$

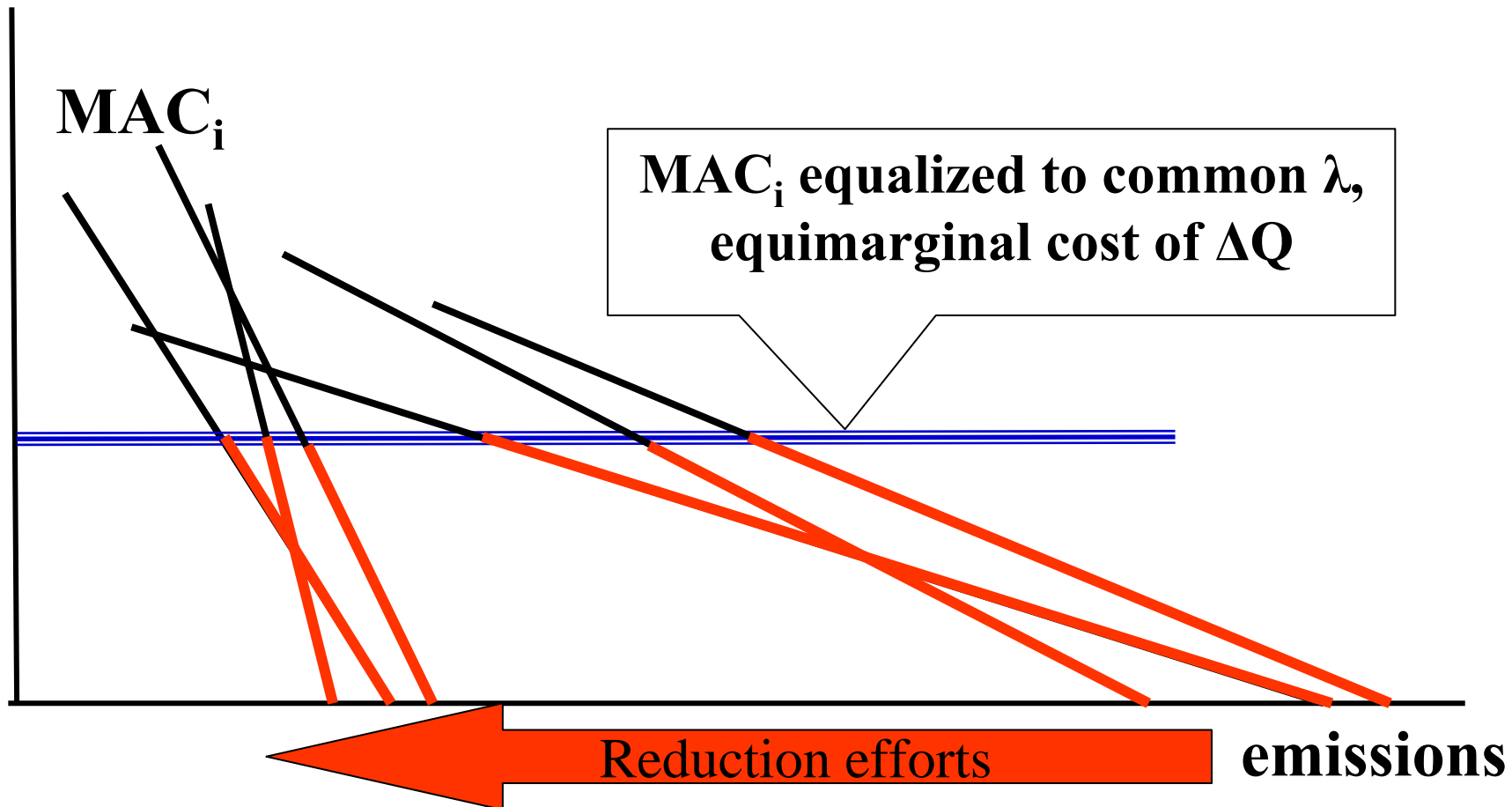
(equimarginal principle)

$$\text{While } \lambda = \partial AC / \partial Q$$



Equi-marginality OK **iff** cost functions are comparable

€/unit





Cost Effectiveness: high-school mathematics (2)

**Neoclassical econ.: abstract representation
of Technology, Utility, Markets**

**BUT even within Neoclassical format (e.g.
 $C^\alpha R^{1-\alpha}$ where C = Carbon; R = Rest, etc.)**

Diversity should be modeled on e.g.

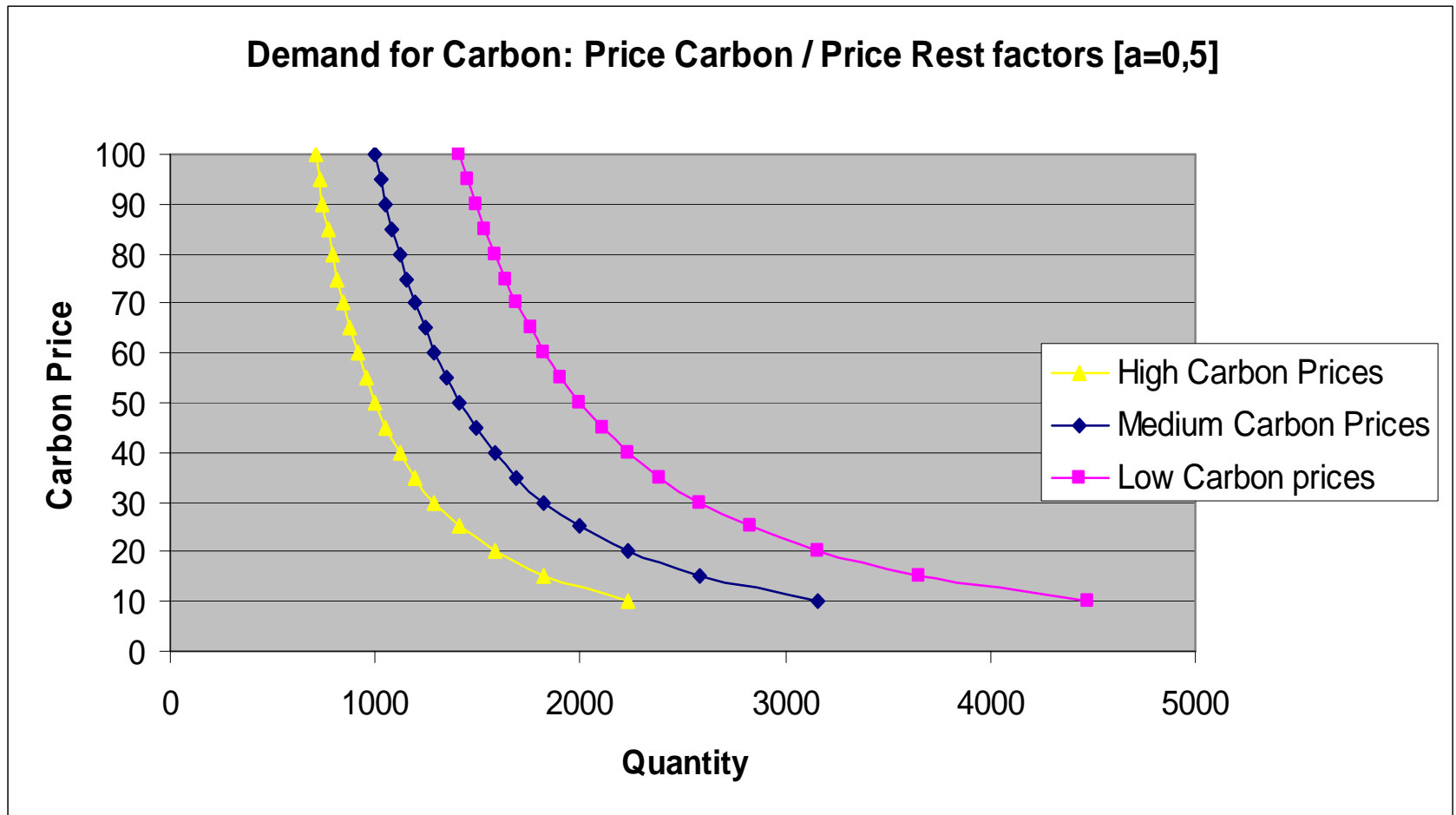
Technology

Factor prices

Scale / Budgets (INCOMES!)

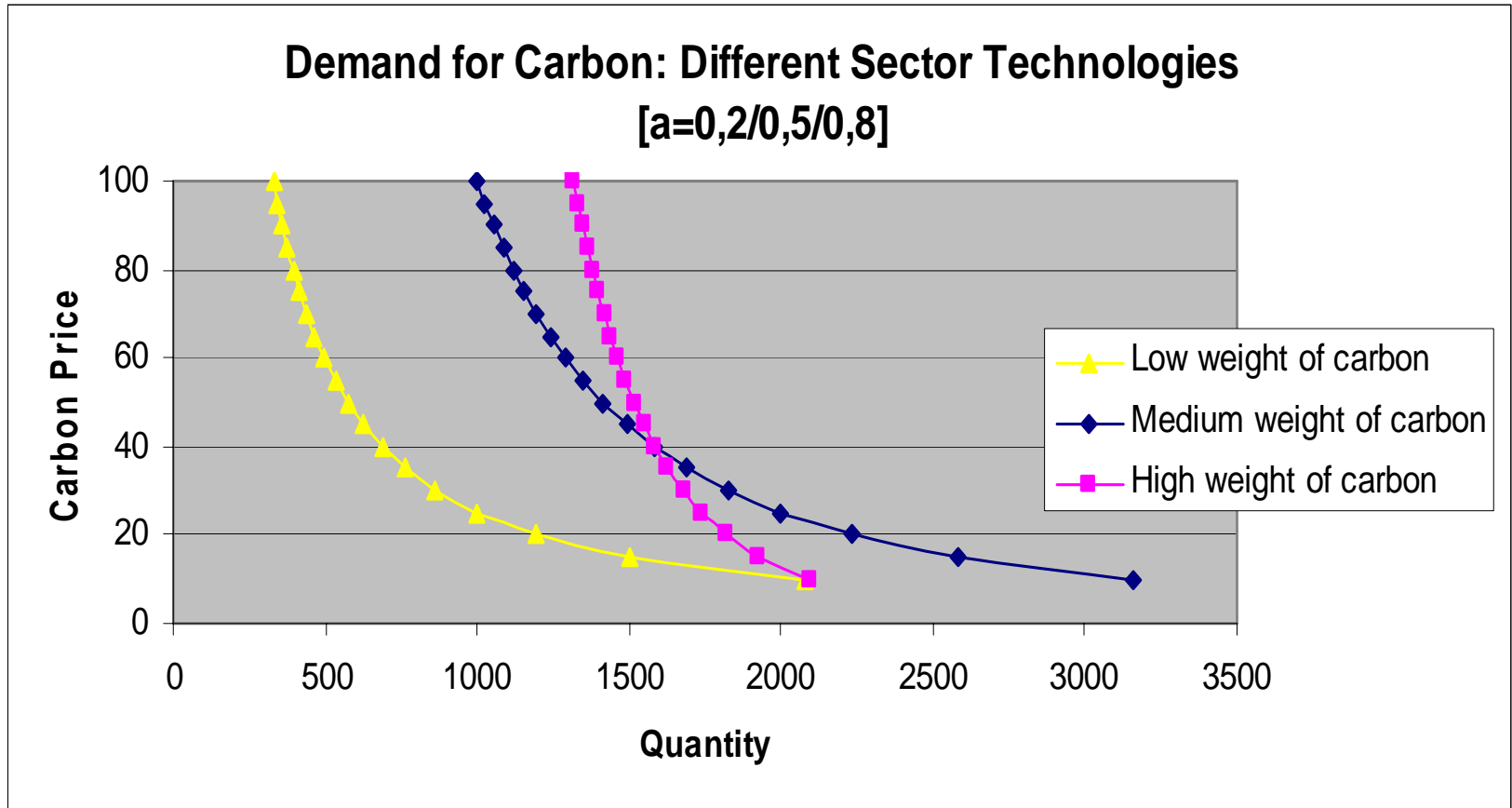


Cobb-Douglas $C^\alpha R^{1-\alpha}$ technology: C and R prices differ



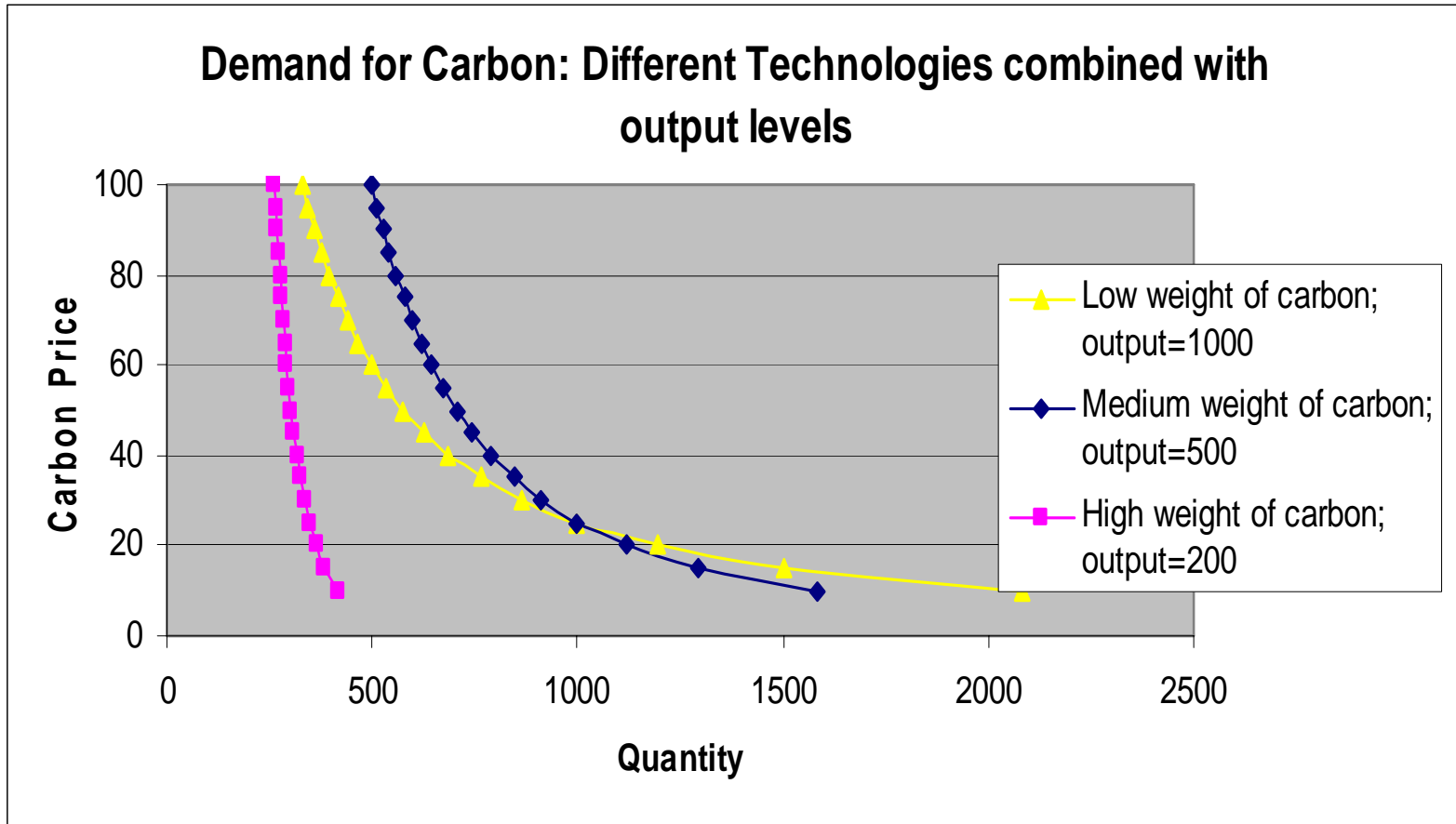


Cobb-Douglas $C^\alpha R^{1-\alpha}$ technology: different sector technologies



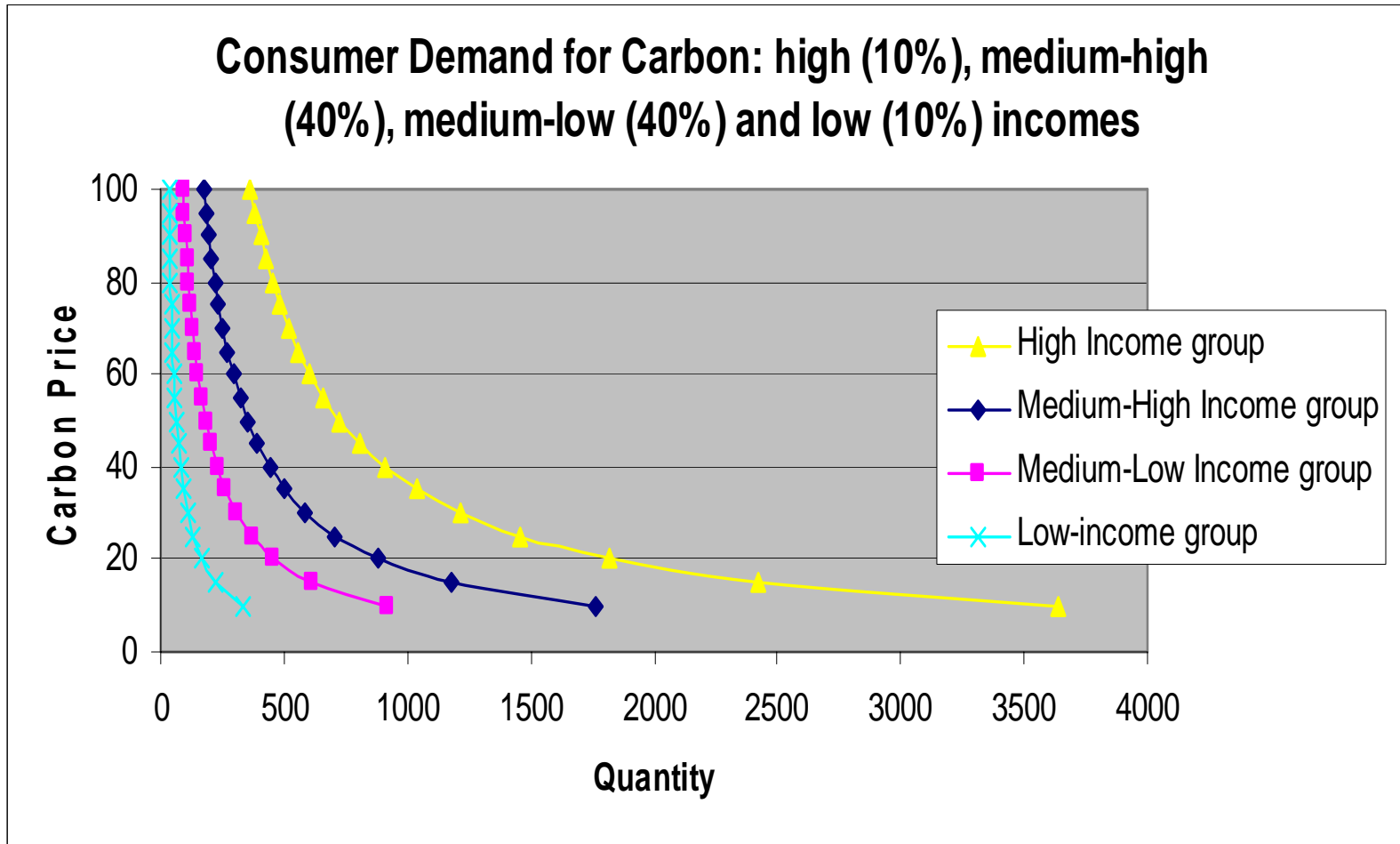


Cobb-Douglas $C^\alpha R^{1-\alpha}$ technology: different technologies and sizes





Cobb-Douglas $C^\alpha R^{1-\alpha}$ Utility: Income differences [Netherlands 2005]





Dream <> Reality

Perfect theoretical world

- simple
- uniform

MAC-fcts are comparable

- harmonized conditions
- only natural differences
- equity of no concern

Low transaction costs: comitonomy

Transparent markets: tax or trade sets single price

Real practical world

- complex
- diverse

MAC-fcts differ in nature

- natural endowments
- artificial biases
- inequalities

High transaction costs: comitology (~astro....)

Gaming the systems: prices volatile & excess profits