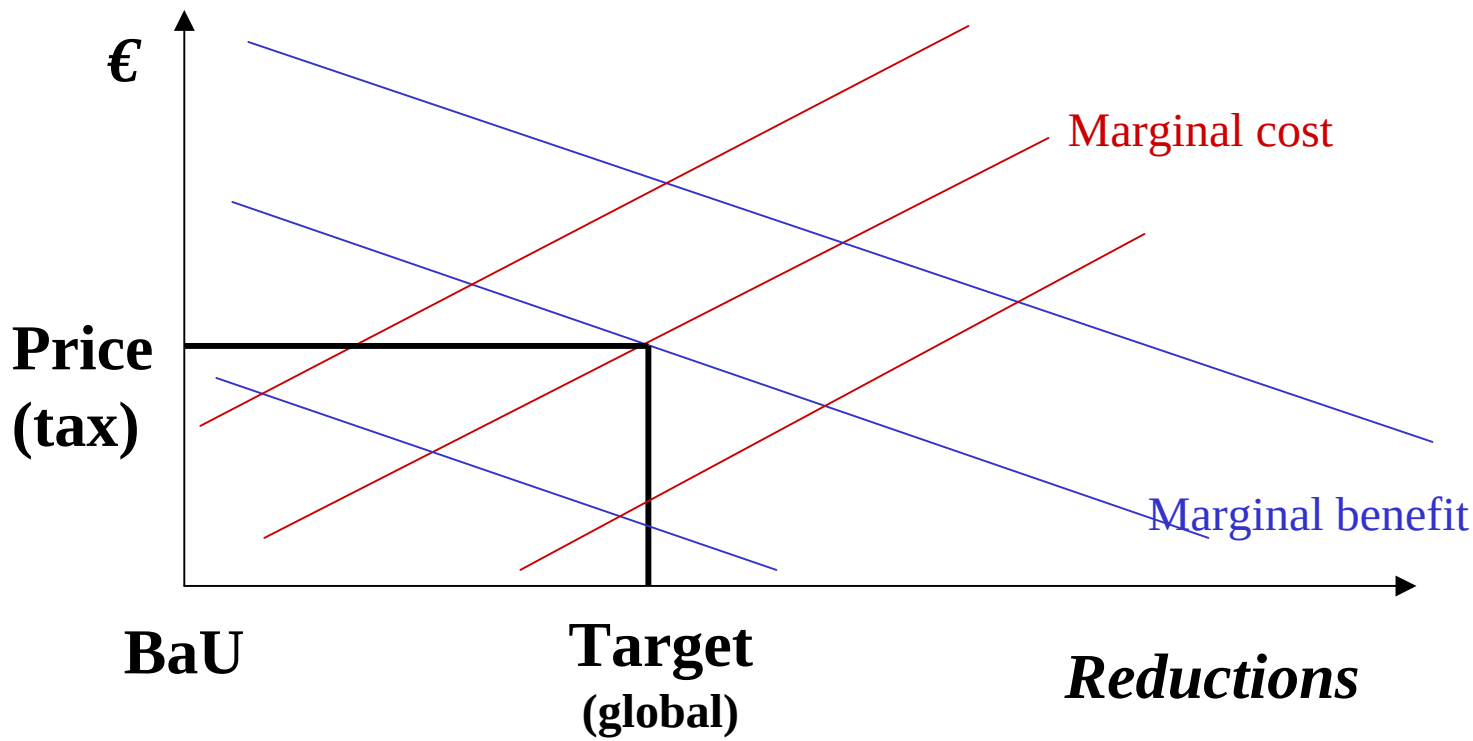
Certainty versus Stringency

Global target: marginal benefit equals marginal cost
Cost uncertainty matters for instrument choice



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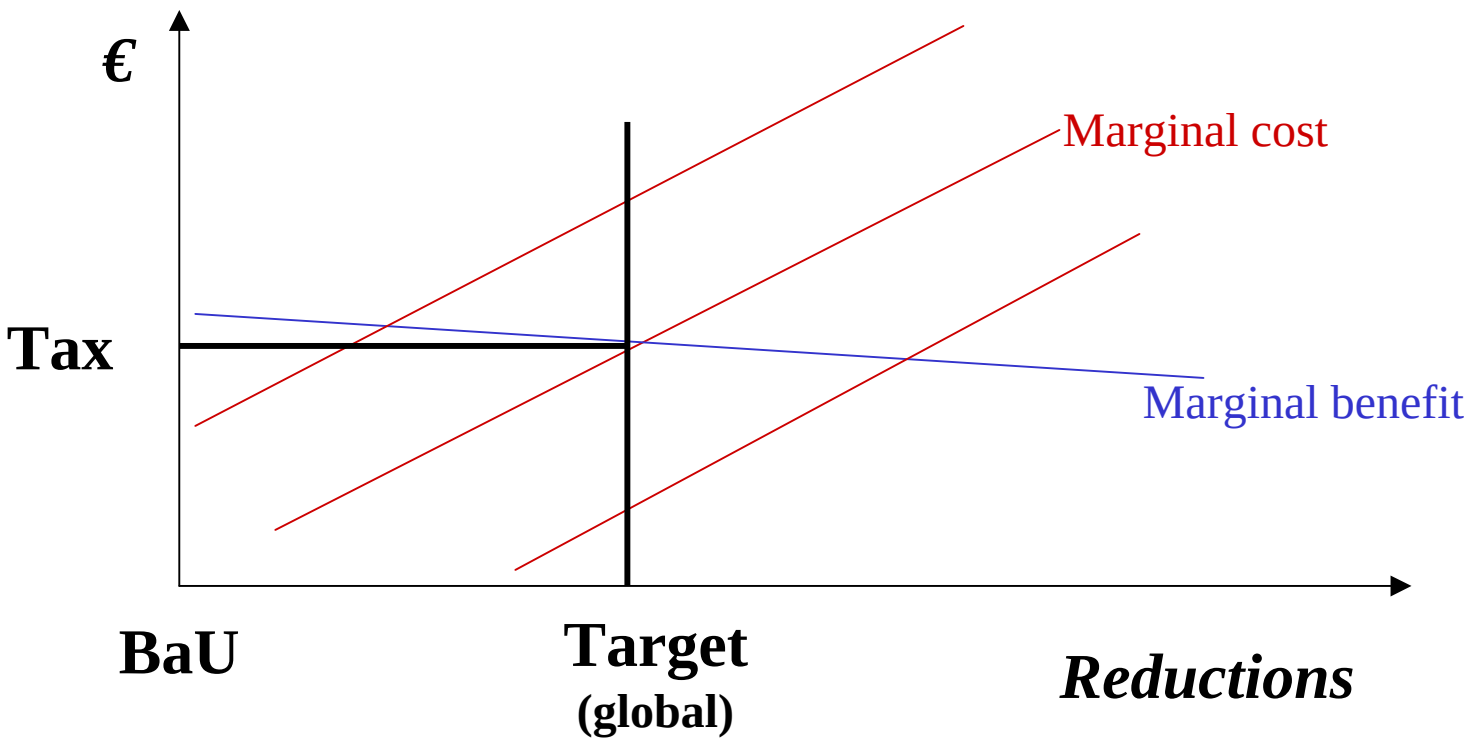
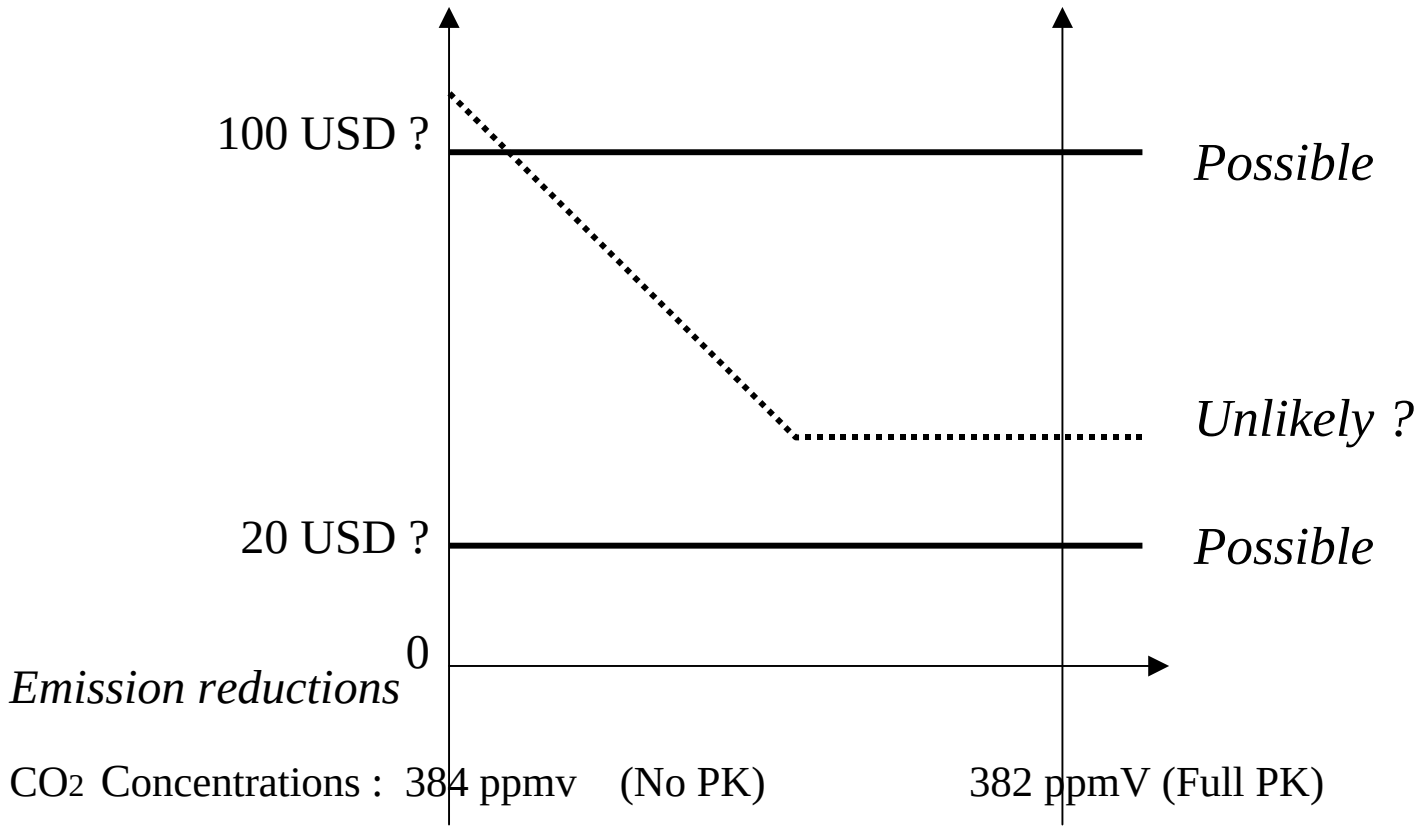
Climate change: flat marginal benefit curve



Why a flat benefit curve?



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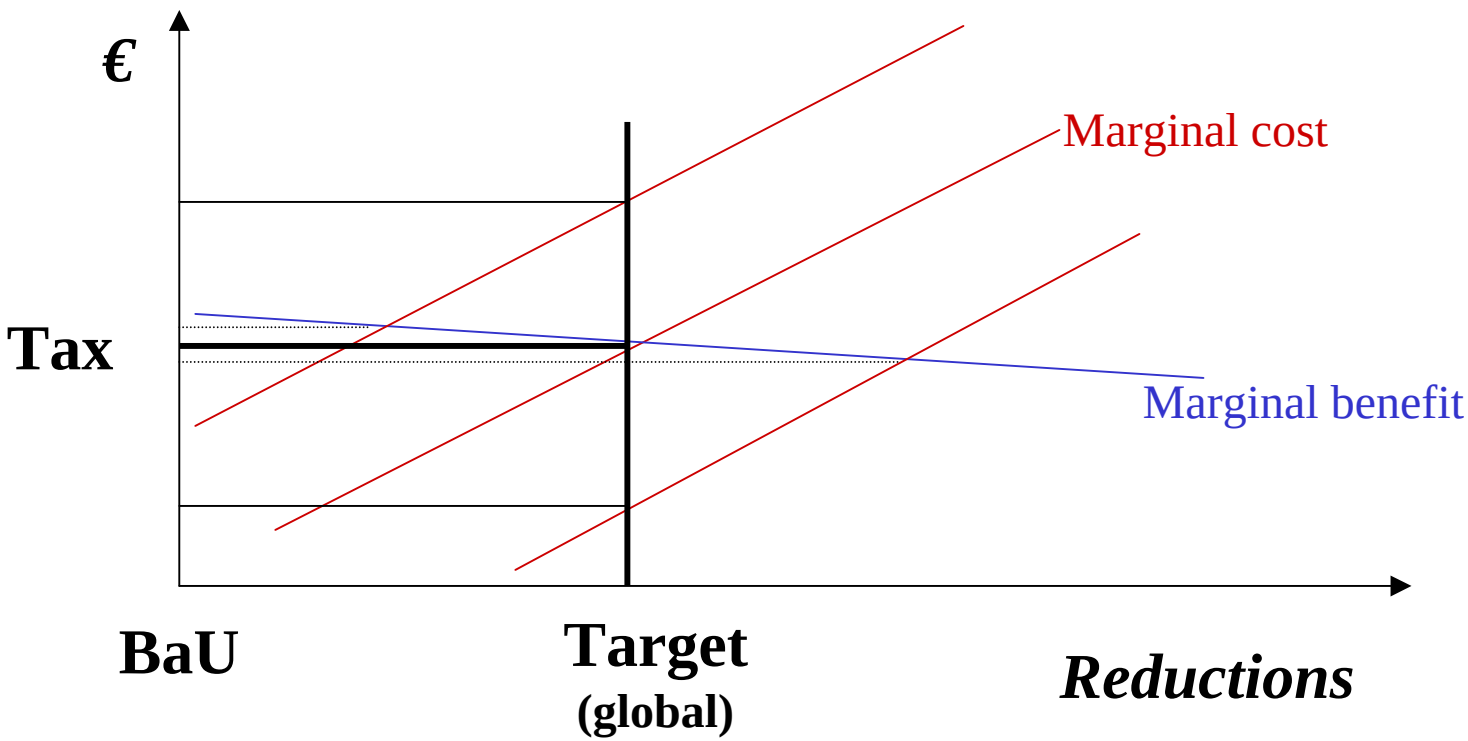

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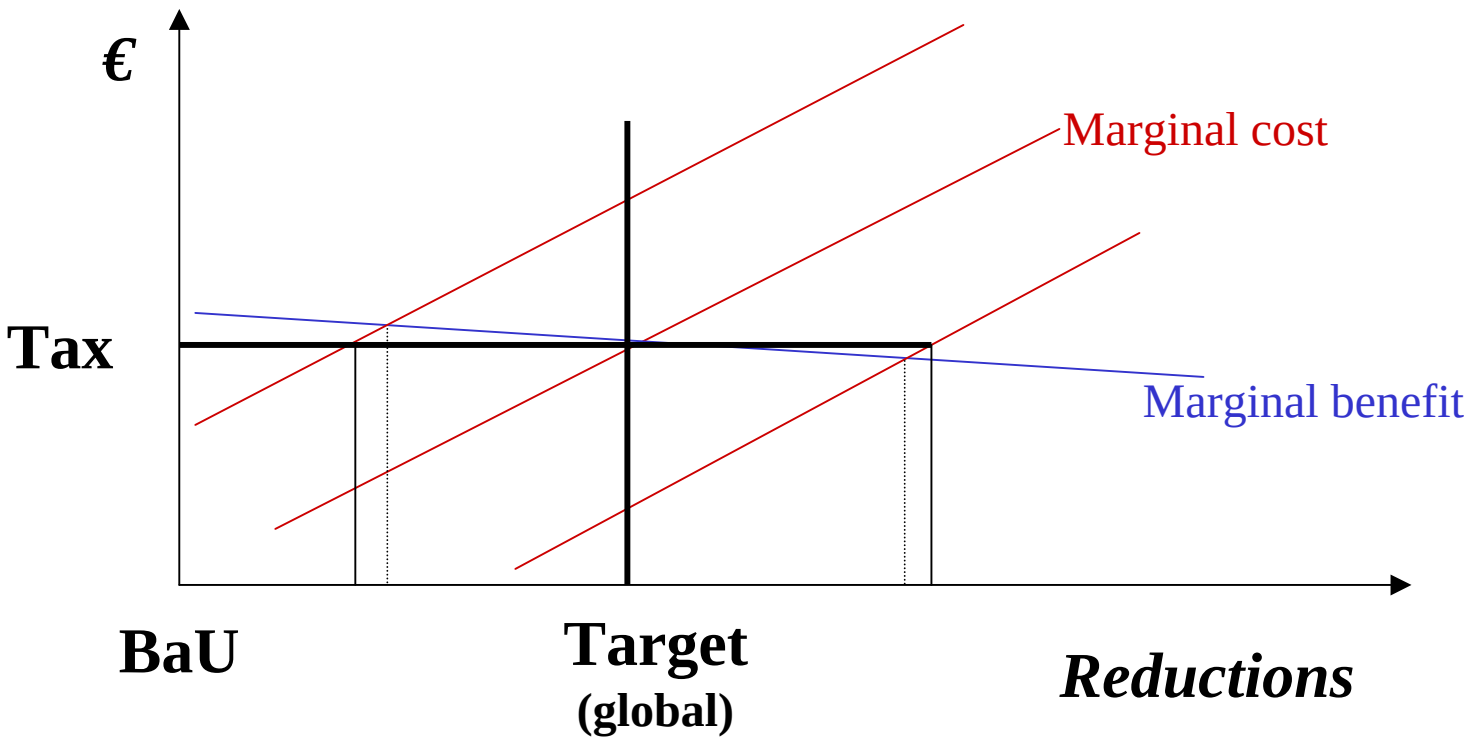

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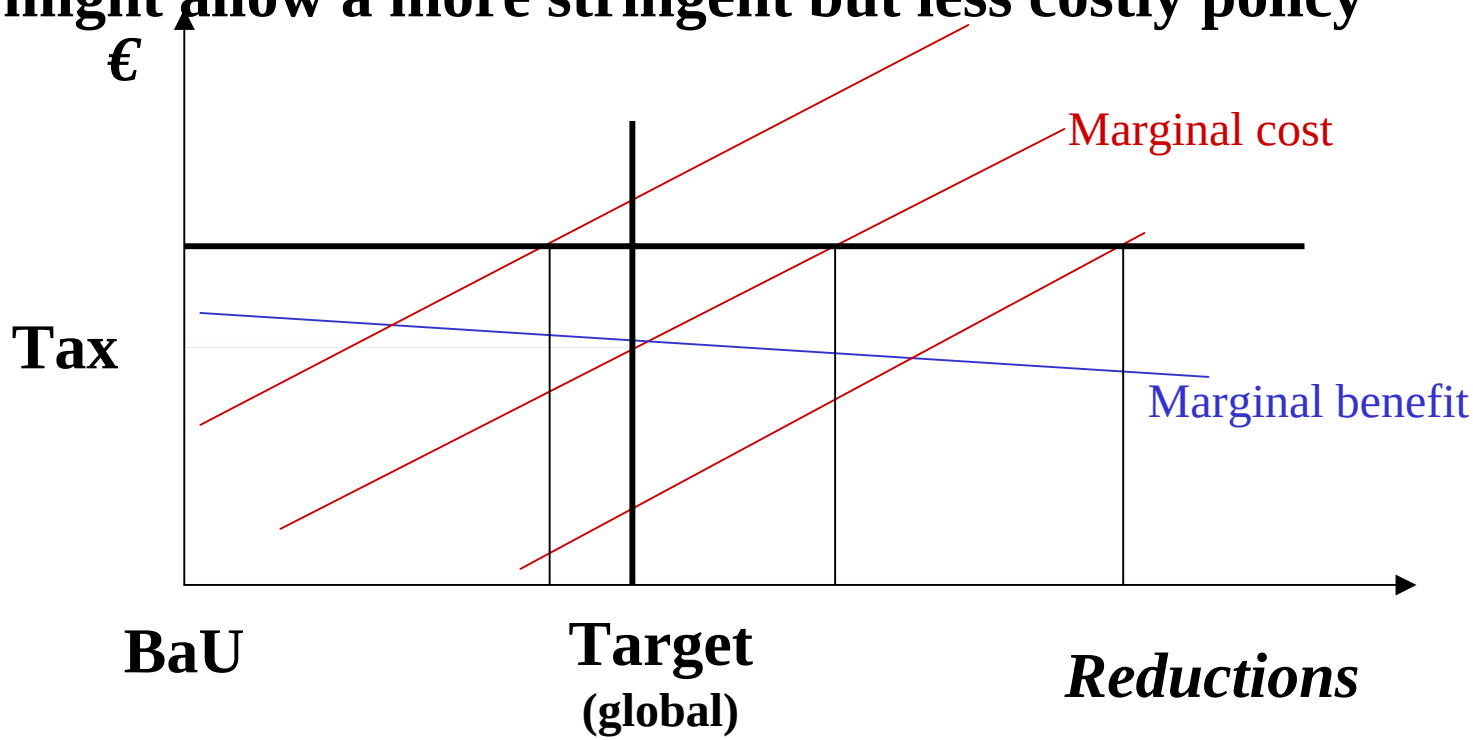

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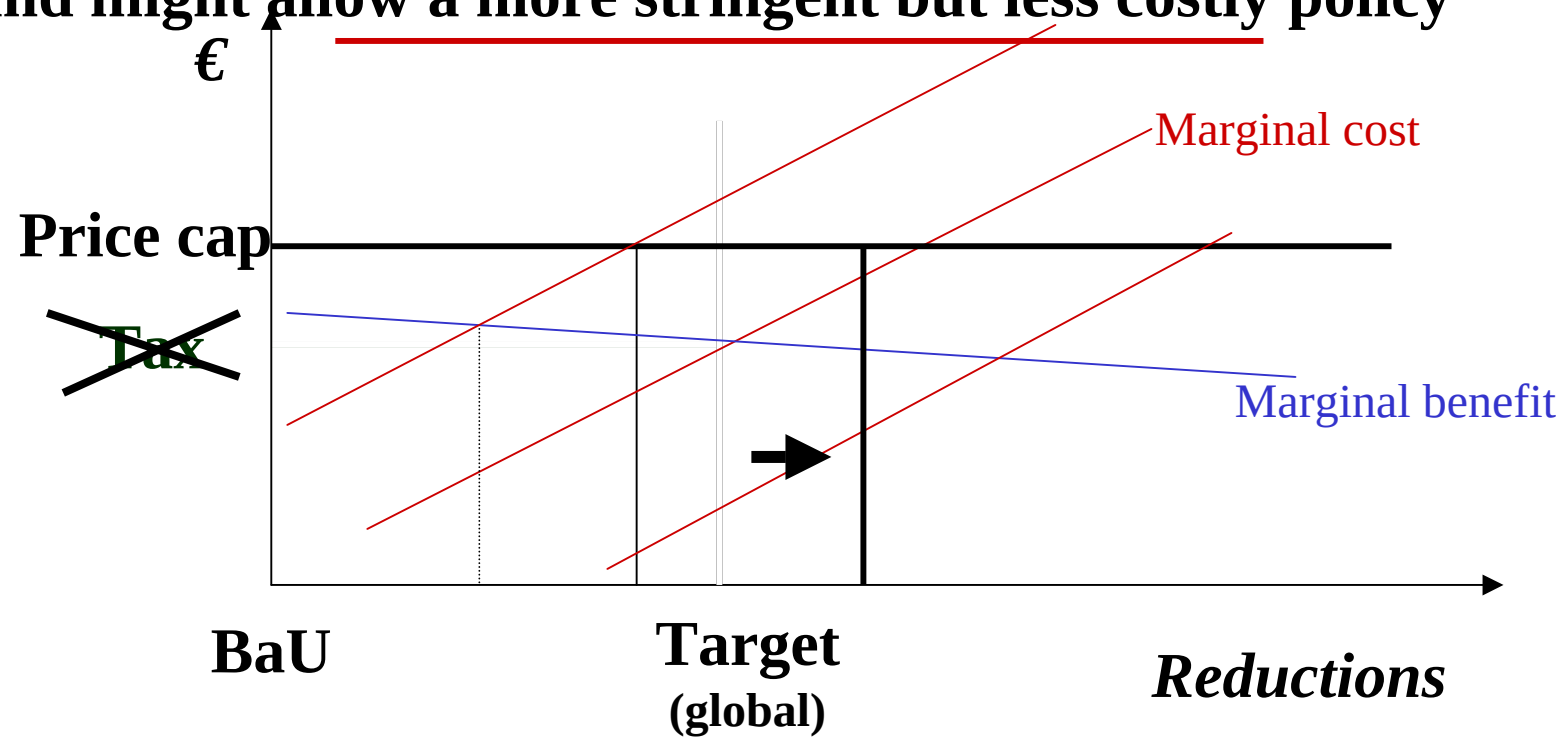


Prices vs Quantities - **Weitzman, 1974**

$$E\left[C_{price} - C_{quantity}\right] = -\frac{\sigma^2}{2c}$$

$$E\left[B_{price} - B_{quantity}\right] = -\frac{\sigma^2}{2c^2}b$$

With price instruments expected costs are lower... But expected benefits are lower too!

c = slope of marginal costs

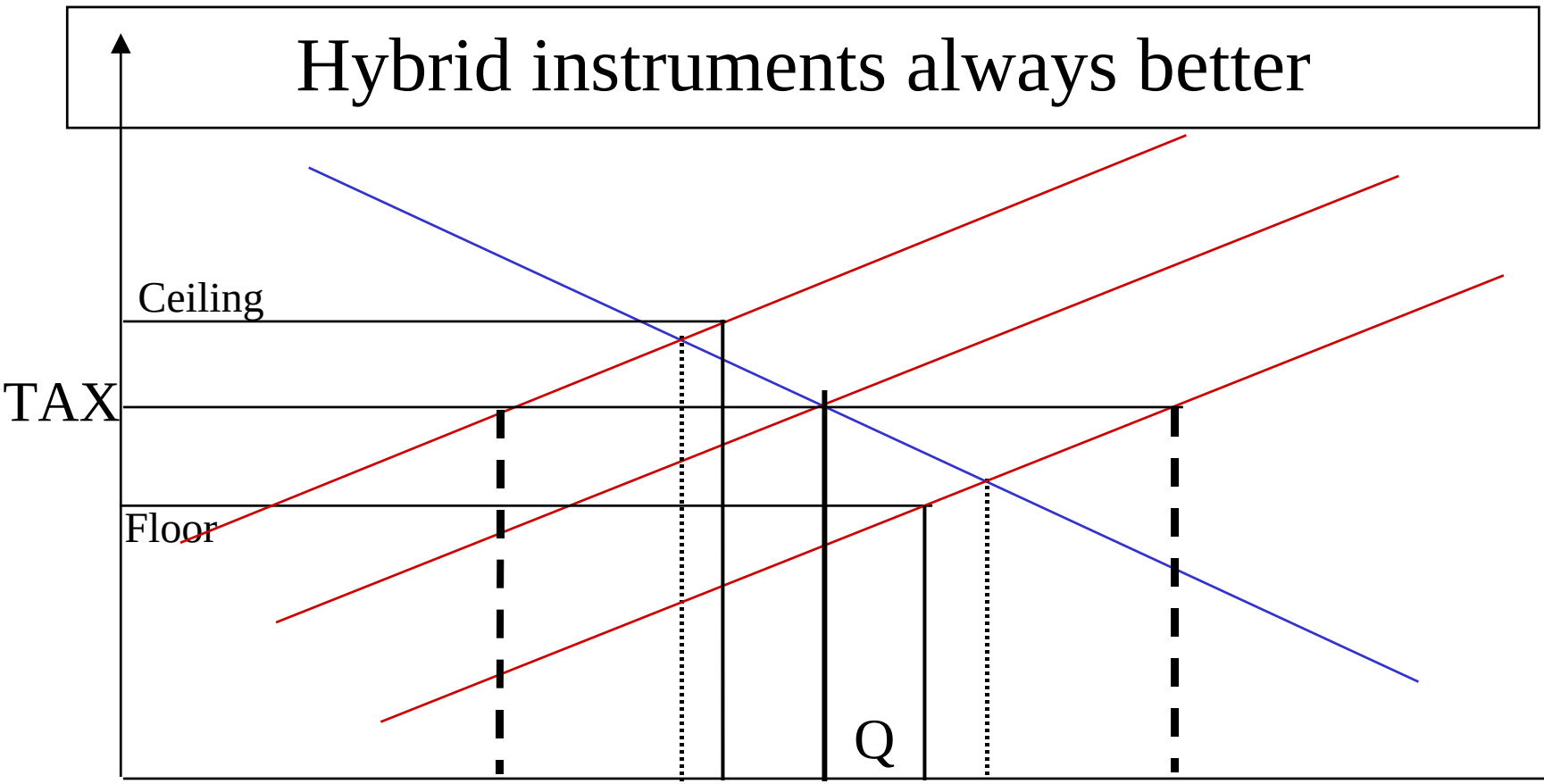
b = slope of marginal benefits

σ^2 = variance of cost function

The difference between net expected benefits with prices and net expected benefits with quantities is:

$$\Delta = \frac{\sigma^2}{2c^2}(c-b)$$

Effluent charges and licences under uncertainty - **Roberts & Spence, 1976**



Regulating Stock Externalities under Uncertainty - **Newell & Pizer, 2000**

$$\Delta_t = \frac{\sigma_t^2}{2c_t^2}(c_t - b_t \Omega_\delta \Omega_{\rho,t})$$

The benefit slope - a function of the stock - is corrected by a benefit persistence factor and a correlation factor - or persistence of technical change.