

Advanced Pollution Control:

Uncertainty (Weitzman & Stavins Rules)

Econ 1661 / API 135 Section 6

February 28, 2022

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Uncertainty (Prices vs. Quantities)

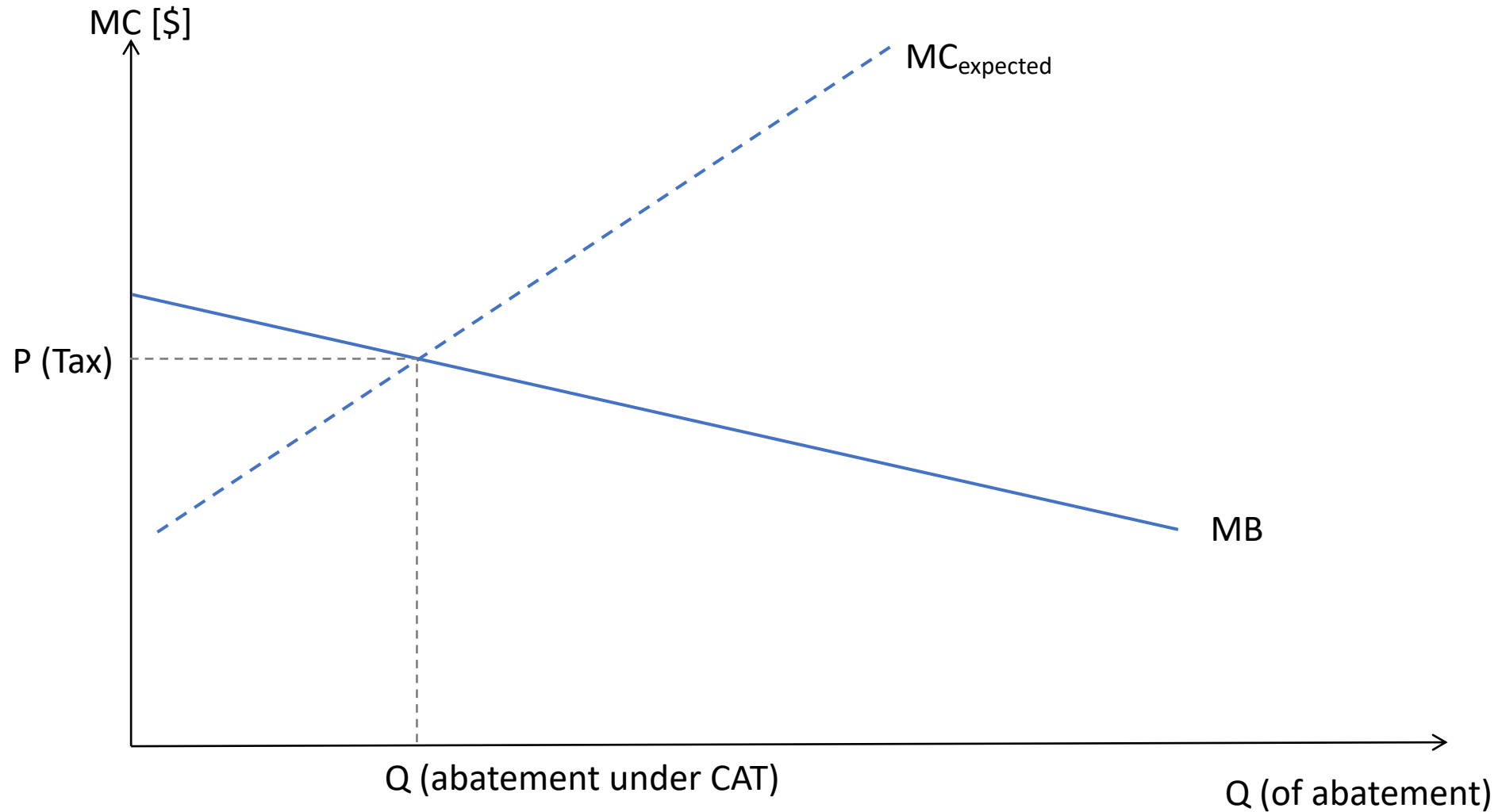
- When there is uncertainty in marginal costs, the invariance between taxes and permits no longer holds.
- A tax or permit price is set based on what policy-makers think marginal costs are. If realized marginal costs differ from expected marginal costs, this will induce deadweight loss (DWL). The efficiency of the policy will now depend on the choice of price versus quantity.

Uncertainty (Prices vs. Quantities)

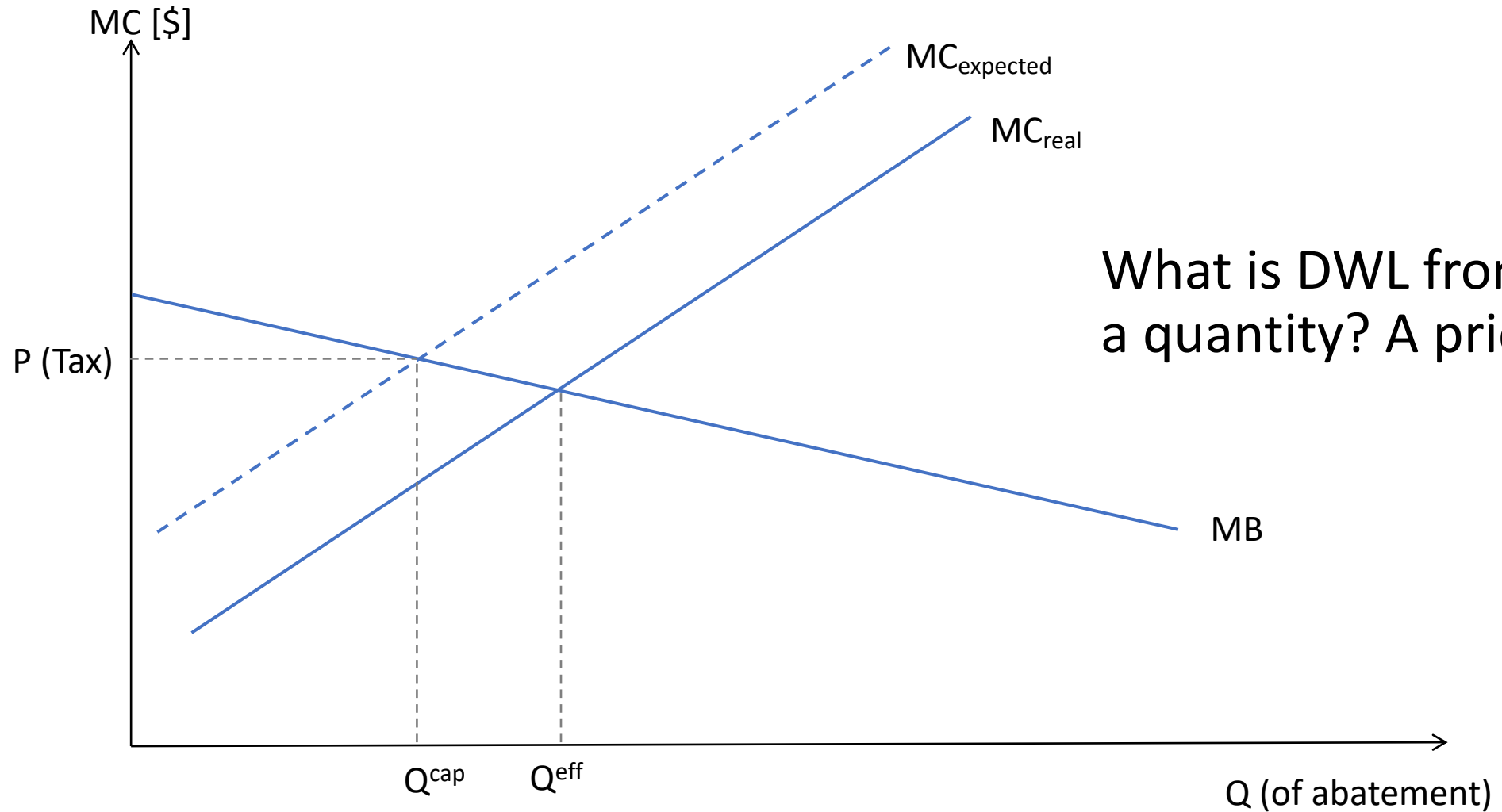
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“A tax (price) is preferable to a cap-and-trade policy (quantity) when the marginal benefit curve is flat relative to marginal cost, and vice versa.”

Marginal costs are steeper than marginal benefits

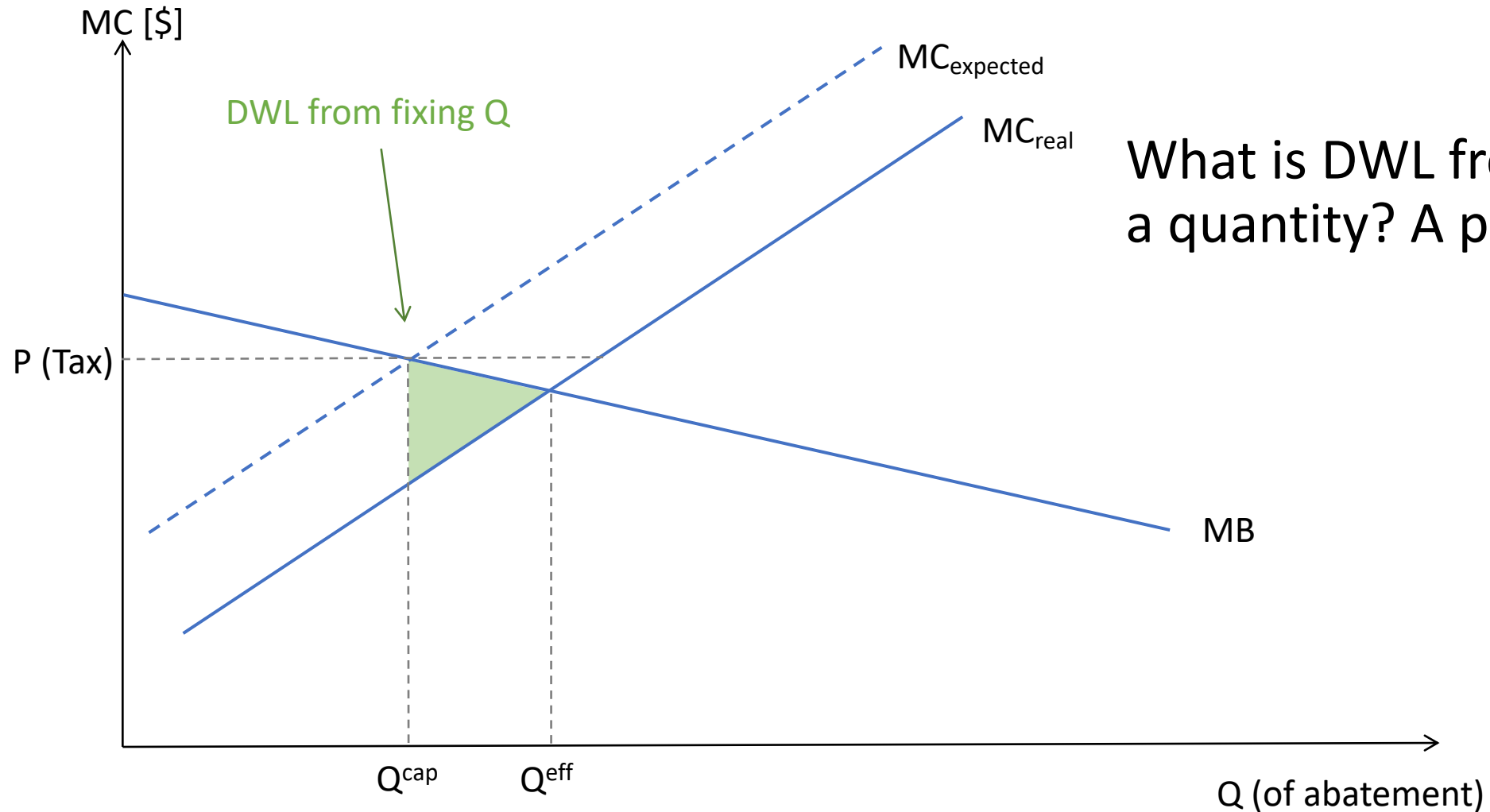


Marginal costs are steeper than marginal benefits



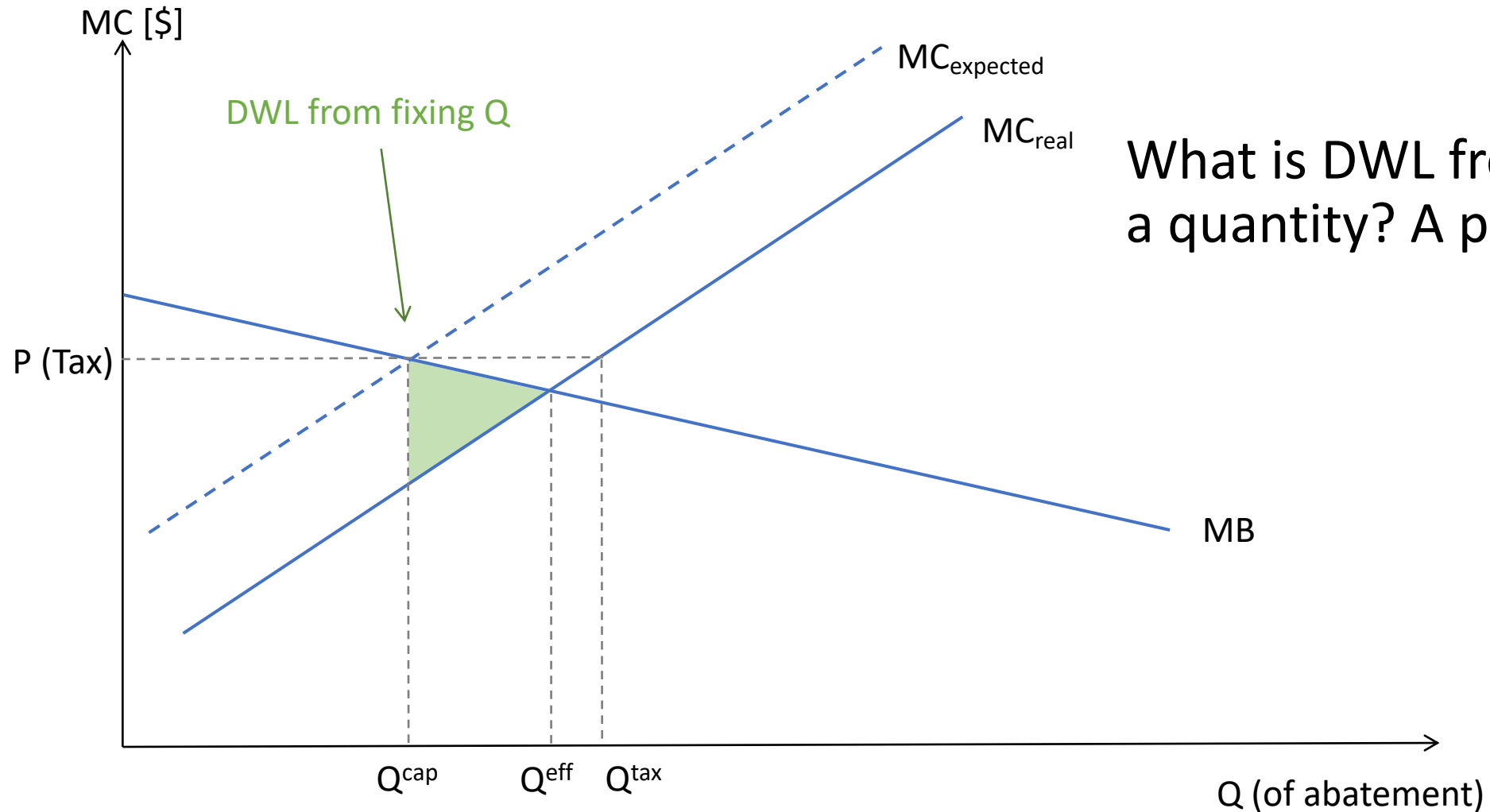
What is DWL from setting a quantity? A price?

Marginal costs are steeper than marginal benefits



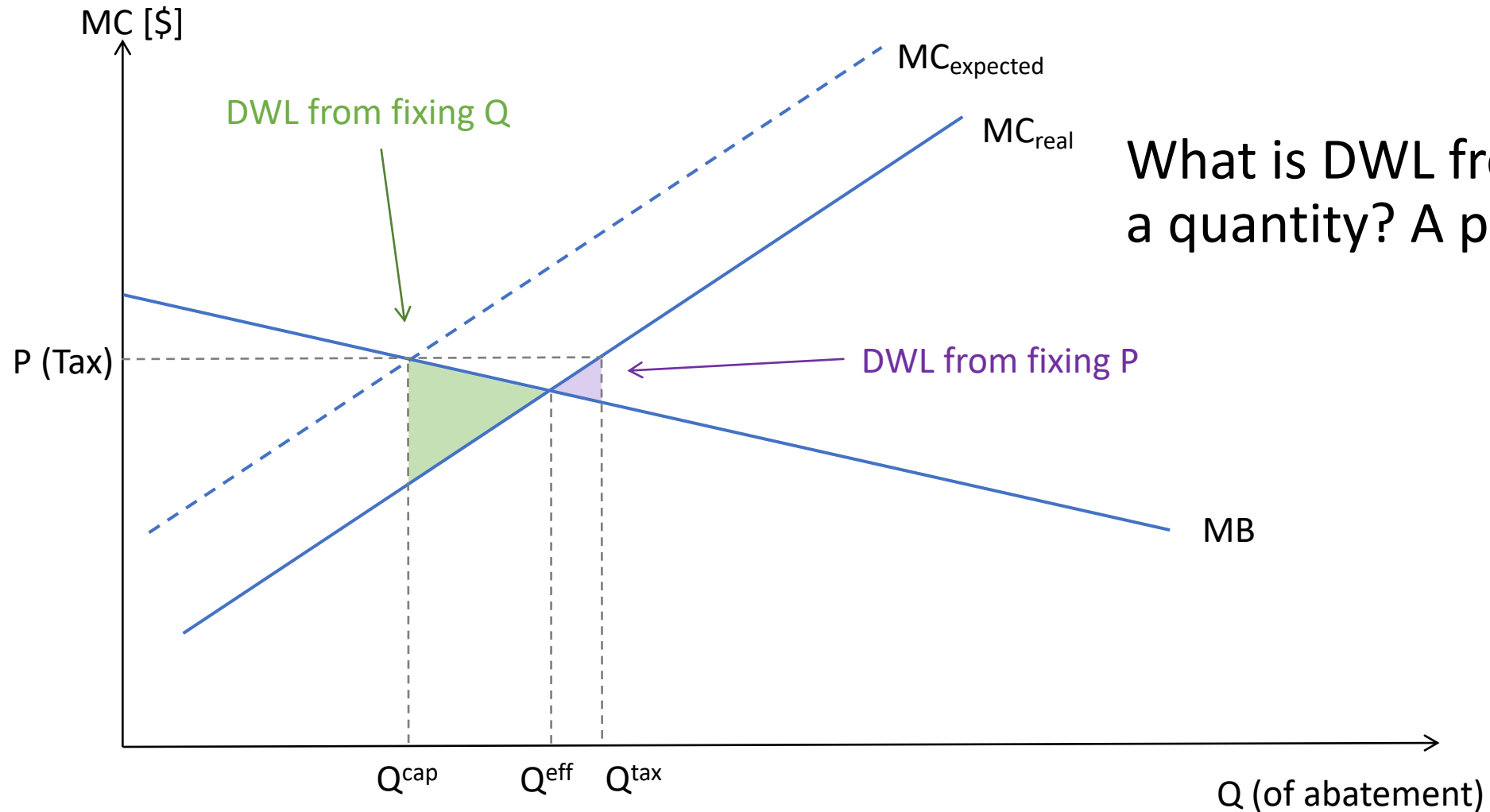
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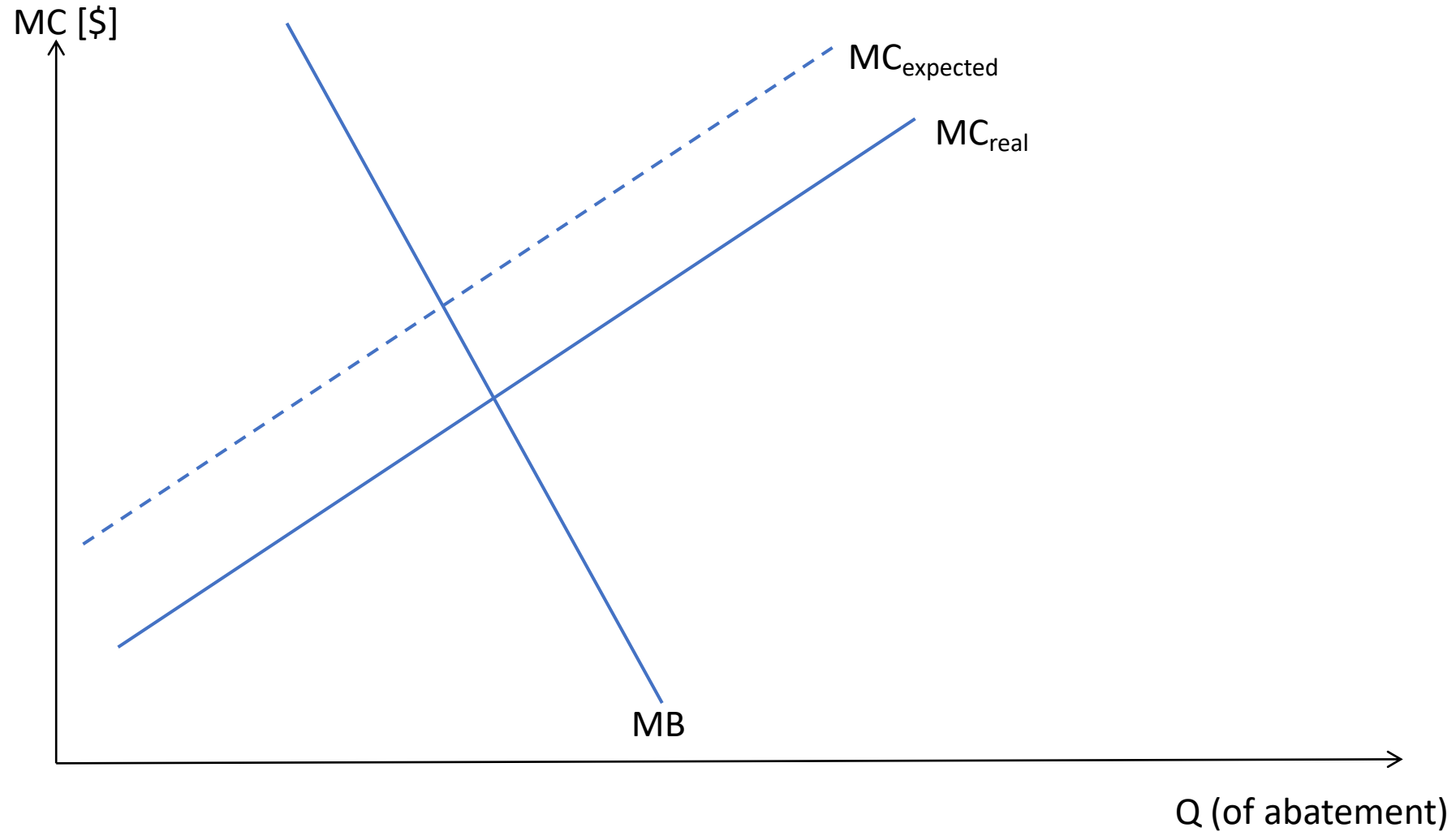
Note 1: Expected vs. Actual

When you consider taxes or CAT programs graphically, note that:

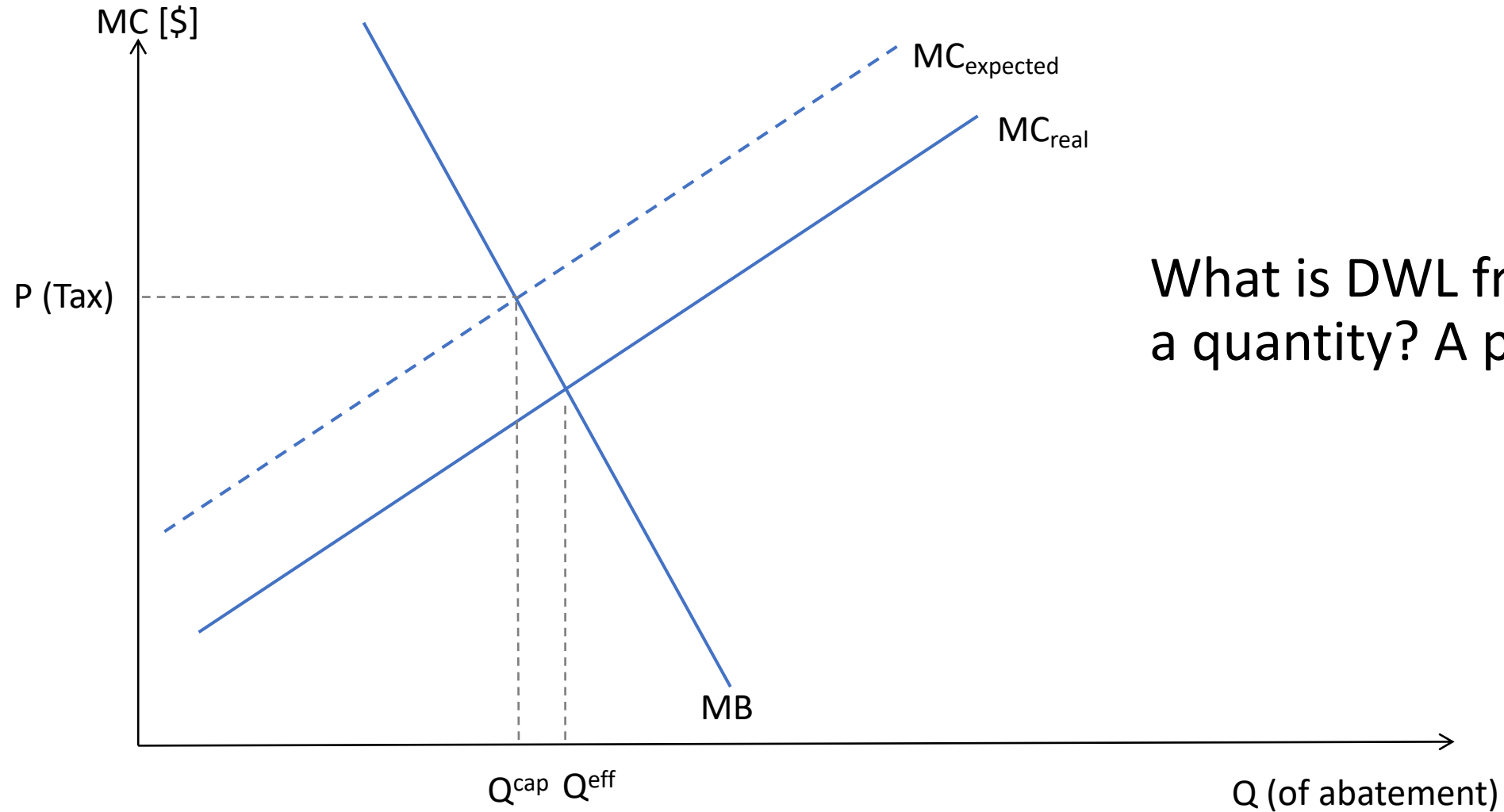
- 1) Policy-makers set the level of the tax or cap based on **expected** costs and benefits
- 2) The efficiency of the tax or CAT program is determined by **actual** costs and benefits

When (1) identifying a policy and (2) evaluating the impact of that policy, I try to ignore (and sometimes physically cover up) the irrelevant curves

Marginal benefits are steeper than marginal costs

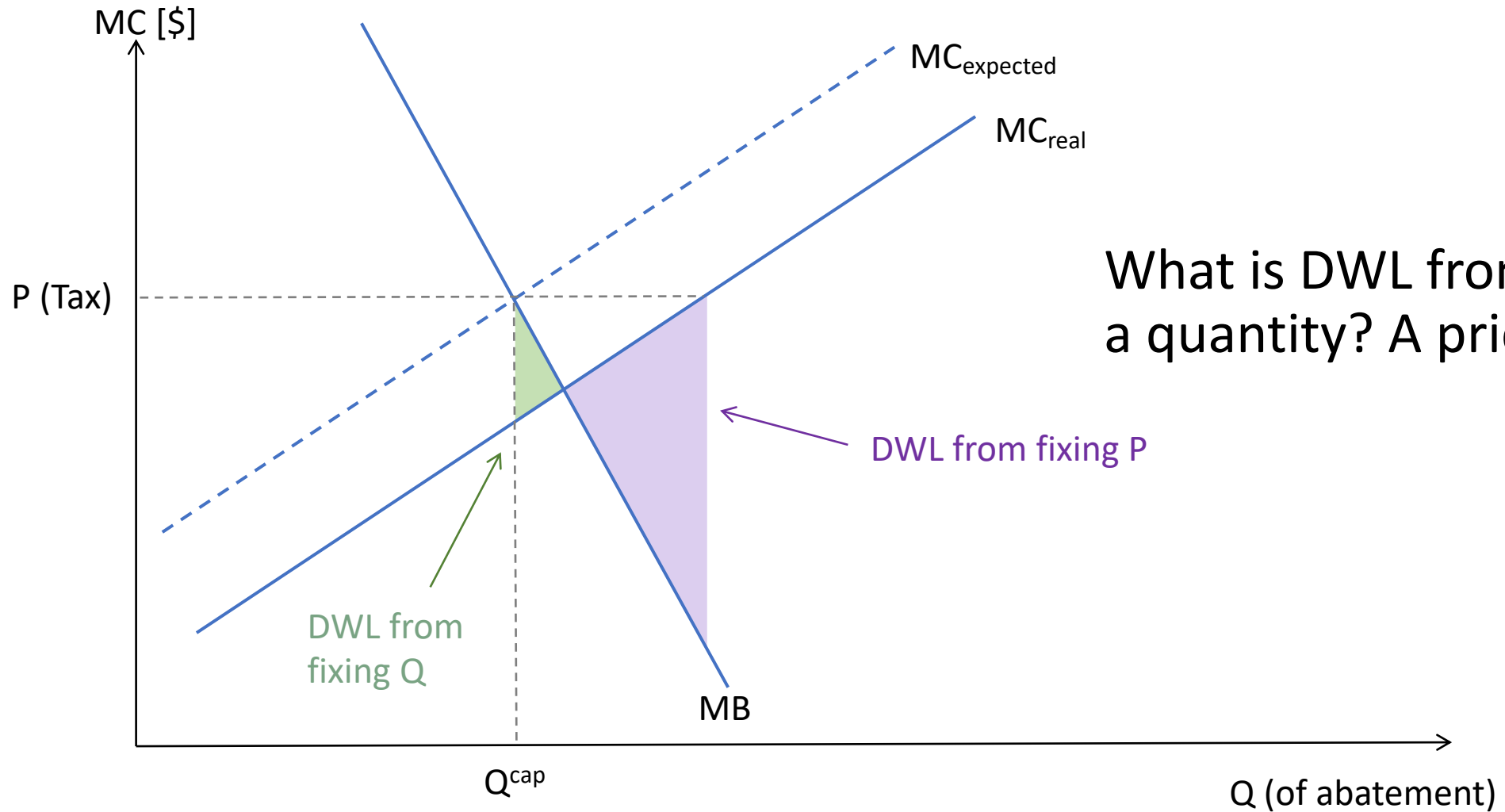


Marginal benefits are steeper than marginal costs



What is DWL from setting a quantity? A price?

Marginal benefits are steeper than marginal costs



What is DWL from setting a quantity? A price?

DWL from fixing P

DWL from fixing Q

Q (of abatement)

Uncertainty: Weitzman Rule

“A tax (price) is preferable to a cap-and-trade policy (quantity) when the marginal benefit curve is flat relative to marginal cost, and vice versa.”

- If the MC are steeper than MB, the DWL associated with setting a price is smaller than the DWL associated with setting a quantity. Thus, a tax is preferred.
- If the MB are steeper than MC, the DWL associated with setting a price is larger than the DWL associated with setting a quantity. Thus, a cap-and-trade policy is preferred.

Uncertainty: Weitzman Rule

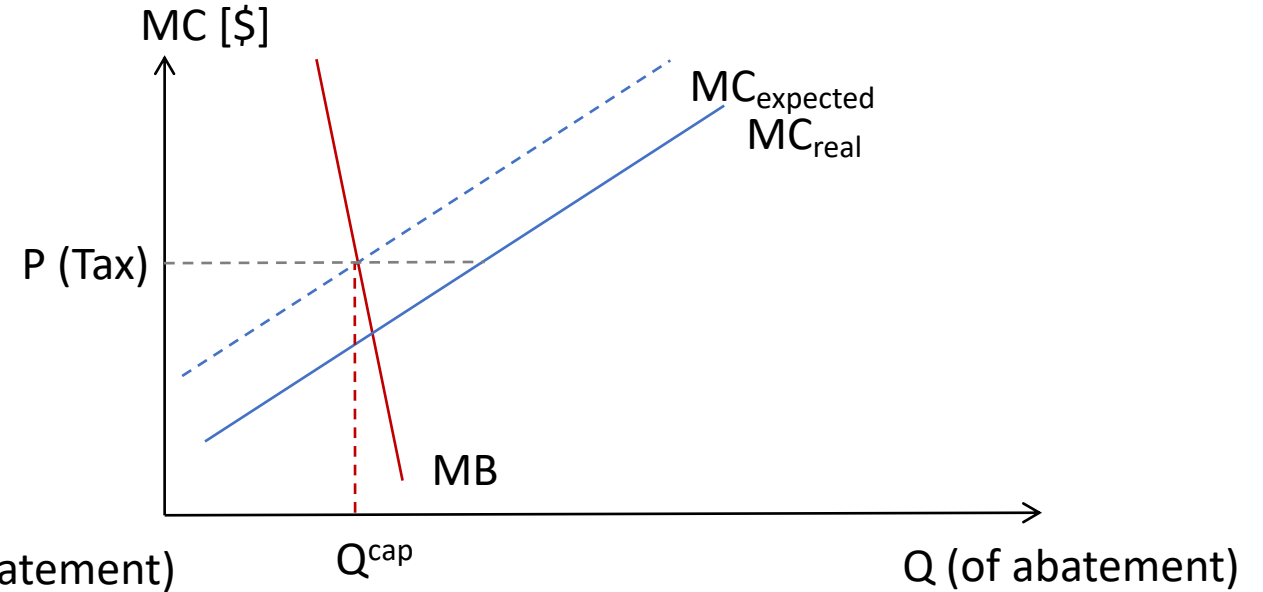
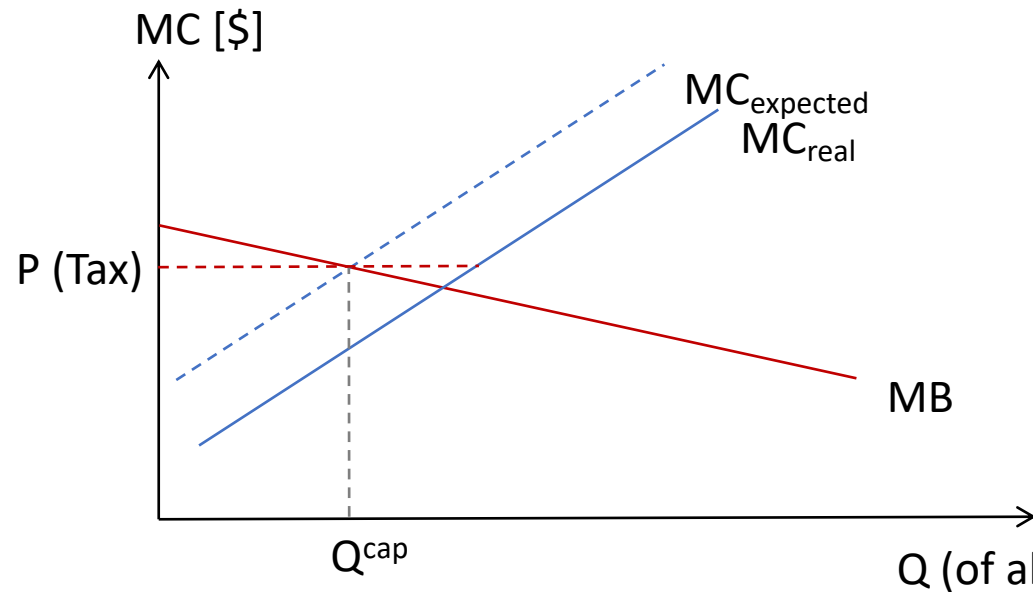
Intuition (one way to think about it)

- Ceteris paribus, a steeper MB curve moves us towards a quantity instrument. A tax more closely mirrors a flat MB curve and quantity more closely mirrors a steep MB curve.

Uncertainty: Weitzman Rule

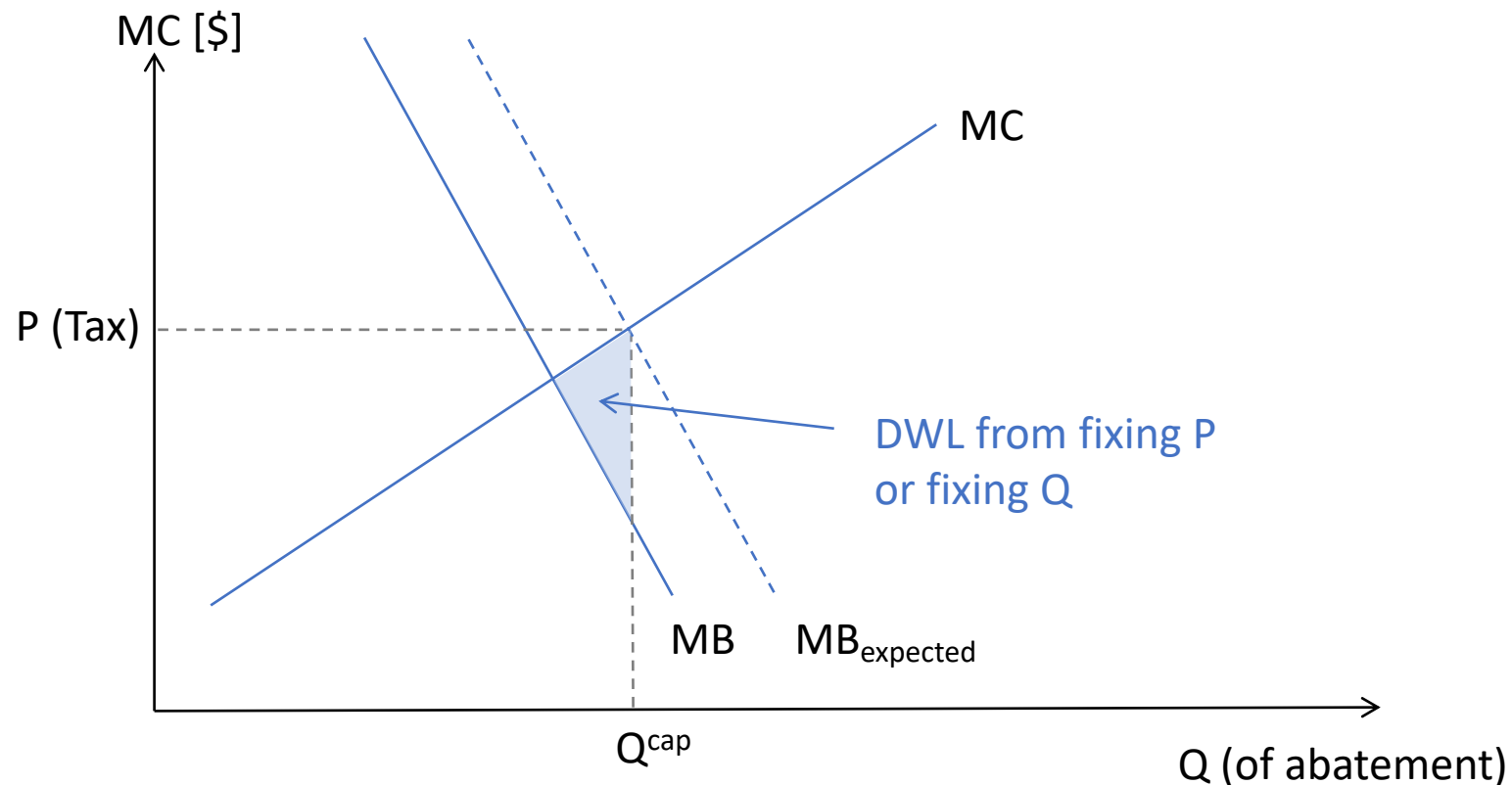
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What about Uncertainty in Marginal Benefits?

- If MB is uncertain and MC is not (or if their uncertainty is uncorrelated), prices and quantities are equivalent.

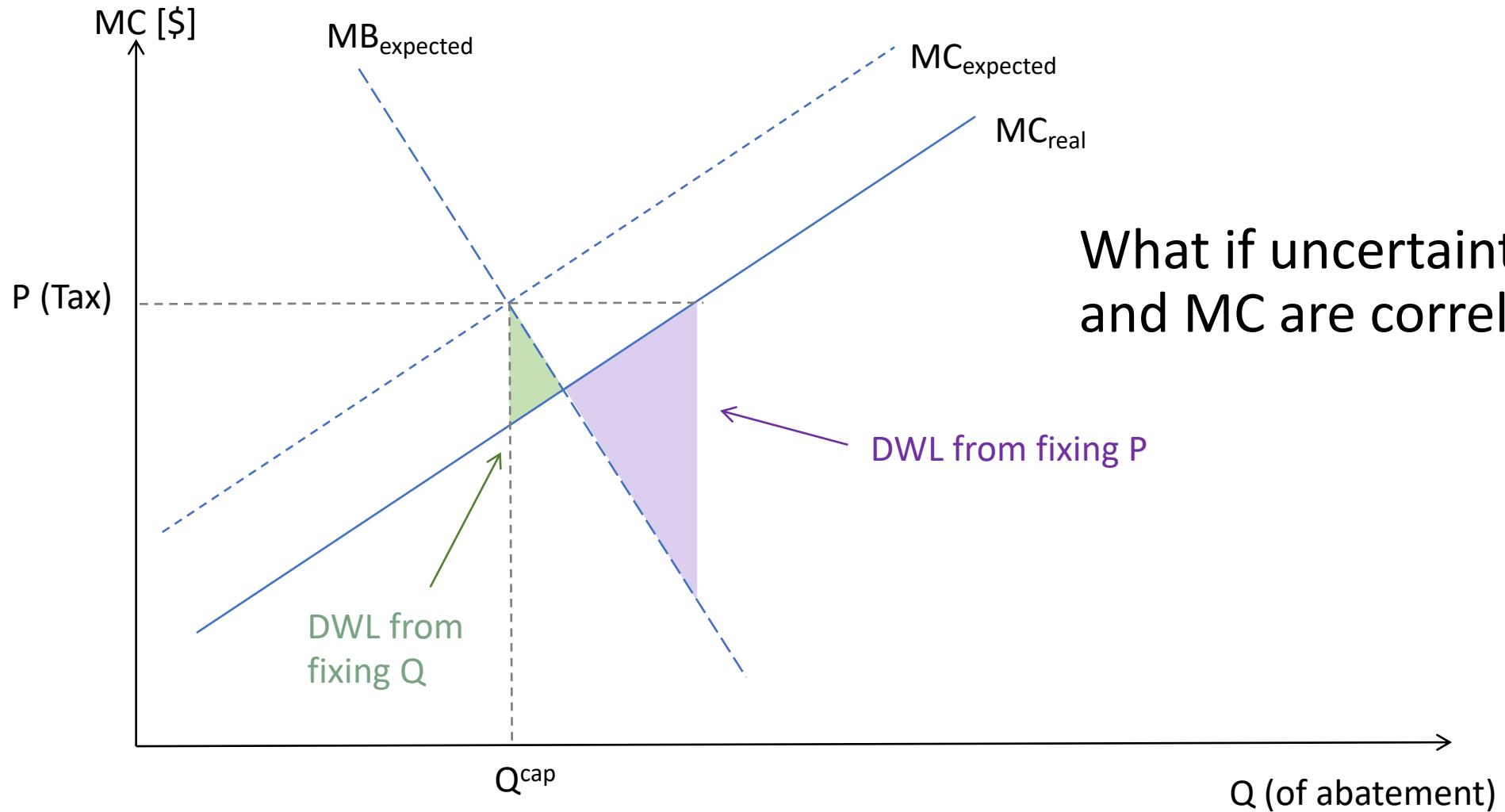


Uncertainty: Stavins Rule

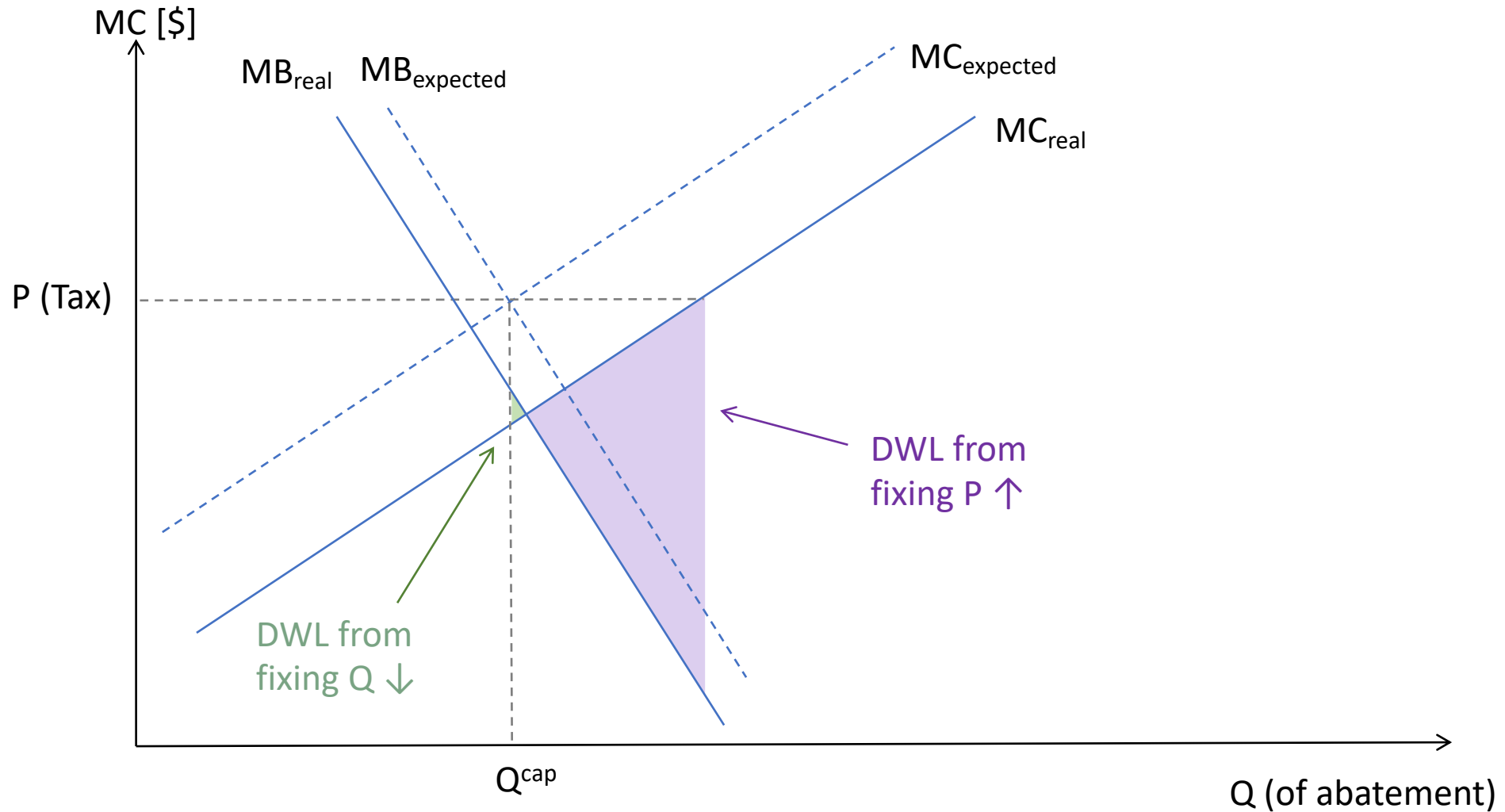
What if the uncertainty in benefits and costs are correlated?

- Positive correlation: the DWL associated with a quantity instrument falls, pushing us towards favoring quantity instruments.
- Negative correlation: the DWL associated with a tax falls. Thus, negative correlation pushes us in the direction of favoring price instruments.

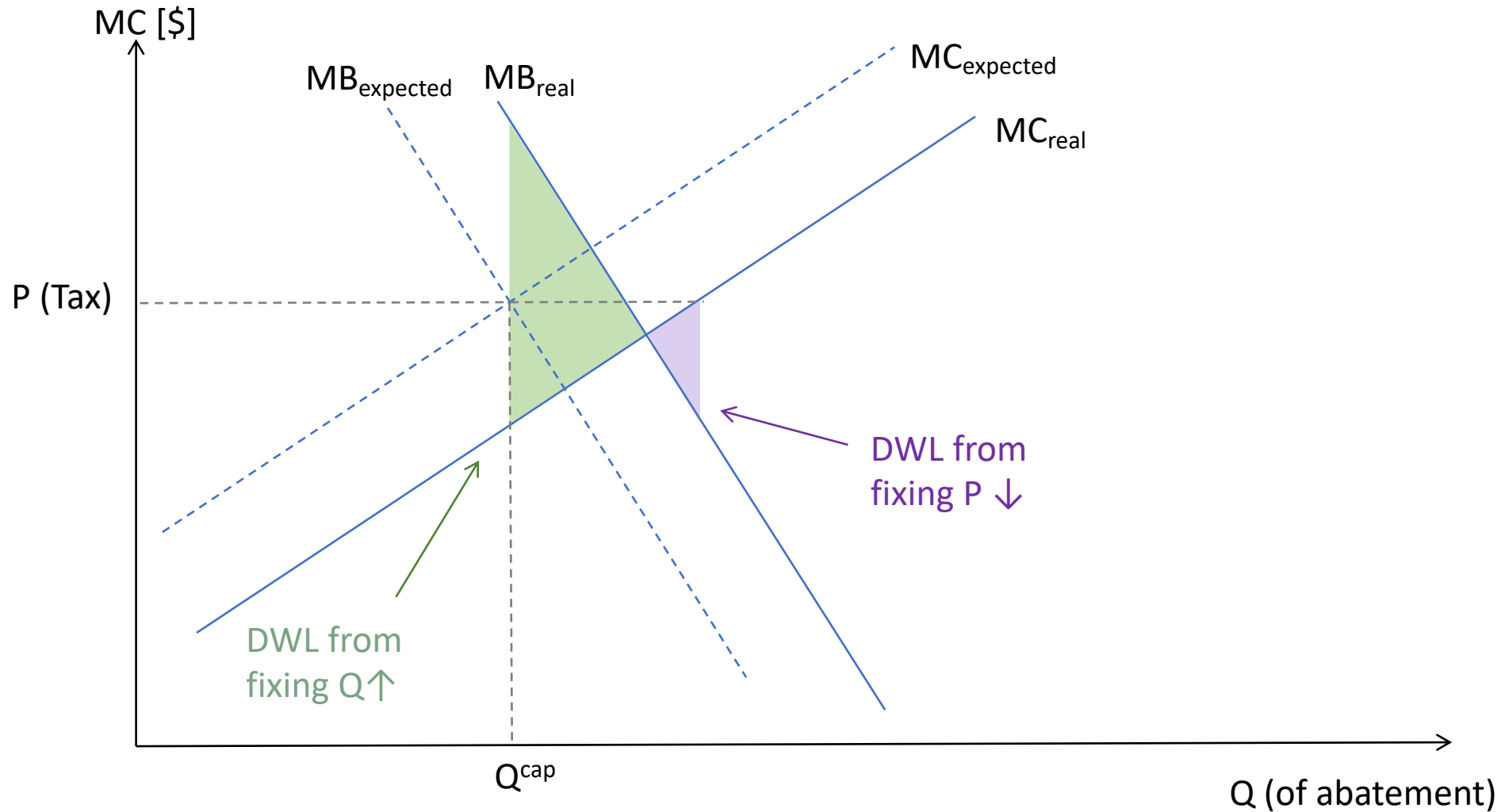
Example: MB are steeper than MC



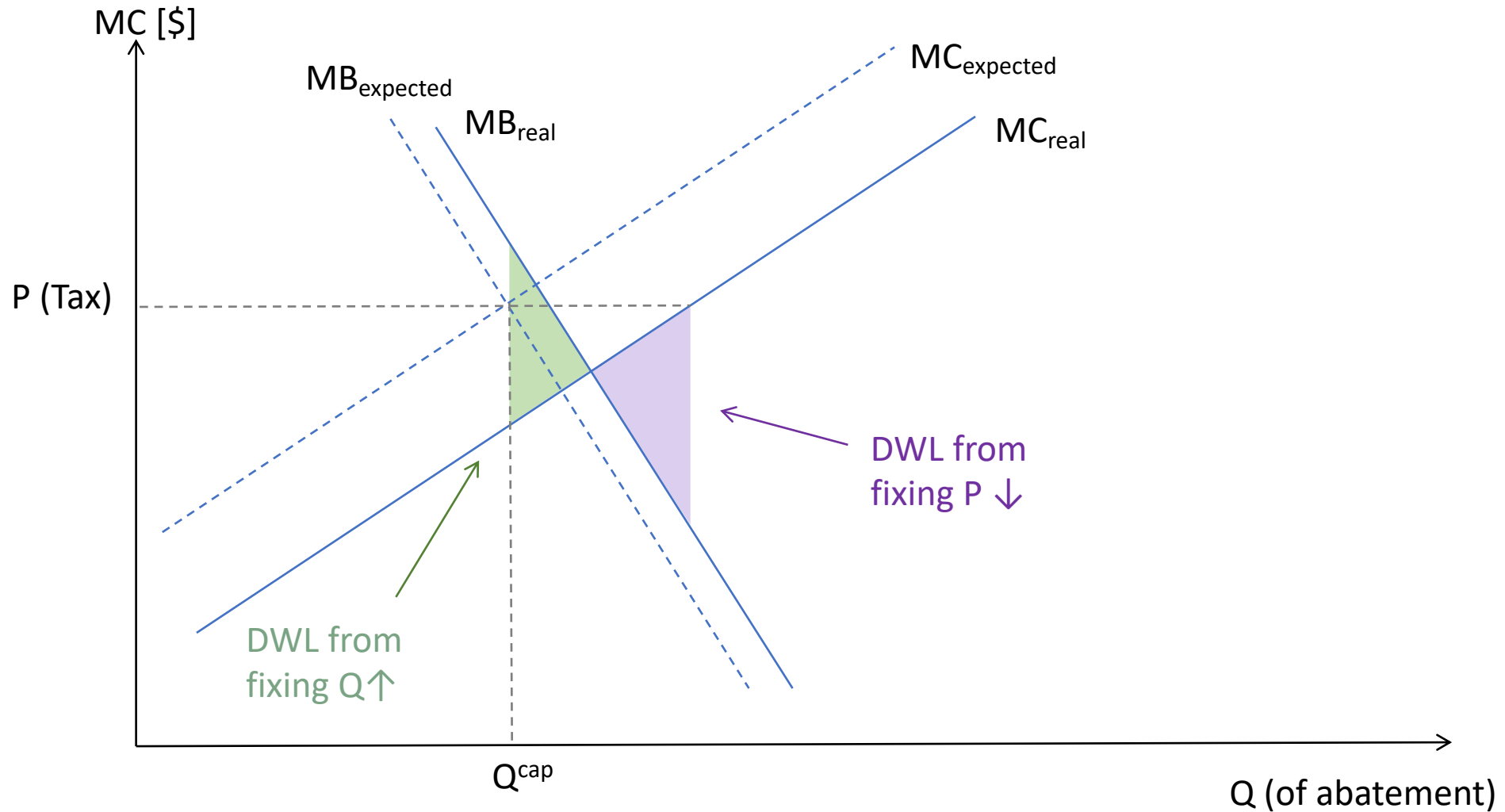
Positive correlation between uncertain benefits and costs



Negative correlation between uncertain benefits and costs



Negative correlation between uncertain benefits and costs

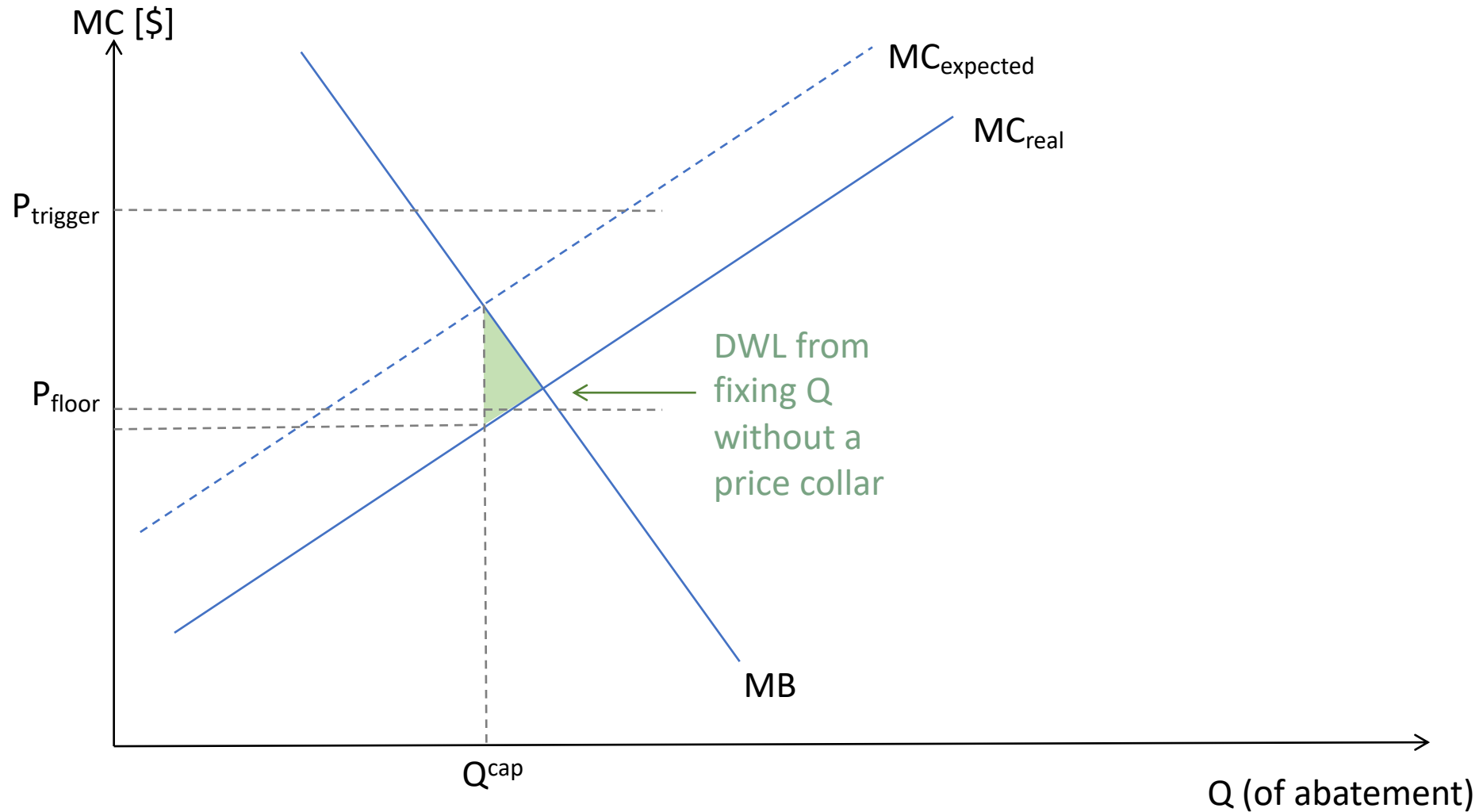


Hybrid Policy Instruments

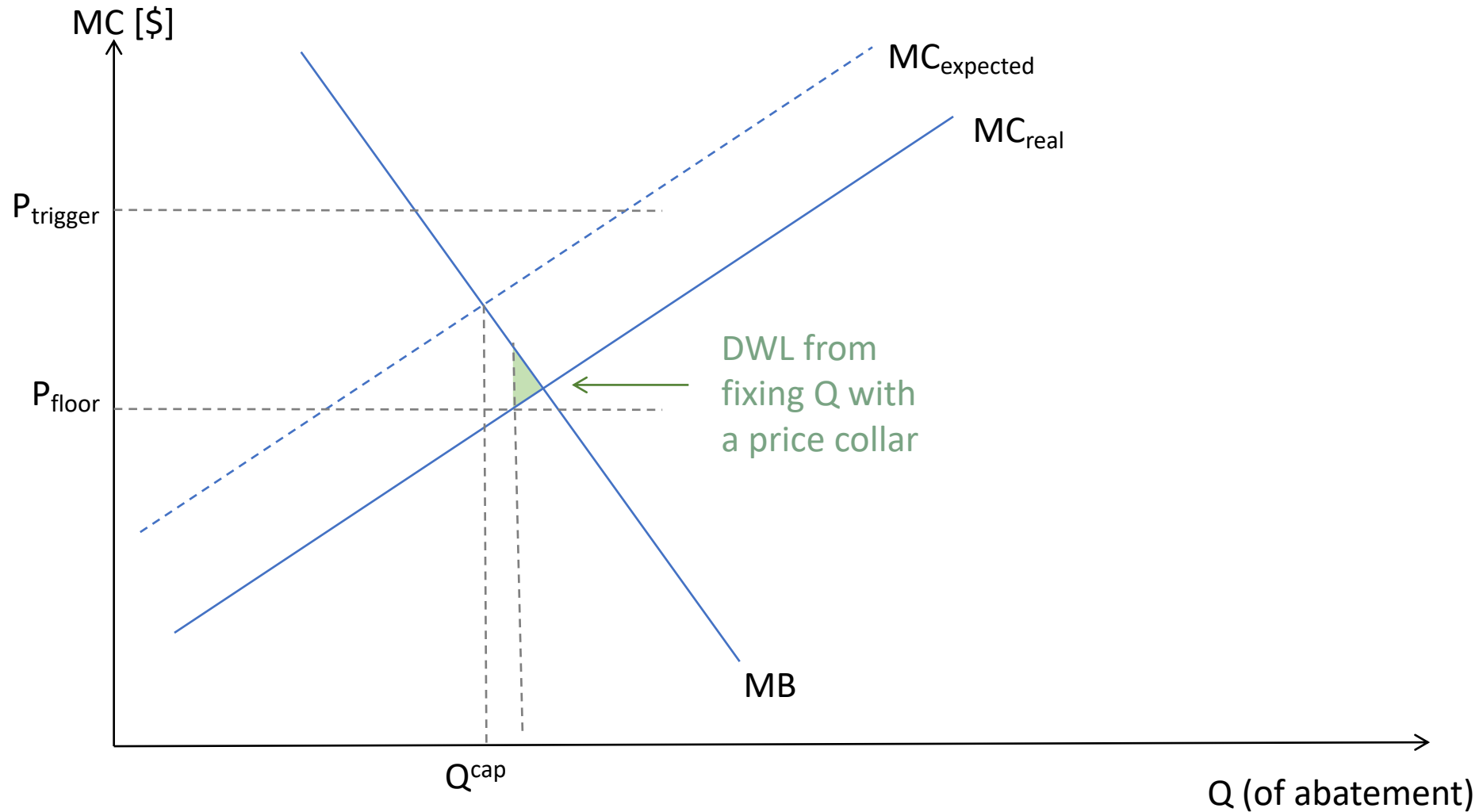
Definition: a hybrid or “safety-valve” policy instrument refers to a combined cap-and-trade and tax system. In the context of a cap-and-trade system, this involves setting a price ceiling or price floor on the permit price.

- The government may announce (in advance) plans to
 - Sell additional allowances if the price exceeds a specific (the trigger) price. This creates a price ceiling.
 - Buy allowances if the price falls below a specific price. This creates a price floor. Alternatively, it can set a minimum allowance price at auctions.
- Using both a price floor and price ceiling creates a “price collar” and limits the volatility of permit prices. As the collar narrows, the cap-and-trade system becomes more like a tax.

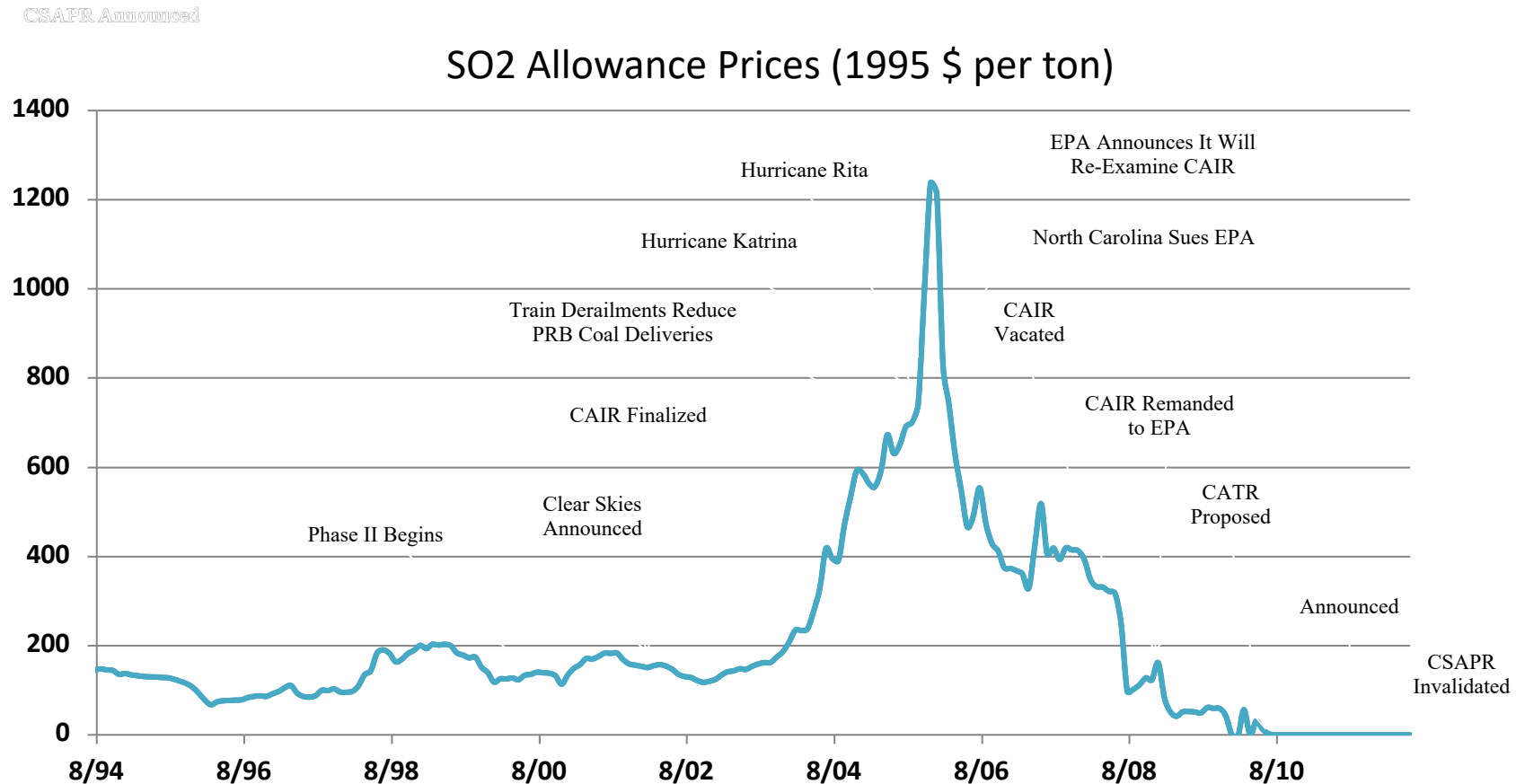
Hybrid Policy Instruments



Hybrid Policy Instruments



Hybrid Policy Instruments



Hybrid policy instruments may limit excessive volatility in the price of allowances.

Banking and Borrowing

- Intuition: rather than trading across firms, an individual firm can trade with itself across time periods. Same goal: equalize the marginal cost of abatement across time periods
- If the marginal cost of abatement is higher in the future than today (e.g. higher allowance prices), then there is an incentive to “bank” permits (abate or buy permits now to save for the future)
- If the marginal cost of abatement is lower in the future than today, then there is an incentive to “borrow” permits (incur a permit “debt” and pay it off by increased abatement or permit purchases in the next period)
- Pro: lowers costs of compliance to firms. Con: induces volatility in the amount of realized abatement in any given period. Likely more appropriate for stock pollutants like CO₂ than flow pollutants like PM_{2.5}

Thank You!