A price or a quantity?

A **tax** fixes the **price** of a ton → the tons follow the real staircase · a **cap** fixes the **tons** → the price follows · when the cost sheets are wrong, **fix what is worse to get wrong**: flat harm → the price; a cliff → the tons.

1 One staircase, two tools

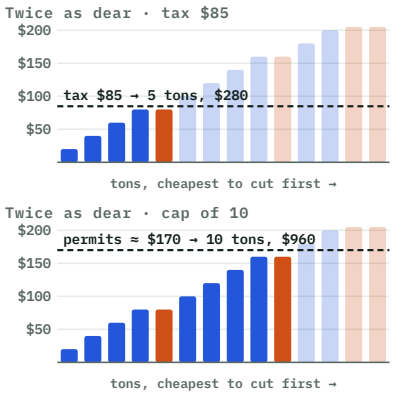
Policy 5 and Lesson 3

- Factory A's k-th ton costs `$10 × k` to cut, B's `$40 × k` → one row, cheapest first: `10 · 20 · 30 · 40 · 40 · 50 · 60 · 70 · 80 · 80` | 90…
- **Tax** $85 a ton → each firm cuts every ton **cheaper than $85** ⇒ 10 tons (A 8, B 2), **$480**
- **Cap and trade** = 10 permits, one per ton, bought and sold → a permit trades between the 10th ton ($80) and the 11th ($90) ⇒ ≈ **$85** · same tons, same bill
- Catch: the council drew the staircase from **last year's cost sheets** → the real one may be twice as tall, or half · **your guess** (price or tons?): never graded or saved

2 Costs surprise: two mistakes

twice as dear, or half

- **Tax fixes the price** → tons move: twice as dear ⇒ **5 tons** (A 4, B 1), $280, **15** still go up · half as dear ⇒ **14 tons**, $475
- **Cap fixes the tons** → price moves: twice as dear ⇒ still **10 tons**, permits ≈ **$170** ($160-180), bill `$480 → $960` · half ⇒ $40-45, $240
- Practice · D `$10 × k`, E `$30 × k`, 20 tons given off, goal 8 · tax **$65**: 8 → **4 tons** twice as dear (D 3, E 1), 16 go up, not 12 · cap: permits `$60-70 → ≈ $130`, bill `$300 → $600`



3 Which mistake is worse?

ask the damage line

- **Flat damage** (every ton ≈ same harm) → wrong tons cost little ⇒ **fix the price** · $85 of harm, twice as dear: tax's 5 tons = exactly the ones worth cutting · cap forces tons 6-10: `100 + 120 + 140 + 160 + 160 = $680` to avoid `5 × 85 = $425` ⇒ **$255 lost**
- **A cliff** (10 tons fine, 11 kill the reef) → wrong tons cost everything ⇒ **fix the tons** · cap holds 10 at $960 · tax lets 15 through
- **Prices versus quantities** · **Martin Weitzman** (American economist, MIT then Harvard, US universities, 1942-2019), **1974**: uncertain costs → fix what it is worse to get wrong
- Practice · the other way: **half as dear**, $65 flat harm → 14 tons worth cutting (D 10, E 4), cap stops at 8 → tons 9-14 cost `$275`, avoid `6 × 65 = $390` ⇒ **$115 lost** · Lesson 1's mill twice as dear ($100…$20), $35 harm: tax cleans only the $20 ton · cap of 2 dumped: `$100` to avoid `$70`
- University: costs **and** damage uncertain, moving together ("correlated shocks") → the answer can flip

4 Both at once

a cap with walls

- **Ceiling** = council sells extra permits at a top price · **floor** = never sells its own below a bottom price → between the walls: tons fixed · at a wall: **price fixed, tons move** (like a tax)
- 10 permits, floor $60, ceiling $110 · twice as dear ⇒ **6 tons** (A 5, B 1), $380, 4 extra permits at $110 · half ⇒ floor bites, **12 tons** · practice: floor $40, ceiling $100 ⇒ **5** when dear, **9** when cheap
- **Hybrid** = cap + floor and/or ceiling → tighter walls ⇒ more like a tax · **banking** (keep a permit for next year) smooths swings too · California 2026: floor ≈ **$28**, ceiling ≈ **$103** a ton (CARB, the state's air board)

5 What each one fixed

Sweden · EU · British Columbia

- **Sweden** → price: carbon tax since **1991**, ≈ $22 a ton then, ≈ **$120** in 2023 (Finance Ministry), moved only by parliament · emissions –⅓ 1990-2021, GDP (all it produces) nearly ×2
- **EU** → tons: cap and trade since **2005** · permit €6 (2017) → €25 (2019) → €80 (2022) → **€84** (2023) → **€65** (2024: weaker industry, cheaper gas, more wind and sun; European Environment Agency) · plants –½ since 2005 · **Market Stability Reserve** (2019): holds back permits when too many pile up
- **British Columbia** (Canada) → price: C$10 (Canadian $) in **2008** → C$80 by 2024, money returned as other tax cuts · 1 April 2025: zero for households and fuels, separate price for large industry
- None proves which tool is right: other rules too · the lesson shows what each fixed, not which to copy
- **Ten questions to ask about any green policy** (so far): **1** · What does the smoke really cost, and who pays that cost now? · **2** · Who owns the resource? What nobody owns, everybody overuses. · **3** · Does it cut where cutting is cheapest? · **4** · **Does it fix the price or the quantity, and which mistake is worse here?**

Watch out: "a tax lets the rich pay to pollute" → a cap sells the right to a ton too, through the permit · the difference = **which number the law nails down** · a falling permit price ≠ more smoke: the cap still holds the tons