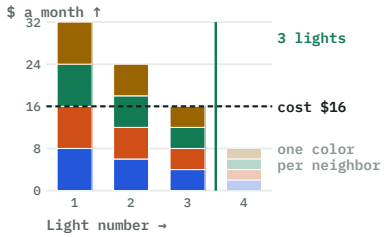
Who pays for the lighthouse, and who owns the river?

Four neighbors would each pay a little for a street light, and each hopes the others will. Add everyone's gain to find how many lights are right; alone, nobody pays. A mill and the fishers downstream who bargain cheaply reach the same amount of waste whoever owns the river; with many parties, it takes a tax, permits or a rule.

1 A public good

Micro 1, Lesson 10 · Samuelson, 1954

- **Public good** = nobody can be kept out + one person's use leaves it whole · street light, lighthouse (Micro 1: `3 × $40 > $90`, never built)
- Street: 4 neighbors · each values lights `8, 6, 4, 2` $/month · a light costs **$16**
- Rule ⇒ add **everyone's** gain from one more ⇒ `4 × 8 = 32`, 24, 16, 8 ⇒ stop where the sum meets the cost ⇒ **3 lights** (16 = 16) · Paul **Samuelson**, American economist, **1954**, Nobel 1970
- Private good ⇒ add **quantities** at one price · public good ⇒ add what each **would pay** for the same quantity · each pays a share = own gain ⇒ **Lindahl price** (Erik Lindahl, Swede, 1919)
- Practice · 3 families, spray $8 · `6+5+4 = 15`, 9, 5 ⇒ **2 sprays** · gain $24 − cost $16 = **+$8**



2 The free rider

Games 1 · Olson, 1965

- Alone: 1st light worth `$8 < $16` ⇒ **0 lights** · **free rider** = enjoys it without paying, nobody can be kept out
- Lane, light $12, each values $8 · both pay $6 ⇒ `2 / 2` · one pays ⇒ `−4 / 8` · nobody ⇒ `0 / 0` ⇒ free-riding pays more whatever the other does ⇒ **both free-ride** = prisoner's dilemma (Games 1)
- Ways out ⇒ **everyone pays** (a tax: 3 lights = $48 = $12 each, gain $18 ⇒ +$6 each) · a **club or schedule** the group runs itself (Elinor Ostrom, American, Nobel 2009, Games 6) · no verdict
- Practice · garden $10, each $7 ⇒ `0 / 0` instead of `2 / 2` · light $12, Nadia $6, Omar $14 ⇒ Omar pays alone (`14 − 12 = $2 > 0`) ⇒ **privileged group** = 1 member gains > cost (Mancur **Olson**, American economist, **1965**)

3 The lighthouse, checked

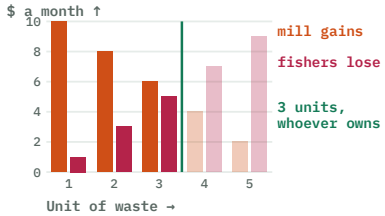
Coase, 1974

- Textbooks ⇒ owners cannot charge ships ⇒ the state must build · Ronald **Coase**, British-born economist, checked the records, **1974**
- Found ⇒ many English lighthouses, 1600s–1800s, run by **private owners**, paid by dues (port fees) from ships at the ports
- Critics ⇒ the Crown (the king) granted the dues, ships had to pay ⇒ not quite a free market

4 The river

Coase theorem, 1960

- Mill's gain per unit of waste `10, 8, 6, 4, 2` · fishers' loss `1, 3, 5, 7, 9` $/month ⇒ allow while gain ≥ loss ⇒ **3 units** (3rd: 6 > 5 · 4th: 4 < 7) · efficient waste ≠ zero
- **Fishers own** the river ⇒ the **mill pays** the fishers for units 1–3 · **mill owns** it ⇒ the **fishers pay** the mill to cut the 4th (between $4 and $7) and 5th ($2–$9)
- **Coase theorem** = if bargaining costs little ⇒ the efficient amount **whoever owns the right** ⇒ same quantity, money flows the other way · Coase **1960**, Nobel 1991 · named by George Stigler, 1966
- Practice · club gains `9, 7, 5, 3, 1`, hotel loses `2, 4, 6, 8, 10` ⇒ **2 hours** either way · club owns the music ⇒ hotel buys off the 3rd hour for $5–$6



5 When bargaining fails

transaction costs

- **Transaction costs** = time, money, effort to find the other side, agree, enforce · high ⇒ the bargain never happens
- Few parties + clear rights ⇒ **bargain** (mill + fishing club, loud party, two farms and a well, beekeeper + orchard) · many parties ⇒ **tax, permits or a rule** (city exhaust, ocean fish, carbon, 500 farms and a lake)
- Tax (Arthur Pigou, English, 1920; Micro 1 Lesson 10) or permits = tradable rights to pollute (Policy 5) ⇒ one price for all, needs an authority that knows the numbers · bargain ⇒ cheap when few, never starts when many ⇒ **no verdict**
- "Coase said pollution is fine" ⇒ **legend** · he stressed that real bargaining has costs, so who owns the right matters
- **Eleven ideas behind the curves** · `1 · A demand curve is a chain of best bundles` `2 · A price change is two effects: substitution and income` `3 · Selling what you own is the same choice` `4 · Risk has a price: the risk premium` `5 · Cost curves come from the cheapest mix of inputs` `6 · A seller with many prices takes the buyers' surplus` `7 · Rivals answer each other's quantities: more firms, lower price` `8 · When one side knows more, the market shrinks` `9 · Trade stops where nobody can gain without a loss` `10 · A public good needs everyone's gain added; a river needs an owner or a rule`

Watch out: compare the cost with **everyone's** gain (2nd light: `4 × 6 = $24`, not one person's $6) · Coase ≠ "the polluter must pay": the right only decides **who pays whom**