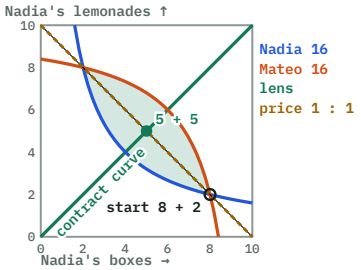
Can a trade make nobody worse off?

Nadia has plenty of strawberries and few lemonades, Mateo the opposite. One box shows every way to share them. They swap while their rates differ and stop where nobody can gain without a loss for someone. One market price gets there too, but an efficient share need not be a fair one.

1 The box

Micro 1, Lesson 1 · Lesson 1

- **Edgeworth box** = one box for two traders · Nadia from the **bottom-left** corner, Mateo from the **top-right** ⇒ each point = both holdings
- Totals fixed: **10** boxes of strawberries + **10** lemonades · Mateo = 10 − Nadia
- Points = `boxes × lemonades` (made-up score, like Micro 11) · share written boxes + lemonades · start Nadia 8 + 2, Mateo 2 + 8 ⇒ 8 × 2 = **16 each**
- Francis **Edgeworth**, Irish economist, *Mathematical Psychics*, **1881** · Vilfredo **Pareto**, Italian economist, drew the box, **1906**
- Practice · 12 + 12 box, Nadia 10 + 2 ⇒ Omar `12 − 10 = 2` mangoes, `12 − 2 = 10` coconuts · 20 points each



2 The lens

gains from trade

- **Indifference curve** = every share with the same points · one per trader through the start (16)
- **Lens** = between the two curves ⇒ shares **both** prefer to the start ⇒ a swap ending there, both accept
- **Rate** = boxes given for 1 more lemonade, as happy · `boxes ÷ lemonades` = slope of the curve = **marginal rate of substitution** (Micro 11)
- At 6 + 4 (24 each) ⇒ Nadia `6 ÷ 4 = 1.5` · Mateo `4 ÷ 6 = ⅔` ⇒ rates differ ⇒ price between (1 box for 1 lemonade) ⇒ **deal left**

3 Where it stops

Pareto, 1906

- **Pareto efficient** = nobody can gain without someone else losing ⇒ test: the two **rates are equal** · curves just touch
- 5 + 5 each ⇒ rates `5 ÷ 5 = 1` ⇒ **25 points each** ⇒ trading stops
- **Contract curve** = all efficient shares ⇒ the **diagonal** (3 + 3, 5 + 5, 7 + 7…) · the lens cuts it in a short stretch ⇒ bargaining picks the point (Games 9)
- Practice · 8 + 4 ⇒ rates 2 and ½ ⇒ not efficient · 5 + 7 ⇒ both 35, yet `5 ÷ 7 ≠ 7 ÷ 5` ⇒ swap to 6 + 6 (36 each) · box 12 × 6 ⇒ contract curve `mangoes = 2 × coconuts`

4 One price

first welfare theorem

- Market price **1 box for 1 lemonade**, taken as given ⇒ Nadia's 8 + 2 worth `8 + 2 = 10` ⇒ gold line · best share: rate = price ⇒ **5 + 5**
- Mateo: 2 + 8 worth 10 ⇒ wants 5 boxes ⇒ `5 + 5 = 10` = what exists ⇒ the price **clears** the market, on the diagonal
- **First welfare theorem** (theorem = proved result · welfare = well-being) = price taken as given (nobody can move it) + nothing hidden + no harm to outsiders ⇒ market share is Pareto efficient ⇒ Adam Smith's invisible hand (Scottish, 1776: self-interest guided by prices serves others) made precise (Thinkers 1)
- Broken by hidden information (Lesson 8) · effects on outsiders (Micro 1, Lesson 10) · Kenneth **Arrow** (American) and Gérard **Debreu** (French), each alone, **1951** · together, prices that clear exist, **1954** · Nobel 1972, 1983
- Practice · 12 + 12 at 1 for 1 ⇒ each 6 + 6 · box 12 × 6 at **2 mangoes for 1 coconut** ⇒ each worth 12 ⇒ 6 + 3 (10 → 18 points) · at 1 for 1 they want `5½ + 3½ = 9` coconuts, only 6 ⇒ the scarce good costs more

5 Efficient ≠ fair

second welfare theorem

- Same price, start Nadia 9 + 5, Mateo 1 + 5 ⇒ worth 14 and 6 ⇒ **7 + 7** and **3 + 3** ⇒ efficient, `49` points against `9`
- **Second welfare theorem** = any efficient share can be the market's answer from the right start ⇒ the **start** decides who has more
- Move the start first (Policy 10) · or leave it: changing it has costs, the swaps are chosen ⇒ **no verdict**
- **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`

Watch out: efficient = no gain left on the table, **not** fair · both gaining (5 + 7, 35 each) ≠ efficient · the test is equal rates