Why are some countries rich?

Growth as real GDP per person, the rule of 70, why small rates make big gaps, productivity and its five ingredients, and growth on the PPF and AD/AS.

1 What is growth?

real GDP per person

- **Economic growth** = rise in **real GDP per person** over time · real GDP ÷ people
- GDP +3% **and** people +3% ⇒ no growth · prices ×2 ⇒ nominal GDP ×2, real GDP same ⇒ no growth
- Coralia: $2,000 (1926) → $20,000 (2026), 2026 prices · ×10 in 100 years ⇒ only **≈ 2.3% a year** (not 900% ÷ 100 = 9%)
- **Compound growth** = growth on top of past growth ⇒ each year's % is taken on a bigger number

2 Rule of 70

years to double

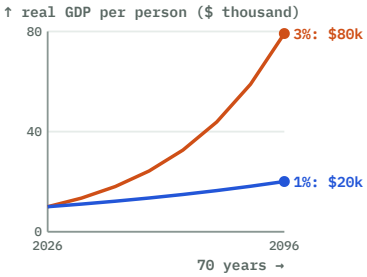
GROWTH A YEAR	YEARS TO DOUBLE
1%	70 ÷ 1 = **70**
2%	70 ÷ 2 = **35**
5%	70 ÷ 5 = **14**
7%	70 ÷ 7 = **10**

- `years to double ≈ 70 ÷ growth rate (%)` · a shortcut, "about"
- Island Tarn: $5,000 at 5% ⇒ 14 years per doubling ⇒ $10,000 ⇒ $20,000 = **2 doublings = 28 years** (exact 28.4)
- Coralia's century: 2.3% ⇒ ≈ 30 years per doubling ⇒ $2,000 → $4,000 → $8,000 → $16,000 → $20,000

3 Small rates, big gaps

70 years from $10,000

- **1%** ⇒ doubles once ⇒ **$20,000** · **3%** ⇒ doubles every ≈ 23 years, 3 times ⇒ ≈ **$80,000** ⇒ 2 points more = **4×** richer
- Rates 0.5 / 1 / 1.5 / 2 / 2.5 / 3% ⇒ $14k / $20k / $28k / $40k / $56k / $79k
- 2% ⇒ 35 years per doubling ⇒ ×4 = $40,000 · at 1%, $40,000 needs **140 years** (2 × 70)



4 Productivity

output per hour of work

- **Productivity** = output per hour · fisher: 5 kg an hour (1926) → 50 kg (today) = **×10**
- Output = hours × output per hour ⇒ hours same, +10% per hour ⇒ potential output +10% (M = million: $1,000M → **$1,100M**)
- Real pay buys what workers make ⇒ real pay rises for good only if output per hour rises · more money ⇒ only price tags (Lesson 9)
- Chain: schools ⇒ output per hour ↑ ⇒ potential ↑, **LRAS right** (long-run aggregate supply: vertical at potential output) ⇒ real GDP per person ↑ ⇒ standard of living ↑

5 Five ingredients

what makes an hour worth more

- **Physical capital** = boats, machines, roads · **human capital** = skills, schooling, health
- **Technology** = better ways to make things · **natural resources** = fish, land, beaches
- **Institutions** = property rights + rule of law ⇒ farmer plants palms (6 years) only if she keeps them
- Watch out: **not** ingredients ⇒ printing money (prices only) · $500 check for one year (aggregate demand, AD) · a sunny summer (one-year boom)

6 Charts and cases

PPF, AD/AS, catch-up

- **PPF** (production possibilities frontier): choose **Invest** (more capital goods) ⇒ frontier moves **out** in 10 years · cost = fewer consumer goods now (opportunity cost)
- **AD/AS**: growth ⇒ **LRAS (and SRAS, short-run aggregate supply) right**: $1,000M → $1,100M · AD +$100M too ⇒ real GDP $1,100M, price level stays **100**
- Storm destroys capital ⇒ LRAS, SRAS **left** $80M ⇒ AD crosses at **$960M, price level 110** (less output, higher prices)
- **Catch-up growth**: South Korea ≈ 7% a year 1960-1990 ⇒ doubling every 10 years ⇒ ≈ 8× by the rule (data ≈ 7×) · Ghana no growth
- Limits: GDP misses lost mangroves (coastal forests) · an average hides who gains

