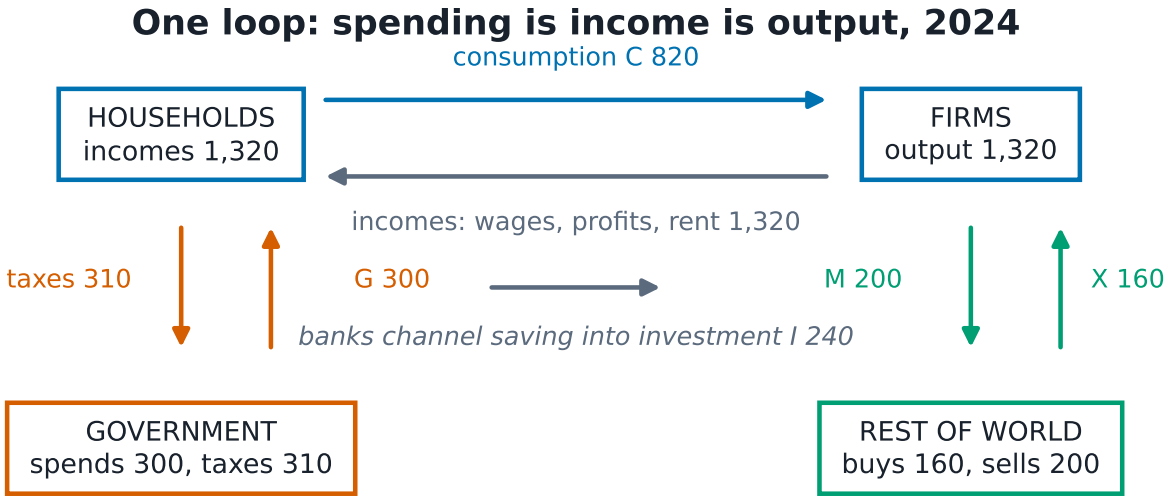
Exercise walk-through

# 4.2
# Growth and productivity

University Business

# National accounts: the loop closes at 1,320

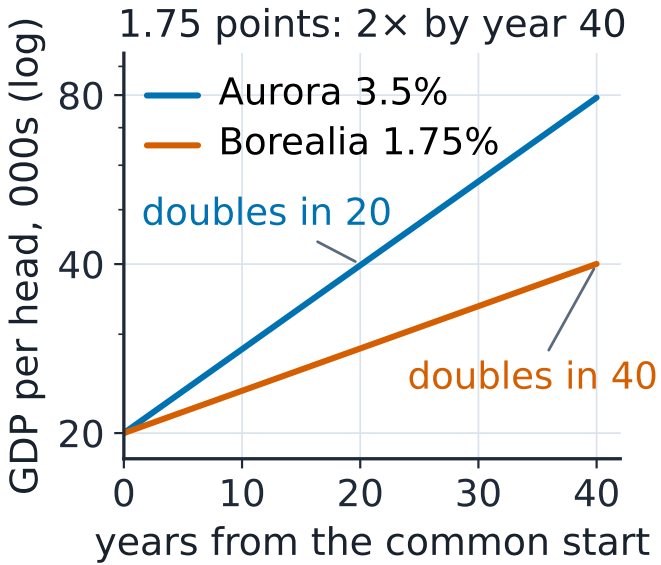


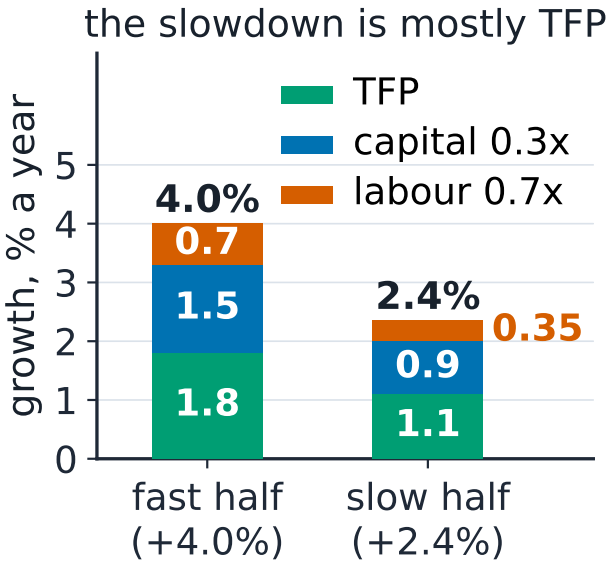

**Y = 820 + 240 + 300 + 160 - 200 = 1,320 (both sides close)**

C + I + G + X - M = 1,320, and income closes at the same 1,320.

# Growth: small rates, compounded

## Small growth gaps compound, and where they come from

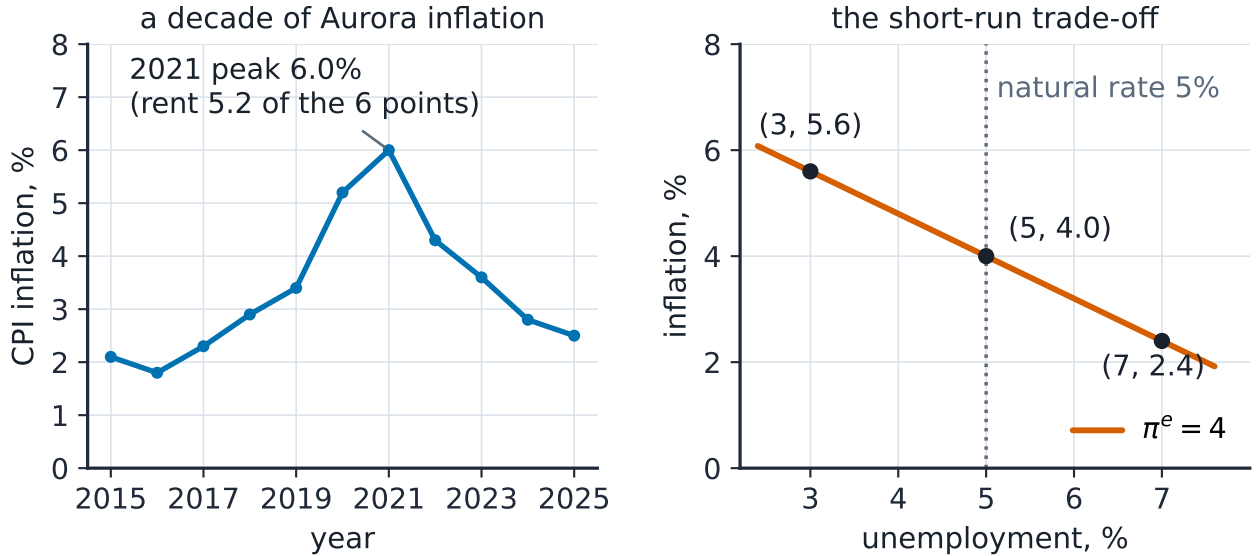



On a log scale, 3.5% growth doubles in 20 years, 1.75% in 40.

# Inflation: audit the index

**Prices and jobs: an index you can audit, a trade-off that expires**




CPI 106.0 means 6% **inflation**; the trade-off holds until expectations move.

# Exercises 2.1·2.2

**2.1** Output grows 5.5% with capital +7.0% and labour +1.5% ($\alpha = 0.3$). Compute TFP growth. [2]

**2.2** At 2.5% a year, roughly how long until income doubles? And at 7%? [2]

# Exercises 2.1·2.2

**2.1** Output grows 5.5% with capital +7.0% and labour +1.5% ($\alpha = 0.3$). Compute TFP growth. [2]

**2.1**

- $\Delta A/A = 5.5 - 0.3(7.0) - 0.7(1.5) = 5.5 - 2.1 - 1.05$.
- $= \mathbf{2.35}\%$.

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**2.2** At 2.5% a year, roughly how long until income doubles? And at 7%? [2]

**2.2**

- $70/2.5 = \mathbf{28}$ years.
- $70/7 = \mathbf{10}$ years.

# Exercises 2.3·2.4

**2.3** Income of 10,000 compounds at 7% for 10 years. Compute the ending value to the nearest hundred (use $1.07^{10} \approx 1.97$). [2]

**2.4** A country's capital stock grows 6%, labour 2%, TFP 0.4%. Compute output growth, then say which contributor is largest. [3]

# Exercises 2.3·2.4

**2.3** Income of 10,000 compounds at 7% for 10 years. Compute the ending value to the nearest hundred (use $1.07^{10} \approx 1.97$). [2]

**2.3**

- $10{,}000 \times 1.97 = \mathbf{19{,}700}$.
- Nearly a doubling in ten years – the rule of 70 in action.

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**2.4** A country's capital stock grows 6%, labour 2%, TFP 0.4%. Compute output growth, then say which contributor is largest. [3]

**2.4**

- $\Delta Y/Y = 0.4 + 0.3(6) + 0.7(2) = 0.4 + 1.8 + 1.4$.
- $= \mathbf{3.6}\%$.
- Largest contributor: capital deepening (1.8 points), then labour (1.4) – not TFP.

# Exercises 2.5·2.6

**2.5** For each of – (a) firms install robots, (b) courts speed up contract enforcement, (c) participation of older workers rises – say PROXIMATE (and which term) or FUNDAMENTAL. [3]

**2.6** A finance minister says ”our 3% growth is entirely a technology story”. Write the one-line check you would run before believing it. [2]

# Exercises 2.5·2.6

**2.5** For each of – (a) firms install robots, (b) courts speed up contract enforcement, (c) participation of older workers rises – say PROXIMATE (and which term) or FUNDAMENTAL. [3]

**2.5**

- (a) Proximate – capital (and its efficiency lands in TFP).
- (b) Fundamental – institutions.
- (c) Proximate – labour input.

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**2.6** A finance minister says ”our 3% growth is entirely a technology story”. Write the one-line check you would run before believing it. [2]

**2.6**

- Run growth accounting: attribute the 3% to $0.3\Delta K/K + 0.7\Delta L/L$ and inspect the residual.
- Only if inputs explain little is it a technology story; the residual also carries measurement error, so say “TFP”, not “technology”.