Macroeconomics

7. The Phillips Curve and Aggregate Supply

Bachelor's Degrees in Management and in Finance and Accounting

Luís Clemente-Casinhas

https://luisclementecasinhas.org/

ISCTE-IUL - Department of Economics

March 23–27, 2026

The expectations-augmented Phillips curve

Short-run and long-run definitions

- **Short-run Phillips curve**: a negative relationship between the unemployment gap and the inflation rate (taking into account agents' expectations and the natural rate of unemployment) – there is a *trade-off* between the inflation rate and unemployment.

$$\pi = \pi^e - \omega(U - U_n)$$

- **Long-run Phillips curve**: there is no *trade-off* between the inflation rate and the unemployment rate:
  - In the long run, prices and wages adjust (they are flexible), i.e., $\pi = \pi^e$.
  - Therefore, unemployment is equal to its natural rate and is independent of the inflation rate.

$$U = U_n$$

The Phillips curve with supply shocks

- Supply-side shocks affect inflation through production costs, so it is necessary to incorporate these phenomena (ρ) into the expectations-augmented Phillips curve.

$$\pi = \pi^e - \omega(U - U_n) + \rho$$

  - If $\rho = 0$, we say there is no price shock;
  - If $\rho > 0$, we say there is a positive price shock, that is, $\uparrow \pi$;
  - If $\rho < 0$, we say there is a negative price shock, that is, $\downarrow \pi$.

Adaptive expectations (*backward-looking*)

- To simplify our analysis, we assume that economic agents form their expectations on the basis of the past:

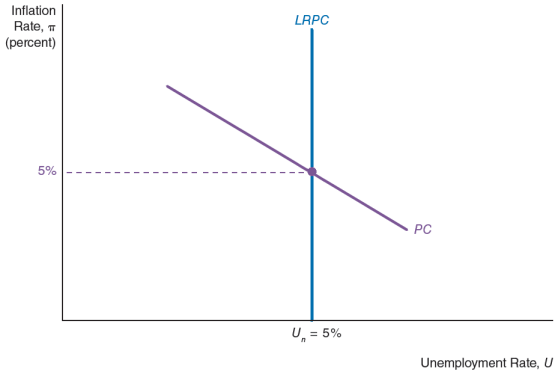
$$\pi^e = \pi_{-1}$$

- The Phillips curve under adaptive expectations is therefore given by:

$$\pi = \pi_{-1} - \omega(U - U_n) + \rho$$

Short-run and long-run Phillips curves

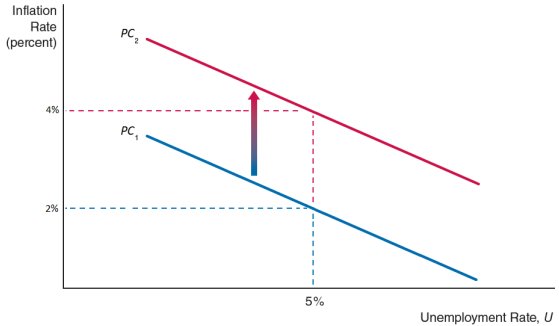
Graphical representation



Short-run and long-run Phillips curves

Shifts of the short-run Phillips curve

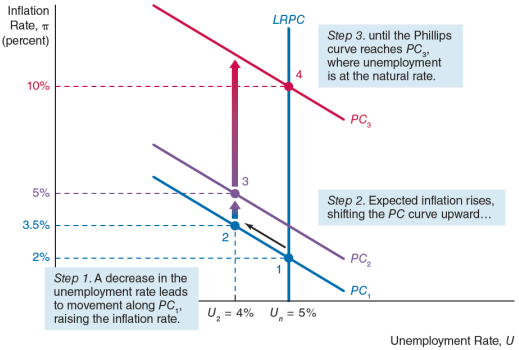
- Graphical representation of an **increase** in expected inflation (π^e) or a **positive** price shock ($\rho > 0$) in the short-run Phillips curve:



Short-run and long-run Phillips curves

Movements along the short-run Phillips curve

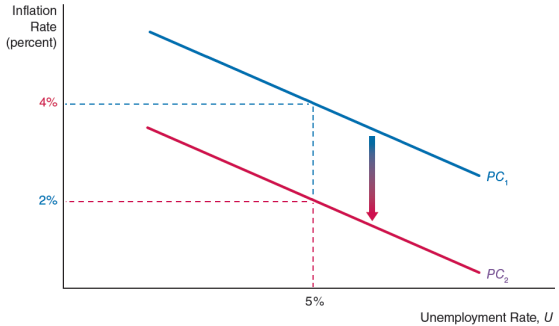
- Graphical representation of a **decrease** in the unemployment rate (U) along the short-run Phillips curve:



Short-run and long-run Phillips curves

Shifts of the short-run Phillips curve

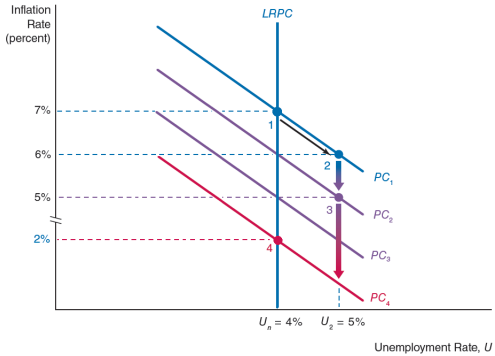
- Graphical representation of a **decrease** in expected inflation (π^e) or a **negative** price shock ($\rho < 0$) in the short-run Phillips curve:



Short-run and long-run Phillips curves

Movements along the short-run Phillips curve

- Graphical representation of an **increase** in the unemployment rate (U) along the short-run Phillips curve:



Okun's Law

Definition

- **Okun's Law**: a negative relationship between the unemployment gap and the output gap.

$$U - U_n = -\theta(Y - Y^p)$$

- Unemployment is a countercyclical variable (assuming $0 < \theta < 1$):
  - If $Y > Y^p \Rightarrow (U - U_n) < 0 \Leftrightarrow U < U_n$
  - If $Y < Y^p \Rightarrow (U - U_n) > 0 \Leftrightarrow U > U_n$

The Aggregate Supply Curve (AS)

Short-run and long-run definitions

- **Short-run AS curve**: a positive relationship between the output gap and inflation:

$$\pi = \pi^e + \gamma(Y - Y^p) + \rho$$

  - Under adaptive expectations, $\pi^e = \pi_{-1}$.

- **Long-run AS curve**: there is no *trade-off* between inflation and output.
  - In the long run, prices and wages adjust (they are flexible), that is, $\pi = \pi^e = \pi_{-1}$.
  - Therefore, output is at its potential level and is independent of the inflation rate.

$$Y = Y^p$$

  - In the long run, output depends only on the productive factors existing in the economy: $Y = AF(K, L)$.

The Aggregate Supply Curve (AS)

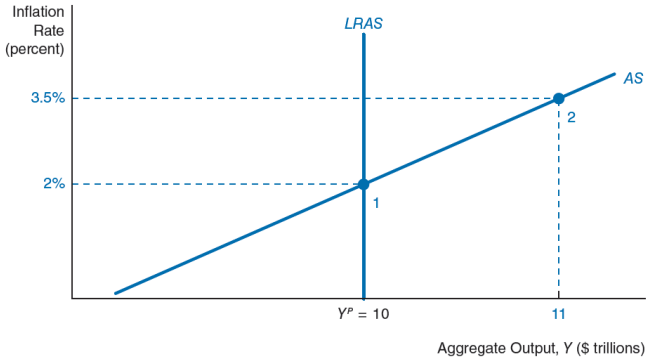
Derivation (of the short-run curve)

- We substitute Okun's Law into the Phillips curve with adaptive expectations:

$$\pi = \pi_{-1} - \omega(U - U_n) + \rho \Rightarrow$$
$$\Rightarrow \pi = \pi_{-1} + \omega\theta(Y - Y^p) + \rho \Leftrightarrow$$
$$\Leftrightarrow \pi = \pi_{-1} + \gamma(Y - Y^p) + \rho$$

Short-run and long-run Aggregate Supply curves

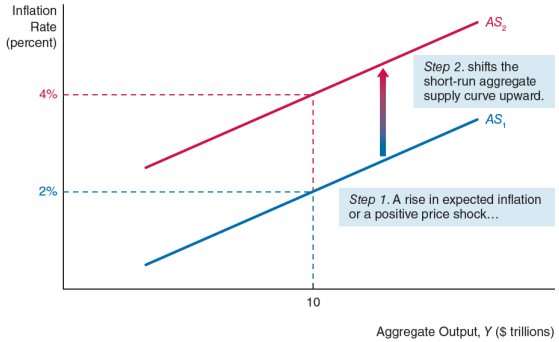
Graphical representation



Short-run and long-run Aggregate Supply curves

Shifts of the short-run Aggregate Supply curve

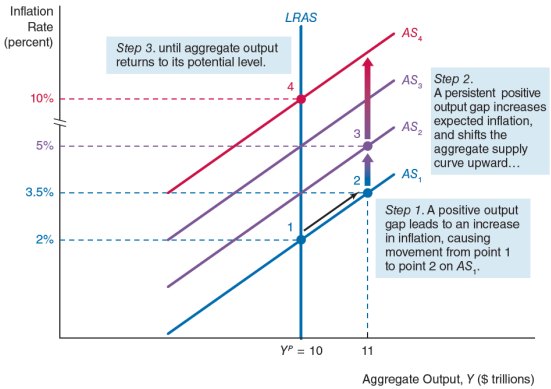
- Graphical representation of an **increase** in expected inflation (π^e) or a **positive** price shock ($\rho > 0$) in the short-run AS curve:



Short-run and long-run Aggregate Supply curves

Movements along the short-run Aggregate Supply curve

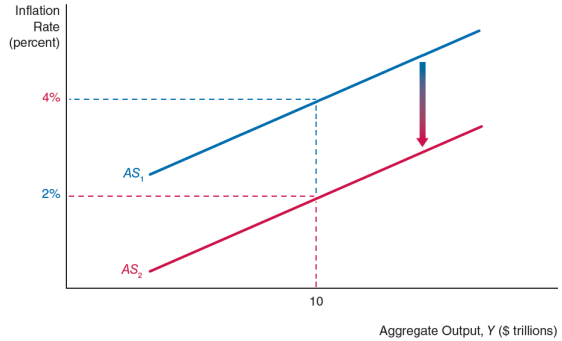
- Graphical representation of an **increase** in output such that $Y > Y^p$ along the short-run AS curve:



Short-run and long-run Aggregate Supply curves

Shifts of the short-run Aggregate Supply curve

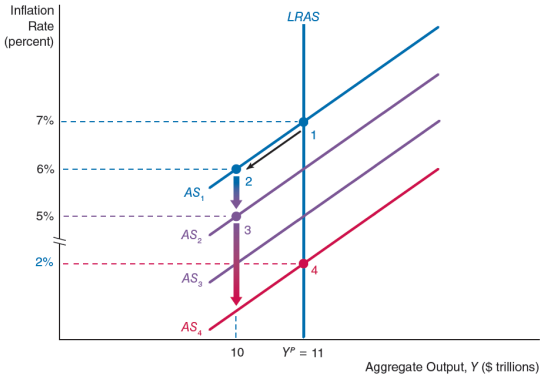
- Graphical representation of a **decrease** in expected inflation (π^e) or a **negative** price shock ($\rho < 0$) in the short-run AS curve:



Short-run and long-run Aggregate Supply curves

Movements along the short-run Aggregate Supply curve

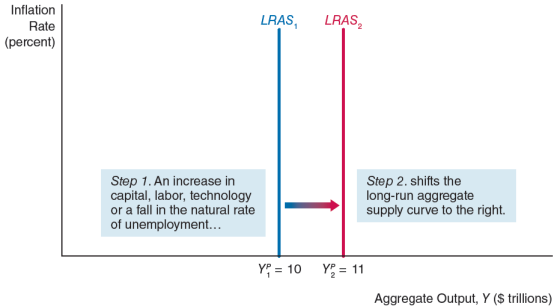
- Graphical representation of a **decrease** in output such that $Y < Y^p$ along the short-run AS curve:



Short-run and long-run Aggregate Supply curves

Shifts of the long-run Aggregate Supply curve

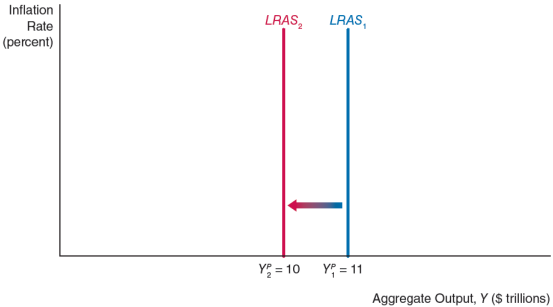
- Graphical representation of an **increase** in labour (L), capital (K), and technology (A) or a **decrease** in the natural rate of unemployment (U_n) in the long-run AS curve:



Short-run and long-run Aggregate Supply curves

Shifts of the long-run Aggregate Supply curve

- Graphical representation of a **decrease** in labour (L), capital (K), and technology (A) or an **increase** in the natural rate of unemployment (U_n) in the long-run AS curve:



References

- Mishkin, F. S. (2014), *Macroeconomics: Policy and Practice*, 2nd Edition, Pearson, Addison-Wesley, New York.