The short-run aggregate supply curve

In the long run, workers and firms have correct expectations about prices: \( P = p_e \) (so that the price level drops out of the aggregate supply relation).

But in the short run, expectations can be wrong: \( P \neq p_e \).
The wage-setting relation: \[ W = P^e (1 - au + \tau) \]

The price-setting relation: \[ W = \frac{P}{1+\beta} \]

\[ \Rightarrow \quad P = (1+\beta) P^e (1 - au + \tau) \] (the short-run AS curve)

- \( \beta, a, \tau \) are constants (they do not change over time).
- \( P, P^e, \) and \( u \) are macroeconomic variables which do vary over time.
- The AD-AS framework is a theory about how these key macroeconomic variables move over time.
- \( P \) and \( u \) move relatively quickly, but \( P^e \) is assumed to respond to changes in \( P \) with a lag.
Let's hold $p^e$ fixed for now, and graph the SRAS curve. Remember that $u = 1 - \frac{y}{N}$. Insert this expression into the equation above to get:

$$P = (1+\beta) p^e (1 - au + \varepsilon)$$

$$= (1+\beta) p^e (1 - a(1 - \frac{y}{N}) + \varepsilon)$$

$$= (1+\beta) p^e (1 - a + a \frac{y}{N} + \varepsilon)$$

$P$ and $Y$ are the variables — everything else is a constant for now (later, we will allow $p^e$ to be a variable too).
Suppose the economy is at point A and P increases (holding $p^e$ fixed). Then the nominal wage $W$ must rise to keep the real wage constant (price-setting relation). But if the nominal wage rises, then the unemployment rate $u$ must fall for this nominal wage to be an outcome of the bargaining process (and $u \downarrow \Rightarrow Y \uparrow$).
What are the short-run effects of an increase in aggregate demand?

Initially, the economy is at point A: \( P = P_e \) and \( Y = Y_n \). After the increase in aggregate demand, the economy moves to point B: \( P' > P_e \) and \( Y' > Y_n \). Both output and the price level increase (remember that \( P_e \) is fixed for now). Because output rises, the unemployment rate \( u \) falls.
Intuition for the short-run effects of an increase in aggregate demand

- Y increases, leading to a fall in u.
- The fall in u increases workers’ bargaining power, so the nominal wage rises (P* held fixed for now).
- Firms set the price of their output equal to a constant (proportional) markup over the marginal cost (W) of producing an extra unit of output. Hence, P increases. In fact, because the real wage $\frac{W}{P} = \frac{1}{1+\beta}$, it does not change when aggregate demand increases: P increases by the same proportion that W increases.
What are the short-run effects of a shock to aggregate supply?

Suppose the price of a barrel of oil rises.

This increase can be captured in our simple model of aggregate supply by an increase in the markup $\beta$.

Firms must increase the markup to cover the additional costs of producing (over and beyond the labor costs).
How does an increase in \( \beta \) (the markup) affect the short-run aggregate supply curve?

The equation for the aggregate supply curve is:

\[
P = (1 + \beta) P^e (1 - au + \tau)
\]

Holding \( P \) fixed, if \( \beta \) increases, then \( u \) must increase too in order for this equation to hold. Because \( u \) increases, \( Y \) falls.

The aggregate supply curve, therefore, shifts to the left: at every price, there is a decrease in aggregate supply when the markup (\( \beta \)) increases.
The short-run effects of a decrease in aggregate supply (caused by an increase in $\beta$)

The economy starts at point $A$, where $p = p_e$ and $y = y_n$. After the shift in the SRAS curve, the economy moves to point $B$, where $p' > p_e$ and $y' < y_n$; prices rise, output falls, and unemployment increases.
Intuition for the short-run effects of a decrease in aggregate supply (caused by an increase in $\beta$)

- $Y$ decreases, leading to an increase in $u$.
- The increase in $u$ decreases workers' bargaining power, so the nominal wage falls (P held fixed for now).
- Firms set $P$ to be a constant proportional markup over the marginal cost ($W$) of producing one additional unit of output: $P = (1+\beta)W$.

As argued above, $W$ falls as a result of the increase in $\beta$. But the direction of the change in $P$ is unclear from the price-setting relation: $W$ goes down, but $(1+\beta)$ goes up, so the change in $(1+\beta)W$ is not clear. However, from the AD–AS diagram, we know that $P$ goes up. (We also know that the real wage $W/P = 1/(1+\beta)$ goes down because $\beta$ goes up.)
• An increase in the markup ($\beta$) also has long-run effects on aggregate supply: it shifts the LRAS curve to the left.

• Remember from Lecture Slides #5 that we derived an equation for the natural rate of unemployment:

$$u_n = \frac{1}{a} \left( \frac{\beta}{1+\beta} + \varepsilon \right).$$

So if $\beta$ increases, $\frac{\beta}{1+\beta}$ increases too, and $u_n$ increases. This increase in $u_n$ in turn decreases $Y_n = (1-u_n)N$. So the LRAS curve shifts to the left.
To understand the long-run effects of an increase in $\beta$ on the natural rate of unemployment, examine the wage- and price-setting relations under the assumption that $p = p^e$.

Wage-setting relation: \[ \frac{w}{p} = 1 - au_n + z \]

Price-setting relation: \[ \frac{w}{p} = \frac{1}{1+\beta} \]

From the second equation, an increase in $\beta$ reduces the real wage $\frac{w}{p}$. From the first equation, for this lower real wage to be an outcome of the bargaining process for wages, the natural rate of unemployment $u_n$ must increase (so that workers’ bargaining power is reduced). The increase in $u_n$ in turn decreases $Y_n$. 