Chapter 13: Aggregate Supply

Instructor: Dmytro Hryshko

Plan

1. Develop theories for position and slope of the AS curve in the short run.
2. The short-run tradeoff between inflation and unemployment: reduction in inflation is achieved by an increase in unemployment.
3. Why the tradeoff occurs in the short run and not in the long run?

Models of Short-Run Aggregate Supply

Common to all models:

- Some friction/market imperfection causes output to deviate from the natural level.
- SRAS curve can be expressed as:

$$Y = \overline{Y} + \alpha \times (P - P^e),$$

where $\overline{Y}$ is the 'natural' level of output;

P^e is the expected level of prices, and $\alpha > 0$.

The Sticky Wage Model

Imperfection: sluggish adjustment of nominal wages. Thus, nominal wages are sticky in the short run.

- Assume nominal wages are set *before* prices are known.
- Workers and employers target some real wage (can be above the equilibrium wage).

Then,

$$W = \omega \times P^e,$$

where W is the nominal wage, ω is the target real wage, and P^e is the expected level of prices. When the nominal wages are struck, prices realize, and

$$W/P = \omega \times (P^e/P).$$

The Sticky Wage Model—Contd.

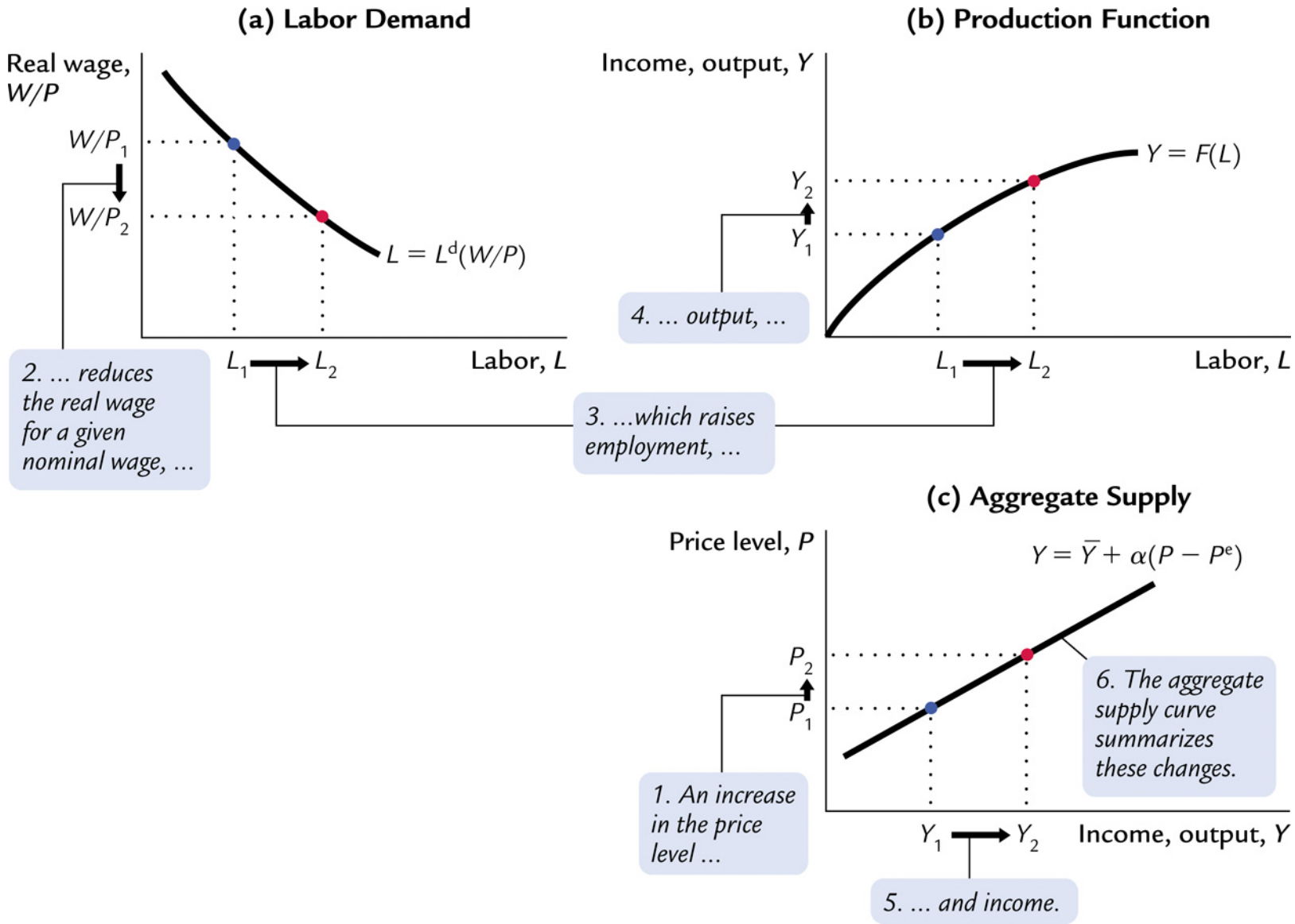
$$W/P = \omega \times (P^e/P)$$

If $P > P^e$, the real wage falls below the target real wage, and vice versa.

Assume that the level of employment is determined by the demand for labor by firms at a given level of real wages: $L = L^s = L^d(W/P)$—the lower the real wage, the more workers are hired.

When $W/P < \omega$, i.e., when $P > P^e$, more worker are hired, and since output is an increasing function of labor, Y will increase.

Hence, we obtain an upward sloping AS for a given P^e.


(a) Labor Demand
Real wage, W/P
W/P1
W/P2
L = Ld(W/P)
L1
L2
Labor, L
2. ... reduces the real wage for a given nominal wage, ...
(b) Production Function
Income, output, Y
Y = F(L)
Y2
Y1
4. ... output, ...
L1
L2
Labor, L
3. ...which raises employment, ...
(c) Aggregate Supply
Price level, P
Y = Ȳ + α(P − Pe)
P2
P1
6. The aggregate supply curve summarizes these changes.
1. An increase in the price level ...
Y1
Y2
Income, output, Y
5. ... and income.

The Imperfect Information Model

- In this model, markets clear and, thus, wages and prices are fully flexible. Imperfection: temporary misperceptions about prices.
- Producers monitor closely prices for their products, not the other prices in the economy.
- Thus, they can misjudge own price changes for the relative price changes and adjust their production.

The model implies the AS curve: $Y - \overline{Y} = \alpha \times (P - P^e)$.

The Sticky Price Model

Imperfection: firms do not instantaneously adjust prices they charge in response to changes in demand.

- Assume an economy consists of flexible price setters and sticky price setters.
- Flexible price setters' rule: $p^f = P + a \times (Y - \overline{Y})$, where p is the desired price of an individual producer; P is the aggregate price level, and Y is the real income in the economy.
- Sticky price setters' rule: $p^s = P^e$.
- The fraction of sticky price setters is s in the population; and $(1 - s)$ is the fraction of flexible producers.

The Sticky Price Model—Contd.

The overall price level is

$$P = (1 - s) \times p^f + s \times p^s.$$

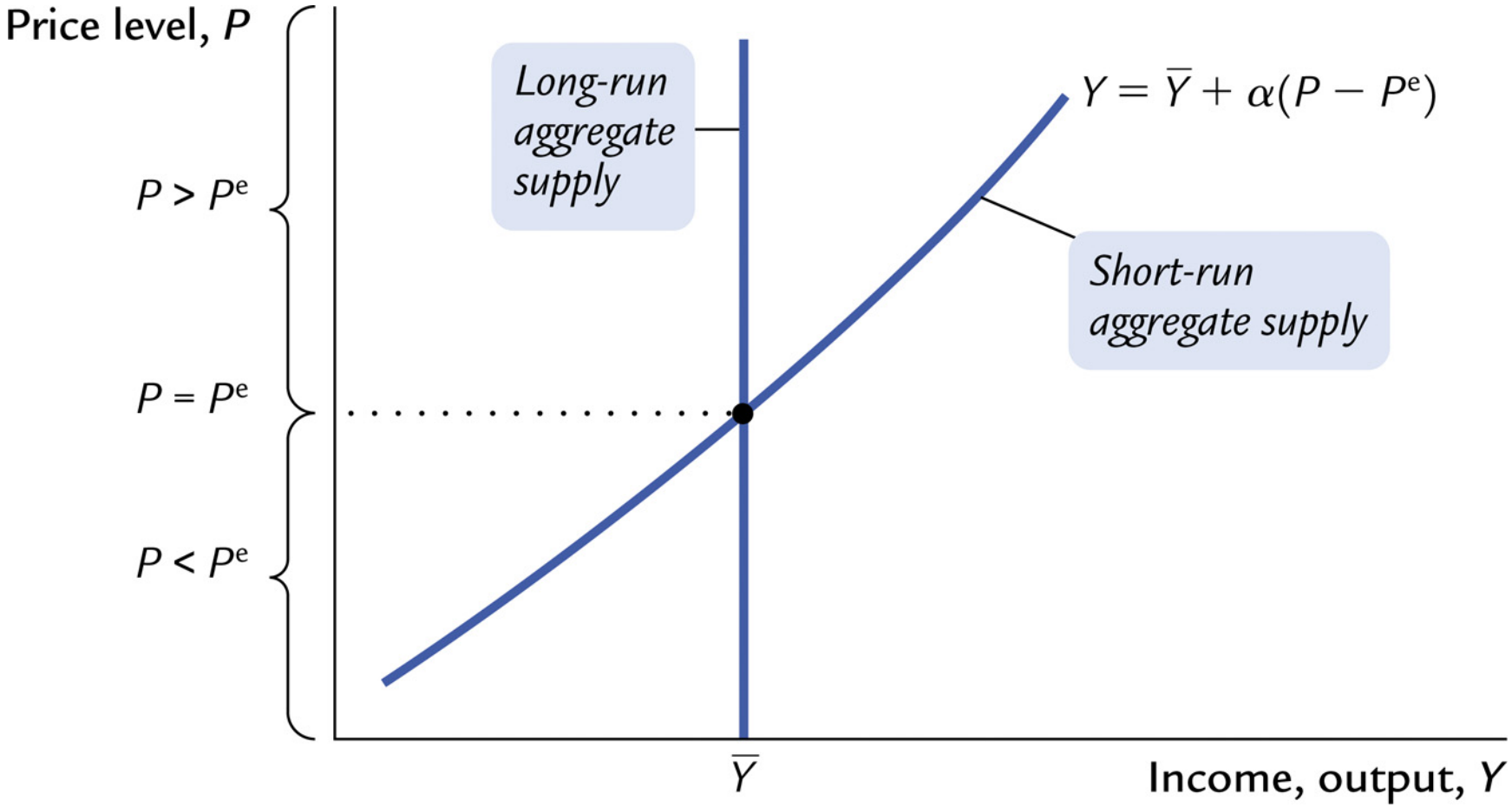
It can be further expressed as

$$P = (1 - s) \times \left(P + a(Y - \overline{Y})\right) + s \times P^e.$$

Rearranging, we obtain:

$$P = P^e + \frac{a(1 - s)}{s} \times (Y - \overline{Y}), or$$
$$Y = \overline{Y} + \alpha \times (P - P^e),$$

where $\alpha = \frac{s}{(1-s)\times a}$.


Price level, P
P > Pe
P = Pe
P < Pe
Long-run aggregate supply
Y = Ȳ + α(P − Pe)
Short-run aggregate supply
Ȳ
Income, output, Y

Inflation, Unemployment, and the Phillips Curve

The Phillips curve reflects the tradeoff between unemployment and inflation: as policymakers move the economy along the SRAS, unemployment and inflation move in opposite directions.

$$P = P^e + (1/\alpha) \times (Y - \overline{Y}) + \nu \qquad \text{(SRAS)}$$

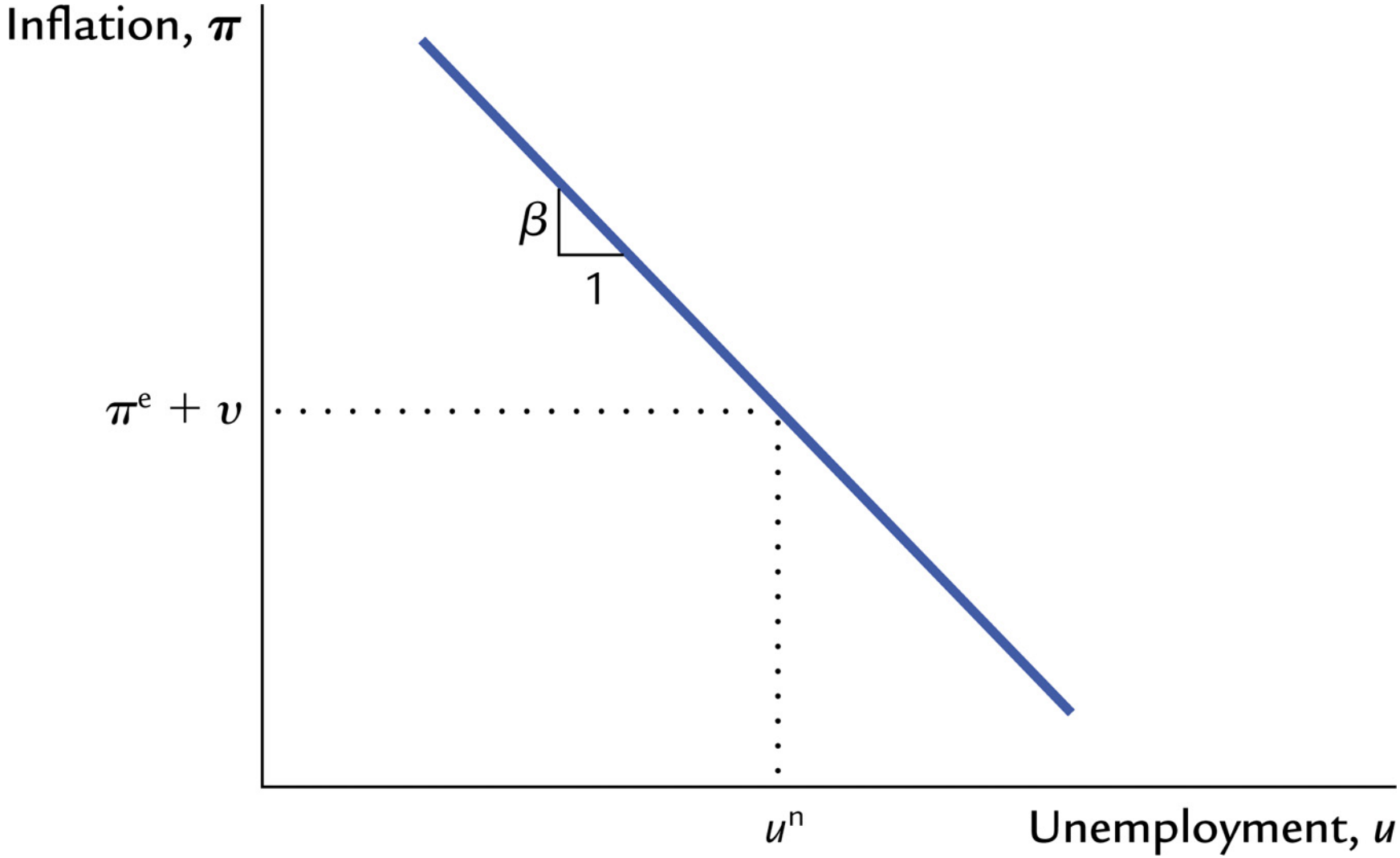
$$P - P_{-1} = (P^e - P_{-1}) + (1/\alpha) \times (Y - \overline{Y}) + \nu$$

$$\pi = \pi^e + (1/\alpha) \times (Y - \overline{Y}) + \nu \qquad \text{(log-rule)}$$

$$(1/\alpha) \times (Y - \overline{Y}) = -\beta \times (u - u^n) \qquad \text{(Okun's law)}$$

$$\pi = \pi^e - \beta \times (u - u^n) + \nu,$$

where ν is the supply shock, and u^n is the *natural rate* of unemployment.


Inflation, π
β
1
$\pi^e + v$
u^n
Unemployment, u

Adaptive Expectations and Inflation Inertia

Phillips Curve:

$$\pi = \pi^e - \beta \times (u - u^n) + \nu.$$

What determines π^e?

Adaptive expectations: $\pi^e = \pi_{-1}$.

Phillips curve under adaptive expectations:
$\pi = \pi_{-1} - \beta \times (u - u^n) + \nu.$

For this case, u^n is the non-accelerating inflation rate of unemployment ($NAIRU$). In the absence of ν, and deviations of u from u^n, inflation exhibits inertia.

Causes of Rising and Falling Inflation

$$\pi = \pi^e - \beta \times (u - u^n) + \nu.$$

$-\beta \times (u - u^n)$—demand-pull inflation (due to cyclical unemployment).

ν—cost-push inflation (due to supply shocks such as changes in oil prices).

The Short Run Tradeoff Between Inflation and Unemployment

Important: the Phillips curve is drawn for a given π^e, and represents the short-run policymaker's menu of inflation/unemployment.

If π^e rises, the Phillips curve shifts upward and the menu is less attractive: for a given unemployment rate, inflation rate is higher.

In the long run, inflation adapts to the inflation rate chosen by the policymaker, and $u = u^n$.

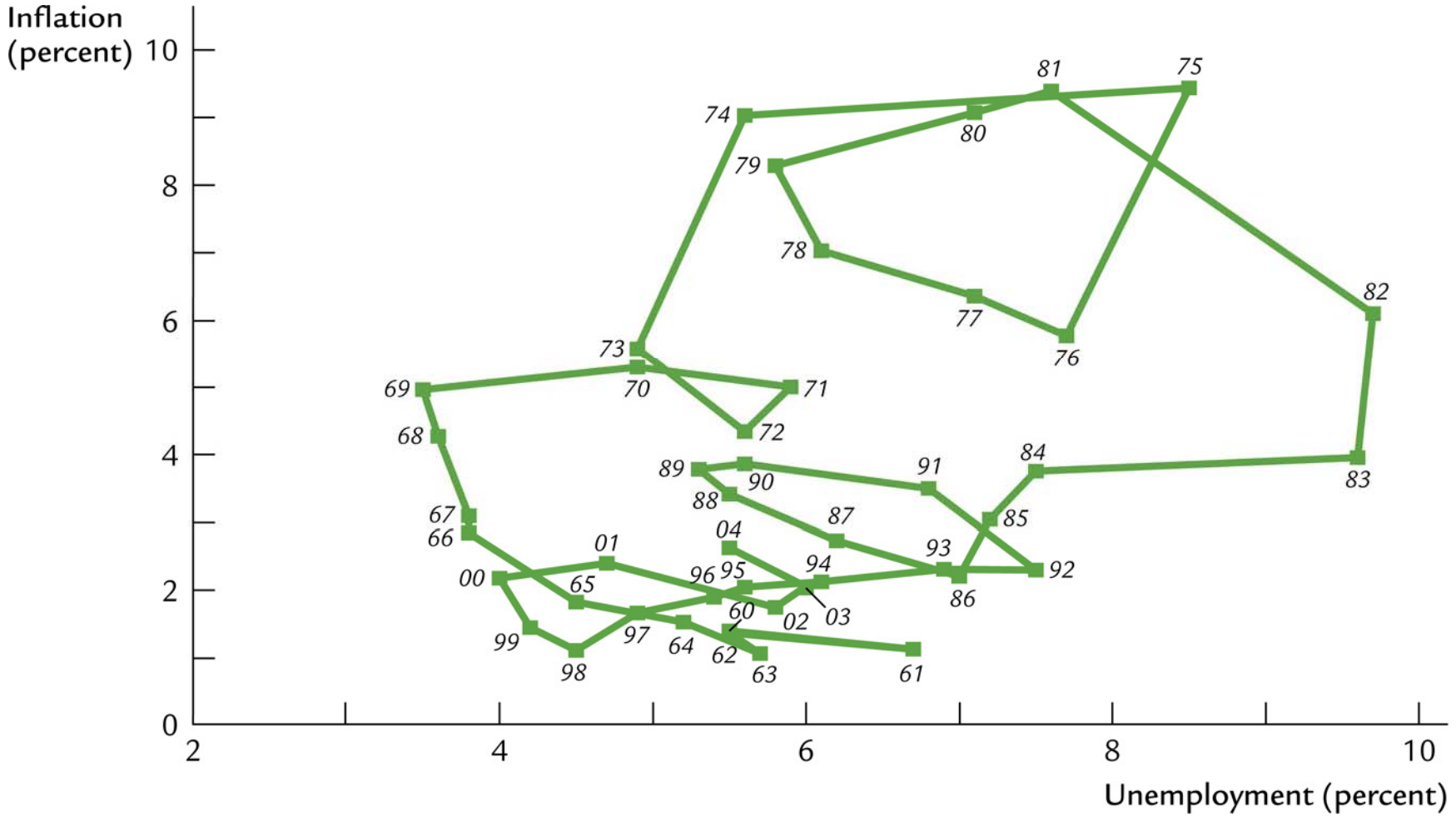
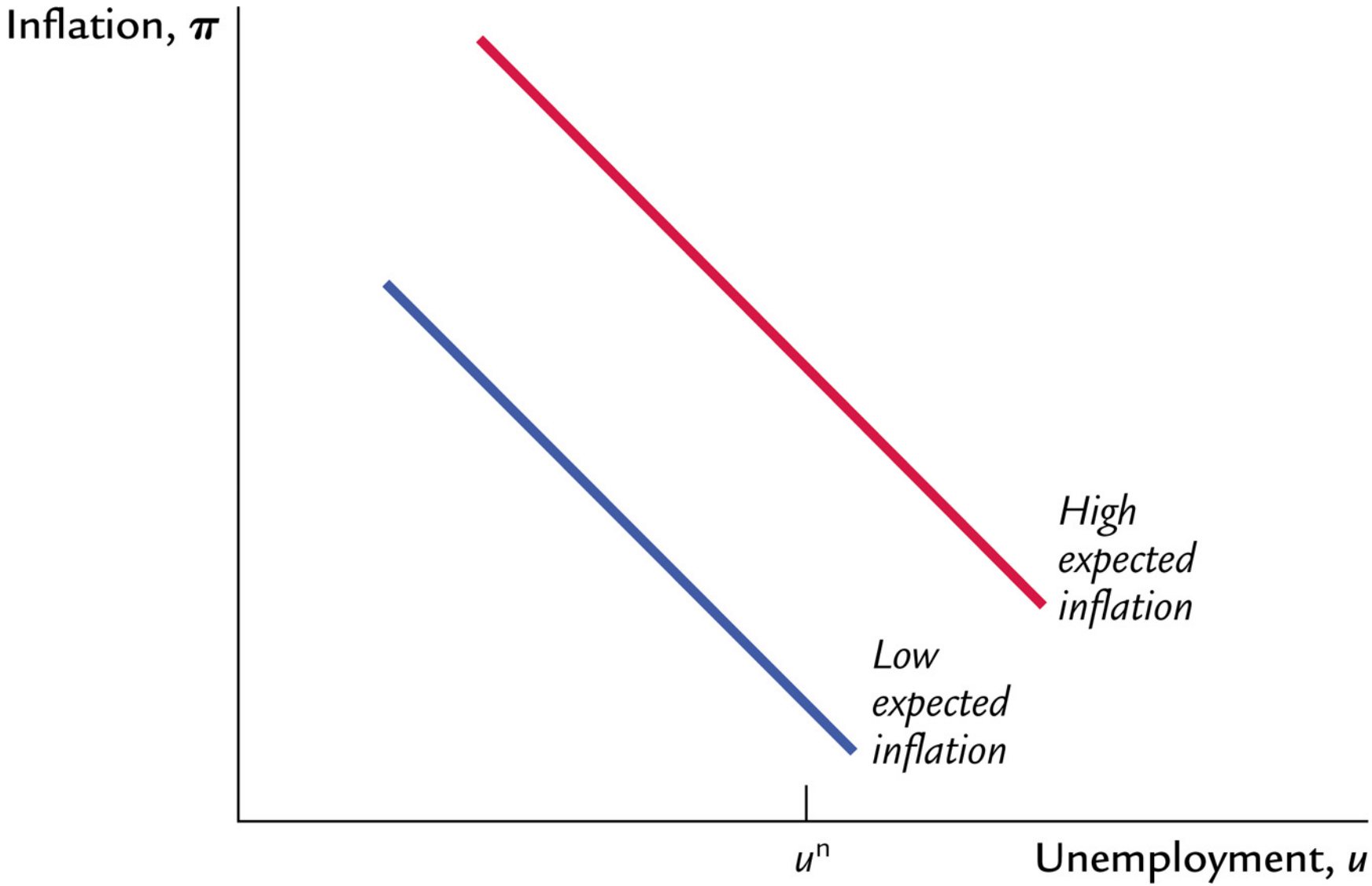


Figure 13.5 Inflation and Unemployment in the United States Since 1960

Mankiw: Macroeconomics, Sixth Edition


Inflation, π
High expected inflation
Low expected inflation
u^n
Unemployment, u

Disinflation and the Sacrifice Ratio

To reduce inflation have to face an increase in u. How it translates into the fall of output?

The sacrifice ratio—the percentage fall in a year's GDP when inflation falls by 1%.

$$\log Y - \log \overline{Y} = \gamma(\pi - \pi^e).$$

γ measures the sacrifice ratio.

Thus, if the sacrifice ratio γ equals 5, the disinflation of 4% leads to a sacrifice of 20% of a year's GDP. If spread over two years, it requires a 10% sacrifice of a year's GDP.

Rational Expectations and the Possibility of Painless Disinflation

If firms and households form rational expectations (RE), i.e., adjust their expectations to fiscal and monetary policies, inflation will exhibit less inertia.

- RE: short run tradeoff is not an accurate description of the policymaker's menu.
- RE: at the extreme, disinflation may be costless if done correctly, i.e., if policies are announced beforehand, and if they are credible.

In reality, disinflation is not costless, yet the sacrifice ratios do depend on credibility of policies, and whether disinflation is gradual or "cold-turkey."

TABLE 13-1

Unemployment During the Volcker Disinflation

Year	Unemployment Rate u	Natural Rate u^n	Cyclical Unemployment $u - u^n$
1982	9.5%	6.0%	3.5%
1983	9.5	6.0	3.5
1984	7.4	6.0	1.4
1985	7.1	6.0	1.1
		Total	9.5%

The sacrifice ratio=Output lost/total disinflation.

Total output lost can be calculated using the Okun's law: $9.5 \times 2 = 19\%$. Total disinflation?

In 1981, $\pi = 9.7\%$, in 1985, $\pi = 3\%$. Thus, the total disinflation is 6.7%, and the sacrifice ratio is $19/6.7 \approx 2.8$.

2.8 percentage points of GDP were lost for each 1 percentage point reduction in inflation.