The short-run trade-off between inflation and unemployment

(Chapter 36 in Mankiw and Taylor)
Short versus long run

- We have considered the long-run determinants of:
  - Inflation
    - Depends only on growth in money supply
  - Unemployment
    - The natural rate depends on minimum wages, unions, efficiency wages and job search

- In the long run, inflation and unemployment are unrelated

- But they are related in the short run... recall AD/AD model
  - If BoE expands Money Supply then AD shifts to the right up a given SRAS curve \(\rightarrow\) lower unemployment (higher GDP growth) but higher inflation in the short run
  - In the long run, there’s only inflation as expectations adjust
• Let’s consider this short-run trade-off in more detail
Origins of the Phillips Curve

• **Phillips curve**
  – Shows the short-run trade-off between inflation and unemployment

• **1958, A. W. Phillips**
  – “The relationship between unemployment and the rate of change of money wages in the United Kingdom, 1861–1957”
  – Negative correlation between the rate of unemployment and the rate of (price and/or wage) inflation
Origins of the Phillips Curve

• 1960, Paul Samuelson & Robert Solow
  – “Analytics of anti-inflation policy”
    • Negative correlation between the rate of unemployment and the rate of inflation

• Policymakers: Monetary and fiscal policy
  – To influence aggregate demand
    • Choose any point on Phillips curve
    • Trade-off: High unemployment and low inflation or low unemployment and high inflation
    • Menu for policymakers
The Phillips curve illustrates a negative association between the inflation rate and the unemployment rate. At point A, inflation is low and unemployment is high. At point B, inflation is high and unemployment is low.
AD, AS, and the Phillips Curve

- Phillips curve
  - Combinations of inflation and unemployment that arise in the short run
  - Can rationalise the Phillips Curve using the AS-AD model
  - It shows the combinations of inflation and unemployment as shifts in the AD curve move the economy along the short-run AS curve
AD, AS, and the Phillips Curve

• Higher aggregate-demand
  – Higher output & Higher price level
  – Lower unemployment & Higher inflation

• Lower aggregate-demand
  – Lower output & Lower price level
  – Higher unemployment & Lower inflation
This figure assumes a price level of 100 for the year 2020 and charts possible outcomes for the year 2021. Panel (a) shows the model of aggregate demand and aggregate supply. If aggregate demand is low, the economy is at point A; output is low (15,000), and the price level is low (102). If aggregate demand is high, the economy is at point B; output is high (16,000), and the price level is high (106). Panel (b) shows the implications for the Phillips curve. Point A, which arises when aggregate demand is low, has high unemployment (7%) and low inflation (2%). Point B, which arises when aggregate demand is high, has low unemployment (4%) and high inflation (6%).
The Long-Run Phillips Curve

• The long-run Phillips curve
  – Is vertical (just like the LRAS curve)
  – Unemployment rate tends toward its normal level
    • Natural rate of unemployment
  – Unemployment does not depend on money growth and inflation in the long run
  – This is consistent with *classical* theory and *classical dichotomy*: monetary growth does not have real effects (in the long-run)
The Long-Run Phillips Curve

• If the BoE increases the money supply slowly
  – Inflation rate is low
  – Unemployment – natural rate

• If the BoE increases the money supply quickly
  – Inflation rate is high
  – Unemployment – natural rate
According to Friedman and Phelps, there is no trade-off between inflation and unemployment in the long run. Growth in the money supply determines the inflation rate. Regardless of the inflation rate, the unemployment rate gravitates toward its natural rate. As a result, the long-run Phillips curve is vertical.
The Long-Run Phillips Curve

• The long-run Phillips curve
  – Expression of the classical idea of monetary neutrality

• Increase in money supply
  – Aggregate-demand curve – shifts right
    • Price level – increases
    • Output – natural rate
  – Inflation rate – increases
    • Unemployment – natural rate
How the LR Phillips Curve Is Related to the Model of AD & AS

Panel (a) shows the model of aggregate demand and aggregate supply with a vertical aggregate-supply curve. When expansionary monetary policy shifts the aggregate-demand curve to the right from AD$_1$ to AD$_2$, the equilibrium moves from point A to point B. The price level rises from P$_1$ to P$_2$, while output remains the same. Panel (b) shows the long-run Phillips curve, which is vertical at the natural rate of unemployment. In the long run, expansionary monetary policy moves the economy from lower inflation (point A) to higher inflation (point B) without changing the rate of unemployment.
The Meaning of “Natural”

• **Natural rate of unemployment**
  – Unemployment rate toward which the economy gravitates in the long run
  – Not necessarily socially desirable
  – Not constant over time

• **Labour-market policies**
  – e.g. more flexible labour markets
  – Affect the natural rate of unemployment
  – Shift the Phillips curve
The Meaning of “Natural”

• Policy change - reduce the natural rate of unemployment
  – Long-run Phillips curve shifts left
  – Long-run aggregate-supply shifts right
  – For any given rate of money growth and inflation
    • Lower unemployment
    • Higher output
Reconciling Theory and Evidence

So “theory” says there is no (long-run) trade-off between inflation and unemployment.

But the “data” says there is.

We can reconcile theory and data by noting that:

- **Expected inflation**
  - Determines position of short-run AS curve
  - Similar argument to why the SRAS slopes upward but the LRAS curve is vertical

- But applied to the Phillips Curve
Reconciling Theory and Evidence

• Short run
  – The BoE can take
    • Expected inflation & thus the short-run AS curve are already determined
  – Money supply changes
    • AD curve shifts along a given short-run AS curve
    • This delivers unexpected fluctuations in:
      – Output & prices
      – Unemployment & inflation
• And so a downward-sloping Phillips Curve
• **Long run**
  – The BoE cannot keep on creating surprise inflation
  – Can do so only in the short run
  – In the long run people expect whatever inflation rate the BoE chooses to produce
    • Nominal wages adjust to keep pace with inflation
    • So the long-run aggregate-supply curve is vertical
Reconciling Theory and Evidence

• Long run
  – Money supply changes
    • AD curve shifts along a vertical long-run AS
    • No fluctuations in
      – Output & unemployment
    • Unemployment – natural rate
  – Vertical long-run Phillips curve
The Short-Run Phillips Curve

• We can summarise this Friedman/Phelps story in a simple equation:

• **Unemployment rate =**

  = Natural rate of unemployment – 

  \( a(\text{Actual inflation} – \text{Expected inflation}) \)

• actual > expected → lower unemployment

where \( a \) is a parameter that measures how much unemployment responds to unexpected inflation

– Analogous to AS equation we saw last week
The Short-Run Phillips Curve

• This equation implies that there is no stable short-run Phillips curve
  – Each short-run Phillips curve
    • Reflects a particular expected rate of inflation
  – Expected inflation – changes
    • Short-run Phillips curve shifts

• So it is dangerous to view the Phillips Curve as offering a menu of choices between inflation and unemployment
  – There is a trade-off, but it’s only temporary
The higher the expected rate of inflation, the higher the short-run trade-off between inflation and unemployment. At point A, expected inflation and actual inflation are equal at a low rate, and unemployment is at its natural rate. If the BoE pursues an expansionary monetary policy, the economy moves from point A to point B in the short run. At point B, expected inflation is still low, but actual inflation is high. Unemployment is below its natural rate. In the long run, expected inflation rises, and the economy moves to point C. At point C, expected inflation and actual inflation are both high, and unemployment is back to its natural rate.
Natural-Rate Hypothesis

• “Natural-rate hypothesis”
  – Unemployment eventually returns to its normal/natural rate
  – Regardless of the rate of inflation
  – Move from Keynesian to monetarist economics

• Late 1960s (short-run), policies:
  – Expand AD for goods and services
  – Expansionary fiscal policy
    • Government spending rose
      – Vietnam War
US evidence on the Phillips Curve

- Late 1960s (short-run), policies
  - Monetary policy
    • The Fed – try to hold down interest rates
    • Money supply – rose 13% per year
    • High inflation (5-6% per year)
    • Unemployment decreased
    • Trade-off appeared to exist

- Similar story in UK
  - Post oil crisis and miners’ strike of the early 1970s
Figure 6

The Phillips Curve in the 1960s

This figure uses annual data from 1961 to 1968 on the unemployment rate and on the inflation rate (as measured by the GDP deflator) to show the negative relationship between inflation and unemployment.
US evidence in the long-run

• But by the late 1970s (long-run)
  – Inflation – stayed high
    • People’s expectations of inflation caught up with reality
  – Unemployment was at its natural rate
  – No trade-off between unemployment and inflation in the long-run
The Breakdown of the Phillips Curve

This figure shows annual data from 1961 to 1973 on the unemployment rate and on the inflation rate (as measured by the GDP deflator). The Phillips curve of the 1960s breaks down in the early 1970s, just as Friedman and Phelps had predicted. Notice that the points labeled A, B, and C in this figure correspond roughly to the points in Figure 5.
Birth of supply-siders

- Through the 1980s the UK and US sought to conquer inflation and no longer fine-tune AD.

- Sought to improve the supply-side of the economy and decrease the natural rate of unemployment.
  - Cut taxes; cut red tape; reduce union power...

- Also sought to control inflationary expectations and thereby shift the Phillips Curve to the left.
  - Bank of England independence in 1997 was central to this.
The long-run Phillips Curve as an argument for Central Bank independence

- Giving control of monetary policy to the central bank means the Government can no longer manipulate monetary policy prior to an election, for example.

- If we believe the central bank will achieve inflation of 2% (*via* an inflation target) then it will be achieved.
  - In contrast to the Government, the public believe the central bank has no incentive to reduce unemployment (even in the short-run).
  - *Time-consistent policy*: only at a much higher rate of inflation (when more inflation is more costly than a temporary reduction in unemployment) will the government be believed it won’t try to increase AD.
Shifts in Phillips Curve

• Friedman and Phelps convinced us in the 1970s that changes in expected inflation shift the short-run Phillips Curve

• But the oil price shocks in the 1970s focused economists on Supply shocks
  – Events that directly alter firms’ costs and prices and shift the economy’s short-run AS curve
  – Also shift the Phillips curve
Shifts in Phillips Curve

- **Increase in oil price**
  - Short-run AS curve shifts left
  - Stagflation
    - Lower output
    - Higher prices
  - Short-run Phillips curve shifts right
    - Higher unemployment
    - Higher inflation
An Adverse Shock to Aggregate Supply

Panel (a) shows the model of aggregate demand and aggregate supply. When the AS curve shifts to the left from AS\(_1\) to AS\(_2\), the equilibrium moves from point A to point B. Output falls from \(Y_1\) to \(Y_2\), and the price level rises from \(P_1\) to \(P_2\). Panel (b) shows the short-run trade-off between inflation and unemployment. The adverse shift in aggregate supply moves the economy from a point with lower unemployment and lower inflation (point A) to a point with higher unemployment and higher inflation (point B). The short-run Phillips curve shifts to the right from PC\(_1\) to PC\(_2\). Policymakers now face a worse trade-off between inflation and unemployment.
Shifts in Phillips Curve

• But is this rightward shift in the short-run Phillips Curve, due to the increase in the oil price, temporary or permanent?
  – Depends on how people adjust their expectations given actual inflation ↑
    • If expected to be temporary, PC reverts back
    • If expected to be permanent, the PC stays where it is at its new less desirable position
      – needs government intervention
The experience in the UK

– 1970s, 1980s, U.K.

• Expected inflation rose dramatically due to the oil shocks of the 1970s
• Led to higher actual inflation at given rates of unemployment than historically
• Contributed to election of Mrs. Thatcher and her commitment to bring down inflation and inflationary expectations
Figure 9
The Supply Shocks of the 1970s

This figure shows annual data from 1972 to 1981 on the unemployment rate and on the inflation rate (as measured by the GDP deflator). In the periods 1973–1975 and 1978–1981, increases in world oil prices led to higher inflation and higher unemployment.
The Cost of Reducing Inflation

• **Disinflation**
  – Reduction in the rate of inflation

• **Deflation**
  – Reduction in the price level

• **Margaret Thatcher (UK) and Paul Volcker (US)**
  – Contractionary monetary policy
The Cost of Reducing Inflation

• Contractionary monetary policy
  – Aggregate demand – contracts
    • Higher unemployment
    • Lower inflation
  – Over time
    • Phillips curve shifts left
      – Lower inflation
      – Unemployment back at its natural rate
Figure 10
Disinflationary Monetary Policy in the Short Run & Long Run

When the UK/US pursue contractionary monetary policy to reduce inflation, the economy moves along a short-run Phillips curve from point A to point B. Over time, expected inflation falls, and the short-run Phillips curve shifts downward. When the economy reaches point C, unemployment is back at its natural rate.
Counting the Cost of Reducing Inflation

- **Sacrifice ratio**
  - Number of percentage points of annual output lost in the process of reducing inflation by 1 percentage point
  - Typical estimate: 3 to 5
    - For each percentage point that inflation is reduced
    - 3 to 5 percent of annual output must be sacrificed in the transition
    - In early 1980s inflation in UK was 22%. To reduce to 5% meant losing 40% of annual output.
The Cost of Reducing Inflation might not be so bad…

• Rational expectations
  – People optimally use all information they have
    • including information about government policies
    • when forecasting the future
With rational expectations

- Possibility of costless disinflation
  - Rational expectations - smaller sacrifice ratio
  - Government - credible commitment to a policy of low inflation
    - People: lower their expectations of inflation
    - Short-run Phillips curve - shifts downward
    - Economy - low inflation quickly
      - Without temporarily high unemployment & low output
The Cost of Reducing Inflation

• The Thatcher disinflation
  – Peak inflation: 20%
    • Sacrifice ratio = 3 to 5
      – Reducing inflation – great cost
    • Rational expectations
      – Reducing inflation – smaller cost
  – 1983 inflation: 5% due to monetary policy
    • Cost: recession
      – High unemployment: 11% in 1982 and 1983
      – Low output
      – Challenges claims of a 100% costless disinflation
This figure shows annual data from 1979 to 1988 on the unemployment rate and on the inflation rate (as measured by the RPI index). The reduction in inflation during this period came at the cost of very high unemployment in 1982 and 1983.
The Cost of Reducing Inflation

• Rational expectations
  – Costless disinflation

• Volker (US) and Thatcher (UK) disinflations
  – Cost – not as large as predicted (but still high, esp. in UK)
  – The public did not believe them
    • When they announced monetary policy to reduce inflation
Inflation Targeting in the UK

• From monetary targets in the 1980s to an inflation target in the 1990s…
• Set interest rates to target future inflation
  – Current inflation is already determined
• Therefore need to forecast *future* inflation
• Both target and policy announced publicly
  – So inflation target is credible and inflationary expectations are consistent with the target (2%)