

16
The Short-Run Trade-off Between Inflation and Unemployment

PRINCIPLES OF  
MACROECONOMICS  
FOURTH CANADIAN EDITION

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PowerPoint® Slides  
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Canadian adaptation by Marc Prud'Homme

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**In this chapter, look for the answers to these questions:**

- How are inflation and unemployment related in the short run? In the long run?
- What factors alter this relationship?
- What is the short-run cost of reducing inflation?

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Introduction

- In the long run, inflation & unemployment are unrelated:
  - The inflation rate depends mainly on growth in the money supply.
  - Unemployment (the “natural rate”) depends on the minimum wage, the market power of unions, efficiency wages, and the process of job search.



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## Introduction

- In the short run, *society faces a trade-off between inflation and unemployment.*
- If policymakers expand aggregate demand, they can lower unemployment, but only at the cost of higher inflation.
- If they contract aggregate demand, they can lower inflation, but at the cost of temporarily higher unemployment.



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## The Phillips Curve

- **Phillips curve:** shows the short-run combinations of unemployment and inflation that arise as shifts in the aggregate demand curve move the economy along the short-run aggregate supply curve.
- 1958: A.W. Phillips showed that nominal wage growth was negatively correlated with unemployment in the U.K.
- 1960: Paul Samuelson & Robert Solow found a negative correlation between U.S. inflation & unemployment, named it "the Phillips Curve."

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## Deriving the Phillips Curve

- Suppose  $P = 100$  this year.
- The following graphs show two possible outcomes for next year:
  - A. aggregate demand low, small increase in  $P$  (i.e., low inflation), low output, high unemployment.
  - B. aggregate demand high, big increase in  $P$  (i.e., high inflation), high output, low unemployment.

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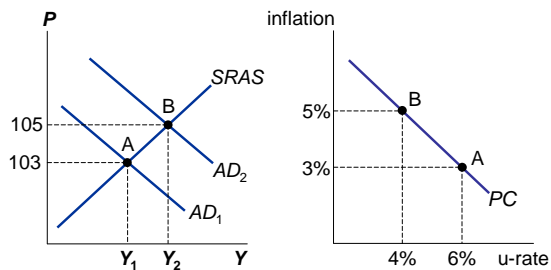
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### Deriving the Phillips Curve

A. Low aggregate demand, low inflation, high u-rate



B. High aggregate demand, high inflation, low u-rate

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### The Phillips Curve: A Policy Menu?

- Since fiscal and monetary policy affect aggregate demand, the PC appeared to offer policymakers a menu of choices:
  - low unemployment with high inflation
  - low inflation with high unemployment
  - anything in between
- In the 1960s, Friedman and Phelps concluded that inflation and unemployment are unrelated in the long run.
  - The long-run Phillips curve is vertical at the *natural rate of unemployment*.
  - Monetary policy could be effective in the short run but not in the long run.

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### The Vertical Long-Run Phillips Curve

- **Natural-rate hypothesis:** the claim that unemployment eventually returns to its normal or "natural" rate, regardless of the inflation rate
- Based on the classical dichotomy and the vertical LRAS curve.

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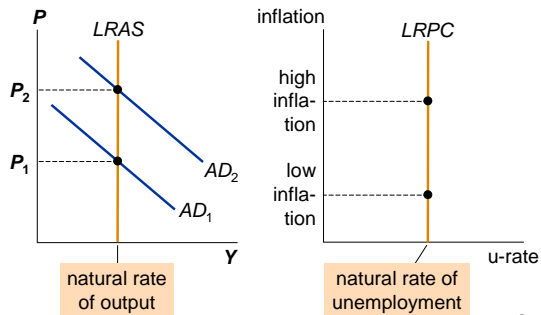
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### The Vertical Long-Run Phillips Curve

In the long run, faster money growth only causes faster inflation.



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### Reconciling Theory and Evidence

- Evidence (from '60s):  
PC slopes downward.
- Theory (Friedman and Phelps' work):  
PC is vertical in the long run.
- To bridge the gap between theory and evidence, Friedman and Phelps introduced a new variable: **expected inflation** – a measure of how much people expect the price level to change.

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### The Phillips Curve Equation

$$U \text{ rate} = \text{Natural rate of } U - \alpha (\text{Actual inflation} - \text{Expected inflation})$$

#### Short run

Fed can reduce u-rate below the natural u-rate by making inflation greater than expected.

#### Long run

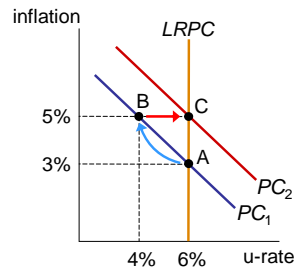
Expectations catch up to reality, u-rate goes back to natural u-rate whether inflation is high or low.

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### How Expected Inflation Shifts the *PC*

Initially, expected & actual inflation = 3%, unemployment = natural rate (6%).  
BOC makes inflation 2% higher than expected, u-rate falls to 4%.  
In the long run, expected inflation increases to 5%, *PC* shifts upward, unemployment returns to its natural rate.



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### ACTIVE LEARNING 1: Exercise

Natural rate of unemployment = 5%  
Expected inflation = 2%  
Coefficient  $\alpha$  in *PC* equation = 0.5

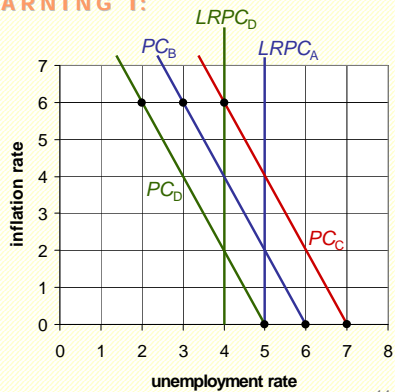
- Plot the long-run Phillips curve.
- Find the u-rate for each of these values of actual inflation: 0%, 6%. Sketch the short-run *PC*.
- Suppose expected inflation rises to 4%. Repeat part B.
- Instead, suppose the natural rate falls to 4%. Draw the new long-run Phillips curve, then repeat part B.

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### ACTIVE LEARNING 1: Answers

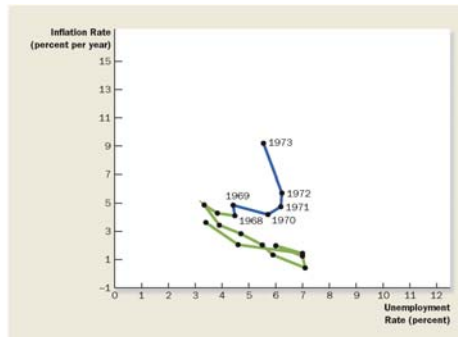
An increase in expected inflation shifts *PC* to the right.

A fall in the natural rate shifts both curves to the left.



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## The Breakdown of the Phillips Curve



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## Another PC Shifter: Supply Shocks

- **Supply shock:**  
an event that directly alters firms' costs and prices, shifting the AS and PC curves
- Example: large increase in oil prices
- In the 1970s, policymakers faced two choices when OPEC cut output and raised worldwide prices of petroleum.
  - Fight the unemployment battle by expanding aggregate demand and accelerate inflation.
  - Fight inflation by contracting aggregate demand and endure even higher unemployment.

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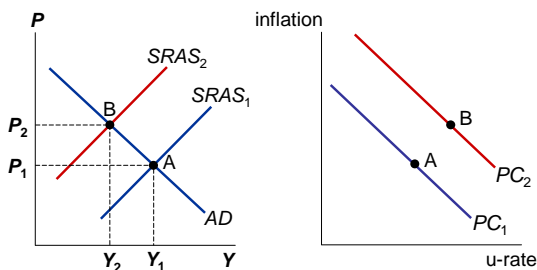
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## How an Adverse Supply Shock Shifts the PC

SRAS shifts left, prices rise, output & employment fall.



Inflation & u-rate both increase as the PC shifts upward.

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### The 1970s Oil Price Shocks

Oil price per barrel	
1/1973	\$ 3.56
1/1974	10.11
1/1979	14.85
1/1980	32.50
1/1981	38.00

The BOC chose to accommodate the first shock in 1973 with faster money growth.

Result:  
Higher expected inflation, which further shifted *PC*.

1979:  
Oil prices surged again, worsening the BOC tradeoff.

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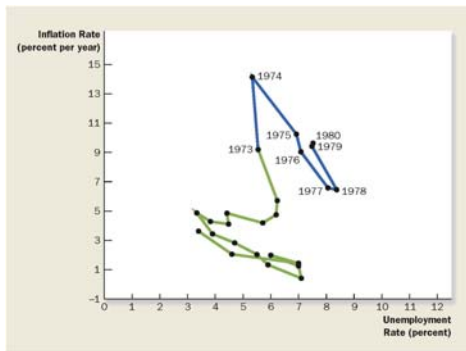
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### The 1970s Oil Price Shocks



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### The Cost of Reducing Inflation

- **Disinflation:** a reduction in the inflation rate
- To reduce inflation, BOC must slow the rate of money growth, which reduces aggregate demand.
- Short run: output falls and unemployment rises.
- Long run: output & unemployment return to their natural rates.

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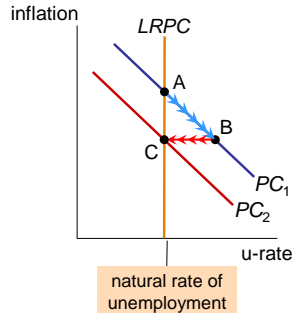
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## Disinflationary Monetary Policy

Contractionary monetary policy moves economy from A to B.

Over time, expected inflation falls,  $PC$  shifts downward.

In the long run, point C: the natural rate of unemployment, and lower inflation.



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## The Cost of Reducing Inflation

- Disinflation requires enduring a period of high unemployment and low output.
- **Sacrifice ratio:** the number of percentage points of annual output lost in the process of reducing inflation by 1 percentage point
- Typical estimate of the sacrifice ratio: 2 to 5
  - Reducing inflation rate 1% requires a sacrifice of 2% to 5% of a year's output.
- This cost can be spread over time. Example: To reduce inflation by 6%, can either
  - sacrifice 30% of GDP for one year
  - sacrifice 10% of GDP for three years

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## Rational Expectations, Costless Disinflation?

- **Rational expectations:** a theory according to which people optimally use all the information they have, including info about govt policies, when forecasting the future
- Early proponents: Robert Lucas, Thomas Sargent, Robert Barro
- Expected inflation explains why there is a tradeoff between inflation and unemployment in the short run but not in the long run.
- How quickly the short-run tradeoff disappears depends on how quickly expectations adjust.
- Implied that disinflation could be much less costly...

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### Rational Expectations, Costless Disinflation?

- Suppose the BOC convinces everyone it is committed to reducing inflation.
- Then, expected inflation falls, the short-run *PC* shifts downward.
- Result:  
Disinflations can cause less unemployment than the traditional sacrifice ratio predicts.

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### The Volcker Disinflation

Fed Chairman Paul Volcker

- appointed in late 1979 under high inflation & unemployment
- changed Fed policy to disinflation

1981-1984:

- Fiscal policy was expansionary, so Fed policy needed to be very contractionary to reduce inflation.
- Success: Inflation fell from 10% to 4%, but at the cost of high unemployment...

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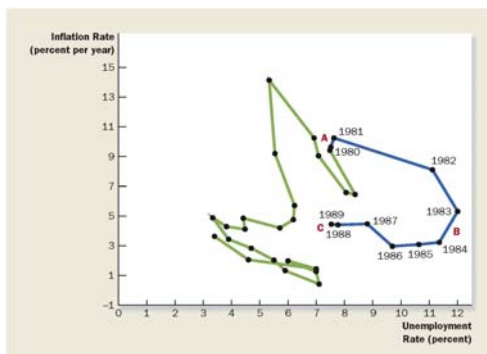
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FIGURE 16.11: Disinflation in the 1980s



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### The Zero-Inflation Target

- Some economists believe that if the central bank makes a credible statement of its intention to deflate, that lower rates of inflation can be obtained at smaller cost.
- In 1988, the Bank of Canada announced its zero-inflation target, and in 1989 monetary contraction began
- The target was reached in 1994, by which time the unemployment rate exceeded 10 percent.
- Inflation fell from 4.5% to 1.1%.

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### The Zero-Inflation Target

- Unemployment remained above the natural rate during the 1989-1999 period.
- The sacrifice ratio was 4.8, twice that of the 1981-89 period.
- The Bank of Canada clearly defined their intention to reduce inflation to zero, and yet the cost of reducing inflation seemed to be larger than ever before.

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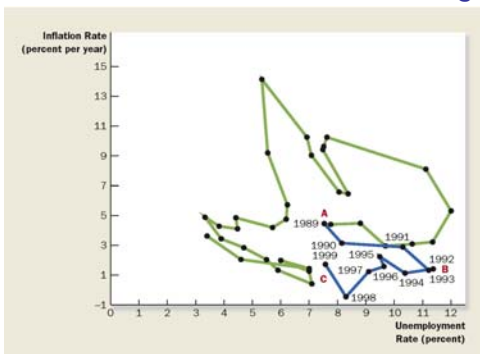
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**FIGURE 16.12: The Zero-Inflation Target**



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### The Zero-Inflation Target

- Since 2000, Canada's Phillips curve has shifted to the right since the 1960s.
- Inflation and unemployment have fluctuated within a tight range of one to two percentage points.

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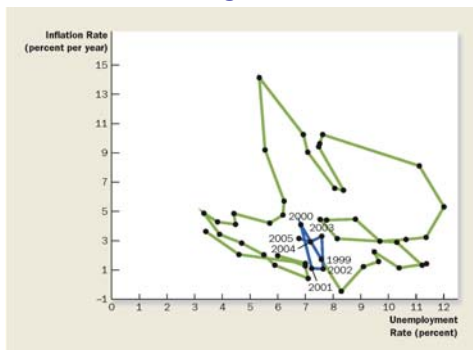
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**FIGURE 16.13: A Tight Cluster Since 2000**



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### CHAPTER SUMMARY

- The Phillips curve describes a negative relationship between inflation and unemployment.
- By expanding aggregate demand, policymakers can choose a point on the Phillips curve with higher inflation and lower unemployment.
- By contracting aggregate demand, policymakers can choose a point on the Phillips curve with lower inflation and higher unemployment.

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## CHAPTER SUMMARY

- The tradeoff between inflation and unemployment described by the Phillips curve holds only in the short run.
- The long-run Phillips curve is vertical at the natural rate of unemployment.

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## CHAPTER SUMMARY

- The short-run Phillips curve also shifts because of shocks to aggregate supply.
- An adverse supply shock gives policymakers a less favorable tradeoff between inflation and unemployment.

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## CHAPTER SUMMARY

- When the Bank of Canada contracts growth in the money supply to reduce inflation, it moves the economy along the short-run Phillips curve.
- This results in temporarily high unemployment.
- The cost of disinflation depends on how quickly expectations of inflation fall.

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## End: Chapter 16

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