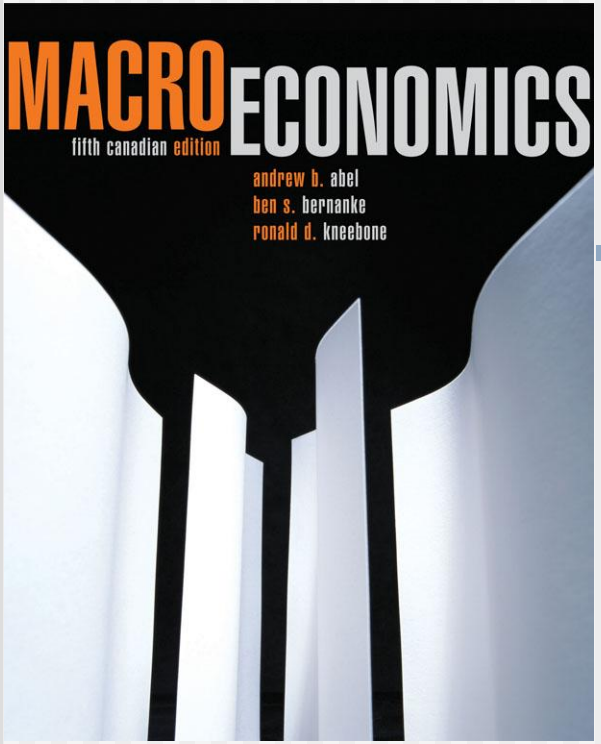


Chapter 13

Unemployment and Inflation

Unemployment and Inflation

- What happens to unemployment and inflation has important policy implications.
- They are often called the twin evils of macroeconomics.
- Multiplied together Arthur Okun referred to this construct as the "misery index".
- This Chapter takes you through one of the great debates in macroeconomics and what were its implications.
- The role of expectations will be critical.

Unemployment and Inflation: Is There a Trade-Off?

- The Phillips curve is a negative empirical relationship between unemployment and wages, which appeared to be stable (he looked at 97 years of UK data).
- In Canada and elsewhere, up until the late 1960s, the Phillips curve seemed to show a stable relationship between inflation and unemployment suggesting a trade-off that could be exploited.
- In 1970-2006 this changed; there seemed to be no reliable relationship between these two variables.
  - *Why did original curve appear stable?*
  - *Why did it change after 1970?*
  - *Does the curve offer up a menu of choices for policy makers?*

FIGURE 13.1

THE PHILLIPS CURVE AND THE CANADIAN ECONOMY DURING THE 1960s

During the 1960s, Canadian rates of inflation seemed to lie along a Phillips curve. Inflation rose and unemployment fell fairly steadily during this decade, and policymakers had apparently decided to live with higher inflation in order to reduce unemployment.

Source: Adapted from the following: Unemployment rate: *Historical Statistics of Canada*, Series D233; Inflation rate, 1960–61: Calculated using GNP deflator, *Historical Statistics of Canada*, Series K17; 1961–69: Calculated using GDP deflator, Statistics Canada CANSIM II, series v1997756.

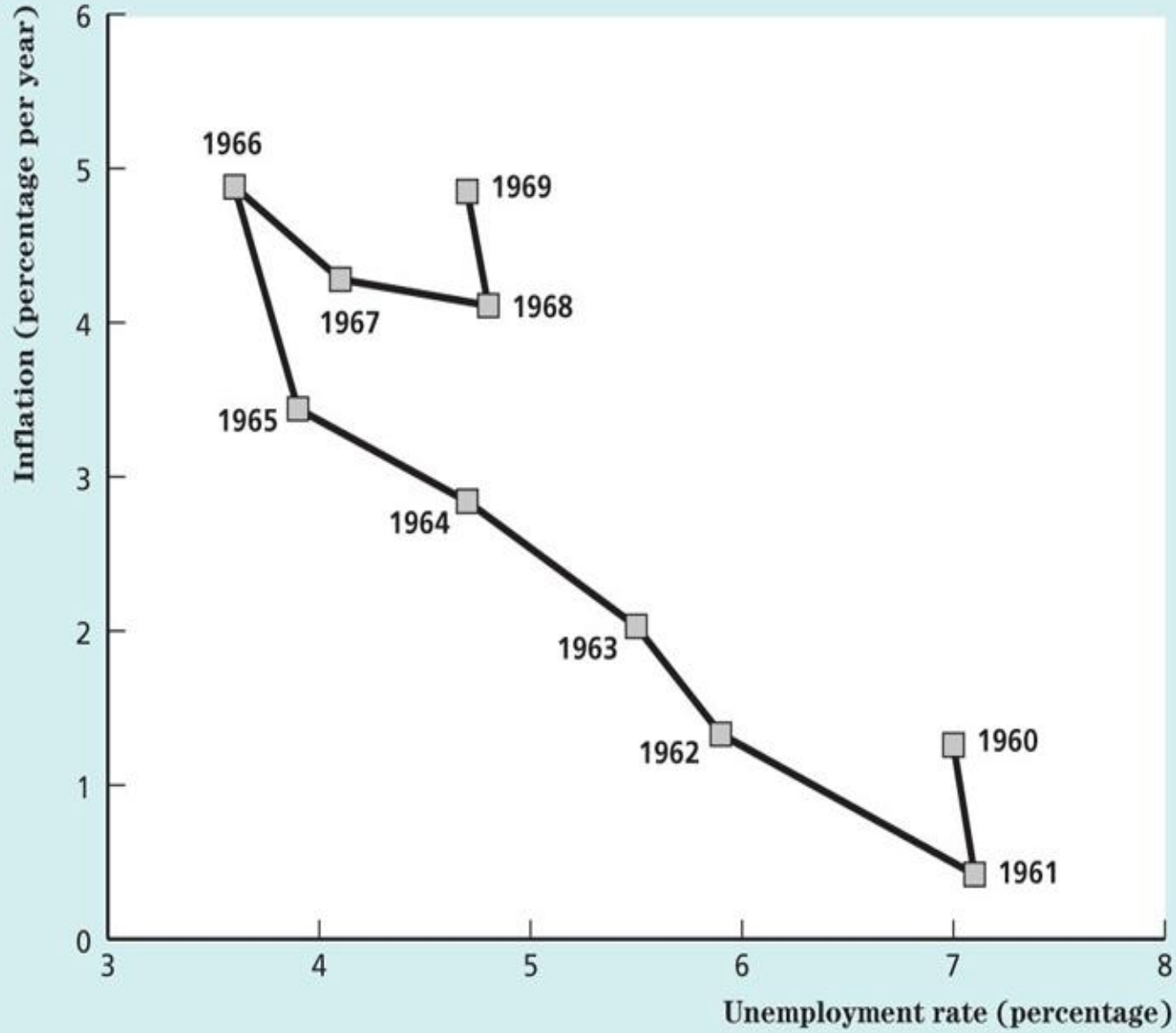
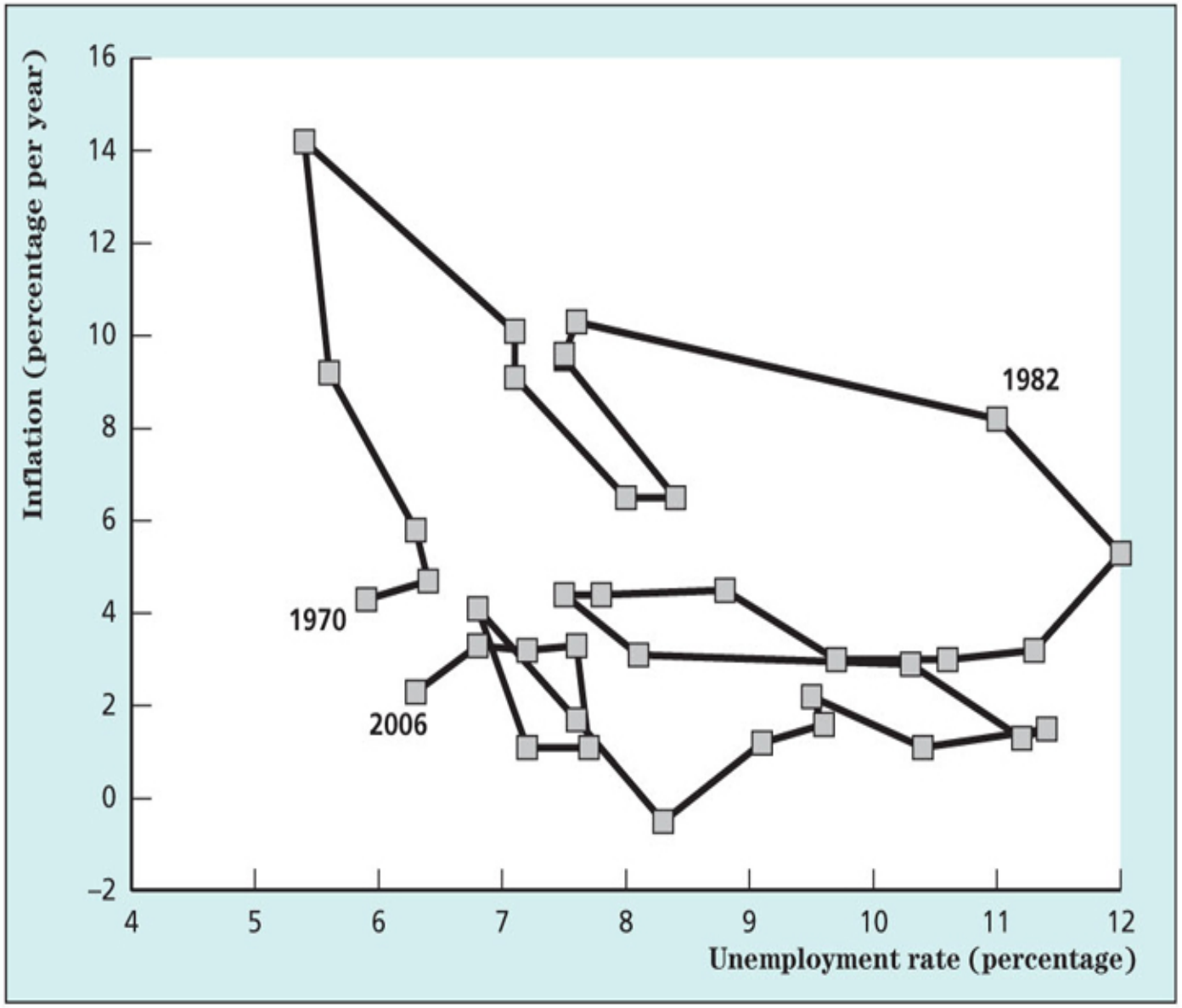


FIGURE 13.2

INFLATION AND UNEMPLOYMENT IN CANADA, 1970–2006

The figure shows the combinations of inflation and unemployment experienced in Canada each year from 1970 to 2006. Unlike the situation during the 1960s (see Figure 13.1), after 1970, the relationship between inflation and unemployment seemed to change from what it had been in the 1960s.

Source: Adapted from the following: Unemployment rate, 1970–75: *Historical Statistics of Canada*, Series D233; 1976–2006: Statistics Canada CANSIM II, series v2461224; Inflation rate: Calculated using GDP deflator, Statistics Canada CANSIM II, series v1997756.



The Expectations Augmented Phillips Curve

- The work done on explaining these puzzles, by Friedman (‘68) and Phelps (’70) – both would get Nobel prizes, in part for this work, was actually completed prior to the shift in the relationship .
- In their view, a negative relationship should exist only between unanticipated inflation and cyclical unemployment, not between inflation and unemployment.

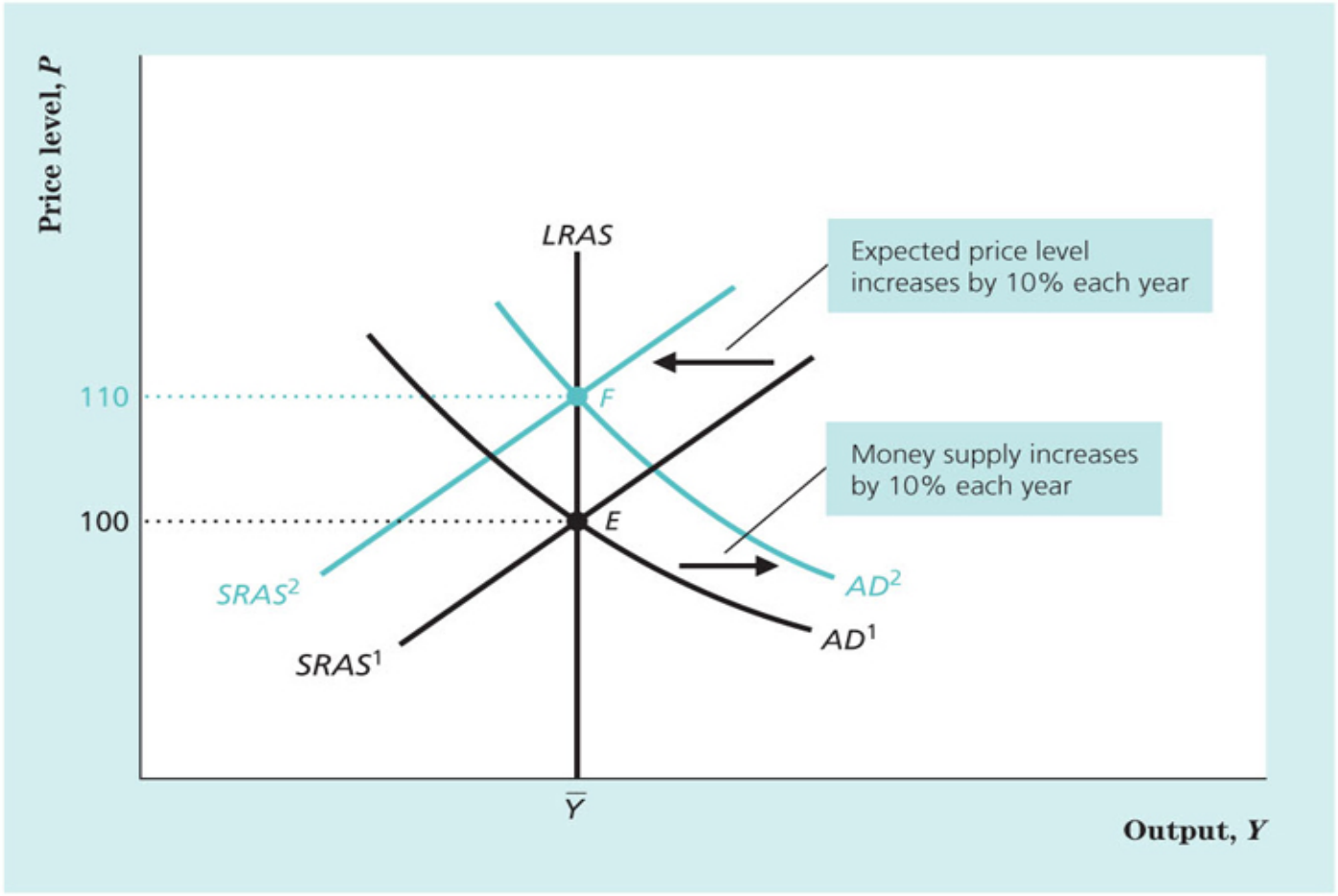
The Phillips Curve (continued)

- To see how it works start with an economy in long-run equilibrium.
- If increases in *M* are anticipated, and if there are no misperceptions, the economy remains at $\overline{Y}$, unemployment remains at $\overline{u}$, and cyclical unemployment (the difference between actual unemployment and $\overline{u}$ is zero.
- But we do get shifts up in the *AD* (because of the increase in *M*) and *SRAS* curves (Figure 13.3).
- An implication is that the long-run relationship between inflation and unemployment is a vertical line.

FIGURE 13.3

ONGOING INFLATION IN THE EXTENDED CLASSICAL MODEL

If the money supply grows by 10% every year, the *AD* curve shifts up by 10% every year, from AD^1 in year 1 to AD^2 in year 2, and so on. If the money supply has been growing by 10% per year for some time and the rate of inflation has been 10% for some time, the expected rate of inflation is also 10%. Thus, the expected price level also grows by 10% each year, from 100 in year 1 to 110 in year 2, and so on. The 10% annual increase in the expected price level shifts the *SRAS* curve up by 10% each year, for example, from $SRAS^1$ in year 1 to $SRAS^2$ in year 2. The economy remains in full-employment equilibrium at the intersection of the *AD* curve and the *SRAS* curve in each year (point *E* in year 1 and point *F* in year 2), with output at $\overline{Y}$, unemployment at the natural rate of unemployment $\bar{u}$, and inflation and expected inflation both at 10% per year.



The Phillips Curve (continued)

- Now suppose that the central bank increases the money supply by *more than expected* – this part is crucial for the analysis.
- The economy moves along its *SRAS* curve (output increases) and inflation rises but by less than the increase in *M*.
- Output rises because real *M* increases (it shifts the *LM* curve down or what is the same thing, it increases the *AD* curve.
- As well, firms now believe that the relative prices of the goods they produce have risen so they increase output and hire more workers to meet the increased demand.

The Phillips Curve (continued)

- If the increase in *M* is unanticipated, unanticipated inflation is created, *Y* is above $\overline{Y}$, and *u* is below $\overline{u}$.

$$\pi - \pi^e = -h(u - \overline{u})$$

- *h* measures the strength of the relationship between unanticipated inflation and cyclical unemployment.
- This is the relationship that should exist between inflation and unemployment.

The Phillips Curve (continued)

- Rearranging terms slightly we can get a new relationship.
- The expectation-augmented Phillips curve states that if π exceeds π^e then u is less than $\bar{u}$.

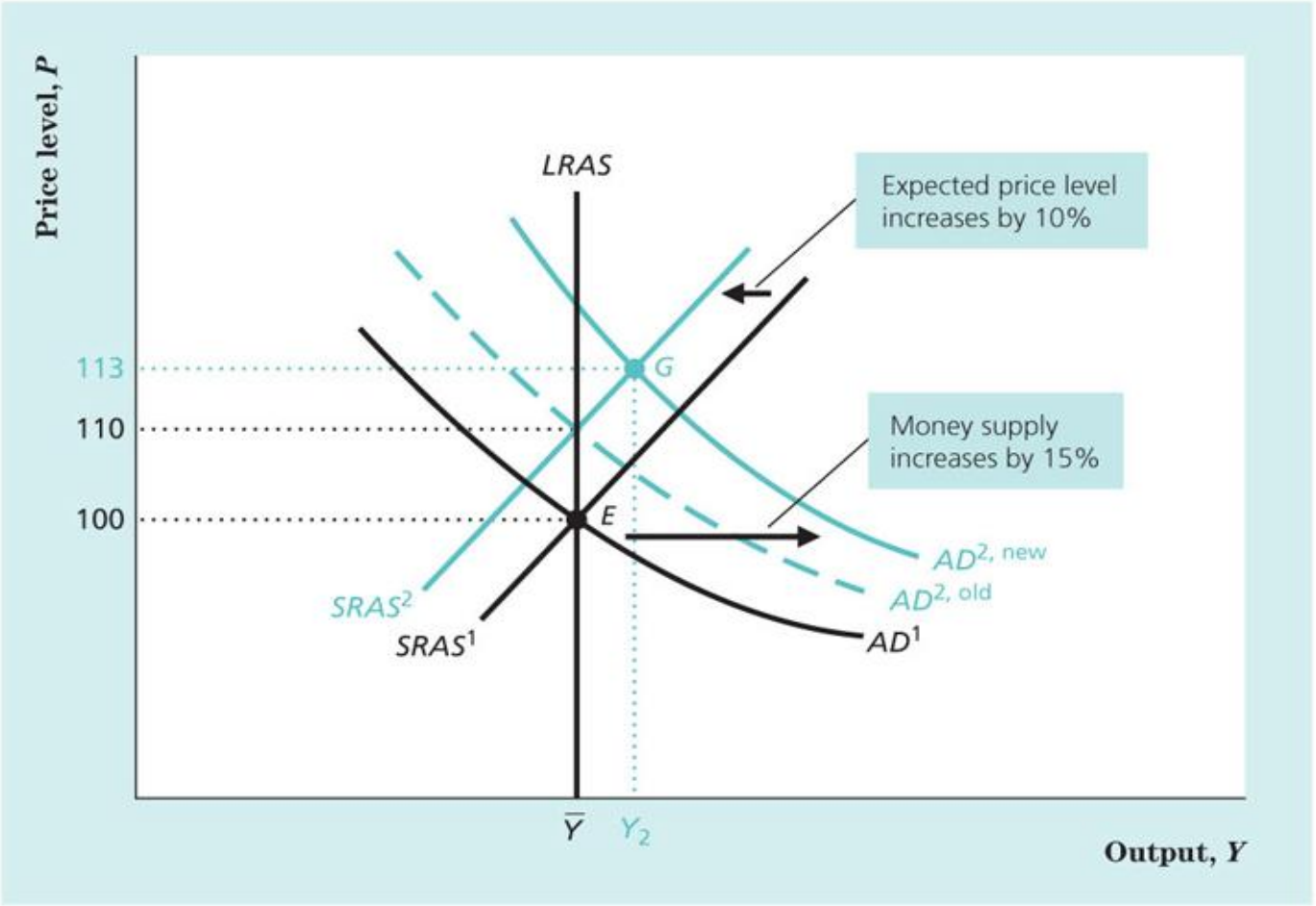
$$\pi = \pi^e - h(u - \bar{u})$$

- h is also related to the slope of the *SRAS* curve as can be seen from Figure 13.4.

FIGURE 13.4

UNANTICIPATED INFLATION IN THE EXTENDED CLASSICAL MODEL

If the money supply has been growing by 10% per year for a long time and is expected to continue growing by 10%, the expected price level increases by 10% each year. The 10% increase in the expected price level shifts the *SRAS* curve up from $SRAS^1$ in year 1 to $SRAS^2$ in year 2. Then, if the money supply actually increases by 15% in year 2, rather than by the expected 10%, the *AD* curve is $AD^{2,\ new}$, rather than $AD^{2,\ old}$. As a result of higher-than-expected money growth, output increases above $\bar{Y}$ in year 2, and the price level increases to 113, at point *G*. Because the price level rises by 13%, rather than the expected 10%, unanticipated inflation is 3% in year 2. This unanticipated inflation is associated with output higher than $\bar{Y}$ and unemployment below the natural rate $\bar{u}$ (negative cyclical unemployment).



Shifting of the Philips Curve

- We can use the expectations augmented Phillips curve to analyse what happened to the inflation-unemployment relation.
- The Phillips curve depends on the expected rate of inflation and the natural rate of unemployment. If either factor changes the Phillips curve will shift.

$$\pi = [\pi^e + h\bar{u}] - hu$$

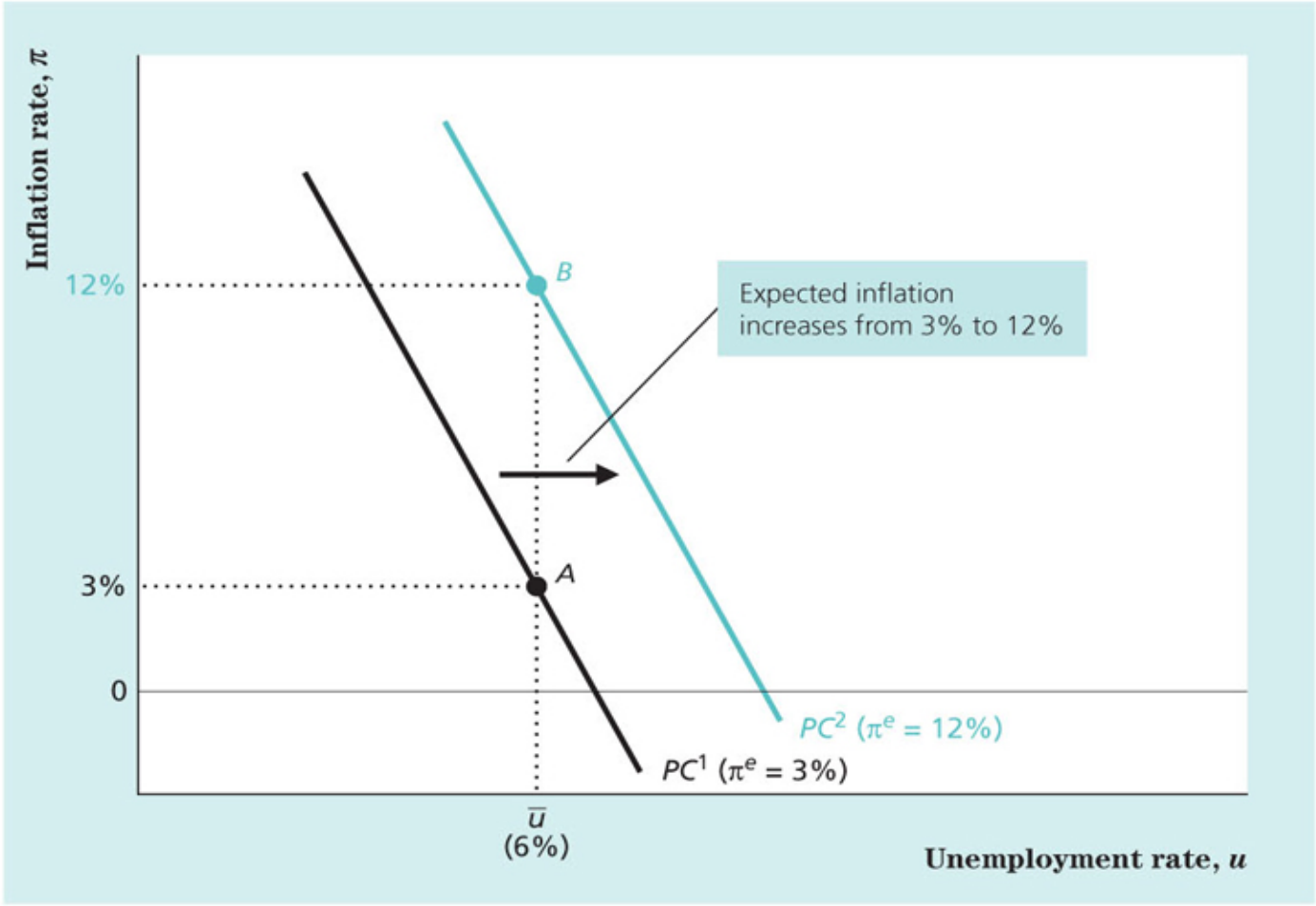
Changes in the Expected Rate of Inflation

- If households anticipate a change in the price level their expectations of the price level (the rate of inflation) rise one-for-one.
- The Phillips curve shifts up by the amount of the increase in the expected rate of inflation.

FIGURE 13.5

THE SHIFTING PHILLIPS CURVE: AN INCREASE IN EXPECTED INFLATION

The Friedman–Phelps theory implies that there is a different Phillips curve for every expected inflation rate. For example, PC^1 is the Phillips curve when the expected rate of inflation is 3%. To verify this claim, note from Eq. (13.1) that when the actual unemployment rate equals the natural rate $\bar{u}$ (6% here), the actual inflation rate equals the expected inflation rate. At point *A*, the unemployment rate equals the natural rate and the inflation rate equals 3% on PC^1, so the expected inflation rate is 3% on PC^1. Similarly, at point *B* on PC^2, where the unemployment rate equals its natural rate, the inflation rate is 12%, so the expected inflation rate is 12% along PC^2. Thus, an increase in the expected inflation rate from 3% to 12% shifts the Phillips curve up and to the right, from PC^1 to PC^2.



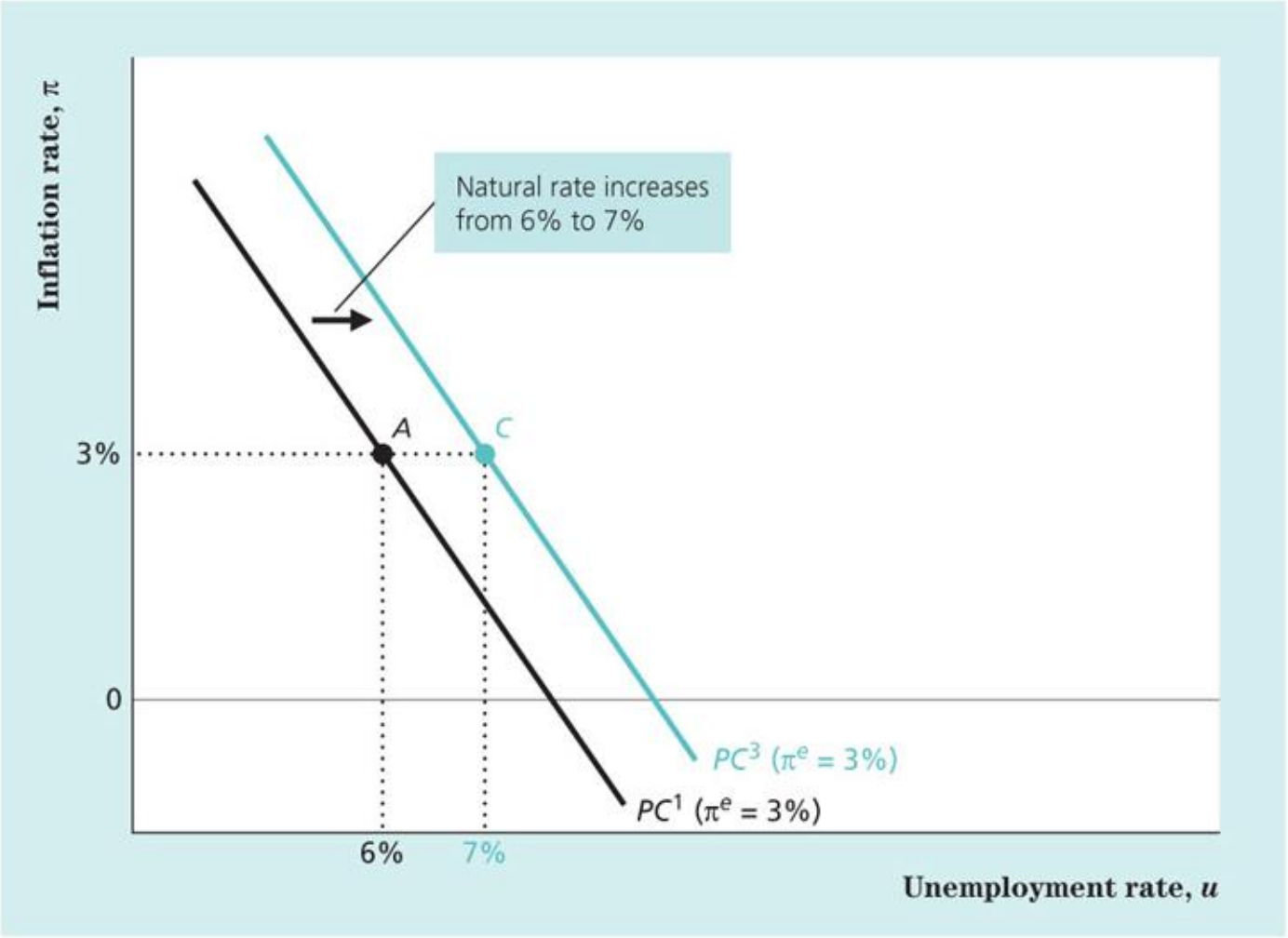
Changes in the Natural Rate of Unemployment

- An increase in the natural unemployment rate causes the Phillips curve to shift up and to the right.
- The natural rate could shift for a variety of reasons, discussed later.

FIGURE 13.6

THE SHIFTING PHILLIPS CURVE: AN INCREASE IN THE NATURAL UNEMPLOYMENT RATE

According to the Friedman–Phelps theory, an increase in the natural unemployment rate shifts the Phillips curve up and to the right. At point *A* on PC^1, the actual inflation rate and the expected inflation rate are equal at 3%, so the natural unemployment rate equals the actual unemployment rate at *A*, or 6%. Thus, PC^1 is the Phillips curve when the natural unemployment rate is 6% and the expected inflation rate is 3%, as in Figure 13.5. If the natural unemployment rate increases to 7%, with expected inflation unchanged, the Phillips curve shifts to PC^3. At point *C* on PC^3, both expected and actual inflation equal 3%, so the natural unemployment rate equals the actual unemployment rate at *C*, or 7%.



Supply Shocks and the Phillips Curve

- Let's see how well the model fits the facts.
- An adverse supply shock causes a burst of inflation, which may lead people to expect higher inflation.
- It also raises the natural rate of unemployment:
  - *by increasing the degree of mismatch between workers and jobs (classical economists);*
  - *by reducing MPN and labour demanded at full employment, coupled with rigid wages (Keynesian economists);*
  - *if the shock were thought to be permanent, it could increase labour supply and result in even more unemployment.*

Supply Shocks and the Phillips Curve (con't)

- An adverse supply shock should shift the Phillips curve up and to the right.
- The Phillips curve should be particularly unstable during periods of supply shocks.

The Shifting Phillips Curve in Practice

- The Friedman-Phelps analysis shows that a negative relationship between the levels of inflation and unemployment holds as long as expected inflation and the natural unemployment rate are approximately constant.
- This was the case during the 1960s (and certainly true in the 1950s) and it was the relationship we saw in Figure 13.1 above.

The Shifting Phillips Curve in Practice (continued)

- During 1970-2006 there were a number of productivity shocks:
  - oil prices moved around dramatically;
  - these shocks tended to increase both the natural rate as well as expected inflation.
- There were as well as changes in government and macroeconomic policies:
  - overly expansionary and then very restrictive monetary and fiscal policies;
  - structural changes to employment insurance (EI).
- All these caused the relationship to change.

The Shifting Phillips Curve in Practice (continued)

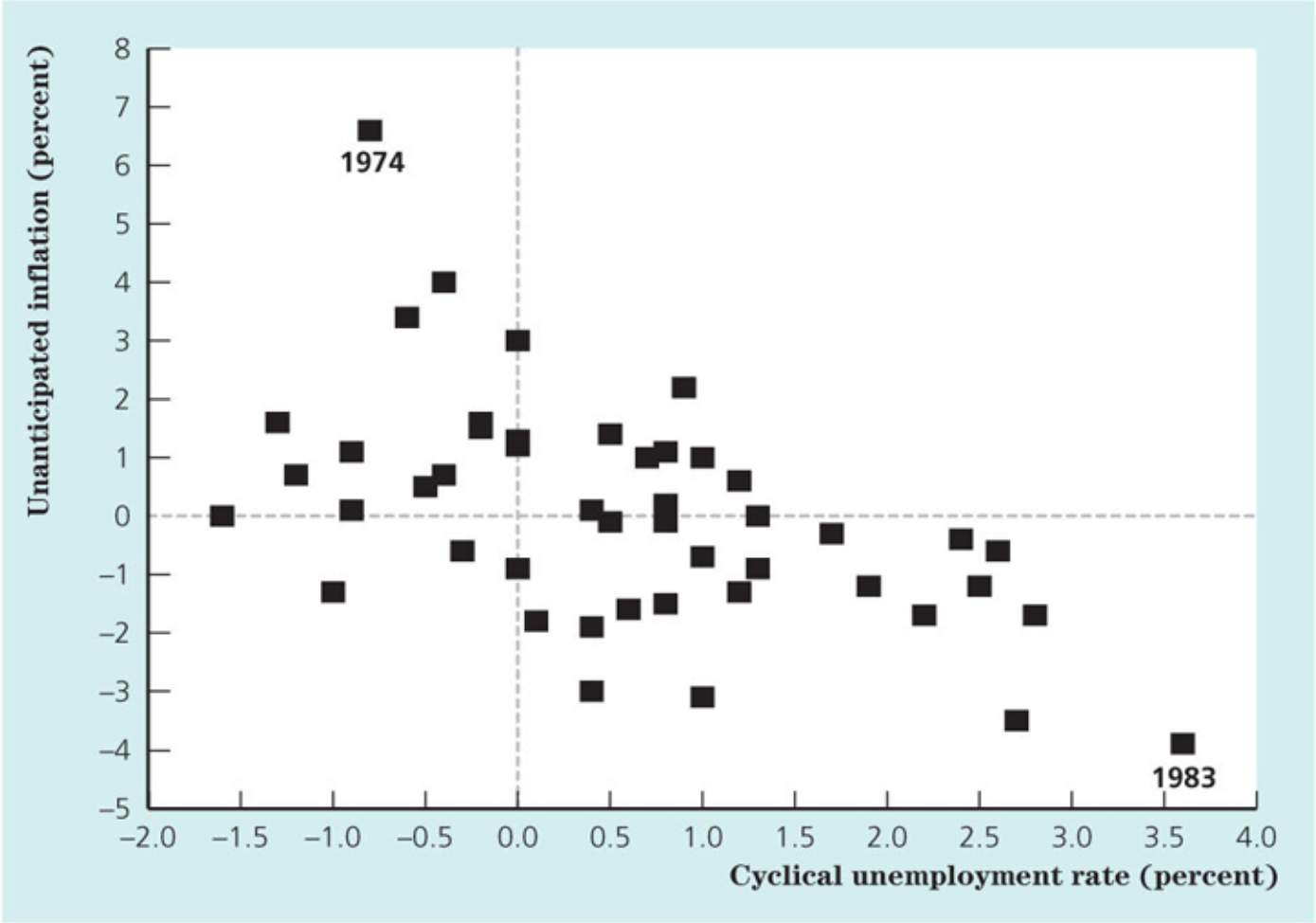
- Nevertheless there is not a systematic relationship between inflation and unemployment.
- Rather the relationship is between *unanticipated* inflation and *cyclical* unemployment, and this does appear in the data.

FIGURE 13.7

THE EXPECTATIONS-AUGMENTED PHILLIPS CURVE IN CANADA, 1960–2006

The expectations-augmented Phillips curve is a negative relationship between unanticipated inflation and cyclical unemployment. The figure shows this relationship for the years 1960 to 2006 in Canada. Unanticipated inflation equals actual inflation minus expected inflation, where expected inflation in any year is measured here as the average inflation rate for the preceding two years. Cyclical unemployment for each year is the actual unemployment rate minus an estimate of the natural unemployment rate for that year (see Figure 13.9, p. 500). Note that years in which unanticipated inflation is high usually are years in which cyclical unemployment is low.

Source: Unemployment rate and inflation: see Figure 13.2; natural rate of unemployment: see Figure 13.9.



Macroeconomic Policy and the Phillips Curve

- We have addressed two questions:
  - why the curve seemed to be stable in the 1960s;
  - and why it seemed to shift after that period.
- Now we want to see if we can exploit the relationship.

Macroeconomic Policy and the Phillips Curve (continued)

- In a recession, expansionary *AD* policy can increase inflation back to the anticipated levels that were used as a basis for nominal wage contracts and pricing (Keynesian view).
- However, monetary policy cannot be used to lower u below $\bar{u}$.
- Indeed any attempt to do so would only result in ever increasing inflation and inflation expectations.
- The rate of unemployment that just keeps inflation constant is called the "non-accelerating inflation rate of unemployment" or *NAIRU*.

The Lucas Critique

- But are the responses of the economy predictable?
- Policies are often based on models of the economy, which in turn reflect historical experience.
- New policies change the economic "rules" and often those historical relationships.
- Because of this, they affect economic behaviour, no one can safely assume that historical relationships between variables will hold when policies change, in large part because these policy changes will influence how the economy responds.
- In part for such reasons, central banks tend to move cautiously – at least until recently.

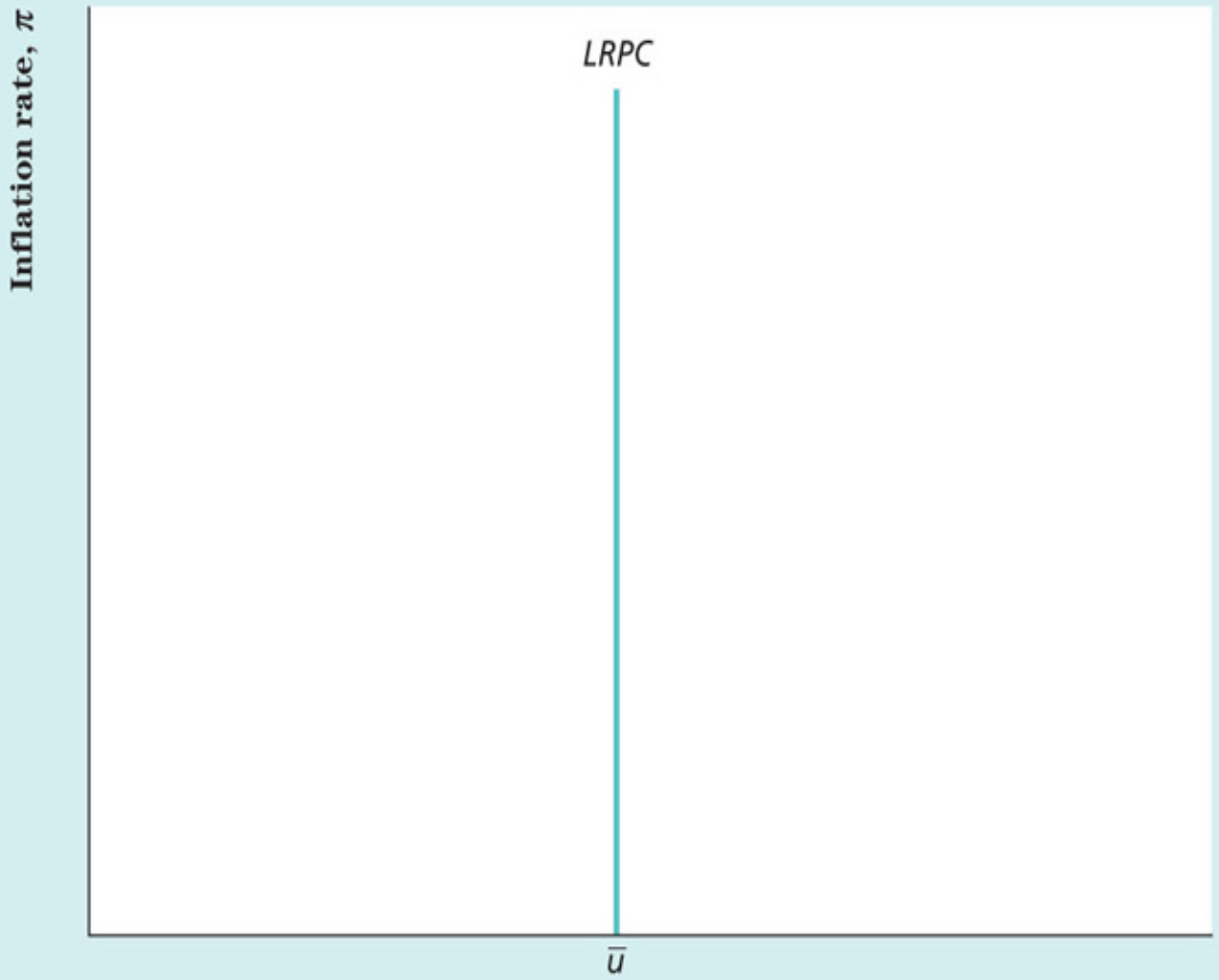
The Long-Run Phillips Curve

- Economists agree that in the long run economy will adjust to the general equilibrium where $\pi = \pi^e$ and $u = \bar{u}$.
- The long-run Phillips curve is vertical line at $u = \bar{u}$.
- It is from this relationship that we derive our notion of the *NAIRU*.
- It is related to the long-run neutrality of money.
- Money is also "super neutral" – the growth in the money supply cannot affect a real variable like u but rather only inflation.

FIGURE 13.8

THE LONG-RUN PHILLIPS CURVE

Because people will not permanently overestimate or underestimate the rate of inflation, in the long run, the expected and actual inflation rates are equal and the actual unemployment rate equals the natural unemployment rate. Because in the long run, actual unemployment equals the natural rate regardless of the inflation rate, the long-run Phillips curve (*LRPC*) is vertical.



The Cost of Unemployment

- The output is lost because fewer people are productively employed.
- Unemployed workers and their families face psychological cost.
- The offsetting factors are workers acquiring new skills and (perhaps) more leisure time.

The Long-Term Behaviour of the Unemployment Rate

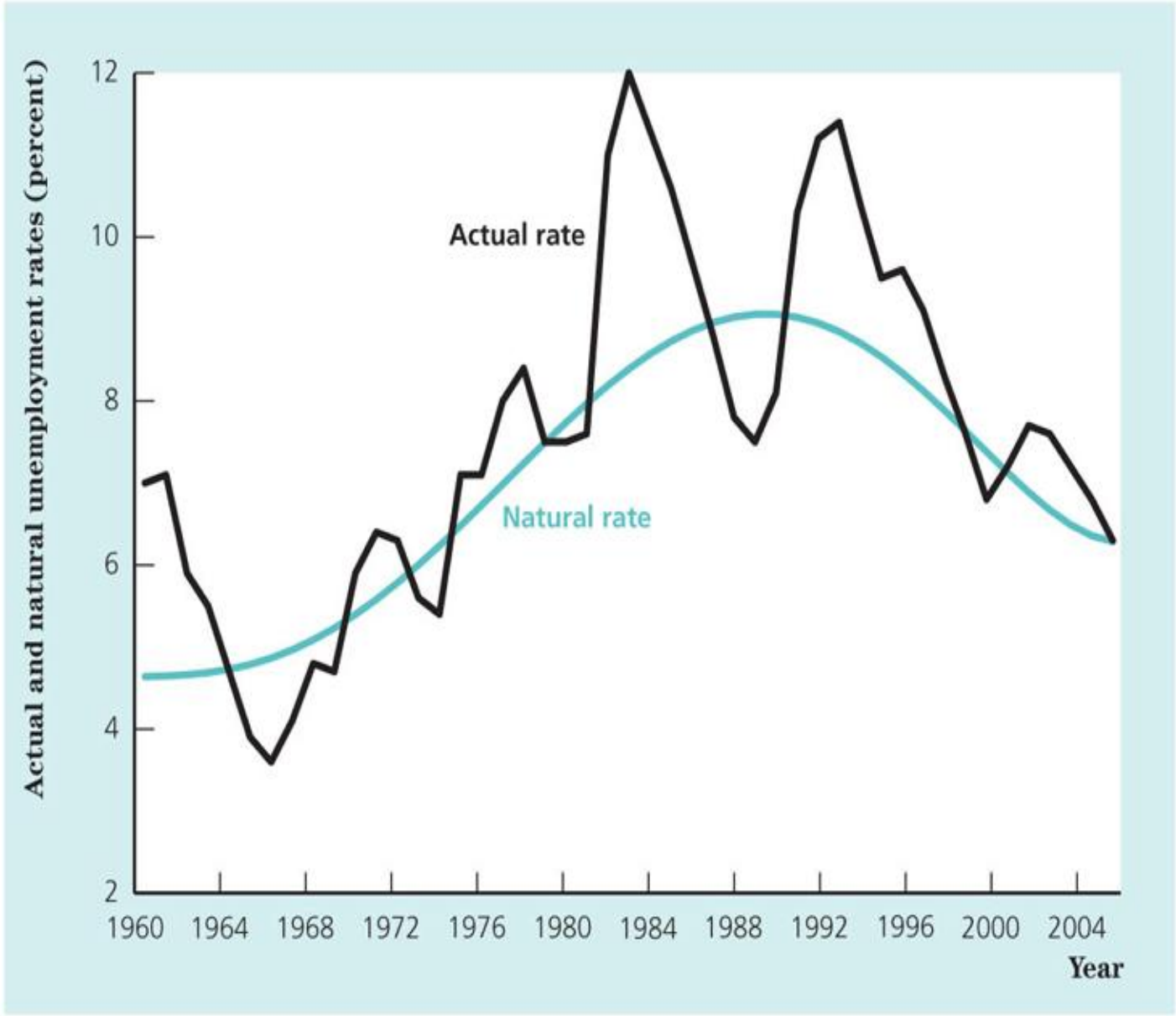
- We can't directly observe the natural rate, so it must be estimated.
- Base on work by Andrew Burns (Economic Council) and others:
  - *in mid-1960s, the rate was roughly stable at 4½%;*
  - *it then rose to about 8½% by mid-80s;*
  - *it has since fallen back.*
- The questions is why?

FIGURE 13.9

ACTUAL AND NATURAL UNEMPLOYMENT RATES IN CANADA

The figure shows the actual unemployment rate and an estimate of the natural rate of unemployment in Canada for the period 1960–2006. The difference between the actual and natural unemployment rates is the cyclical unemployment rate. Note that the natural rate of unemployment rose from the 1960s to the 1980s but has been fallen since.

Source: Unemployment rate: see Figure 13.2; natural rate of unemployment, estimated by the authors.



The Long-Term Behaviour of the Unemployment Rate (continued)

- The long-term unemployment rate may be influenced by:
  - *changes in the composition of the labour force by age and sex;*
  - *structural changes in the economy; and*
  - *changes in the design of the employment insurance program.*
- All of these have had effects.

The Long-Term Behaviour of the Unemployment Rate (continued)

- Demographic changes:
  - *younger workers and, until mid-90s, females have higher unemployment rates so increases in their participation can raise the natural rate (a composition effect);*
  - *since then, a fall in the number of younger workers and a change in the work patterns of females has lowered the natural rate.*

The Long-Term Behaviour of the Unemployment Rate (continued)

- Technological change:
  - *this would tend to create mismatches;*
  - *as well there were declines in the importance of manufacturing and a rise in the share of services; and*
  - *this explanation doesn't explain recent declines when there has been even more technological change, so perhaps this is not the whole story.*

The Long-Term Behaviour of the Unemployment Rate (continued)

- The role of employment insurance (EI):
  - *persistent differences in unemployment rates between provinces suggest a non-cyclical explanation;*
  - *key aspects of EI – replacement ratios, benefit duration and eligibility requirements – vary by province and are related to local conditions;*
  - *their generosity can create disincentives to look for work;*
  - *one study found that the disincentive effect was lowest in Alberta and highest in Nova Scotia, with Ontario lying in between.*

The Long-Term Behaviour of the Unemployment Rate (continued)

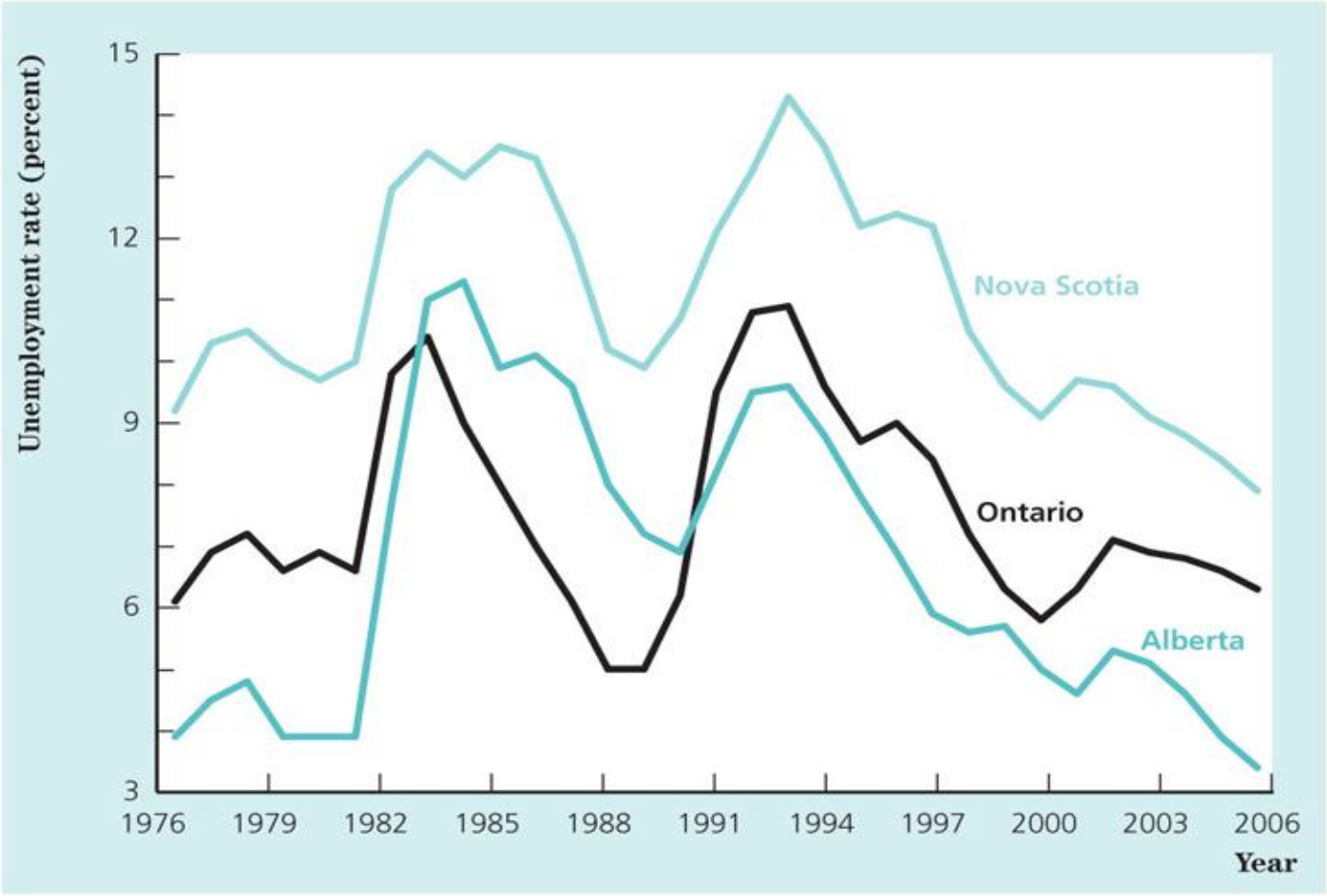
- Until recently unemployment rates differed between Canada and the US.
- There are a number of explanations:
  - *differences in definitions; and*
  - *differences in generosity of employment insurance (more people looking for work).*
- But these are not whole story since the EI program has been tightened more recently.
  - *cyclical differences are also important;*
  - *more recently these rates have moved closer together.*

FIGURE 13.10

UNEMPLOYMENT RATES BY REGION

The figure shows unemployment rates for selected provinces from 1976 to 2006. The average value of the unemployment rate differs systematically across provinces. Although the changes in the provincial unemployment rates from year to year have a common pattern, there also are movements specific to each province. For example, the unemployment rate in Alberta is particularly sensitive to the price of fossil fuels. Thus, while the 1982 recession increased unemployment rates in all provinces, the added effect of a legislated reduction in the price of oil caused Alberta's unemployment rate to move from well below Ontario's rate to well above. Since the end of energy price controls, the unemployment rate in Alberta has again fallen below that in Ontario.

Source: Adapted from Statistics Canada CANSIM II series v2465004, v2466894, and v2463114.



Hysteresis in Unemployment

- Hysteresis in unemployment means that the natural unemployment rate changes in response to the actual unemployment rate – there is a feedback effect.
- *First*, if workers are idle for long periods of time their skills deteriorate and mismatches increase.

Hysteresis in Unemployment (continued)

- *Second*, some regulations on firms may cause them to be cautious about hiring workers because the regulations make it difficult to fire them.
- *Third*, insider-outsider theory suggests that unionized labour increases wages for insiders and leaves outsiders unemployed (often a European issue) – in effect, the unemployed have become disenfranchised.
- Insiders may also lobby for more generous unemployment benefits.
- In Canada, there is not much, if any, evidence of hysteresis, although there is persistence in the unemployment rate.

Basing Policy on Estimates of the Natural Unemployment Rate

- Knowing the level of the natural rate would help policymakers (both monetary and fiscal authorities) to know the actual position of the economy.
  - *Unfortunately it can only be measured imprecisely, at best.*
  - *Some researchers blame the inflation of the 1970s on poorly measured natural rates (Orphanides).*
  - *As a result, many feel that policy changes should be gradual – probing by the Fed in the 1990s is an example.*

How to Reduce the Natural Rate of Unemployment

- With no exploitable trade-off, policymakers focus on fundamental causes of unemployment. Policies could include:
  - *Increase government support for job training and reallocation.*
  - *Increase labour-market flexibility.*
  - *Reform Employment Insurance programs.*
- All economists agree that macro policies cannot be used to affect the natural rate.

Perfectly Anticipated Inflation

- The costs of inflation depend whether or not it can be predicted.
- Because nominal wages are rising together with prices, the purchasing power is not hurt by the perfectly anticipated inflation.
- Perfectly anticipated inflation would also not hurt the value of savings accounts for similar reasons.

The Cost of Perfectly Anticipated Inflation

- But even perfectly anticipated inflation can have costs.
  - *Shoe leather costs of inflation is time and effort incurred by people and firms who are trying to minimize their holdings of cash.*
  - *Such costs may be small but they are not trivial – they have been estimated at about 0.3% of GDP in Canada.*
  - *Menu costs of inflation, the cost incurred in changing prices more frequently, tend to be small.*
  - *Welfare costs of inflation-induced tax distortions.*
- These costs are all small although perhaps non-trivial.

The Cost of Unanticipated Inflation

- The costs of unanticipated inflation are larger.
- Creditors and those with incomes set in nominal terms are hurt, whereas debtors and those who make fixed nominal payments are helped by unanticipated inflation – there is an arbitrary redistribution of income and wealth.
- While a redistribution nets out for the economy as a whole, people are made worse off by increasing risk of gaining or losing wealth.
- People must spend time and effort learning about different prices – price changes are no longer serving as a signal.

The Cost of Hyperinflation

- Hyperinflation occurs when the inflation rate is extremely high for a sustained period of time.
  - The shoe leather costs are enormous.
  - The government's ability to collect taxes is undermined – people delay paying.
  - The market efficiency is disrupted if not destroyed.
- A particularly high inflation rate occurred in Hungary after WWII – 19 800% per month!
- If this rate were annualized, it would be 3 followed by 52 digits – an enormous number.

Fighting Inflation: The Role of Inflationary Expectations

- Inflation occurs when the aggregate demand for goods exceed supply.
- The only factor that can create sustained rises in aggregate demand and ongoing inflation is a high rate of money growth.
- While monetary policy can be used to stimulate demand during a recession, the stimulus has to be withdrawn once full employment is achieved – in the past, failure to do so has led to inflation.

Fighting Inflation (continued)

- The process of disinflation – the reduction of money growth – can, and often does, lead to a recession.
- If inflation falls below the expected rate, unemployment will rise above the natural rate.
- The expectations augmented Phillips curve suggests a recession can be avoided (or at least lessened) if the expected inflation rate can be made to fall.
- How to lower expectations is the trick.

Rapid versus Gradual Disinflation

- A cold turkey strategy is a rapid and decisive reduction in the growth rate of the money supply.
- Some have argued that such an approach would quickly lower expectations.
- However, if prices and wages are slow to adjust, it will lead to rising unemployment.
- This seemed to be the case in Canada during the late 1980s, at least for a while.

Rapid versus Gradual Disinflation (continued)

- A policy of gradualism is a policy of reducing the rate of money growth gradually over a period of time.
- This policy will raise unemployment by less than the cold-turkey strategy, but the period of higher unemployment will be longer.

Rapid versus Gradual Disinflation (continued)

- The cost, in terms of lost output or rising unemployment, is called the sacrifice ratio.
- In the 1980s, inflation fell from 11.6% to 3.8%, a drop of 7.8 percentage points over 16 quarter period, while the cumulative output loss was 18.6% of potential GDP.
- The sacrifice ratio in that period was 2.4%, or for every one percentage point fall in inflation the cost was 2.4% of GDP.
- The average sacrifice ratio in Canada is 1.5%.
- Given these costs, is there an easier way to do this?

Another Way: Wage and Price Controls

- Frustration with inflation has sometimes led governments to implement wage and price controls (income policies), which are legal limits on the ability of firms to raise wages or prices.
- Versions of this policy were tried in both Canada and the US in the 1970s, with mixed results.
  - *Price controls are likely to create shortages and are hard to enforce in certain markets – commodities for instance.*
  - *Other demand policies must go in the same direction, actions which would help lower inflation expectations – this was not the case in the US but was so in Canada.*
  - *Wage-price controls are intended to affect the public's expectations of inflation but the public may in turn expect a catch-up after the controls are lifted – and this tended to happen.*
  - *There was some success with the "6 and 5" program in the early 1980s on expectations but these were not comprehensive controls.*

Credibility and Reputation

- All economists agree that achieving low-cost disinflation requires reducing π^e the major message from Friedman and Phelps has sunk in.
- One way is to have clear and unambiguous announcement of policy – Canada has done this.
- Also need to develop a reputation but this may take time – but there are benefits.
- As well you need an independent central bank – in 1997, the new Labour government made the Bank of England and long-term interest rates fell immediately.

Using a Model to Calculate the Cost of Disinflation

- Consider the following simple model of the economy, an inflation augmented Phillips curve and an Okun's law relationship – to measure the output costs of disinflation (problem 1).

$$\pi = \pi^e - 2.0(u - \bar{u})$$

$$(Y - Y^{FE})/Y^{FE} = -2.0(u - \bar{u})$$

- Consider a two year disinflation period (in year 1, $\pi = 0.04; \pi^e = 0.08;$ followed in year 2 by, $\pi = 0.04, \pi^e = 0.04$). The natural rate ($\bar{u}$) is 0.06.
- Because actual inflation falls while expectations remain unchanged then in year 1, u rises to 0.08 and the output gap (the output cost of disinflation) is -0.04.

Using a Model to Calculate the Cost of Disinflation (continued)

- In year 2, actual and expected inflation are the same and accordingly actual unemployment equals the natural rate – the adjustment is over.
- The sacrifice ratio is then the cost of the disinflation divided by the fall in inflation (0.04/0.04 = 1).
- Now suppose we have the following:

Year	**1**	**2**	**3**	**4**
π	0.08	0.04	0.04	0.04
π^e	0.10	0.08	0.06	0.04

Using a Model to Calculate the Cost of Disinflation (continued)

- We can calculate the cost in terms of unemployment and output using the simple model. These are:

Year	**1**	**2**	**3**	**4**
u	0.07	0.08	0.07	0.06
$(Y - Y_{t-1})/Y_{t-1}$	-0.02	-0.04	-0.02	0.00

- Note that the Okun's Law relationship changes after the initial period to a rate of change.
- The drop in inflation was from 0.08 to 0.04 = - 0.04, while the cumulative output costs were – 0.08.
- The sacrifice ratio is now 2 – the longer it takes to get expectation down the higher the sacrifice ratio.