

AGGREGATE DEMAND AND AGGREGATE SUPPLY ANALYSIS

Chapter 13

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Chapter Outline

- **13.1** Aggregate Demand
- **13.2** Aggregate Supply
- **13.3** Macroeconomic Equilibrium in the Long Run and the Short Run
- **13.4** A Dynamic Aggregate Demand and Aggregate Supply Model
- **Appendix** Macroeconomic Schools of Thought

Aggregate Demand and Aggregate Supply Model

In the last few chapters, we have learned how long-run economic growth is modeled and also how real GDP is determined in the short run.

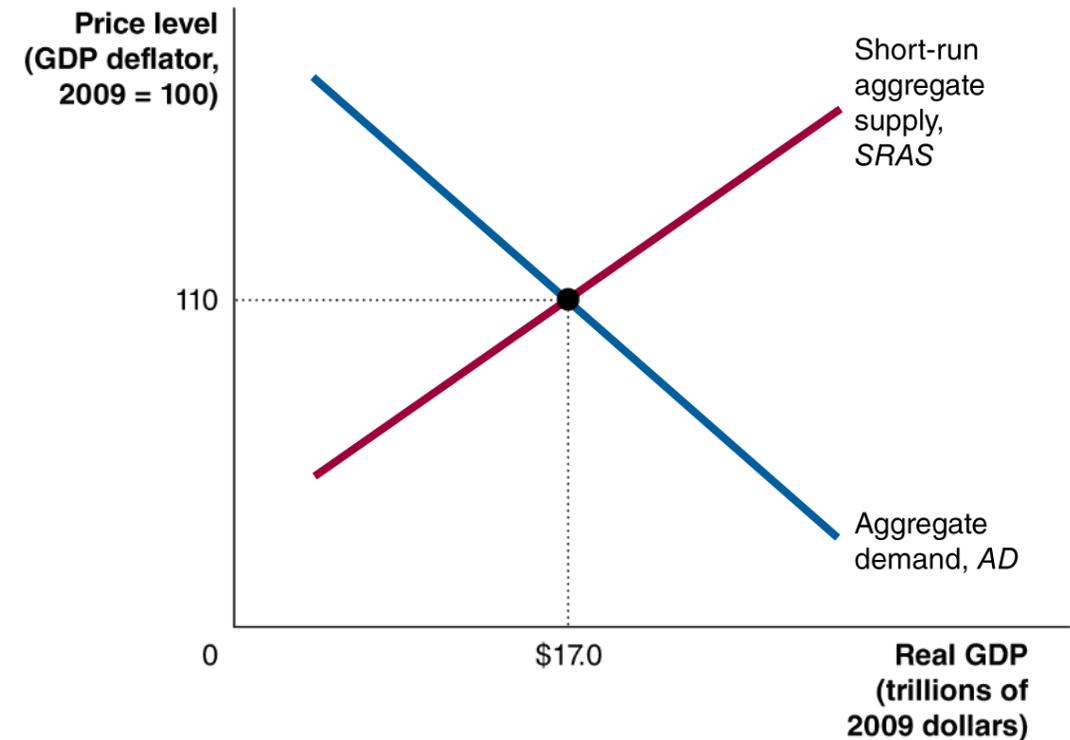
New goal: extend the model of the economy in the short run, in order to explain why the following fluctuate:

- Real GDP
- Employment
- The price level

New model: **Aggregate demand and aggregate supply model**, a model that explains short-run fluctuations in real GDP and the price level.

Determining Real GDP and Price Level

- **Aggregate demand (AD) curve:** A curve that shows the relationship between the price level and the quantity of real GDP demanded by households, firms, and the government.
- **Short-run aggregate supply (SRAS) curve:** A curve that shows the relationship in the short run between the price level and the quantity of real GDP supplied by firms.
- In the short run, the **real GDP** and **price level** are determined by the intersection of aggregate demand curve and the short-run aggregate supply curve as shown by **Figure 13.1** on the right.



13.1 Aggregate Demand: Consumers

The Aggregate Demand curve is downward sloping. We can examine each of the components of real GDP to prove that.

Recall that, real GDP has four components:

- Consumption (C)
- Investment (I)
- Government purchases (G)
- Net exports (NX)

Adding these gives real GDP:

$$Y = C + I + G + NX$$

Government purchases are generally determined by the decisions of policymakers; but each of the others changes, depending on the price level. We will examine each in turn.

The Wealth Effect: How a Change in the Price Level Affects Consumption

Household consumption is most strongly determined by income, but it is also affected by wealth.

Some household wealth is held in *nominal assets*, so as price levels rise, the real value of household wealth declines.

Suppose you own a house worth \$1.1 million. As the price level rises, the real value of the house is less than \$1.1m. As a result, you feel poorer than you were. This results in less consumption.

- Implication: higher price level leads to lower consumption.

The Interest-Rate Effect: How a Change in the Price Level Affects Investment

When prices rise, households and firms need more money to finance buying and selling. e.g. buying raw materials for production or machinery.

This increase in demand for money causes the “price” of holding money (the interest rate) to rise. Rising interest rates discourage firm investment.

- Implication: higher price level leads to lower investment.

The International-Trade Effect: How a Change in the Price Level Affects Net Exports

Suppose, when U.S. price levels rise, U.S. products are costlier than the rest of the world's products. Thus, U.S. exports become more expensive and imports become relatively cheaper.

Fewer exports and more imports means net exports falls.

- Implication: higher price level leads to lower net exports.

All three effects show higher price levels leading to lower values of components of real GDP. ***This establishes that the aggregate demand curve slopes downward.***

Movements along the Aggregate Demand Curve vs. Shifts of the Aggregate Demand Curve

The aggregate demand curve shows the relationship between the price level and real GDP demanded, *holding everything else constant*.

- A change in the price level not caused by a component of real GDP changing results in a movement along the AD curve.
- A change in some component of aggregate demand, on the other hand, will shift the AD curve.

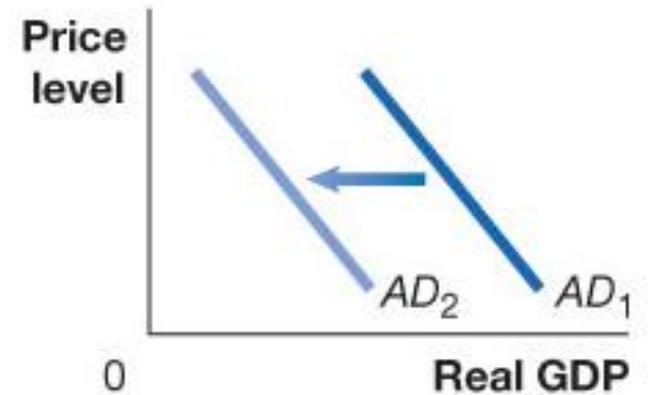
Variables That Shift The Aggregate Demand Curve: Government Policies

A government policy change could shift aggregate demand. There are two categories of government policies here:

1. **Monetary policy**: The actions the Federal Reserve takes to manage the *money supply* and *interest rates* to pursue macroeconomic policy objectives.

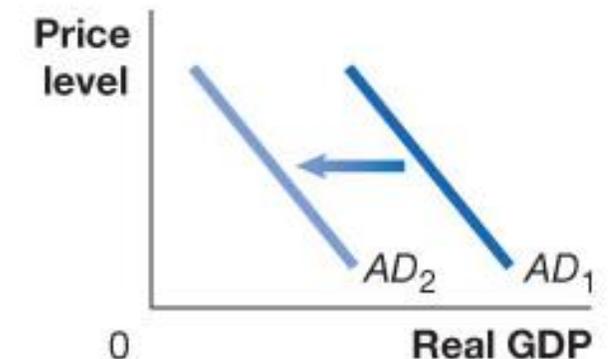
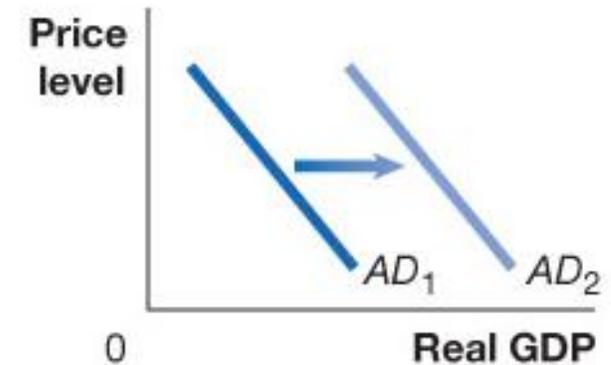
Say, the Federal Reserve causes *interest rates* to rise. This increases the cost of borrowing for individuals and firms, thus causing consumption and investment spending to fall and the AD curve shifts to the left as shown in the figure on the right.

If it causes interest rates to fall, investment spending will rise and the AD curve shifts to the right (not shown).



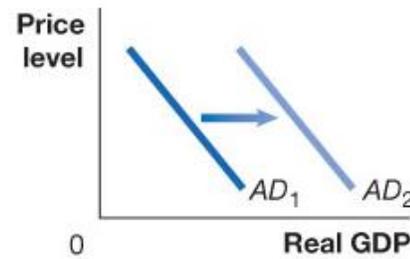
Variables That Shift The Aggregate Demand Curve: Government Policies

2. **Fiscal policy:** Changes in *federal taxes and purchases (government spending)* that are intended to achieve macroeconomic policy objectives.
- *Increasing or decreasing taxes* affects disposable income and hence consumption. Say if the tax rate decreases, your disposable income is higher than before. Consumption is higher, aggregate demand is higher and hence the AD curve shifts to the right and vice versa.
 - The government can also alter its *level of government purchases*. If government spending decreases, people want to consume less than before, aggregate demand falls and hence the AD curve shifts to the left and vice versa.



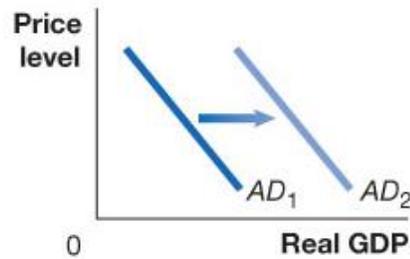
Variables That Shift The Aggregate Demand Curve: Expectations of the Future

households' expectations of their future incomes



consumption spending increases.

firms' expectations of the future profitability of investment spending

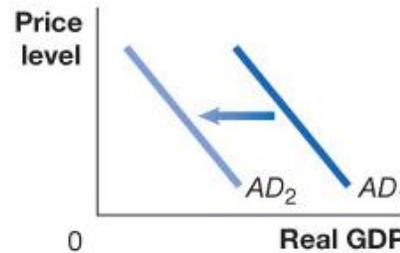


investment spending increases.

- *Households or firms could become more optimistic* about the future, increasing consumption or investment respectively thus shifting the AD curve to the right.
- Of course, the opposite could also occur.

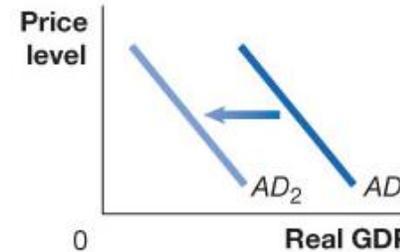
Variables That Shift The Aggregate Demand Curve: Relative GDP Growth and Exchange Rate

the growth rate of domestic GDP relative to the growth rate of foreign GDP



imports will increase faster than exports, reducing net exports.

the exchange rate (the value of the dollar) relative to foreign currencies



imports will rise and exports will fall, reducing net exports.

- If *foreign incomes* rise more slowly than ours, their imports of our goods (our exports) fall, aggregate demand falls and the AD curve shifts to the left; if ours rise more slowly, *our* imports fall.
- If our *exchange rate* (the value of the \$US) rises, our exports become more expensive, so foreigners buy less of them (and we buy more imports, also).

Making the Connection: Recessions and the Components of AD

We can understand the 2007-2009 recession better by examining what happened to the components of real GDP:

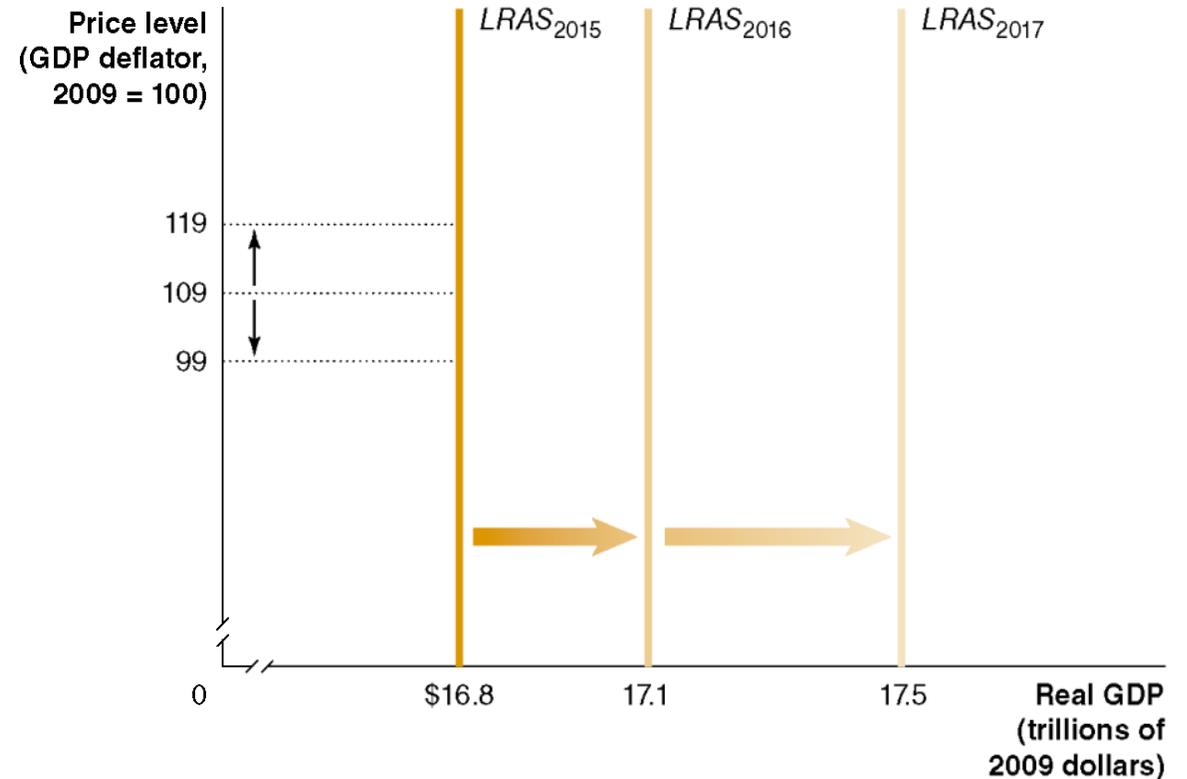
- **Consumption** spending fell, relative to potential GDP, during the recession. This was unusual: consumption usually stays steady during a recession. Consumption also stayed low in the post-recession years.
- **Residential investment** had been falling before the recession and continued to fall during it. Spending on residential investment has continued to be below the pre-recession boom levels. The non-housing components of investment actually rose relative to potential GDP during the recession, before falling after.
- **Net exports** increased (became less negative) just before and during the recession. This was in part due to the falling value of the \$US. After the recession, net exports started to decrease once more, but then has stayed relatively steady.
- Loose monetary policy has kept the value of the \$US down.

13.2 Aggregate Supply: Producers

- Aggregate supply refers to the quantity of goods and services that firms are willing and able to supply.
- The relationship between this quantity and the price level is different in the long and short run.
- So we will develop both a *short-run* and *long-run aggregate supply curve*.
- **Long-run aggregate supply (LRAS) curve**: A curve that shows the relationship in the long run between the price level and the quantity of real GDP supplied.

Figure 13.2 The Long-Run Aggregate Supply Curve

- In the long run, the level of real GDP is determined by the number of workers, the level of technology, and the *capital stock* (factories, machinery, etc.).
- None of these elements are affected by the price level, **so LRAS does not depend on the price level**; hence, it is a vertical line.
- LRAS occurs at the level of *potential or full-employment GDP*, which advances each year.



Short-Run Aggregate Supply Curve

While the LRAS is vertical, the SRAS is upward-sloping. Why?

- *As prices of final goods (output) and services rise, prices of inputs—such as the wages of workers or the price of natural resources—rise more slowly.* Higher prices for output means higher profits, and a increasing willingness to produce more to increase profits further.
- A secondary reason is that some firms are slow to adjust their prices when the price level rises or falls.

Economists tend to believe that *some firms and workers fail to accurately predict changes in the price level.* This gives three potential explanations for why the SRAS curve is upward-sloping:

- *Contracts make some wages and prices “sticky”*
- *Firms are often slow to adjust wages*
- *Menu costs make some prices sticky*

Why Is the SRAS Curve Upward-Sloping?

Contracts make some wages and prices “sticky”

- Prices and wages are said to be “sticky” when they do not respond quickly to changes in demand or supply.
- Some firms and workers fail to predict price level changes, and hence do not correctly build them into long-term contracts.

Firms are often slow to adjust wages

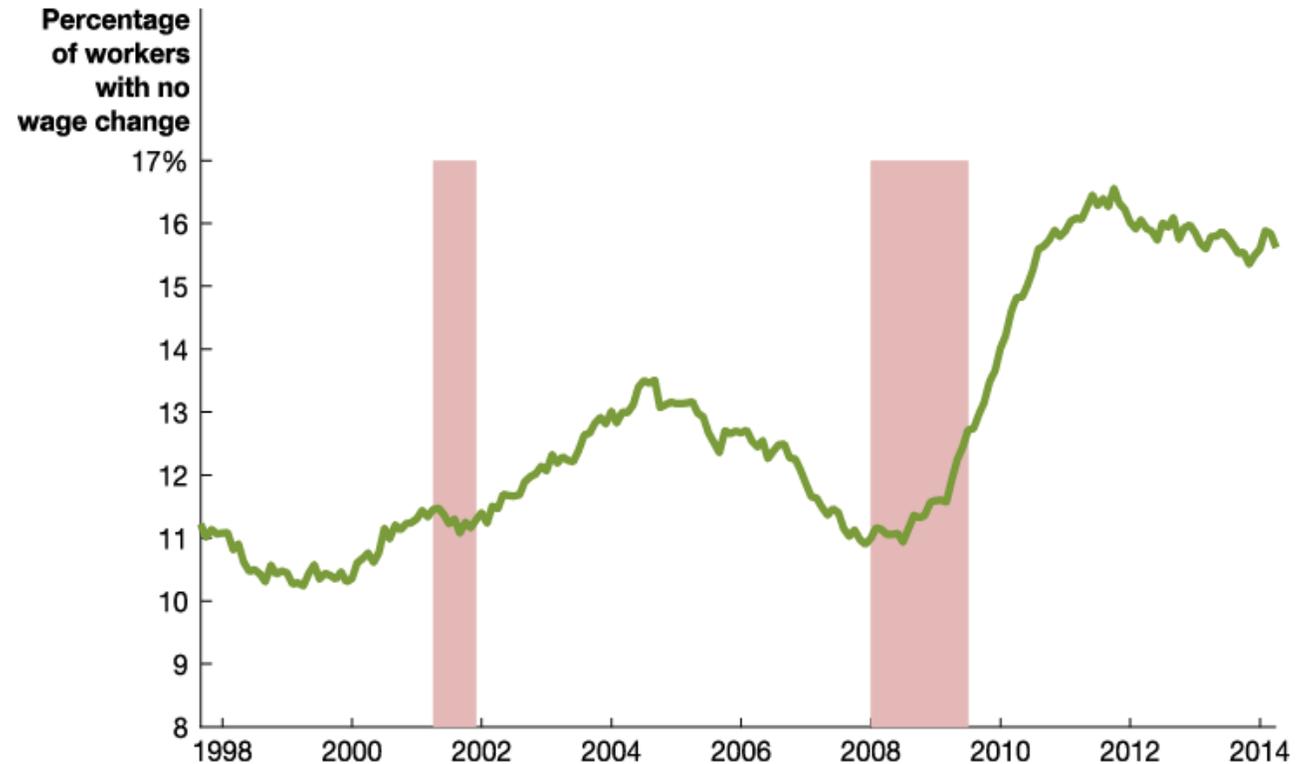
- Annual salary reviews are “normal,” for example.
- Also, firms dislike cutting wages—it’s bad for morale.

Menu costs make some prices sticky

- Firms have **menu costs**: the costs to firms of changing prices.
- A small “optimal” change in price may not be worth the hassle for a firm to perform.

Making the Connection: How Sticky Are Wages?

- It is unclear how sticky wages are. There is good evidence that wages are at least sticky *downward*.
- Instead of cutting (nominal) wages, firms tend to fire current workers, freeze pay, and offer lower salaries to new workers.
- The graph shows the percentage of workers with no wage change in a given year.



Shifts of the SRAS Curve vs. Movements along It

The short-run aggregate supply curve describes the relationship between the price level and the quantity of goods and services firms are willing to supply, *holding constant all other variables that affect the willingness of firms to supply goods and services.*

- A change in the price level *not caused by factors that would otherwise affect short-run aggregate supply* results in a movement along a stationary SRAS curve.
- But some factors cause the SRAS curve to shift; we will consider them in turn.

Figure 13.3 How Expectations of the Future Price Level Affect the Short-Run Aggregate Supply Curve

- If workers and firms believe the price level will rise by a certain amount, say 3 percent, they will try to adjust their wages and prices accordingly.
- Holding constant all other variables that affect aggregate supply, the SRAS will shift to the left.
- *Widely held expectations of future price-level increases are self-fulfilling!*

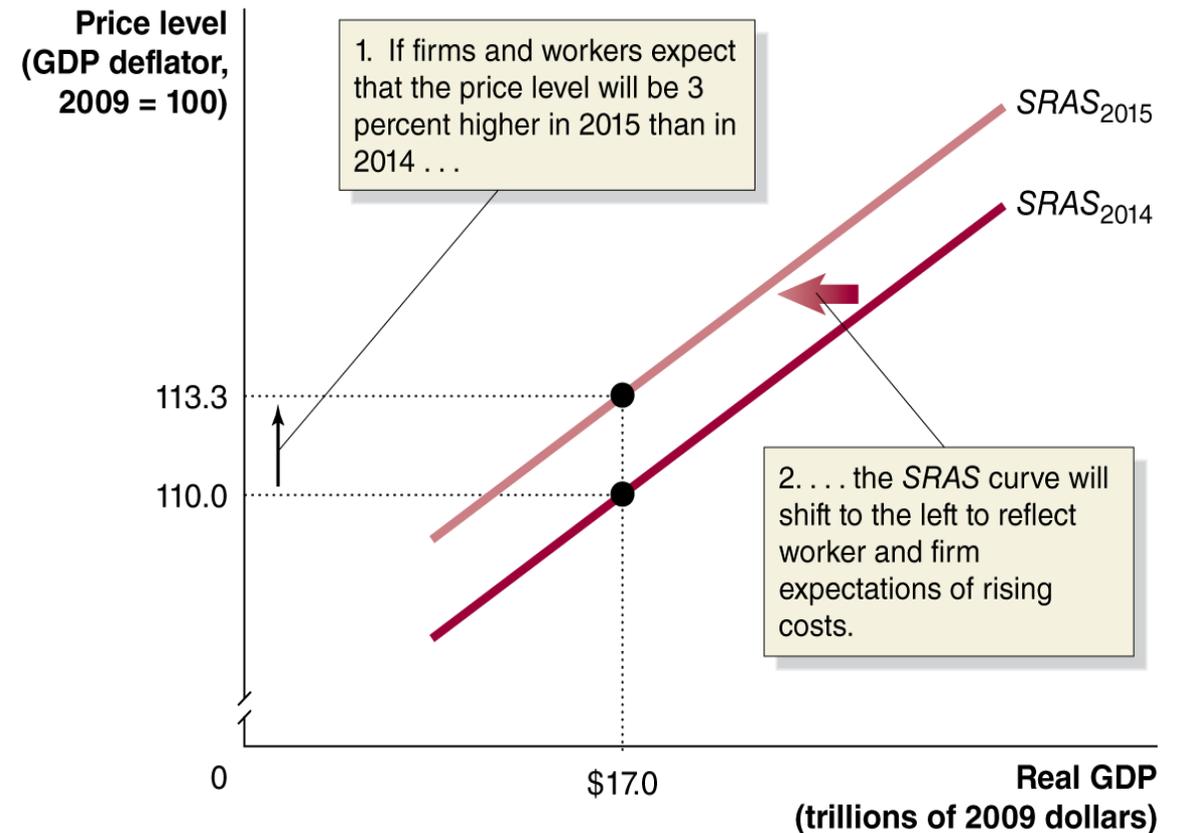
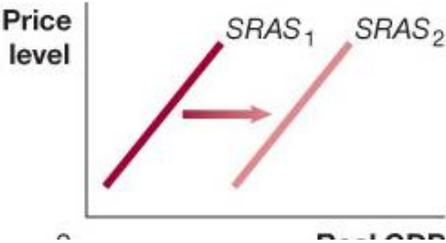
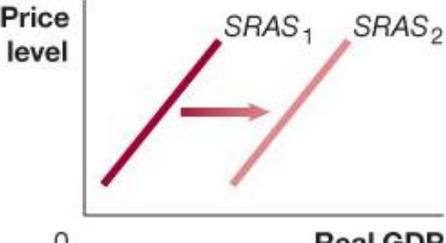


Table 13.2 Variables That Shift the Short-Run Aggregate Supply Curve (1 of 3)

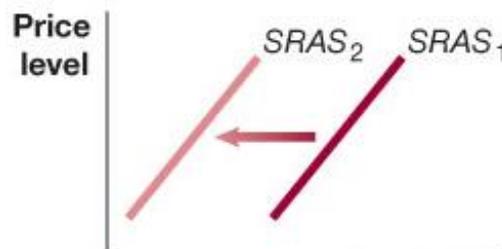
An increase in ...	shifts the short-run aggregate supply curve ...because ...
the labor force or the capital stock	 <p>more output can be produced at every price level.</p>
productivity	 <p>costs of producing output fall.</p>

An increase in the *availability of the factors of production*, like labor and capital, allows more production at any price level.

- A decrease in the availability of these factors decreases SRAS.
- *Improvements in technology* allow productivity to improve, and hence the level of production at any given price level.

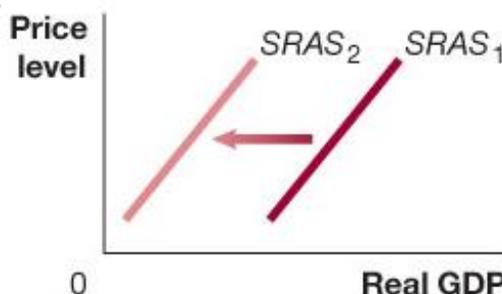
Table 13.2 Variables That Shift the Short-Run Aggregate Supply Curve (2 of 3)

the expected future price level



workers and firms increase wages and prices.

workers and firms adjusting to having previously underestimated the price level



workers and firms increase wages and prices.

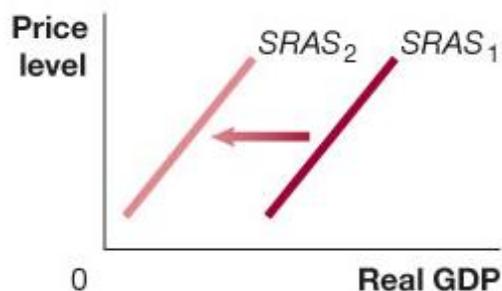
If workers and firms expect higher prices in the future, SRAS shifts to the left.

This could happen because:

- Inflation expectations increase or
- Workers and firms realize they previously underestimated the price level.

Table 13.2 Variables That Shift the Short-Run Aggregate Supply Curve (3 of 3)

the expected price of an important natural resource



costs of producing output rise.

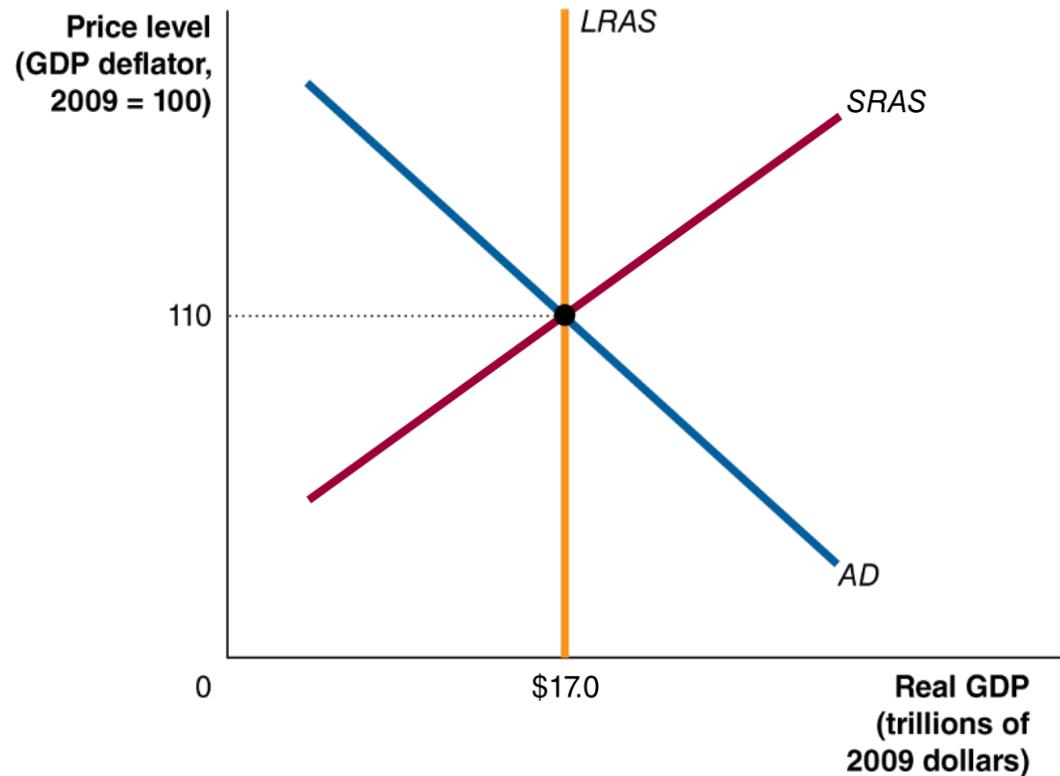
- A **supply shock** is an unexpected event that causes the short-run aggregate supply curve to shift.
- *Example: Oil prices increase suddenly. Firms immediately anticipate rising input prices and as a consequence will only produce the same amount of output if their own prices rise.*
- Unexpected input price increases decrease SRAS; unexpected input price *decreases* would shift SRAS to the right instead.

13.3 Macroeconomic Equilibrium in the Long Run and the Short Run

- Now we are ready to introduce the long-run aggregate supply curve into our model.
- Remember, the LRAS shows the level of potential, or full-employment, GDP.

Note, we will use the aggregate demand and aggregate supply model to illustrate the difference between short-run and long-run macroeconomic equilibrium.

Figure 13.4 Long-Run Macroeconomic Equilibrium

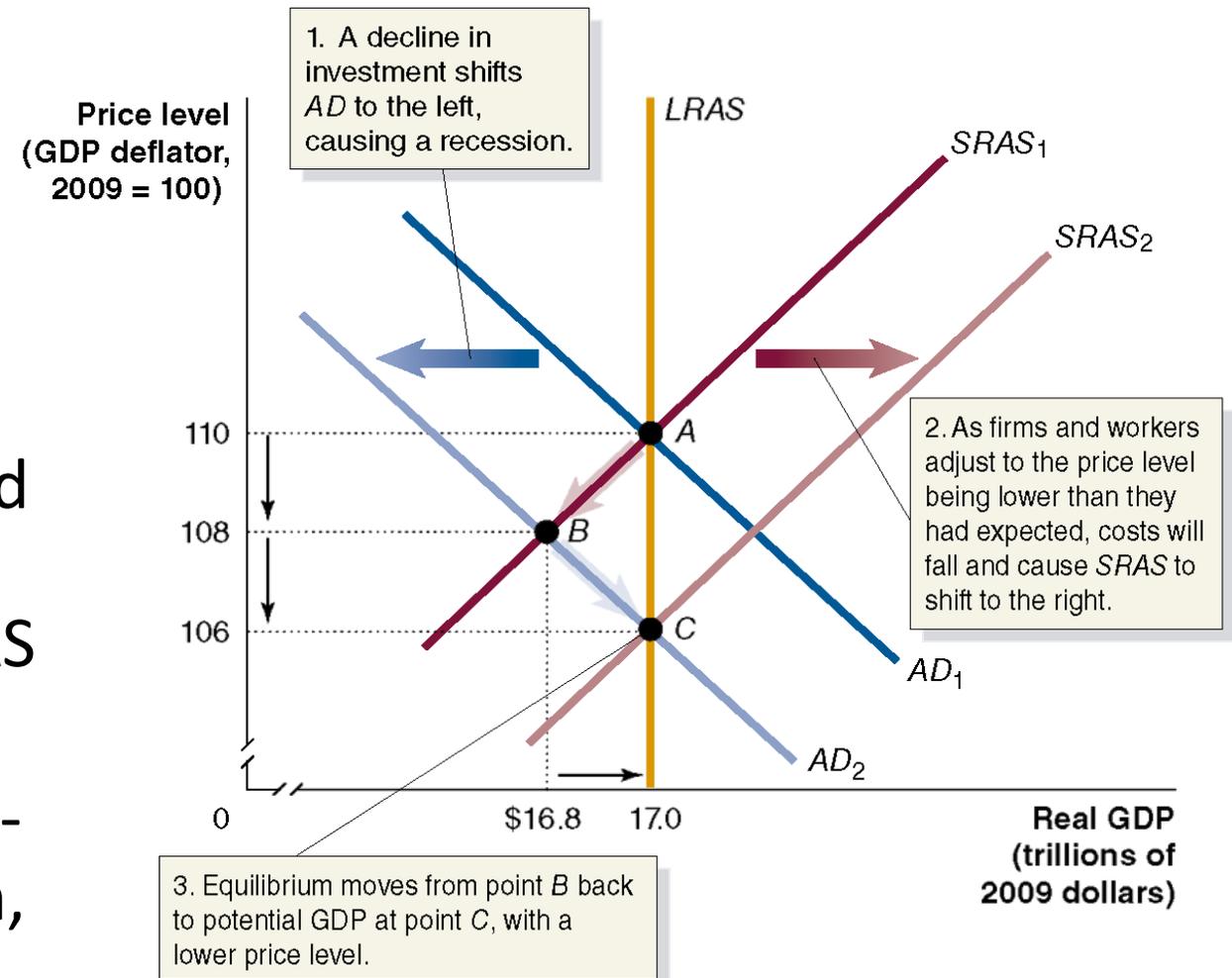


- Long-run macroeconomic equilibrium occurs when the AD and SRAS curves intersect at the LRAS level, i.e. when the economy is in short-run equilibrium, and GDP is at its full-employment level.
- For simplicity, assume no inflation (current and expected price level is 110) and no growth (LRAS fixed at \$17.0 trillion).

Figure 13.5 The Short-Run and Long-Run Effects of a Decrease in Aggregate Demand

Suppose interest rates rise.

- Planned investments fall: AD shifts left
- Workers lose their jobs, firms lose sales: a recession
- Workers accept lower wages and firms expect lower prices, including lower input costs: SRAS shifts right
- SRAS shifting right restores long-run macroeconomic equilibrium, with a lower price level.



Making the Connection: Does It Matter What Causes Aggregate Demand to Fall?

GDP has four components; an decrease in any of the four could cause a recession. Does it make any difference *which* component causes the recession?

- Ed Leamer of UCLA: “housing *is* the business cycle.”
- Recent research suggests that recessions caused by financial crises tend to be larger and more long-lasting than declines due to other factors.

Figure 13.6 The Short-Run and Long-Run Effects of an Increase in Aggregate Demand

Suppose that firms become more optimistic about the future.

- They increase investment, shifting AD to the right.
- Unemployment falls below its *natural rate*, workers will push for higher wages; the increased demand for goods raises prices.
- Firms and workers raise expectations about the price level, shifting SRAS to the left—restoring long run equilibrium.

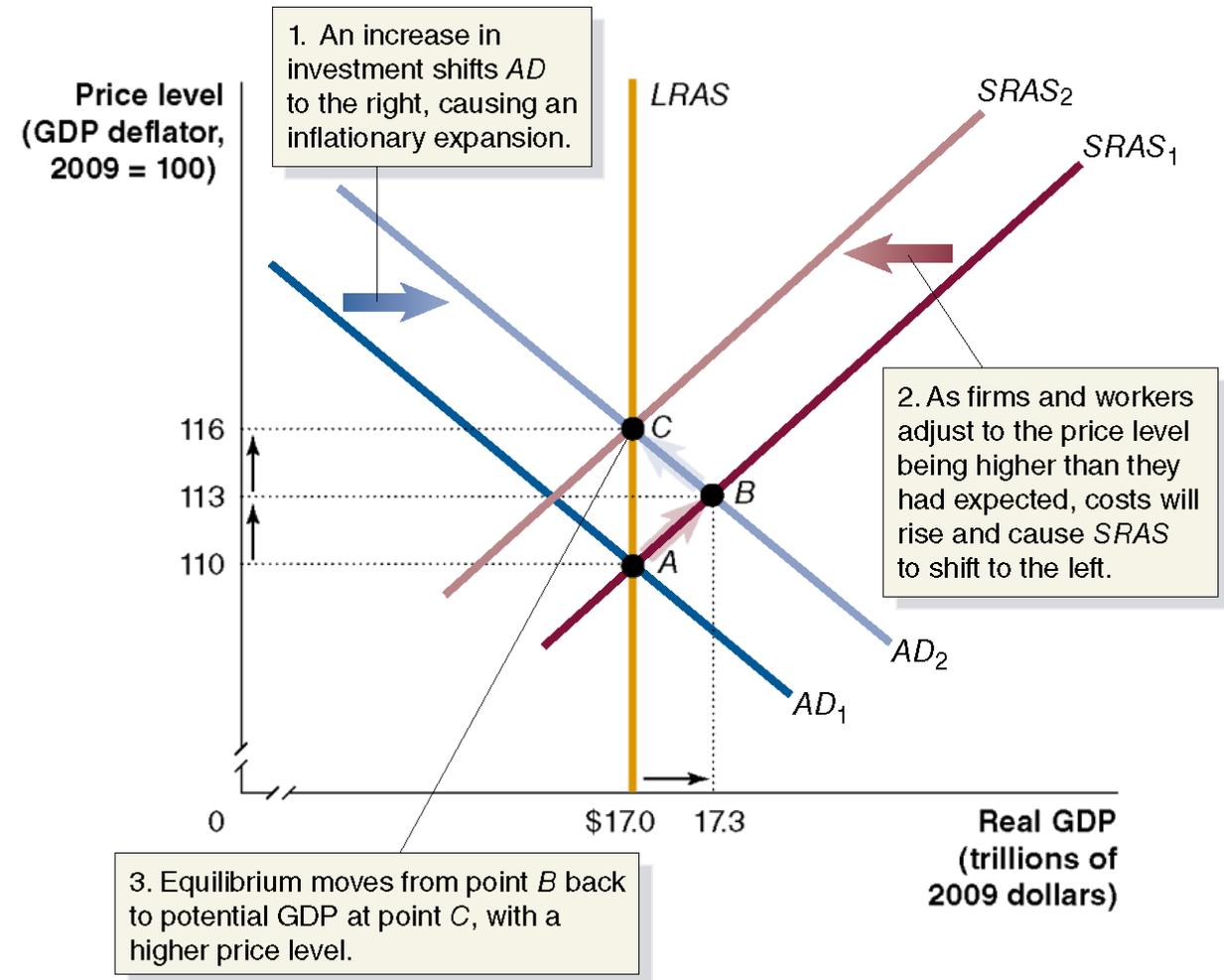


Figure 13.7 The Short-Run and Long-Run Effects of a Supply Shock (1 of 3)

- In the previous analyses, AD moved suddenly. What if instead SRAS moved suddenly? We call this a *supply shock*.
- For example, suppose a sudden increase in oil prices shifts SRAS to the left.
- This causes **stagflation**, a combination of inflation and stagnation, usually resulting from a supply shock.

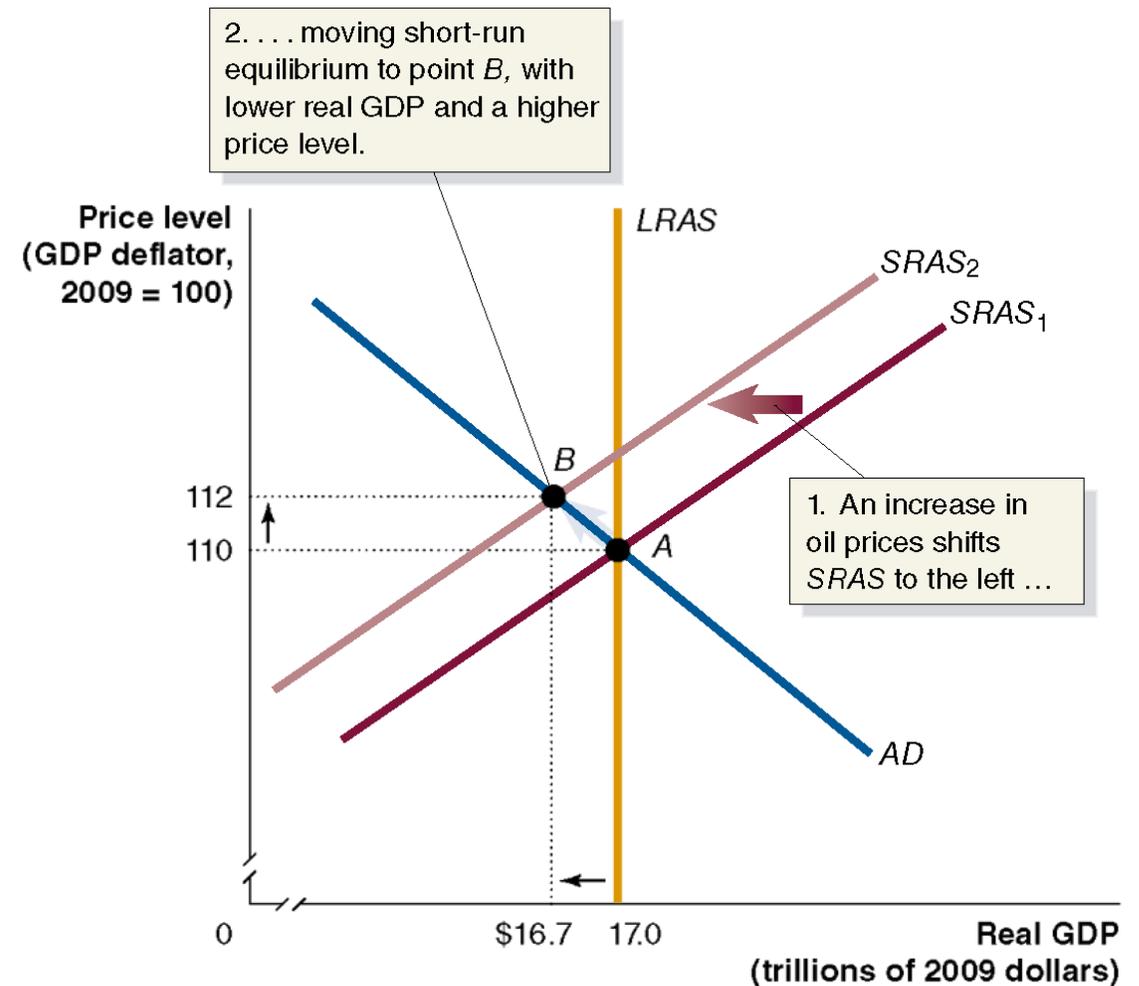


Figure 13.7 The Short-Run and Long-Run Effects of a Supply Shock (2 of 3)

- With the lower level of output, people are unemployed and products go unsold.
- Workers accept a lower wage, and firms decrease prices in order to clear inventories.
- With the decrease in expectations about prices, SRAS moves to the right, restoring long-run equilibrium.

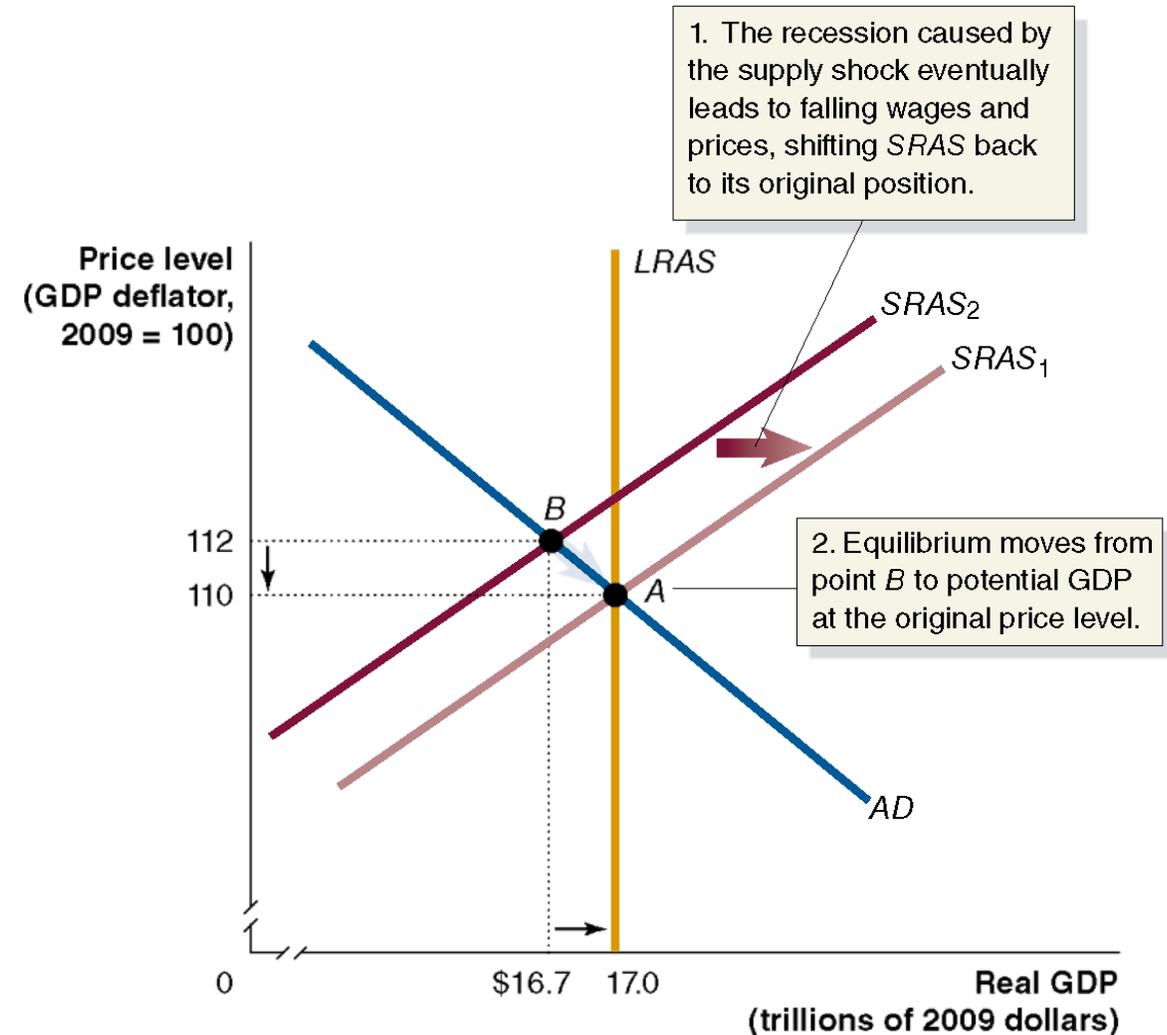
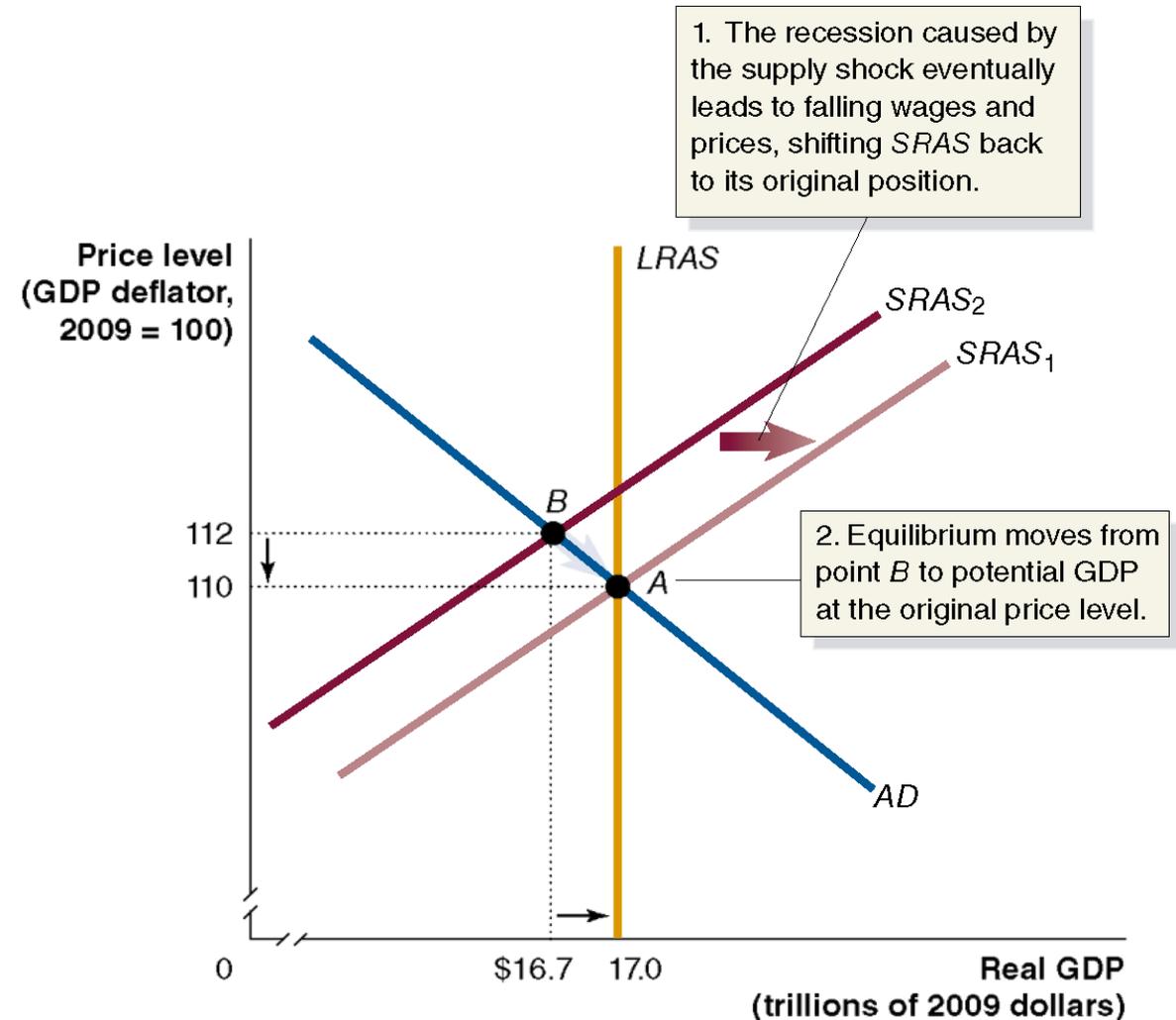


Figure 13.7 The Short-Run and Long-Run Effects of a Supply Shock (3 of 3)

How long does it take to restore full employment?

- It depends on the severity of the supply shock, but it is likely to take several years.
- An alternative to waiting this long is to use fiscal or monetary policy to increase aggregate demand.
- This will result in permanently higher prices but may be worth the cost.



Making the Connection: How Long Is the Long Run in Macroeconomics?

How long after a recession does real GDP return to its previous peak level?

- Since 1950, average is 6 quarters (1½ years).
- But variability across recessions is large.

What about employment?

- Very long, after recession of 2007-2009.
- But second-longest since 1950 was 2001 recession.

13.4 A Dynamic Aggregate Demand and Aggregate Supply Model

Our model of aggregate demand and aggregate supply so far has been *static*, in the sense that:

- Price levels were constant (no inflation)
- There was no long-run growth

We will now form a *dynamic aggregate demand and aggregate supply* model, incorporating:

- Continually increasing real GDP, shifting LRAS to the right
- AD also ordinarily shifting to the right
- SRAS shifting to the right except when workers and firms expect high rates of inflation

Figure 13.8 A Dynamic Aggregate Demand and Aggregate Supply Model

- Initially the economy is at A.
- As the LRAS and SRAS curves shift to the right, so does the AD curve.
- The resulting equilibrium is at B.
- Note, that the price level remains the same because shifts in the LRAS and SRAS curves are of the same magnitude.

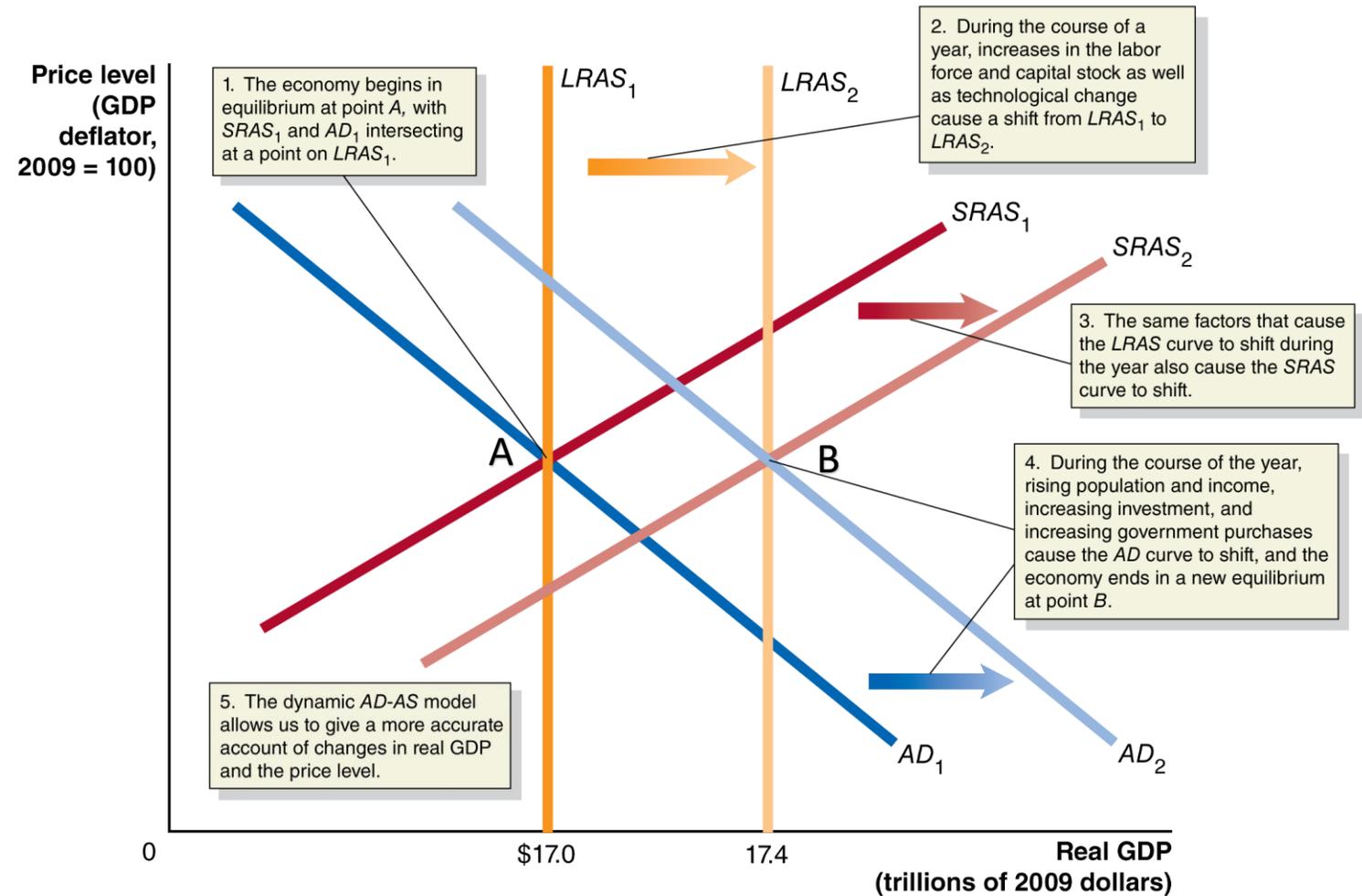
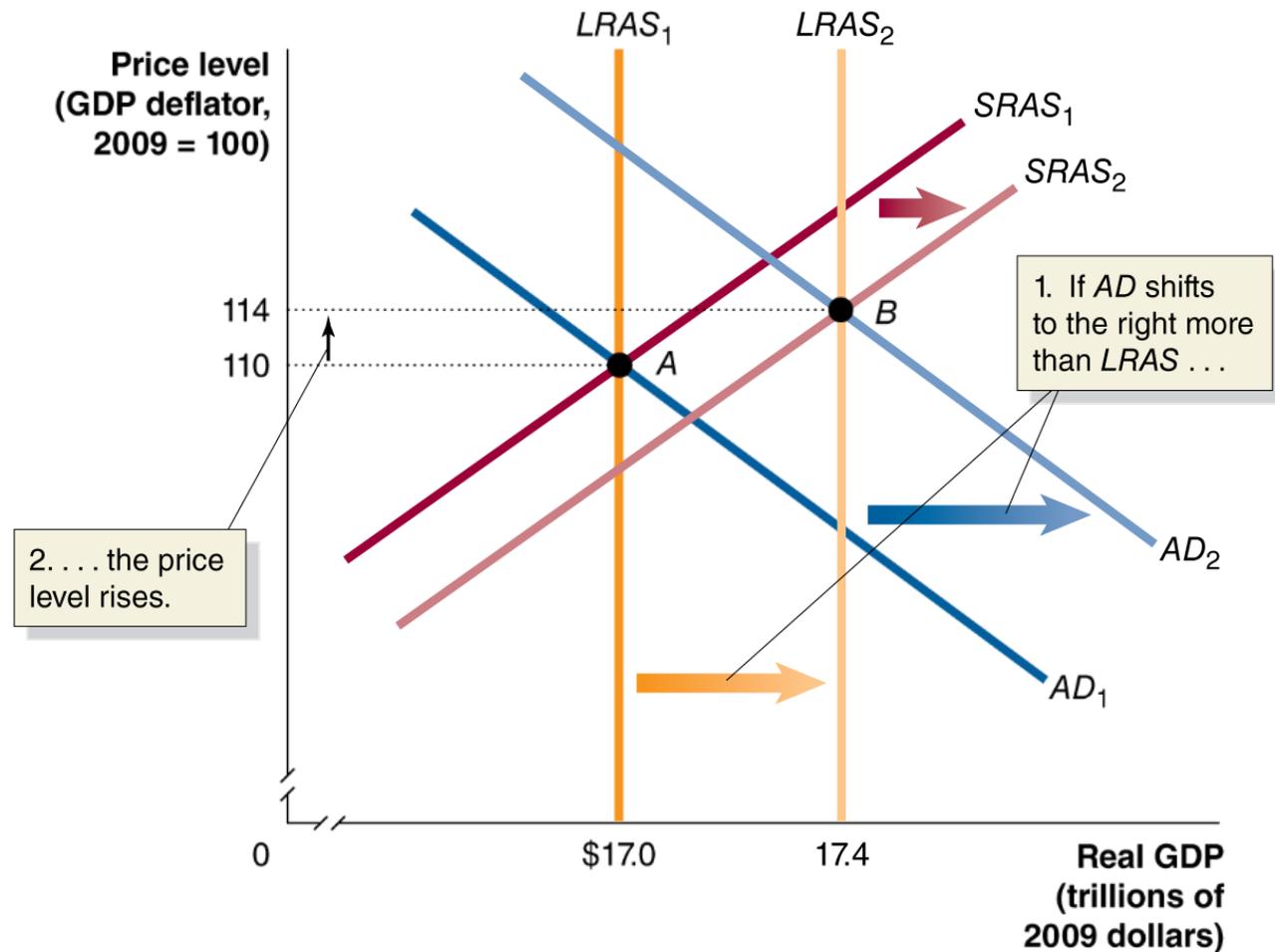


Figure 13.9 Using Dynamic aggregate Demand and Aggregate Supply to Understand Inflation

The usual cause of **inflation** is total spending (AD) increasing faster than production (AS). Here, the shifts in the LRAS and SRAS curves are of different magnitudes.

- AD moves further right than does LRAS.
- SRAS moves to the right; but the anticipated rise in the price level causes it to *move less far* than LRAS.
- Long run equilibrium is restored but with a higher price level.



Main Factors Causing the Recession of 2007-2009: Did You Know?

- *The end of the housing bubble*

House prices rose in the early 2000s—initially due to low interest rates—but then due to *speculation*. In 2006, the speculative bubble began to deflate, and the spending on residential investment fell.

- *The financial crisis*

Since housing prices were falling, people were paying more in mortgage payments than the market value of their houses. As many people defaulted on their mortgages, many financial institutions took heavy losses. This financial crisis led to a *credit crunch*, decreasing consumption and investment spending.

- *The rapid increase in oil prices during 2008*

Several factors combined to increase the price of oil from \$34 per barrel in 2004 to \$140 per barrel in mid-2008. This *supply shock* exacerbated the ongoing recession.

Figure 13.10 The Beginning of the Recession of 2007-2009

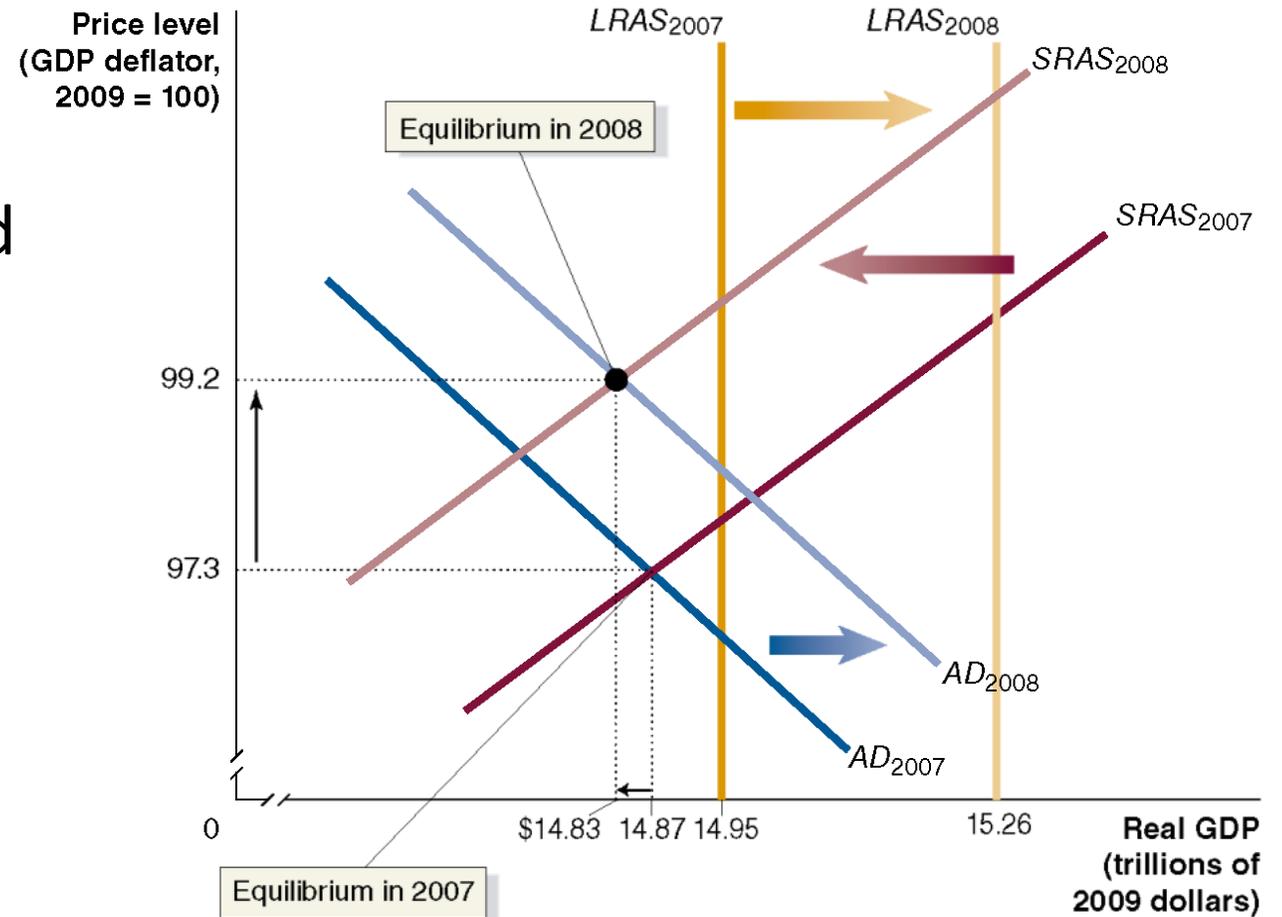
In 2007, the economy was a little below long-run equilibrium.

As usual, potential GDP increased from 2007 to 2008.

- But aggregate demand did not keep pace (housing bubble, financial crisis).

At the same time, increasing oil prices shifted short-run aggregate supply to the left.

- The result: higher prices and well below potential real GDP.



Appendix: Macroeconomic Schools of Thought

Macroeconomic theory is relatively less settled than microeconomic theory.

Macroeconomics developed as a separate field within economics after the Great Depression.

- John Maynard Keynes' 1936 book *The General Theory of Employment, Interest, and Money* inspires the model we have addressed in this chapter.
- Widespread acceptance of Keynes' model became known as the **Keynesian revolution**.

New Keynesian Economics

Modern followers of Keynes refer to themselves as *New Keynesians*.

- Emphasize the stickiness of wages and prices in explaining fluctuations in real GDP—a concept which Keynes did not include in his original model.

The Monetarist Model

Monetarism refers to the macroeconomic theories of Milton Friedman and his followers, particularly the idea that the quantity of money should be increased at a constant rate.

Friedman argued in the 1940s that most fluctuations in real output were caused by fluctuations in the *money supply*.

Therefore, the Federal Reserve should concentrate less on interest rates, and more on following a **monetary growth rule**, a plan for increasing the quantity of money at a fixed rate that does not respond to changes in economic conditions.

Monetarism is based on the *quantity theory of money*, which we will examine in the next chapter.

The New Classical Model

- **New classical macroeconomics** emerged in the 1970s; it consists of the macroeconomic theories of Robert Lucas and others, particularly the idea that workers and firms have *rational expectations*.
- In the new classical school of thought, workers and firms develop *expectations about price levels*. If these expectations are wrong, then the *real wage will be too high or too low*, causing firms to reduce or increase employment respectively—recession or expansion.
- New classical economists believe these fluctuations can be minimized by helping workers and firms to form correct expectations—again, a consistent *monetary growth rule*.

The Real Business Cycle Model

- The real business cycle model of the economy focuses on real, rather than monetary, causes of the business cycle.
- Adherents to this model also believe that workers and firms form rational expectations about prices and wages, which adjust quickly to supply and demand.
- But they argue that the main sources of fluctuations in real GDP are *temporary productivity shocks*.
- They maintain that aggregate supply is vertical *even in the short run*, unaffected by the price level. It is supply shocks that affect the level of real output.

The Austrian Model

- The Austrian school of economics began in the late nineteenth century with the writings of Carl Menger and was advanced by Ludwig von Mises and Friedrich von Hayek.
- The Austrian school argues for the superiority of the market system over economic planning. Hayek particularly argued that only the price system could make use of all of the dispersed information to achieve efficiency.
- He also developed a theory of the business cycle wherein central bank induced low interest rates *cause* the business cycle, by prompting overinvestment.

Austrians argue the 2007-2009 recession fits this model—the Fed cut interest rates too low in fighting the 2001 recession, they claim.

Which School of Thought Is Correct?

Well, we do not know which school of thought is correct about the economy.

- Many pieces of evidence can be interpreted in several different ways.
- Economists cannot isolate particular elements to study and conduct controlled experiments.

So it is likely that debate about the applicability of schools of thought, and hence optimal policies for governments to pursue, will continue for the foreseeable future.

Making the Connection: Karl Marx: Capitalism's Strongest Critic

- The schools of thought so far presented are “mainstream”; one vocal critic of mainstream economic thought was 19th century German Karl Marx.
- He believed in the *labor theory of value*, which attributed all of the value of a good or service to the labor embodied in it.
- Marx argued that the market system would eventually be replaced by a Communist economy, in which the workers would control production.
- This would happen because workers (*proletariat*) would rebel against exploitation by large capitalist firms (*bourgeoisie*), unable to afford an above-subsistence standard of living.

THE END

“The long run is a misleading guide to current affairs. In the long run we are all dead.”

- John Maynard Keynes, A Tract on Monetary Reform